BEFORE

THE CENTRAL ELECTRICITY REGULATORY COMMISSION,

NEW DELHI

PETITION NO. _____ OF 2025

IN THE MATTER OF

Application under Section-14, 15, 79(1)(e) of the Electricity Act, 2003 read with Central Electricity Regulatory Commission (Procedure, Terms and Conditions for Grant of Transmission License and other related matters) Regulations, 2024 with respect to Grant of Transmission License to KPS III HVDC Transmission Limited

AND IN THE MATTER OF

Adani Energy Solutions Limited

.... Petitioner

Versus

Central Transmission Utility of India Limited and Ors.

.... Respondents

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Adani Energy Solutions Limited

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Adani Energy Solutions Limited

Place: Ahmedabad

Date: 01.12.2025

Petitioner

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BEFORE

THE CENTRAL ELECTRICITY REGULATORY COMMISSION,

NEW DELHI

PETITION NO. _____ OF 2025

IN THE MATTER OF

Application under Section-14, 15, 79(1)(e) of the Electricity Act, 2003 read with Central Electricity Regulatory Commission (Procedure, Terms and Conditions for Grant of Transmission License and other related matters) Regulations, 2024 with respect to Grant of Transmission License to KPS III HVDC Transmission Limited

AND IN THE MATTER OF

Adani Energy Solutions Limited

.... Petitioner

Versus

Central Transmission Utility of India Limited and Ors.

.... Respondents

MEMO OF PARTIES

Adani Energy Solutions Limited
Having its registered office at;
Adani Corporate House, Shantigram
Near Vaishno Devi Circle, S. G. Highway,
Khodiyar, Ahmedabad -382421 ....Petitioner

Adani Energy Solutions Limited

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Versus

1. Central Transmission Utility of India Limited

   Saudamini, Plot No.2, Sector-29,

   Gurgaon-122 001

2. PFC Consulting Limited

   Urjanidhi, 1, Barakhamba Lane, Connaught Place,

   New Delhi, Delhi -110001

3. Madhya Pradesh Power Management Company Limited (MPPMCL)

   Block No. – 11, Ground Floor, Shakti Bhavan,

   Vidhyut Nagar, Rampur,

   Jabalpur – 482 008, Madhya Pradesh

4. Chhattisgarh State Power Distribution Company Limited (CSPDCL)

   P.O. Sunder Nagar, Dangania,

   Raipur – 492013, Chhattisgarh

5. Maharashtra State Electricity Distribution Company Limited (MSEDCL),

   Prakashgad, 4th Floor, Bandra (East),

   Mumbai – 400051

6. Gujarat Urja Vikas Nigam Limited (GUVNL)

   Vidhyut Bhavan, Race Course,

   Vadodara – 390007

7. DNH Power Distribution Corporation Limited,

   66 kV, Amli Ind. Estate, Silvasa – 396230

   Dadar Nagar Haveli

Adani Energy Solutions Limited

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8. Electricity department, Government of Goa,
   Vidyut Bhavan, Near Mandvi Hotel,
   Panaji, Goa – 403001
9. Dadra and Nagar Haveli and Daman and Diu
   Power Distribution Corporation Limited
   1st & 2nd Floor, Vidyut Bhavan, Silvassa,
   Dadra and Nagar Haveli – 396230

.....Respondents

Adani Energy Solutions Limited

Petitioner

Place: Ahmedabad
Date: 01.12.2025

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BEFORE

THE CENTRAL ELECTRICITY REGULATORY COMMISSION,

NEW DELHI

PETITION NO. _____ OF 2025

NOTARY * DEVENDRA K. PRAJAPATI * AHMEDABAD DIST GUJARAT STATE REGD.NO. 18130/2020 GOVERNMENT OF INDIA

IN THE MATTER OF

Application under Section-14, 15, 79(1)(e) of the Electricity Act, 2003 read with Central Electricity Regulatory Commission (Procedure, Terms and Conditions for Grant of Transmission License and other related matters) Regulations, 2024 with respect to Grant of Transmission License to KPS III HVDC Transmission Limited

AND IN THE MATTER OF

Adani Energy Solutions Limited

....Petitioner

Versus

Central Transmission Utility of India Limited & Ors

....Respondents

AFFIDAVIT

I, **Prashant Kumar**, son of Sh. Jagdish Prasad aged about 48 years, R/o B-101, Sanskar Apartments, Satellite, Ahmedabad do hereby solemnly affirm and state on oath as under:

1. That I am the Authorised Representative, of the Petitioner, Adani Energy Solutions Limited, and I am fully conversant with the facts and circumstances of the case and I have been duly authorized and am, therefore, competent to affirm this affidavit.

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Adani Energy Solutions Limited

2. That I have read the accompanying submissions being submitted on behalf of Adani Energy Solutions Limited and have understood the contents thereof and that the contents therein are true and correct to the best of my knowledge and belief.

Prashant Kumar

DEPONENT

Adani Energy Solutions Limited

VERIFICATION

I, **Prashant Kumar**, the above named deponent do hereby verify that the contents of this affidavit are true and correct to the best of my knowledge and belief, no part of it is false and nothing material has been concealed therefrom.

Verified by me on this 1st December, 2025 at Ahmedabad.

Prashant Kumar

DEPONENT

Adani Energy Solutions Limited

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NOTARY DEVENDRA K. PRAJAPATI AHMEDABAD DIST GUJARAT STATE REGD.NO. 18130/2020 GOVERNMENT OF INDIA

Serial No. 2390/A/2025
Book No. A
Page No. 134

DEVENDRA K. PRAJAPATI
NOTARY
GOVT. OF INDIA

- 1 DEC 2025

SOLEMNLY AFFIRMDE BEFORE ME

DEVENDRA K. PRAJAPATI
NOTARY
GOVT. OF INDIA

- 1 DEC 2025

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BEFORE

THE CENTRAL ELECTRICITY REGULATORY COMMISSION,

NEW DELHI

PETITION NO. _____ OF 2025

IN THE MATTER OF

Application under Section-14, 15, 79(1)(e) of the Electricity Act, 2003 read with Central Electricity Regulatory Commission (Procedure, Terms and Conditions for Grant of Transmission License and other related matters) Regulations, 2024 with respect to Grant of Transmission License to KPS III HVDC Transmission Limited

AND IN THE MATTER OF

Adani Energy Solutions Limited

.... Petitioner

Versus

Central Transmission Utility of India Limited & Ors

.... Respondents

PETITION / APPLICATION UNDER SECTION 14, 15, 79 (1) (e) OF THE ELECTRICITY ACT, 2003 FOR GRANT OF TRANSMISSION LICENSE MOST RESPECTFULLY SHOWETH:

1. It is most respectfully submitted that Adani Energy Solutions Limited (herein after referred to as "Petitioner") is filing the present Application under Section-14 of the Electricity Act, 2003 read with Central Electricity Regulatory Commission (Procedure,

Adani Energy Solutions Limited

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Terms and Conditions for Grant of Transmission License and other related matters) Regulations, 2024 (hereinafter referred to as "Transmission ***Licence Regulations***") for grant of Transmission Licence to establish transmission project for "**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C** " on build, own, operate and transfer basis (hereinafter referred to as "***the project***") consisting of following elements:

	Name of the Transmission Element	**Scheduled COD in months from Effective Date**
1.	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	48 months from SPV transfer
2.	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*	
3.	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal	
4.	KPS3 - KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations	
5.	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)	

**The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC and HVAC switch yards shall be implemented by the TSP*

2. It is most respectfully submitted that Ministry of Power, Government of India, vide Gazette Notification dated 29.08.2023 has notified PFC Consulting Limited (PFCCL)

Adani Energy Solutions Limited

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to be the Bid Process Coordinator (Hereinafter referred as "BPC") for the purpose of selection of Bidder as Transmission Service Provider (Hereinafter referred as "TSP") to establish Transmission System for **"Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"** through tariff based competitive bidding process.

A copy of the Government of India, Ministry of Power's Gazette Notification is enclosed herewith and marked as ***ANNEXURE A1.***

3. It is further submitted that BPC had initiated the selection of successful bidder to acquire the TSP in accordance with the "*Tariff Based Competitive Bidding Guidelines for Transmission Service*" and "*Guidelines for Encouraging Competition in Development of Transmission Projects*" issued by Government of India, Ministry of Power under Section-63 of the Electricity Act, 2003.

4. BPC has issued notification of Request for Proposal (RFP) and subsequently its amendment to the RFP for clarifications and extension of related to project. A copy of Request for Proposal along with amendments is enclosed herewith and marked as ***ANNEXURE A2.***

5. It is most respectfully submitted that pursuant to the process of competitive bidding conducted by the BPC, M/s. Adani Energy Solutions Limited has been declared as the successful bidder. Adani Energy Solutions Limited (successful bidder selected through Tariff Based Competitive Bidding process) under the Companies Act 1956 by the name "Adani Transmission Limited" having its registered office at Adani Corporate House,

Adani Energy Solutions Limited

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Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad - 382421, Gujarat, has been incorporated on 09.12.2013. Further, name of the company has been changed from "ADANI TRANSMISSION LIMITED" to "ADANI ENERGY SOLUTIONS LIMITED" on 27.07.2023. A copy of the Certificate of Registration of the Petitioner Company is enclosed herewith and marked as ***ANNEXURE A3.***

6. Further, on 14th November, 2025 the BPC issued a Letter of Intent (hereinafter referred to as "***LoI***") to M/s Adani Energy Solutions Limited. A copy of the Letter of Intent (LoI) along with the details of Annual Transmission Charges is enclosed herewith and marked as ***ANNEXURE A4***. AESL vide its letter dated 18th November, 2025 accepted LoI. A copy of the AESL letter unconditionally acceptance of LoI is enclosed herewith and marked as ***ANNEXURE A5***.

7. It is humbly submitted that as per the Clause 2.15.4 of RFP, the TSP/Petitioner is required to apply for Grant of Transmission Licence.

8. Further the Transmission Service Agreement (TSA) will be signed between the Central Transmission Utility of India Limited (Nodal Agency) and "KPS III HVDC Transmission Limited". Copy of the Draft TSA is enclosed herewith and marked as ***ANNEXURE A6***.

9. It is humbly submitted that Section-14 of the Electricity Act, 2003 provides that the Appropriate Commission may, on an application made under Section-15 of the Electricity Act, 2003, grant Licence to any person to transmit electricity as a

Adani Energy Solutions Limited

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transmission licensee in any area as may be specified in the Licence. The word 'person' has been defined in Section 2(49) of the Act to include any company or body corporate or association or body of individuals, whether incorporated or not, or artificial juridical person. Therefore, the Petitioner in accordance with the TSA and under Section 14 of the Electricity Act, 2003 is filing the present Petition/Application inter-alia seeking grant of Transmission Licence for the Project explained above.

10. Further, it is most respectfully submitted that Section 15(1) of the Act provides that every application under Section 14 shall be made in such manner and in such form as may be specified by the Appropriate Commission and shall be accompanied with such fees as may be prescribed. Central Electricity Regulatory Commission (Procedure, Terms and Conditions for Grant of Transmission License and other related matters) Regulations, 2024 and as per Regulation-4 of the aforementioned Regulations, a person selected through the process under the guidelines for competitive bidding is eligible for grant of licence for which the Petitioner is constrained to approach this Commission.

11. That the Petitioner, Adani Energy Solutions Limited, incorporated under the Companies Act, 1956 and has been selected on the basis of the Tariff Based Competitive Bidding as per the Tariff Based Bidding Guidelines for Transmission Service issued by the Government of India, Ministry of Power and thus eligible for issuance of transmission licence.

12. It is submitted that as per Clause 2.15.4 of Request for Proposal, application to the grant of transmission license is a condition and is also a requirement in law without which the Petitioner cannot proceed with the establishment of the Transmission System.

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Adani Energy Solutions Limited

13. The Hon'ble Commission in its CERC (Procedure, Terms & Conditions for grant of Transmission Licence and other related matters) Regulations, 2024 had prescribed the form of Application and also the amount of fee for making an Application for a Transmission Licence and the Petitioner is submitting herewith the Application in such prescribed format along with the fees as per Regulation 5(1) of the said Regulation. Copy of duly filled Form-I along with the Resolution passed by the Board of Directors of Adani Energy Solutions Limited is enclosed herewith and marked as ***ANNEXURE A7***.

14. It is most respectfully submitted that the copy of the Application for grant of Transmission Licence is being forwarded to each of the Respondents as per Regulation 5(3) of CERC (Procedure, Terms and Conditions of Transmission Licence and other related matters) Regulations, 2024.

15. It is further submitted that the Petitioner is submitting/furnishing a copy of the instant Application to Central Transmission Utility, as required under Section 15 (3) of the Act and Regulation 5(3) of CERC (Procedure, Terms and Conditions of Transmission Licence and other related matters) Regulations, 2024 for the recommendation, if any, in accordance with Section 15 (4) of the Act simultaneously along with submission of this petition to Hon'ble Commission.

16. The Petitioner has posted the Application for grant of Transmission Licence on its website www.adanienergysolutions.com as per Regulation 5(4) of CERC (Procedure, Terms and Conditions of Transmission Licence and other related matters) Regulations,

Adani Energy Solutions Limited

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2024 so as to facilitate the access to the Application by any person through internet. The petitioner shall publish a notice of its application in Form-II prescribed under Regulation 5(5) of CERC (Procedure, Terms and Conditions of Transmission Licence and other related matters) Regulations, 2024 for inviting comments from general public. This notice shall also be uploaded on website of petitioner.

17. Keeping in view the above, the Petitioner fulfils the eligibility criteria for grant of transmission licence as stipulated in Central Electricity Regulatory Commission (Procedure, Terms and Conditions for grant of Transmission Licence and other related matters) Regulations, 2024 and therefore the Hon'ble Commission may grant the prayer as prayed for.

18. It is humbly submitted that the bidding process was governed by the Tariff Based Competitive Bidding Guidelines for the Transmission Services and Standard Bidding Documents issued by the Ministry of Power. The tariff quoted inter alia takes into consideration the rights and obligations of the developer including the provisions available to claim time and cost variations as allowed in the TSA.

19. The terms of the TSA are binding on the parties (TSP & CTUIL) to the said agreement and any claim for escalation of transmission charges or for extension of time in pursuance of such competitive bidding process need to be dealt with in accordance with the terms contained in the bidding documents including the TSA. Post selection of the successful bidder and the decision to award the project, there cannot be a review of the bidding terms including in regard to the scope of the implications of the clauses such as force majeure, change in law etc. stipulated in the TSA. Further there are provisions in

Adani Energy Solutions Limited

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law such as Section 56 of the Indian Contract Act, 1872, which deals with the frustration of contract, impossibility of Performance etc. giving statutory remedies to the contracting parties. The Hon'ble Commission and other judicial forums have provided reliefs in the past in various cases as per the terms of the contract or as per the provisions of law where events occurrence during implementation are not attributable to the developers. Also, in terms of Section 28 of the Indian Contract Act, 1872, no restraint in taking legal proceedings in future can be validly placed.

20. It is further stated that in terms of the TSA the Applicant would implement the project as per the provisions of the Article 16.4 of the Transmission Service Agreement ('TSA'), which reads as under: -

"16.4 Parties to Perform Obligations:

Notwithstanding the existence of any Dispute and difference referred to Commission as provided in Article 16.3 and save as the Commission may otherwise direct by a final or interim order, the Parties hereto shall continue to perform their respective obligations/ roles (which are not in dispute) under this Agreement"

21. It is submitted that in facts and circumstances mentioned hereinabove, it is humbly submitted that claims, if any, made by the Applicant shall be in accordance with the provisions of the RFP projects Documents.

22. With reference to ensure the compliance of the requirements stipulated in Article 5.1.1 and Article 5.4 of the TSA, the Petitioner is making the following submission in the subsequent paragraphs.

23. That according to the terms of the TSA, there are three external agencies viz. CEA, CTU and Independent Engineer, which monitor the quality of the construction of the Transmission Project being constructed by the Applicant. Further, the Applicant under

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Adani Energy Solutions Limited

the TSA is entrusted with the obligation of providing progress report on a monthly basis, a progress report to the Nodal Agency and Central Electricity Authority ("CEA"), with regard to the project and its execution, to enable them to monitor and co-ordinate the development of the Project. Further, it is most respectfully submitted that in terms of the TSA the Nodal Agency shall appoint Independent Engineer for the purpose of inspecting the progress of the Project. In addition, the CEA may carry out random inspections during the Project execution, as and when deemed necessary by it. The relevant provisions of the TSA are extracted as below:

*"**Clause 4.1 (g) – TSP's obligation in development of the Project:***
Subject to the terms and conditions of this Agreement, the TSP at its own cost and expenses shall observe, comply with, perform, undertake and be responsible:
(g) To provide the Nodal Agency and CEA, on a monthly basis, progress reports with regards to the Project and its execution (in accordance with prescribed Form) to enable the CEA to monitor and co-ordinate the development of the Project matching with the Interconnection Facilities."

"Clause 5.5 – Progress Monitoring & Quality Assurance:
5.5.1 The Project Execution Plan submitted by the TSP in accordance with Article 3.1.3.c) shall comprise of detailed schedule of all the equipments/items/materials required for the Project, right from procurement of raw material till the dispatch from works and receipt at the site. Further, it should also include various stages of the construction schedule up to the commissioning of the Project.
5.5.2 Nodal Agency, CEA & Independent Engineer shall have access at all reasonable times to the Site and to the Manufacturer's works and to all such places where the Project is being executed.
5.5.3 Independent Engineer shall ensure conformity of the conductor specifications with the functional specifications specified in RFP.
5.5.4 The Independent Engineer shall monitor the following during construction of the Project:

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Adani Energy Solutions Limited

a) Quality of equipments, material, foundation, structures and workmanship etc. as laid down in Article 5.4 and 6.1.4 of the TSA. Specifically, quality of Sub-station equipments, transmission line material and workmanship etc. would be checked in accordance with the Article 5.4.

b) Progress in the activities specified in Condition Subsequent

c) Verification of readiness of the elements including the statutory clearances & completion of civil works, fixing of all components and finalisation of punch points (if any) prior to charging of the elements

d) Progress of construction of substation and Transmission Lines

5.5.5 The progress shall be reviewed by the Independent Engineer against the Project Execution Plan. The Independent Engineer shall prepare its report on monthly basis and submit the same to Nodal Agency highlighting the progress achieved till the end of respective month vis-A-vis milestone activities, areas of concern, if any, which may result in delay in the timely completion of the Project. Based on the progress, Nodal Agency and/ or CEA shall issue written instructions to the TSP to take corrective measures, as may be prudent for the timely completion of the Project. In case of any deficiency, the Nodal Agency would be at liberty to take action in accordance with the procedure of this Agreement.

5.5.6 For any delay in commissioning any critical Element(s), as identified in Schedule 1 & Schedule 2 of this Agreement, beyond a period of 45 days shall lead to a sequestration of 10% of the Contract Performance Guarantee."

*"**Clause 5.8 - Remedial Measures:***

The TSP shall take all necessary actions for remedying the shortfall in achievement of timely progress in execution of the Project, if any, as intimated by the Independent Engineer and/ or CEA and/ or the Nodal Agency. However, such intimation by the Independent Engineer and/ or CEA and/ or the Nodal Agency and the subsequent effect of such remedial measures carried out by the TSP shall not relieve the TSP of its obligations in the Agreement. Independent Engineer and/ or CEA and/ or the Nodal Agency may carry out random inspections during the Project execution, as

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Adani Energy Solutions Limited

and when deemed necessary by it. If the shortfalls as intimated to the TSP are not remedied to the satisfaction of the CEA and/ or the Nodal Agency, this Agreement may be terminated by the Nodal Agency by giving a Termination Notice to the TSP, in writing, of at least seven (7) days, with a copy to CEA and the Lenders' Representative in order to enable the Lenders to exercise right of substitution in accordance with Article 15.3 of this Agreement."

24. That the TSA further provides that the TSP i.e. the Applicant must ensure that the design and construction of the project is in accordance with Indian Standards and Codes issued by the Bureau of Indian Standards and in case they are not applicable, other equivalent internationally recognized Standards and Codes shall be followed. Further, in terms of the TSA the Applicant is also responsible for constructing and commissioning the Project in accordance with the norms prescribed in various Regulations issued by the CEA, Prudent Utility Practices and other applicable Laws. The relevant provisions of the TSA are extracted as below:

*"**Clause 5.1.1 of the TSA -TSP's Construction Responsibilities***
The TSP, at its own cost and expense, shall be responsible for designing, constructing, erecting, testing and commissioning each Element of the Project by the Scheduled COD in accordance with the Regulations and other applicable Laws specified in Article 4.1 of this Agreement."

*"**Clause 5.4 of the TSA - Quality of Workmanship**:*
The TSP shall ensure that the Project is designed, built and completed in a good workmanship using sound engineering and construction practices, and using only materials and equipment that are new and manufactured as per the MQP and following approved FQP for erection, testing & commissioning and complying with Indian /International Standards such that, the useful life of the Project will be at least thirty five (35) years from the COD of the Project.

Adani Energy Solutions Limited

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The TSP shall ensure that all major substation equipment / component (e.9. transformers, reactors, Circuit Breakers, Instrument Transformers (IT), Surge Arresters (SA), Protection relays, clamps & connectors etc.), equipment in terminal stations of HVDC installations including Thyristor/ IGBT valves, Converter Transformers, smoothing reactors, Transformer bushings and wall bushings, GIS bus ducts, towers and gantry structures and transmission towers or poles and line materials (conductors, earth wire, OPGW, insulator, accessories for conductors, OPGW & earth wires, hardware fittings for insulators, aviation lights etc), facilities and system shall be designed, constructed and tested (Type test, Routine tests, Factory Acceptance Test (FAT)) in accordance with relevant CEA Regulations and Indian Standards. In case Indian Standards for any particular equipment/ system/ process is not available, IEC/ IEEE or equivalent International Standards and Codes shall be followed."

25. It is most respectfully submitted that in terms of the above quoted provisions of the TSA there are sufficient checks and balances, and the quality control mechanism is already available whereby, CEA, Nodal Agency and Independent Engineer will monitor the overall quality of construction of the Project by the Applicant to ensure that the Applicant is complying with Article 5.1.1 and 5.4 of the TSA.

26. It is further submitted that the Applicant being an experienced entity will ensure that the project is constructed by following the required quality standard and prudent utility practices by putting in place the following: -

    i. At the procurement stage, the Qualification Requirement for shortlisting's of a supplier/contractor is done on the basis of the technical specifications as mentioned on the TSA. The purchase Order/contract mentions the technical

Adani Energy Solutions Limited

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standards and the testing requirements. Material dispatch is allowed after the conformance report is validated.

ii. For tower material, a Manufacturing Quality Plan (MQP) in line with the applicable technical standards and the one followed by CTU is followed.

iii. For ensuring construction quality, a Field Quality Plan (in line with the standards mentioned in TSA and that followed by CTU) is specified to the contractors in advance. The conformance report to the said document is also maintained at site.

iv. The construction and material supply quality are also validated with respect to the TSA by the Lenders Independent Engineer during its quarterly construction review.

27. That the above statement is without any prejudice to the rights of the Applicant/Transmission License as provided in the Electricity Act, TSA and the Laws.

28. The Petitioner shall also comply with all the other requirements as provided in the Transmission License Regulations including publication of notices in newspapers, service on the beneficiaries of the Petitioner's Transmission System. The Petitioner shall place the compliance report on record before the Hon'ble Commission.

29. **PRAYER**

The Petitioner hereby humbly prays the Hon'ble Commission to:

a) Issue / Grant the Transmission License to the, "**KPS III HVDC Transmission Limited**" for establishing, operating and maintaining the Inter-state Transmission System as provided for in the Transmission Service Agreement;

b) Allow the "**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C**" to be part of PoC Pool as per CERC (Sharing of Inter-State Transmission

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Charges and Losses) Regulations, 2020 and any other amendments thereon issued from time to time by Hon'ble Commission.

c) Condone any inadvertent errors omissions/ errors / shortcomings and permit the Petitioner to add/change/modify/alter these filings and make further submissions as may be required at a future date.

d) Pass any such other order / orders, as may be deemed fit and proper in the facts and circumstances of the case.

Adani Energy Solutions Limited

Petitioner

Place: Ahmedabad

Date: 01.12.2025

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Annexure A1

रजिस्ट्री सं. डी.एल.- 33004/99 REGD. No. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

सी.जी.-डी.एल.-अ.-06092023-248580
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असाधारण
EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)

प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

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विद्युत मंत्रालय

अधिसूचना

नई दिल्ली, 29 अगस्त, 2023

का.आ. 3894(अ).—केन्द्र सरकार, विद्युत अधिनियम, 2003 (2003 की संख्या 36) की धारा 63 के अंतर्गत परिचालित दिशा-निर्देशों के पैरा 3 के उप-पैरा 3.2 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, पारेषण संबंधी राष्ट्रीय समिति की 14वीं बैठक की सिफारिशों पर, पारेषण स्कीमों के लिए पारेषण स्कीमों के नाम के निमित्त दर्शाए अनुसार, निम्नलिखित बोली-प्रक्रिया समन्वयकों (बीपीसी) की नियुक्ति करती है:

<table>
<tr><th>क्र.सं.</th><th>पारेषण स्कीम का नाम एवं कार्यक्षेत्र</th><th>बोली प्रक्रिया समन्वयक</th></tr>
<tr><td>1.</td><td>चरण IV (7 गीगावॉट) के अंतर्गत गुजरात के खावड़ा क्षेत्र में संभावित नवीकरणीय ऊर्जा क्षेत्र से विद्युत की निकासी के लिए पारेषण प्रणाली: भाग ए
संभावित कार्यान्वयन की समय-सीमा: एसपीवी अंतरण से 24 महीने और खावड़ा चरण-IV (7 गीगावॉट) के भाग बी, सी एवं डी के साथ मिलान
कार्य क्षेत्र:
<table>
<tr><th>क्र.सं.</th><th>पारेषण स्कीम का कार्य क्षेत्र</th><th>क्षमता/मार्ग की लंबाई</th></tr>
<tr><td>1.</td><td>765 केवी बस सेक्शनलाइज़र और 1x330 एमवीएआर, बस सेक्शन-II में 765 केवी बस रिएक्टरों सहित केपीएस3 (जीआईएस) में 765 केवी बस सेक्शन- II का निर्माण 3x1500 एमवीए, बस सेक्शन-II में</td><td>केपीएस3 765 केवी बस सेक्शनलाइज़र में बस सेक्शन- II - 1 सेट
1500 एमवीए, 765/400 केवी आईसीटी-3</td></tr>
</table></td><td>आरईसी पावर डेवलपमेंट एंड कंसल्टेंसी लिमिटेड</td></tr>
</table>

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	765/400 केवी आईसीटी दोनों के साथ बस खंड-II का निर्माण 765 केवी और 400 केवी स्तर पर किया जाएगा	330 एमवीएआर, 765 केवी बस रिएक्टर-1 765 केवी रिएक्टर बे-1 765 केवी आईसीटी बे-3
2.	आरई अंतरसंपर्क के लिए 400 केवी बस सेक्शनलाइजर एवं 1x125 एमवीएआर बस सेक्शन-II तीन 400 केवी बे तथा 420 केवी बस रिएक्टरों सहित केपीएस 3 (जीआईएस) में 400 केवी बस सेक्शन-II का निर्माण	केपीएस3 में बस सेक्शन-II 400 केवी बस सेक्शनलाइज़र-1 सेट 125 एमवीएआर, 420 केवी बस रिएक्टर-1 400 केवी रिएक्टर बे-1 400 केवी आईसीटी बे-3 (उपरोक्त क्र.सं. 1 पर आईसीटी के लिए) 400 केवी लाइन बे-3 संख्या (आरई अंतरसंपर्क के लिए)
3.	केपीएस3 (जीआईएस) - लाकाड़िया (एआईएस) 765 केवी डी/सी लाइन	मार्ग की लम्बाई:185 कि.मी.
4.	केपीएस3 (जीआईएस)-लकाडिया (एआईएस) 765 केवी डी/सी लाइन के लिए केपीएस3 (जीआईएस) और लकाडिया (एआईएस) प्रत्येक में दो765 केवी लाइन बे	• 765 केवी लाइन बे (जीआईएस)-2 (केपीएस3 छोर बस सेक्शन-॥ में) • 765 केवी लाइन बे (एआईएस)-2 (लकडिया छोर पर))
5.	1x125 एमवीएआर एमएससी के साथ±300 एमवीएआर स्टैटकॉम, केपीएस3 400 केवी बस सेक्शन-II में 2x125एमवीएआर एमएसआर	• ± 300 एमवीएआर स्टैटकॉम (1x125 एमवीएआर एमएससी, 2x125 एमवीएआर एमएसआर के साथ) • 400 केवी बे-1
6.	केपीएस 1 (जीआईएस) - भुज पीएस 765 केवी द्वितीय डी/सी लाइन	मार्ग की लम्बाई:110 कि.मी.
7.	केपीएस1 (जीआईएस) - भुज पीएस 765 केवी डी/सी लाइनके लिए केपीएस1 (जीआईएस) और भुज पीएस प्रत्येक में दो 765 केवी लाइन बे	• 765 केवी लाइन वे (जीआईएस)-2 (केपीएस1 छोर बस सेक्शन-II में) • 765 केवी लाइन वे (एआईएस)-2 (भुज छोर में)
8.	केपीएस3 (जीआईएस) - लकाडिया 765 केवी डी/सी लाइन (एनजीआर बाइपास व्यवस्था के साथ) - के केपीएस3 छोर पर 330 एमवीएआर स्विचेबल लाइन रिएक्टर	• 330 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर-2 • 765 केवी लाइन रिएक्टर के लिए स्विचिंग उपकरण-2 • केपीएस3 (जीआईएस) छोर पर 1x110 एमवीएआर स्पेयर स्विचेबल रिक्टर यूनिट

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	टिप्पणी: I. वन-एंड-हाफ ब्रेकर स्कीम में व्यास (जीआईएस) को पूरा करने के लिए आवश्यक -बे (बेज) को भी टीएसपी द्वारा निष्पादित किया जाएगा। II. केपीएस3 का टीएसपी क्रम संख्या 1,2,4,5 और 8 में परिकल्पित कार्य के लिए स्थान प्रदान करेगा। III. वर्तमान स्कीम के टीएसपी द्वारा केपीएस3 के क्रम संख्या 5 में विनिर्दिष्ट स्टेटकाम (एमएससी/एमएसआर के साथ) की संस्थापना के लिए अतिरिक्त भूमि की व्यवस्था की जाएगी और केपीएस3 के टीएसपी द्वारा स्टेटकाम की समाप्ति के लिए एक 400 केवी बे के लिए स्थान प्रदान किया जाएगा। IV. केपीएस1 और भुज पीएस का टीएसपी क्रम संख्या 7 में परिकल्पित कार्य के लिए स्थान प्रदान करेगा। V. वर्तमान स्कीम का टीएसपी कार्यान्वयन के लिए वन-एंड-हाफ ब्रेकर एआईएस स्कीम में 1 मुख्य बे और 1 टाई बे (प्रत्येक व्यास के लिए) से युक्त दो(2) 765 केवी व्यास के निर्माण के लिए लकाडिया एस/एस से सटे अतिरिक्त भूमि की व्यवस्था करेगा एवं लकाडिया एस/एस (एस क्रम संख्या 4 पर) पर दो(2) 765 केवी लाइन बे केपीएस3-लकाडिया 765 केवी डी/सी लाइन से जुडे हैं और इसे भविष्य में व्यास पूर्णता के लिए दूसरे मुख्य बे (स्विचेबल लाइन रिएक्टर के साथ भावी लाइन) के एकीकरण के लिए आगे बढ़ाया जाएगा। VI. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी। VII. उपर्युक्त उल्लिखित कार्यान्वयन की समय-अवधि अनंतिम है। अंतिम समय-अवधि आरएफपी दस्तावेज़ में दर्शायी जाएगी।	
2.	**चरण-IV (7 गीगावॉट) के तहत गुजरात के खावड़ा क्षेत्र में संभावित नवीकरणीय ऊर्जा क्षेत्र से विद्युत की निकासी के लिए पारेषण प्रणाली: भाग बी** संभावित कार्यान्वयन समय अवधि: एसपीवी अंतरण और खावड़ा पीएच-IV (7 गीगावाट) के भाग ए, सी और डी के साथ मिलान से 24 महीने **कार्यक्षेत्र:**	**पीएफसी कंसल्टिंग लिमिटेड**

क्र.सं.	पारेषण स्कीम का कार्यक्षेत्र	क्षमता/किमी
1.	2x330 एमवीएआर, 765 केवी और 1x125 एमवीएआर, 420 केवी बस रिएक्टरों के साथ ओलपौड के दक्षिण में (ओलपौड और इच्छापुर के बीच) उपयुक्त स्थान पर 2x1500 एमवीए, 765/400 केवी और 2x500 एमवीए, 400/220 केवी जीआईएस एस/एस की स्थापना **भावी प्रावधान** के लिए स्थान: ○ 765/400 केवी आईसीटी सहित बे-4 ○ स्विचेबल लाइन रिएक्टरों सहित 765 केवी लाइन बे - 8 ○ बे सहित 765 केवी बस रिएक्टर: 2 ○ 765 केवी सेक्शनलाइज़र बे: 1 - सेट ○ स्विचेबल लाइन रिएक्टर सहित 400 केवी लाइन बे - 8 ○ बे सहित 400/220 केवी आईसीटी - 8 ○ बेसहित 420 केवी बस रिएक्टर: 3 ○ 400 केवी सेक्शनलाइज़ेशन बे: 1- सेट	• 765/400 केवी, 1x1500 एमवीए आईसीटी-2 (एक स्पेयर इकाई सहित 7x500 एमवीए एकल चरण इकाइयाँ) • 400/220 केवी, 500 एमवीए आईसीटी - 2 • 765 केवी आईसीटी बे-2 • 400 केवी आईसीटी बे- 4 • 220 केवी आईसीटी बे- 2 • 220 केवी बीसी बे - 1 • 330 एमवीएआर, 765 केवी बस रिएक्टर-2 • 125 एमवीएआर, 420 केवी बस रिएक्टर-1 • 765 केवी रिएक्टर बे- 2 • 765 केवी लाइन बे- 4

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		○ 220 केवी लाइन बे: 18 ○ 220 केवी सेक्शनलाइज़ेशन बे: 1 सेट ○ 220 केवी बीसी: 1 ○ 2500 मेगावाट, ± 500 केवी साउथ ओलपौड (एचवीडीसी) [वीएससी] टर्मिनल स्टेशन (2x1250 मेगावाट) की संस्थापना	• 400 केवी रिएक्टर बे-1 • 400 केवी लाइन बे- 4 • 110 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (लाइन/बस रिएक्टर के लिए स्पेयर यूनिट)-1
2.	वडोदरा (जीआईएस)-साउथ ओलपाड (जीआईएस) 765 केवी डी/सी लाइन	मार्ग की लंबाई: 140 किमी	
3.	वडोदरा (जीआईएस) - साउथ ओलपाड (जीआईएस) 765 केवी डी/सी लाइन (एनजीआर बाईपास व्यवस्था के साथ) के वडोदरा (जीआईएस) के छोर पर प्रत्येक सीकेटी पर 240 एमवीएआर स्विचेबल लाइन रिएक्टर	• 240 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर- 2 • 765 केवी लाइन रिएक्टर के लिए स्विचिंग उपकरण -2 • स्पेयर के रूप में उपयोग के लिए वडोदरा (जीआईएस) में 1x80 एमवीएआर स्पेयर बस रिएक्टर उपलब्ध है	
4.	वडोदरा (जीआईएस)-साउथ ओलपौड (जीआईएस) 765 केवी डी/सी लाइनके लिए दो 765 केवी लाइन बे	• 765 केवी लाइन (जीआईएस) बे - 2 (वडोदरा छोर पर)	
5.	नाममात्र वोल्टेज पर 1700 एमवीए प्रति सीकेटी की न्यूनतम क्षमता के साथ ट्विन एचटीएलएस कंडक्टर का उपयोग करके दक्षिण ओलपौड (जीआईएस) में गांधार-हजीरा 400 केवी डी/सी लाइन का लीलो	लीलो मार्ग की लंबाई ~ 10 किमी।	
6.	अहमदाबाद-दक्षिण ओलपौड (जीआईएस) 765 केवी डी/सी लाइन	मार्ग की लंबाई: 250 किमी	
7.	अहमदाबाद - दक्षिण ओलपैड (जीआईएस) 765 केवी डी/सी लाइन (एनजीआर बाईपास व्यवस्था के साथ) के अहमदाबाद और दक्षिण ओलपैड (जीआईएस) के छोर पर प्रत्येक सीकेटी पर 240 एमवीएआर स्विचेबल लाइन रिएक्टर	• 240 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर-4 [अहमदाबाद छोर के लिए 2 और दक्षिण ओलपैड (जीआईएस) छोर के लिए 2] • 765 केवी लाइन रिएक्टर के लिए स्विचिंग उपकरण - 4 [अहमदाबाद छोर के लिए 2 और दक्षिण ओलपैड (जीआईएस) छोर के लिए 2] • 1x80 एमवीएआर, 765 केवी 1-पीएच स्पेयर लाइन रिएक्टर - 1 (दक्षिण ओलपैड छोर के लिए)	

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			• 1x80 एमवीएआर, 765 केवी 1-पीएच स्पेयर लाइन रिएक्टर लकाड़िया- अहमदाबाद लाइन (खावड़ा चरण- II भाग-ख स्कीम के अंतर्गत) के लिए कार्यान्वित किया जा रहा है जिसे स्पेयर के रूप में उपयोग किया जाएगा।
	8.	अहमदाबाद-दक्षिण ओलपैड (जीआईएस) 765 केवी डी/सी लाइन के लिए अहमदाबाद एस/एस में 765 केवी लाइन बे 2	• 765 केवी लाइन बे (एआईएस) - 2 (अहमदाबाद छोर पर)

टिप्पणी:

I. वडोदरा एस/एस का टीएसपी ऊपर दिए गए क्रमांक 3 और 4 पर परिकल्पित कार्य के लिए स्थान उपलब्ध कराएगा।

II. अहमदाबाद एस/एस का टीएसपी ऊपर दिए गए क्रमांक 7 और 8 पर परिकल्पित कार्य के लिए स्थान उपलब्ध कराएगा।

III. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी।

IV. ऊपर उल्लिखित कार्यान्वयन समयअवधि अस्थायी है। अंतिम समयअवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।

3. **चरण-IV (7 गीगावाट) के तहत गुजरात के खावड़ा क्षेत्र में संभावित नवीकरणीय ऊर्जा क्षेत्र से विद्युत की निकासी के लिए पारेषण प्रणाली : भाग सी**

आरईसी पावर डेवलपमेंट एंड कंसल्टेंसी लिमिटेड

संभावित कार्यान्वयन समय अवधि: एसपीवी अंतरण और खावड़ा के भाग ए, बी और डी के साथ मिलान से 24 महीने चरण-IV (7 गीगावाट)

कार्यक्षेत्र:

क्र.सं.	**पारेषण स्कीम का कार्यक्षेत्र**	**क्षमता**
1.	4x1500 एमवीए, 765/400 केवी और 2x500 एमवीए, 2X330 एमवीएआर सहित 400/220 केवी बोइसर-II (जीआईएस) एस/एस, 765 केवी बस रिएक्टरतथा 2X125 एमवीएआर, 420 केवी बस रिएक्टरों की स्थापना। (2x1500 एमवीए, 765/400 केवी आईसीटी प्रत्येक 400 केवी सेक्शन पर होंगे और 2x500 एमवीए, 400/220 केवी आईसीटी 400 केवी बस सेक्शन-II पर होंगे। 2x125 एमवीएआर बस रिएक्टर ऐसे होंगे कि प्रत्येक पर एक बस रिएक्टर रखा जाएगा। 400 केवी बस सेक्शनलाइजर को सामान्य रूप से खुली स्थिति में रखा जाएगा) **भविष्य के प्रावधान**: के लिए स्थान:	765/400 केवी, 1500 एमवीए आईसीटी- 4 (एक स्पेयर इकाई सहित 13x500 एमवीए एकल चरण इकाइयां) 400/220 केवी, 500 एमवीए आईसीटी - 2 765 केवी आईसीटी बे- 4 400 केवी आईसीटी बे- 6(बस सेक्शन-I पर 2 और बस सेक्शन-II पर 4) 400 केवी बस सेक्शनलाइज़र-1 सेट 220 केवी आईसीटी बे- 2 220 केवी बीसी बे - 1 330 एमवीएआर, 765 केवी बस रिएक्टर-2 125 एमवीएआर, 420 केवी बस

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		○ 765/400 केवी आईसीटी बे सहित- 2 ○ स्विचेबल लाइन रिएक्टरों के साथ 765 केवी लाइन बे - 8 ○ बे सहित 765 केवी बस रिएक्टर: 2 ○ 765 केवी सेक्शनलाइज़र बे: 1 - सेट ○ स्विचेबल लाइन रिएक्टर के साथ 400 केवी लाइन बे - 8 ○ बेज़ सहित 400/220 केवी आईसीटी - 6 ○ बे सहित 420 केवी बस रिएक्टर: 2 ○ 220 केवी लाइन बे: 12 ○ 220 केवी सेक्शनलाइज़ेशन बे: 1 सेट ○ 220 केवी वीसी: 1	रिएक्टर-2 765 केवी रिएक्टर बे- 2 765 केवी लाइन बे- 6 400 केवी रिएक्टर बे- 2 (प्रत्येक बस सेक्शन पर एक) 400 केवी लाइन बे- 6 (बस सेक्शन-I पर 4 और बस सेक्शन-II पर 2) 110 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (लाइन/बस रिएक्टर के लिए स्पेयरयूनिट)-1
2.	साउथ ओलपैड (जीआईएस) - बोइसर -II (जीआईएस) 765 केवी डी/सी लाइन	मार्ग की लंबाई: 225 किमी	
3.	दक्षिण ओलपैड (जीआईएस) - बोइसर- II (जीआईएस) 765 केवी डी/सी लाइन के समापन के लिए साउथ ओलपैड (जीआईएस) में दो 765 केवी लाइन बे	765 केवी लाइन बे (जीआईएस) - 2 (दक्षिण ओलपैड छोर के लिए)	
4.	साउथ ओलपैड (जीआईएस) - बोइसर -II (जीआईएस) 765 केवी डी/सी लाइन (एनजीआर बाईपास व्यवस्था के साथ) के साउथ ओलपैड (जीआईएस) और बोइसर- II (जीआईएस) छोर पर प्रत्येक सीकेटी पर 240 एमवीएआर स्विचेबल लाइन रिएक्टर	• 240 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर-4 [बोइसर-II (जीआईएस) के लिए 2 और साउथ ओलपैड (जीआईएस) के लिए 2] • 765 केवी लाइन रिएक्टर के लिए स्विचिंग उपकरण - 4 (बोइसर -II (जीआईएस) के लिए 2 और साउथ ओलपैड (जीआईएस) के लिए 2) • 1x80 एमवीएआर, 765 केवी 1-पीएच स्पेयर लाइन रिएक्टर - 1 (बोइसर-II छोर के लिए) • 1x80 एमवीएआर, 765 केवी 1-पीएच स्पेयर लाइन रिएक्टर अहमदाबाद-दक्षिण ओलपैड (जीआईएस) 765 केवी लाइन (खावड़ा चरण-IV भाग बी स्कीम के तहत) के लिए प्रस्तावित है जिसे दक्षिण ओलपैड (जीआईएस) एस/एस स्पेयर के रूप में उपयोग किया जाएगा।	
5.	बोइसर-II में नवसारी (नया) का लीलो - पडघे (पीजी) 765 केवी डी/सी लाइन	लीलो मार्ग की लंबाई: 25 किमी.	
6.	बोईसर- II (सेक्शन- II) - वेलगांव (एमएच) 400 केवी डी/सी (क्वाड एसीएसआर/एएएसी/एएल59 मूज़ समतुल्य) लाइन	मार्ग की लंबाई: 10 किमी.	
7.	बोइसर- II - वेलगांव (एमएच) 400 केवी डी/सी (क्वाड एसीएसआर/ एएएसी/ एएल59	400 केवी लाइन बे (जीआईएस) - 2 [वेलगांव (एमएच) छोर के लिए]	

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	मूस समतुल्य) लाइन के समापन के लिए वेलगांव (एमएच) में 2 400 केवी लाइन बे	
8.	नाममात्र वोल्टेज पर 1700 एमवीए प्रति सीकेटी की न्यूनतम क्षमता के साथ जुड़वां एचटीएलएस कंडक्टर का उपयोग करते हुएबोइसर- II (सेक्शन- I) बभलेश्वर का लीलो - पडघे (एम) 400 केवी डी/सी लाइन	लीलो मार्ग की लंबाई: 65 किमी.
9.	उपरोक्त लिलो के बाद बनाई गईबोईसर- II - बाभलेश्वर 400 केवी डी/सी लाइन (एनजीआर बाईपास व्यवस्था के साथ) के बोसर-II छोर पर 80 एमवीएआर स्विचेबल लाइन रिएक्टर	• 80 एमवीएआर, 420 केवी स्विचेबल लाइन रिएक्टर जिसमें स्विचिंग उपकरण भी शामिल है - 2
10.	बोइसर- II के 400 केवी बस सेक्शन- II पर 2x125 एमवीएआर एमएससी, 1x125 एमवीएआर एमएसआर के साथ ± 200 एमवीएआर स्टेटकॉम और बोइसर- II के 400 kV बस सेक्शन- II पर 2x125 एमवीएआर एमएससी, 1x125 एमवीएआर एमएसआर के साथ ±200 एमवीएआर स्टेटकॉम	• 400 केवी सेक्शन-I पर ±200 एमवीएआर स्टेटकॉम (एमएससी/ एमएसआर के साथ) • 400 केवी बे - सेक्शन-I पर 1 • 400 केवी सेक्शन- II पर ±200 एमवीएआर स्टेटकॉम (एमएससी/ एमएसआर के साथ) • 400 केवी बे - सेक्शन-2 पर 1
11.	एक 400 केवी बे (जीआईएस) के साथ नवसारी (नया) (पीजी) एस/एस के 400 केवी स्तर पर 1x125 एमवीएआर एमएसआर 3x125 एमवीएआर एमएससी के साथ± 300 एमवीएआर स्टेटकॉम	• ±300 एमवीएआर स्टेटकॉम (एमएससी/एमएसआर के साथ) • 400 केवी बे - 1

टिप्पणी:

I. वन-एंड-हाफ ब्रेकर स्कीम में व्यास (जीआईएस) को पूरा करने के लिए अपेक्षित बे (बेज) को भी टीएसपी द्वारा निष्पादित किया जाएगा।

II. एमएसईटीसीएल पडघे (एम)-बोइसर- II 400 केवी डी/सी लाइन (अर्थात लिलो बिन्दु से लेकर पडगे (एम) तक)) के शेष भाग का रीकंडक्टरिंग करेगा और पडघे (एम), जैसा कि लिलो लाइन की समय-सीमा के अनुरूप आवश्यक हो, में 400 केवी बे का तदनुरूप उन्नयन भी करेगा। एमएसईटीसीएल ने लाइन की अधिकतम क्षमता की पुष्टि की है जिसे बभलेश्वर-पडघे (एम) 400 केवी डी/सी लाइन के मौजूदा टावरों में 1700 एमवीए प्रति सर्किट के रूप में क्लीयरेंस पर विचार करते हुए रिकंडक्टरिंग के बाद हासिल किया जा सकता है।

III. एमएसईटीसीएल बोइसर- II (आईएसटीएस) एस/एस पर बोइसर- II-वेलगांव 220 केवी डी/सी लाइन के दोनों सर्किटों के लिलो (एलआईएलओ) को बोइसर- II में 4(चार) 220 केवी जीआईएस बे के साथ बोइसर-II (आईएसटीएस) एस/एस. की समय-सीमा के अनुरूप क्रियान्वित करेगा।

IV. साउथ ओलपैड (जीआईएस) एस/एस का टीएसपी क्रम संख्या 3 और 4 पर परिकल्पित कार्य के लिए स्थान उपलब्ध कराएगा।

V. एमएसईटीसीएल वेलगांव एस/एस में क्रम संख्या 7 पर परिकल्पित कार्य के लिए स्थान उपलब्ध कराएगा।

VI. विषय संबंधी स्कीम का टीएसपी साउथ ओलपैड (जीआईएस) - बोइसर-II (जीआईएस) 765 केवी डी/सी लाइन (मुख्य लाइन ब्रेकर के साथ दोनों छोर पर स्विच करने योग्य लाइन रिएक्टर की ट्रिपिंग के लिए) पर इंटर-ट्रिपिंग स्कीम क्रियान्वित करेगा।



	VII. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी। VIII. ऊपर उल्लिखित कार्यान्वयन समय अवधि अनंतिम है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।	
4.	**चरण-IV (7 गीगावाट) के तहत गुजरात के खावड़ा क्षेत्र में संभावित नवीकरणीय ऊर्जा क्षेत्र से विद्युत की निकासी के लिए पारेषण प्रणाली: भाग डी** संभावित क्रियान्वयन समय अवधि: एसपीवी अंतरण से 24 महीने **कार्यक्षेत्र:**	**पीएफसी कंसल्टिंग लिमिटेड**

क्र.सं.	**पारेषण स्कीम का कार्यक्षेत्र**	**क्षमता**
1.	2x330 एमवीएआर, 765 केवी बस रिएक्टर और 2x125 एमवीएआर, 420 केवी बस रिएक्टर सहित 2x1500 एमवीए, 765/400 केवी और 3x500 एमवीए, 400/220 केवी पुणे-III (जीआईएस) एस/एस की स्थापना। **भावी प्रावधान**: निम्नलिखित के लिए स्थान ○ बे सहित 765/400 केवी आईसीटी-4 ○ स्विचेबल लाइन रिएक्टरों के साथ 765 केवी लाइन बे - 8 ○ बे सहित 765 केवी बस रिएक्टर : 2 ○ 765 केवी सेक्शनलाइज़र बे: 1-सेट ○ स्विचेबल लाइन रिएक्टर के साथ 400 केवी लाइन बे - 12 ○ बे 400/220 केवी आईसीटी -5 ○ बे सहित 400 केवी बस रिएक्टर : 2 ○ 400 केवी सेक्शनलाइज़र बे: 1 सेट ○ 220 केवी लाइन बे: 12 ○ 220 केवी सेक्शनलाइज़ेशन बे: 1 सेट ○ 220 केवी वीसी: 1 ○ एमएससी (3x125 एमवीएआर) और एमएसआर (1x125 एमवीएआर) के साथ स्टेटकॉम (±300 एमवीएआर): 1 बे सहित 400 केवी: 1 ○ 80 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (लाइन रिएक्टर के लिए अतिरिक्त यूनिट)-1	765/400 केवी, 1500 एमवीए आईसीटी-2 (एक स्पेयर यूनिट सहित 7x500 एमवीए) 400/220 केवी, 500 एमवीए आईसीटी - 3 765 केवी आईसीटी बे- 2 400 केवी आईसीटी बे- 5 220 केवी आईसीटी बे- 3 220 केवी वीसी बे - 1 330 एमवीएआर, 765 केवी बस रिएक्टर-2 125 एमवीएआर, 420 केवी बस रिएक्टर-2 765 केवी रिएक्टर बे- 2 765 केवी लाइन बे- 6 400 केवी रिएक्टर बे- 2 400 केवी लाइन बे- 2 110 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (लाइन/बस रिएक्टर के लिए अतिरिक्त यूनिट)-1
2.	बोईसर-II - पुणे-III 765 केवी डी/सी लाइन	मार्ग की लंबाई: 200 किमी



3.	बोइसर - II - पुणे- III 765 केवी डी/सी लाइन (एनजीआर बाईपास व्यवस्था के साथ) के पुणे-III छोर पर 330 एमवीएआर स्विचेबल लाइन रिएक्टर	• 330 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर-2 • 765 केवी लाइन रिएक्टर के लिए स्विचिंग उपकरण-2 • पुणे-III (जीआईएस) में स्पेयर के रूप में उपयोग के लिए उपलब्ध 1x110 एमवीएआर स्पेयर बस रिएक्टर
4.	बोइसर- II -पुणे- III 765 केवी डी/सी लाइन के समापन के लिए बोइसर- II में दो 765 केवी लाइन बे	• 765 केवी लाइन बे (जीआईएस) - 2 (बोईसर-II छोर के लिए)
5.	नरेंद्र (नया) का लीलो - पुणे (जीआईएस) पुणे-III पर 765 केवी डी/सी लाइन	लीलो मार्ग की लंबाई: 10 किमी.
6.	नरेंद्र (न्यू) - पुणे- III (जीआईएस) 765 केवी डी/सी लाइन (एनजीआर बाईपास व्यवस्था के साथ) के पुणे- III छोर पर 330 एमवीएआर स्विचेबल लाइन रिएक्टर।	• 330 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर-2 • 765 केवी लाइन रिएक्टर के लिए स्विचिंग उपकरण-2 • पुणे- III (जीआईएस) में स्पेयर के रूप में उपयोग के लिए उपलब्ध 1x110 एमवीएआर स्पेयर बस रिएक्टर
7.	पुणे-III (जीआईएस) एस/एस में हिंजेवाड़ी-कोयना 400 केवी एस/सी लाइन का लिलो	लीलो मार्ग की लंबाई: 40 किमी.
8.	उपर्युक्त लीलो (एनजीआर बाईपास व्यवस्था के साथ) के बाद बनाई गई पुणे-III (जीआईएस)-कोयना 400 केवी एस/सी लाइन के छोर पर पुणे-III (जीआईएस) में 80 एमवीएआर, 420 केवी स्विचेबल लाइन रिएक्टर	• स्विचिंग उपकरण के साथ 80 एमवीएआर, 420 केवी स्विचेबल लाइन रिएक्टर- 1

टिप्पणी:

i. वन-एंड-हाफ ब्रेकर स्कीम में व्यास (जीआईएस) को पूरा करने के लिए आवश्यक बे(बेज) को भी टीएमपी द्वारा निष्पादित किया जाएगा।

ii. पुणे (जीआईएस) के पुणे (जीआईएस) छोर पर मुख्य लाइन ब्रेकर के साथ 330 एमवीएआर स्विचेवल लाइन रिएक्टर की ट्रिपिंग के लिए इंटर-ट्रिपिंग स्कीम के लिए तर्क - नरेंद्र (न्यू) 765 केवी डी/सी लाइन को पुणे -3 में नरेंद्र (न्यू) - पुणे (जीआईएस) 765 केवी डी/सी लाइन के लिलो के बाद लाइन के स्वामी द्वारा क्रियान्वित किया जाएगा।

iii. एमएसईटीसीएल पुणे-III एस/एस की मिलान समय-सीमा में पुणे-III (जीआईएस) एस/एस में 5 220 केवी जीआईएस बे के साथ निम्नलिखित 220 केवी लाइनों को क्रियान्वित करेगा:

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क. जेजुरी-फुरसुंगी के दोनों सर्किटों का लिलो पुणे-III एस/एस में एचटीएलएस कंडक्टर (ट्विन जेब्रा समतुल्य) के साथ एचटीएलएस कंडक्टर (ट्विन जेब्रा समतुल्य) के साथ शेष लाइन सेक्शन अर्थात् लिलो प्वाइंट फुरसुंगी और एलआईएलओ एचटीएलएस कंडक्टर (ट्विन जेब्रा समकक्ष) के साथ जेजुरी को इंगित करता है।

ख. नांदेड़ शहर - पुणे पीजी III 220 केवी एस/सी लाइन एचटीएलएस कंडक्टर के साथ(ट्विन जेब्रा समकक्ष)

iv. वोइसर-II एस/एस का टीएसपी क्रम संख्या 4 पर परिकल्पित कार्य के लिए जगह उपलब्ध कराएगा।

v. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी।

vi. ऊपर उल्लिखित कार्यान्वयन समय अवधि अनंतिम है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।

5. **चरण-IV (7 गीगावाट) के अंतर्गत गुजरात के खावड़ा क्षेत्र में संभावित नवीकरणीय ऊर्जा क्षेत्र से विद्युत की निकासी के लिए पारेषण प्रणाली: भाग ई2**

आरईसी पावर डेवलपमेंट एंड कंसल्टेंसी लिमिटेड

अनंतिम कार्यान्वयन समय अवधि: एसपीवी अंतरण से 21 महीने

कार्यक्षेत्र:

क्र.सं.	पारेषण योजना का कार्यक्षेत्र	क्षमता
1.	आरई अंतरसंपर्क के लिए केपीएस2 (जीआईएस) में 2x1500 एमवीए, बस सेक्शन-I (5वां व 6वां) पर 765/400 केवीए आईसीटी, बस सेक्शन-II (7वां व 8वां) पर 765/400 केवीए आईसीटी और आरई अंतरसंपर्क के लिए बस सेक्शन-I में 2 400 केवीए और आरई अंतरसंपर्क के लिए बस सेक्शन-II में 3 400 केवीए बे का संवर्द्धन।	1500 एमवीए, 765/400 केवी आईसीटी-4 765 केवी बे-4 (2 आईसीटी के लिए पूर्ण व्यास (प्रत्येक बस सेक्शन में एक) और शेष 2 आईसीटी को अतिरिक्त बे (प्रत्येक सेक्शन में एक) में समाप्त किया जाएगा) [4 आईसीटी बे (प्रत्येक सेक्शन पर 2) और 5 लाइन बे (बस सेक्शन -1 पर 2 और बस सेक्शन-II पर 3) के साथ-साथ बस सेक्शन-II पर 1 बे व्यास पूरा करने के लिए]

टिप्पणी:

i. टीएसपी वन-एंड-हाफ ब्रेकर स्कीम में केपीएस2 (जीआईएस) के 765 केवी स्तर पर दो पूर्ण व्यास (बस सेक्शन I पर 1 और बस सेक्शन-II पर 1) क्रियान्वित करेगा, जिसमें व्यास (जीआईएस) को पूरा करने के लिए आवश्यक 2 मुख्य बे और 1 टाई-बे शामिल हैं।

ii. टीएसपी वन-एंड-हाफ ब्रेकर स्कीम में केपीएस2 (जीआईएस) के 400 केवी स्तर पर पांच पूर्ण व्यास (बस सेक्शन-I पर 2 और बस सेक्शन-II पर 3) क्रियान्वित करेगा, जिसमें व्यास (जीआईएस) को पूरा करने के लिए आवश्यक 2 मुख्य बे और 1 टाई-बे शामिल हैं।

iii. इसके अतिरिक्त, केपीएस2 का टीएसपी उपरोक्त संवर्द्धन कार्य को पूरा करने के लिए जगह उपलब्ध कराएगा।

iv. केपीएस2 में आरई अंतरसंपर्क के लिए बस सेक्शन-I में 2 400 केवी बे और आरई अंतरसंपर्क के लिए बस सेक्शन-II में एक 400 केवी बे पहले से ही कार्यान्वित किए जा रहे हैं।

v. ऊपर उल्लिखित कार्यान्वयन समय अवधि अनंतिम है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।

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6.	**चरण-V (8 गीगावाट) के अंतर्गत गुजरात के खावड़ा क्षेत्र में संभावित नवीकरणीय ऊर्जा क्षेत्र से विद्युत की निकासी के लिए पारेषण प्रणाली: भाग ए** संभावित कार्यान्वयन समय अवधि: एसपीवी ट्रांसफर से बाइपोल-1 के लिए 48 महीने और बाइपोल-2 के लिए 54 महीने **कार्यक्षेत्र:**	**आरईसी पावर डेवलपमेंट एंड कंसल्टेंसी लिमिटेड**

क्र.सं	पारेषण स्कीम का कार्यक्षेत्र	क्षमता
1.	400 केवी एचवीएसी स्विचयार्ड के साथ सहायक अंतरसम्पर्क के साथ± 800 केवी केपीएस2 (एचवीडीसी) [एलसीसी] टर्मिनल स्टेशन (4x1500 मेगावाट), 6000 मेगावाट की संस्थापना	6000 मेगावाट, ± 800 केवी केपीएस3 (एचवीडीसी) [वीएससी] टर्मिनल स्टेशन
2.	400 केवी एचवीएसी स्विचयार्ड के साथ अंतरसम्पर्कों के साथ± 800 केवी नागपुर (एचवीडीसी) [एलसीसी] टर्मिनल स्टेशन (4x1500 मेगावाट), 6000 मेगावाट की संस्थापना	6000 मेगावाट, ± 800 केवी साउथ ओलपैड (एचवीडीसी) [वीएससी] टर्मिनल स्टेशन
3.	केपीएस2 (एचवीडीसी) और नागपुर (एचवीडीसी) के मध्य ±800 केवी एचवीडीसीबाइपोल लाइन (हेक्सा लैपविंग) (1200 किमी) (समर्पित मेटैलिक रिटर्न के साथ) (जैसा कि निर्दिष्ट ओवरलोड के साथ 6000 मेगावाट की निकासी में सक्षम)	मार्ग की लंबाई: 1200 किमी
4.	नागपुर एस/एस में 6x1500 एमवीए, 765/400 केवी आईसीटी एचवीडीसी स्विचयार्ड* के साथ सहायक अंतरसम्पर्क सहित 2x330 एमवीएआर (765 केवी) और 2x125 एमवीएआर, 420 केवी बस रिएक्टरों सहित की संस्थापना। 400 केवी बस को 400 केवी बस सेक्शनलाइजर के 1 सेट के माध्यम से 2 सेक्शनों में संस्थापित किया जाएगा ताकि प्रत्येक सेक्शन सेक्शन 3x1500 एमवीए आईसीटीज़ लगाए जा सकें। बस सेक्शनलाइज़र सामान्य रूप से बंद रहेगा और ग्रिड की आवश्यकता के आधार पर खोला जा सकता है। **नागपुर में भावी प्रावधान :** **निम्नलिखित के लिए स्थान :** ○ 765/400 केवी, 1500 एमवीए आईसीटी-4 (400 केवी बस सेक्शन-II पर 1 एवं भविष्य 400 केवी बस सेक्शन-III पर 3) ○ स्विचेबल लाइन रिएक्टरों सहित 765 केवी लाइन बे - 10 ○ बे सहित 765 केवी बस रिएक्टर: 2 ○ 765 केवी सेक्शनलाइज़र बे: 1-सेट	○ 765/400 केवी, 1500 एमवीए आईसीटी-6 (प्रत्येक 400 केवी अनुभाग पर 3) (एक स्पेयर यूनिट सहित 19 एकल चरण यूनिटें) ○ 765 केवी आईसीटी बे- 6 ○ 400 केवी आईसीटी बे- 6 (प्रत्येक सेक्शन पर 3) ○ 330 एमवीएआर 765 केवी बस रिएक्टर-2 ○ 125 एमवीएआर 420 केवी बस रिएक्टर-2 (प्रत्येक सेक्शन पर एक) ○ 765 केवी रिएक्टर बे- 2 ○ 765 केवी लाइन बे- 4 ○ 400 केवी रिएक्टर बे- 2 (प्रत्येक सेक्शन पर एक) ○ 400 केवी बस सेक्शनलाइज़र - 1 सेट ○ 110 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (लाइन/बस रिएक्टर के लिए स्पेयर यूनिट)-1



		○ स्विचेबल लाइन रिएक्टर सहित 400 केवी लाइन बे - 12 ○ 400 केवी बस सेक्शनलाइज़र- 1 सेट ○ बेसहित 400/220 केवी आईसीटी - 9 (400 केवी बस सेक्शन-II पर 3 एवं भावी बस सेक्शन-III पर 6) ○ बे सहित 400 केवी बस रिएक्टर: 4 (400 केवी बस सेक्शन I एवं II पर 1 और भावी के 400 केवी बस सेक्शन-III पर 2) ○ 220 केवी लाइन बे: 16 ○ 220 केवी सेक्शनलाइज़ेशन बे: 2 सेट ○ 220 केवी वीसी एवं टीबीसी: 3 ○ 80 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (लाइन रिएक्टर के लिए स्पेयर यूनिट)-1	
	5.	नागपुर में वर्धा - रायपुर 765 केवी एक डी/सी लाइन (2xडी/सी लाइनों में से) का लिलो	लीलो मार्ग की लंबाई: 30 किमी.
	6.	नागपुर-रायपुर 765 केवी डी/सी लाइन के प्रत्येक सीकेटी पर नागपुर छोर पर 240 एमवीएआर स्विचेबल लाइन रिएक्टर की संस्थापना	• 240 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर्स-2 (नागपुर छोर पर) • 765 केवी लाइन रिएक्टर के लिए स्विचिंग उपस्कर - 2 (नागपुर छोर पर) • 80 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (लाइन रिएक्टर के लिए स्पेयर यूनिट)-1
	* एचवीडीसी एवं एचवीएसी स्विचयार्ड के मध्य 400 केवी अंतरसम्पर्क (सभी सहायक उपस्कर/बस एक्सटेंशन आदि सहित) टीएसपी द्वारा कार्यान्वित किया जाएगा। **टिप्पणी:** i. 2x1500 मेगावाट के खंभे केपीएस 2 के 400 केवी बस सेक्शन 1 से निकलेंगे और नागपुर के बस सेक्शन 1 पर समाप्त होंगे।इसी प्रकार, अन्य 2x1500 मेगावाट के खंभे केपीएस2 के 400 केवी बस सेक्शन 2 से निकलेंगे और नागपुर के बस सेक्शन2 पर समाप्त होंगे। ii. एचवीडीसी प्रणाली को 100% पावर रिवर्सल क्षमता को ध्यान में रखते हुए डिजाइन किया जाएगा।रेटेड विद्युत पारेषण क्षमता के साथ-साथ रेटेड पारेषण वोल्टेज को एसी यार्ड के रेक्टिफायर छोर पर परिभाषित और गारंटी दी जाएगी। iii. केपीएस2 का टीएसपी उपरोक्त कार्यक्षेत्र के अनुसार एचवीडीसी प्रणाली की संस्थापना के लिए जगह उपलब्ध करेगा। iv. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी। v. ऊपर उल्लिखित कार्यान्वयन समय अवधि अस्थायी है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।		

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7.	**चरण-V (8 गीगावाट) के अंतर्गत गुजरात के खावड़ा क्षेत्र में संभावित नवीकरणीय ऊर्जा क्षेत्र से विद्युत की निकासी के लिए पारेषण प्रणाली: भाग सी** संभावित कार्यान्वयन समय अवधि: एसपीवी अंतरण से 48 महीने **कार्यक्षेत्र:**	**पीएफसी कंसल्टिंग लिमिटेड**

क्र.सं	पारेषण स्कीम का कार्यक्षेत्र	क्षमता
1.	400 केवी एचवीएसी स्विचयार्ड* के साथ सहायक अंतरसम्पर्क के साथ केपीएस3 सबस्टेशन के पास उपयुक्त स्थान पर 2500 मेगावाट, ± 500 केवी केपीएस3 (एचवीडीसी) [वीएससी] टर्मिनल स्टेशन (2x1250 मेगावाट) की संस्थापना	2500 मेगावाट, ± 500 केवी केपीएस3 (एचवीडीसी) [वीएससी] टर्मिनल स्टेशन
2.	साउथ ओलपैड एस/एस* के 400 केवी एचवीएसी स्विचयार्ड के साथ सहायक अंतरसम्पर्क के साथ 2500 मेगावाट, ± 500 केवी साउथ ओलपैड (एचवीडीसी) [वीएससी] टर्मिनल स्टेशन (2x1250 मेगावाट) की संस्थापना	2500 मेगावाट, ± 500 केवी साउथ ओलपैड (एचवीडीसी) [वीएससी] टर्मिनल स्टेशन
3.	एचवीडीसी स्विचयार्ड* के साथ सहायक अंतरसम्पर्क के साथ 2x125 एमवीएआर, 420 केवी बस रिएक्टरों सहित केपीएस3 (एचवीडीसी) एस/एस की संस्थापना। 400 केवी बस को सामान्य रूप से खुला रखने के लिए 400 केवी बस सेक्शनलाइज़र के 1 सेट के माध्यम से 2 सेक्शनों में संस्थापित किया जाएगा। एचवीडीसी टर्मिनल को विशेष रूप से सहायक विद्युत की आपूर्ति के लिए 400/33 केवी, 2x50 एमवीए ट्रांसफार्मर। एमवीएआर **केपीएस3 (एचवीडीसी) एस/एस पर भावी प्रावधान** **निम्नलिखित के लिए स्थान:** ○ 400 केवी लाइन बे - 6 (प्रत्येक सेक्शन पर 3) ○ 400 केवी रिएक्टर बे- 2 (प्रत्येक सेक्शन पर एक)	○ 400/33 केवी, 1x50 एमवीए आईसीटी बे सहित- 2 ○ 125 एमवीएआर 420 केवी बस रिएक्टर-2 (प्रत्येक सेक्शन पर एक) ○ 400 केवी रिएक्टर बे- 2 (प्रत्येक सेक्शन पर एक) ○ 400 केवी बस सेक्शनलाइज़र- 1 सेट
4.	केपीएस3 - केपीएस3 (एचवीडीसी) 400 केवी 2xडी/सी (क्वाड एसीएसआर/ एएएसी/एएल59 मूस समतुल्य) लाइन दोनों सबस्टेशनों पर लाइन बे सहित	मार्ग की लंबाई- 2 किमी 400 केवी जीआईएस लाइन बे - केपीएस3 पर 4 (प्रत्येक बस सेक्शन पर 2) 400 केवी जीआईएस लाइन बे - केपीएस3 (एचवीडीसी) पर 4 (प्रत्येक बस सेक्शन पर 2)
5.	केपीएस3 (एचवीडीमी) और साउथ ओलपैड (एचवीडीसी) के बीच ±500 केवी एचवीडीसीबाइपोल लाइन (समर्पित मैटेलिक रिटर्न के साथ) (2500 मेगावाट निकालने में सक्षम)	मार्ग की लंबाई: 600 किमी



	*एचवीडीसी और एचवीएसी स्विचयार्ड के बीच 400 केवी अंतर्संपर्क (सभी संबंधित उपकरण/बस एक्सटेंशन आदि सहित) टीएसपी द्वारा कार्यान्वित किया जाएगा। **टिप्पणी:** i. 1250 मेगावाट का पोल-1 केपीएस3 (एचवीडीसी) के 400 केवी बस सेक्शन 1 से निकलेगा और साउथ ओलपैड एस/एस पर समाप्त होगा। इसी तरह, 1250 मेगावाट का पोल-2 केपीएस3 (एचवीडीसी) के 400 केवी बस सेक्शन 2 से निकलेगा और साउथ ओलपैड एस/एस में समाप्त होगा। ii. एचवीडीसी प्रणाली को 100% विद्युत रिवर्सल क्षमता के साथ-साथ ब्लैक स्टार्ट, स्वचालित ग्रिड बहाली और गतिशील प्रतिक्रियाशील पावर समर्थन क्षमता सहितडिजाइन किया जाएगा। iii. रेटेड विद्युत पारेषण क्षमता के साथ-साथ रेटेड पारेषण वोल्टेज को एसी यार्ड के रेक्टिफायर छोर पर परिभाषित और गारंटी दी जाएगी। iv. केपीएस3 का टीएसपी उपरोक्त कार्यक्षेत्र के अनुसार क्रमांक 4 कार्यक्षेत्र के लिए स्थान उपलब्ध कराएगा। v. साउथ ओलपैड एस/एस का टीएसपी उपरोक्त कार्यक्षेत्र के अनुसार क्रमांक 2 कार्यक्षेत्र के लिए जगह उपलब्ध कराएगा। vi. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी। vii. ऊपर उल्लिखित कार्यान्वयन समय-अवधि अस्थायी है। अंतिम समय-सीमा आरएफपी दस्तावेज़ में इंगित की जाएगी।	
8.	**राजस्थान आरईजेड फेज-IV (भाग-2: 5.5 गीगावाट) (जैसलमेर/बाड़मेर कॉम्प्लेक्स) से विद्युत की निकासी के लिए पारेषण प्रणाली: भाग ए** संभावित कार्यान्वयन समय अवधि: एसपीवी अंतरण से 24 महीने **कार्यक्षेत्र:**	**आरईसी पावर डेवलपमेंट एंड कंसल्टेंसी लिमिटेड**

क्रम सं.	पारेषण स्कीम का कार्यक्षेत्र	क्षमता
1.	2x240 एमवीएआर (765 केवी) बस रिएक्टर और 2x125 एमवीएआर (420 केवी) बस रिएक्टर सहित 4x1500 एमवीए, 765/400 केवी और 5x500 एमवीए, 400/220 केवी फतेहगढ़-IV (सेक्शन -2) पूलिंग स्टेशन की संस्थापना [दिनांक 25.03.22 की 8वीं एनसीटी बैठक में फतेहगढ़-IV में पहले से ही अनुमोदित भावी अंतरिक्ष प्रावधानों का उपयोग वर्तमान स्कीम के लिए किया जाएगा]	• 765/400 केवी, 1500 एमवीए आईसीटी-4 (एक स्पेयर यूनिट सहित 13x500 एमवीए) • 765 केवी आईसीटी बे-4 • 240 एमवीएआर, 765 केवी बस रिएक्टर- 2 (एक स्पेयर यूनिट सहित 7x80 एमवीएआर) • 765 केवी बस रिएक्टर बे-2 • 765 केवी लाइन बे - 4 [फतेहगढ़- III के लीलो के लिए - ब्यावर765 केवी डी/सी (दूसरी) लाइन फतेहगढ़-IV

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				(सेक्शन-2) पीएस पर] • 400/220 केवी, 500 एमवीए आईसीटी-5 • 400 केवी आईसीटी बे-9 • 400 केवी लाइन बे-2 [फतेहगढ़-IV (सेक-2) - भीनमाल (पीजी) डी/सी लाइन के लिए] • 125 एमवीएआर, 420 केवी बस रिएक्टर-2 • 400 केवी बस रिएक्टर बे- 2 • 400 केवी सेक्शनलाइजेशन बे: 1 सेट • 220 केवी आईसीटी बे- 5 • 220 केवी लाइन बे: 6 (आरई कनेक्टिविटी के लिए) • 220 केवी बीसी (2) और 220 केवी टीबीसी (2) • 220 केवी सेक्शनलाइज़ेशन बे: 1 सेट		
		2.	प्रत्येक छोर पर प्रत्येक सीकेटी पर 50 एमवीएआर स्विचेवल लाइन रिएक्टर सहित फतेहगढ़-IV (सेक्शन-2) पीएस - भीनमाल (पीजी) 400 केवी डी/सी लाइन (ट्विन एचटीएलएस*)	मार्ग की लंबाई: 200 किमी • फतेहगढ़-IV (सेक्शन-2) पीएस पर 50 एमवीएआर, 420 केवी स्विचेबल लाइन रिएक्टर-2 • भीनमाल (पीजी) में 50 एमवीएआर, 420 केवी, स्विचेवल लाइन रिएक्टर-2 • फतेहगढ़-IV (सेक्शन-2) पीएस पर 420 केवी, 50 एमवीएआर		



		स्विचेवल लाइन रिएक्टरों के लिए स्विचिंग उपकरण-2 • भीनमाल (पीजी) में 420 केवी, 50 एमवीएआर स्विचेवल लाइन रिएक्टरों के लिए स्विचिंग उपकरण-2
3.	765 केवी फतेहगढ़-IV -ब्यावर के प्रत्येक सीकेटी डी/सी लाइन (लीलो के बाद बनी) के फतेहगढ़- IV पीएस छोर पर 330 एमवीएआर स्विचेवल लाइन रिएक्टर सहित फतेहगढ़- IV (सेक्शन-2) पीएस पर 765 केवी फतेहगढ़-III-ब्यावर डी/सी लाइन के दोनों सीकेटी का लीलो	लीलो की लंबाई: 15 किमी • फतेहगढ़-IV (सेक्शन-2) पीएस पर 330 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर-2 • फतेहगढ़-IV (सेक्शन-2) पीएस पर 330 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टरों के लिए स्विचिंग उपकरण-2 • फतेहगढ़-IV (सेक्शन-2) पीएस छोर पर 110 एमवीएआर (765 केवी) स्पेयर रिएक्टर एकल चरण यूनिट-1
4.	भीनमाल (पीजी) में दो 400 केवी लाइन बे	400 केवी लाइन बे - 2

** नाममात्र वोल्टेज पर प्रत्येक सर्किट पर 2100 एमवीए की न्यूनतम क्षमता सहित।*

टिप्पणी:

i. फतेहगढ़- IV (सेक्शन-1) में चरण-III भाग ए1 के अंतर्गत राजस्थान में आरईजेड से लगभग 2 गीगावाट आरई विद्युत की निकासी (20 गीगावाट) के लिए पारेषण प्रणाली बोली के अधीन है।

ii. चरण-IV (भाग 2) के अंतर्गत पारेषण प्रणाली फतेहगढ़- IV (सेक्शन 2) में 4-5 गीगावाट आरई क्षमता की निकासी के लिए है, जो चरण-III स्कीम के अंतर्गत फतेहगढ़-IV में भावी प्रावधान (दिनांक 25.03.22 को 8वीं एनसीटी बैठक में अनुमोदित) का उपयोग कर रही है।

iii. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी।

iv. भीनमाल (पीजी) में 400 केवी लाइन बे में से 2 के लिए स्थान के साथ-साथ बिना किसी लागत प्रभाव के स्विचेवल लाइन रिएक्टरों के लिए पावरग्रिड स्थान प्रदान करेगा।

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	v. ए, वी, सी, डी, ई, एफ, एच1, एच2 पैकेज का कार्यान्वयन संरेखित किया जाएगा vi. स्विचेबल लाइन रिएक्टरों को एनजीआर बाईपास व्यवस्था सहितकार्यान्वित किया जाएगा। vii. ऊपर उल्लिखित कार्यान्वयन समय अवधि अस्थायी है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।		
9.	**राजस्थान आरईजेड फेज-IV (भाग-2: 5.5 गीगावाट) (जैसलमेर/बाड़मेर कॉम्प्लेक्स) से विद्युत की निकासी के लिए पारेषण प्रणाली: भाग बी** संभावित कार्यान्वयन समय-सीमा: एसपीवी अंतरण से 24 महीने **कार्यक्षेत्र:**	**पीएफसी कंसल्टिंग लिमिटेड**	

क्र. सं.	पारेषण स्कीम का कार्यक्षेत्र	क्षमता
1.	सिरोही के पास उपयुक्त स्थान पर 2x240 एमवीएआर (765 केवी) और 2x125 एमवीएआर (420 केवी) बस रिएक्टर सहित 2x1500 एमवीए, 765/400 केवी सब-स्टेशन की स्थापना **भावी प्रावधान:** निम्नलिखित के लिए स्थान • 765/400 केवी आईसीटी सहित बे- 4 • 765 केवी लाइन स्विचेबल लाइन रिएक्टरों सहित बे - 10 • बे सहित 765 केवी बस रिएक्टर : 1 • बे सहित 400 केवी लाइन स्विचेबल लाइन रिएक्टर-4 • 400 केवी लाइन बे–4 • बे सहित 400 केवी बस रिएक्टर : 1 • 400 केवी सेक्शनलाइजेशन बे: 2 सेट • बे सहित400/220 केवी आईसीटी - 6 • 220 केवी लाइन बे -10 • 220 केवी सेक्शनलाइजेशनबे : 2 सेट • 220 केवी बीसी (3) एवं टीबीसी (3) • दो 400 केवी बे सहित एमएससी (4x125 एमवीएआर) और एमएसआर (2x125 एमवीएआर) सहित स्टेटकॉम (2x±300 एमवीएआर)	• 765/400 केवी, 1500 एमवीए आईसीटी-2 (एक स्पेयर यूनिट सहित 7x500 एमवीए) • 765 केवी आईसीटी बे -2 • 240 एमवीएआर, 765 केवी बस रिएक्टर-2 (एकस्पेयर यूनिट सहित 7x80 एमवीएआर) • 765 केवी बस रिएक्टर बे-2 • 765 केवी लाइन बे-2 [फतेहगढ़-IV (सेक्शन-2) पीएस तक डी/सी लाइन के लिए] • 400 केवी आईसीटी बे - 2 • 400 केवी लाइन बे - 2 [चित्तौड़गढ़ (पीजी)



			एस/एस तक डी/सी लाइन के लिए] • 125 एमवीएआर, 420 केवी बस रिएक्टर -2 • 400 केवी बस रिएक्टर बे-2
	2.	प्रत्येक छोर पर प्रत्येक सर्किट के लिए 240 एमवीएआर स्विचेबल लाइन रिएक्टर सहित फतेहगढ़- IV (सेक्शन-2) पीएस - सिरोही पीएस 765 केवी डी/सी लाइन	मार्ग की लंबाई – 240 किमी • फतेहगढ़-IV (सेक्शन-2) पीएस पर 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टर - 2 • सिरोही पीएसपर 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टर-2 • फतेहगढ़-IV (सेक्शन-2) पीएस पर 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टरों के लिए स्विचिंग उपकरण-2 • सिरोही पीएस पर 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टरों के

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			लिए स्विचिंग उपकरण-2	
	3.	सिरोही पीएस छोर पर प्रत्येक सर्किट के लिए 80 एमवीएआर स्विचेबल लाइन रिएक्टर सहित सिरोही पीएस-चित्तौड़गढ़ (पीजी) 400 केवी डी/सी लाइन (क्वाड)	मार्ग की लंबाई ~ 160 किमी • सिरोही पीएसपर 420 केवी, 80 एमवीएआर स्विचेबल लाइन रिएक्टर-2 • सिरोही पीएस पर 420 केवी, 80 एमवीएआर स्विचेबल लाइन रिएक्टरों के लिए स्विचिंग उपकरण-2	
	4.	चित्तौड़गढ़ (पीजी) एस/एस में दो 400 केवी लाइन बे	चित्तौड़गढ़ (पीजी) एस/एसपर 400 केवी लाइन बे-2	
	5.	फतेहगढ़-IV (सेक्शन-2) पीएस पर दो 765 केवी लाइन बे	फतेहगढ़-IV (सेक्शन-2) पीएसपर 765 केवी लाइन बे-2	
	टिप्पणी: i. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी। ii. चित्तौड़गढ़ (पीजी) में 2 400 केवी लाइन बे के लिए पावरग्रिड स्थान उपलब्ध कराएगा। iii. फतेहगढ़- IV एस/एस (सेक्शन-2) के विकासकर्ता फतेहगढ़- IV (सेक्शन-2) पीएस में दो 765 केवी लाइन बे के लिए स्थान के साथ-साथ स्विचेबल लाइन रिएक्टर के लिए स्थान उपलब्ध कराएंगे। iv. ए, बी, सी, डी, ई, एफ, एच1, एच2 पैकेज का कार्यान्वयन संरेखित किया जाएगा v. स्विचेबल लाइन रिएक्टरों को एनजीआर बाईपास व्यवस्था सहितकार्यान्वित किया जाएगा। vi. ऊपर उल्लिखित कार्यान्वयन समय-अवधि अस्थायी है। अंतिम समय-अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।		
10.	**राजस्थान आरईजेड फेज-IV (भाग-2: 5.5 गीगावाट) (जैसलमेर/बाड़मेर कॉम्प्लेक्स) से विद्युत की निकासी के लिए पारेषण प्रणाली: भाग सी** संभावित कार्यान्वयन समय अवधि: एसपीवी अंतरण से 24 महीने **कार्यक्षेत्र:**			**आरईसी पावर डेवलपमेंट एंड कंसल्टेंसी लिमिटेड**

क्रम सं.	पारेषण स्कीम का कार्यक्षेत्र	क्षमता
1.	2x330 एमवीएआर (765 केवी) बस रिएक्टर एवं 2x125 एमवीएआर, 420 केवी बस रिएक्टर के साथ 3x1500 एमवीए, 765/400 केवी एवं 5x500 एमवीए, 400/220 केवी मंदसौर पूलिंग स्टेशन की स्थापना	765/400 केवी, 1500 एमवीए आईसीटी - 3 (एक स्पेयर यूनिट सहित 10x500 एमवीए एकल



	भावी प्रावधान: निम्नलिखित के लिए स्थान: • 765/400 केवी आईसीटी सहित बे - 3 • बे सहित 765 केवी लाइन स्विचेबल लाइन रिएक्टर - 12 • बे सहित 765 केवी बस रिएक्टर: 2 • 765 केवी सेक्शनलाइजर बे: 1 सेट • स्विचेबल लाइन रिएक्टरों सहित 400 केवी लाइन बे – 12 • बे सहित 400/220 केवी आईसीटी - 5 • बे सहित 400 केवी बस रिएक्टर: 2 • 400 केवी सेक्शनलाइजेशन बे : 1 सेट • 220 केवी लाइन बे: 11 • 220 केवी सेक्शनलाइजेशन बे : 1 सेट • 220 केवी बीसी और टीबीसी: 1 • स्टेटकॉम (± 300 एमवीएआर) सहित एमएससी (2x125 एमवीएआर) और एमएसआर (1x125 एमवीएआर) सहित एक 400 केवी बे।	चरण यूनिटें) 400/220 केवी, 500 एमवीए आईसीटी - 5 (220 केवी बस सेक्शन-1 पर 3 और 220 केवी बस सेक्शन-2 पर 2) 765 केवी आईसीटी बे– 3 400 केवी आईसीटी बे – 8 330 एमवीएआर 765 केवी बस रिएक्टर-2 (एक स्पेयर यूनिट सहित 7x110 एमवीएआर एकल चरण यूनिटें) 765 केवी बस रिएक्टर बे-2 765 केवी लाइन बे- 2 (इंदौर लाइन के लिए) 80 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (स्पेयर यूनिट)-1 125 एमवीएआर, 420 केवी बस रिएक्टर-2 400 केवी रिएक्टर बे- 2 220 केवी आईसीटी बे– 5 220 केवी लाइन बे - 7 (बस सेक्शन-1 पर 4 और बस सेक्शन-2 पर 3) 220 केवी बस सेक्शनलाइज़र - 1 सेट 220 केवी टीबीसी बे - 2 220 केवी बीसी बे - 2
2.	मंदसौर पीएस- इंदौर (पीजी) 765 केवी डी/सी लाइन	मार्ग की लंबाई ~ 200 किमी
3.	मंदसौर पीएस – इंदौर (पीजी) 765 केवी डी/सी लाईन के मंदसौर छोर पर प्रत्येक सीकेटी पर 1x330 एमवीएआर स्विचेबल लाइन रिएक्टर (एसएलआर)	• 330 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर- 2 • 765 केवी लाइन रिएक्टर के लिए स्विचिंग उपकरण -2
4.	मंदसौर पीएस – इंदौर (पीजी) 765 केवी डी/सी लाइन की समाप्ति के लिए इंदौर (पीजी) में 2 (दो) 765 केवी लाइन बे	• 765 केवी लाइन बे – 2 (इंदौर (पीजी) छोर के लिए)
टिप्पणी: i. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी ii. इंदौर सब-स्टेशन में दो 765 केवी लाइन बे के लिए पावरग्रिड स्थान उपलब्ध कराएगा		

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	iii. ए, वी, सी, डी, ई, एफ, एच1, एच2 पैकेज का कार्यान्वयन संरेखित किया जाएगा iv. स्विचेबल लाइन रिएक्टरों को एनजीआर बाईपास व्यवस्था के साथ कार्यान्वित किया जाएगा v. ऊपर उल्लिखित कार्यान्वयन समय अवधि अस्थायी है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।	
11.	**राजस्थान आरईजेड चरण-IV (भाग-2: 5.5 गीगावॉट) (जैसलमेर/बाड़मेर कॉम्प्लेक्स) से विद्युत निकासी के लिए पारेषण प्रणाली: भाग डी** संभावित कार्यान्वयन समय अवधि: एसपीवी अंतरण से 24 महीने **कार्यक्षेत्र:**	**पीएफसी कंसल्टिंग लिमिटेड**

क्र.सं.	पारेषण स्कीम का कार्यक्षेत्र	क्षमता
1.	ब्यावर-मंदसौर पीएस 765 केवी डी/सी लाइन सहित प्रत्येक छोर पर प्रत्येक सर्किट के लिए 240 एमवीएआर स्विचेबल लाइन रिएक्टर	मार्ग की लंबाई – 260 किमी • ब्यावर में 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टर- 2 • मंदसौर पीएस में 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टर- 2 • ब्यावर में 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टर के लिए स्विचिंग उपकरण - 2 • मंदसौर पीएस में 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टर के लिए स्विचिंग उपकरण- 2
2.	ब्यावर सब-स्टेशन और मंदसौर सब-स्टेशन में प्रत्येक में दो 765 केवी लाइन बे	765 केवी लाइन बे - 4 (ब्यावर सब-स्टेशन और मंदसौर पीएस पर प्रत्येक में 2)

टिप्पणी:

i. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी।
ii. मंदसौर पीएस के विकासकर्ता स्विचेबल लाइन रिएक्टर के लिए स्थान के साथ-साथ मंदसौर सब-स्टेशन में दो 765 केवी लाइन बे के लिए स्थान प्रदान करेंगे।
iii. ब्यावर सब-स्टेशन के विकासकर्ता, स्विचेबल लाइन रिएक्टर के लिए स्थान के साथ-साथ ब्यावर सब-स्टेशन में 2 765 केवी लाइन बे के लिए स्थान प्रदान करेंगे।
iv. ए, बी, सी, डी, ई, एफ, एच1, एच2 पैकेजों का कार्यान्वयन संरेखित किया जाएगा
v. स्विचेबल लाइन रिएक्टरों को एनजीआर बाईपास व्यवस्था के साथ कार्यान्वित किया जाएगा
vi. ऊपर उल्लिखित कार्यान्वयन समय अवधि अस्थायी है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।

12.	**राजस्थान आरईजेड चरण-IV (भाग-2: 5.5 गीगावॉट) (जैसलमेर/बाड़मेर कॉम्प्लेक्स) से विद्युत निकासी के लिए पारेषण प्रणाली: भाग ई** संभावित कार्यान्वयन समय अवधि: एसपीवी अंतरण से 24 महीने	**आरईसी पावर डेवलपमेंट एंड कंसल्टेंसी लिमिटेड**

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कार्यक्षेत्र:

क्र.सं.	पारेषण स्कीम का कार्यक्षेत्र	क्षमता
1.	2x240 एमवीएआर (765 केवी) बस रिएक्टर के साथ ऋषभदेव (जिला उदयपुर) के पास उपयुक्त स्थान पर 765 केवी सबस्टेशन की स्थापना **भविष्य के प्रावधान:** **निम्नलिखित के लिए स्थान** ○ बे सहित 765/400 केवी आईसीटी- स्पेयर यूनिट सहित 5 ○ स्विचेबल लाइन रिएक्टर सहित 765 केवी लाइन बे - 6 ○ बे सहित 765 केवी बस रिएक्टर: 1 ○ स्विचेबल लाइन रिएक्टर सहित 400 केवी लाइन बे - 4 ○ 400 केवी लाइन बे -4 ○ बे सहित 400 केवी बस रिएक्टर: 3 ○ 400 केवी सेक्शनलाइजेशन बे: 2 सेट ○ बे सहित 400/220 केवी आईसीटी- 6 ○ 220 केवी लाइन बे-10 ○ 220 केवी सेक्शनलाइजेशन बे: 2 सेट ○ 220 केवी बीसी (3) तथा टीबीसी (3) ○ स्टेटकॉम (2 x ±300 एमवीएआर) एमएससी (4x125 एमवीएआर) और एमएसआर (2x125 एमवीएआर) सहित दो 400 केवी बे	• 240 एमवीएआर, 765 केवी बस रिएक्टर – 2 (एक स्पेयर यूनिट सहित 7x80 एमवीएआर) • 765 केवी बस रिएक्टर बे-2 • 765 केवी लाइन बे - 6 [765 केवी सिरोही पीएस-ऋषभदेव-मंदसौर डी/सी लाइन और ऋषभदेव सब-स्टेशन पर 765 केवी चित्तौड़गढ़-बनासकांता डी/सी लाइन के एक सर्किट के लीलो के लिए]
2.	सिरोही छोर पर प्रत्येक सर्किट के लिए 330 एमवीएआर स्विचेबल लाइन रिएक्टर सहित सिरोही पीएस- ऋषभदेव 765 केवी डी/सी लाइन	मार्ग की लंबाई – 170 किमी • सिरोही पीएस पर 765 केवी, 330 एमवीएआर स्विचेबल लाइन रिएक्टर- 2 • सिरोही पीएस में 765 केवी, 330 एमवीएआर स्विचेबल लाइन रिएक्टरों के लिए स्विचिंग उपकरण -2 • सिरोही पीएसपर 110 एमवीएआर (765 केवी) स्पेयर रिएक्टर एकल चरण यूनिट-1
3.	ऋषभदेव छोर पर प्रत्येक सर्किट के लिए 240 एमवीएआर स्विचेबल लाइन रिएक्टर सहित ऋषभदेव - मंदसौर पीएस 765 केवी डी/सी लाइन	मार्ग की लंबाई – 160 किमी • ऋषभदेव में 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टर – 2 • ऋषभदेव में 765

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			केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टरों के लिए स्विचिंग उपकरण - 2
	4.	ऋषभदेव सब-स्टेशन (20 किमी) पर 765 केवी चित्तौड़गढ़-बनासकांठा डी/सी लाइन के एक सर्किट का लीलो	लीलो मार्ग की लंबाई~ 20 किमी
	5.	सिरोही पीएस और मंदसौर सब-स्टेशन में प्रत्येक में दो 765 केवी लाइन बे	• 765 केवी लाइन बे - 4 (सिरोही पीएस और मंदसौर पीएस पर प्रत्येक में 2)

टिप्पणी:

i. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी

ii. सिरोही पीएस के विकासकर्ता स्पेयर यूनिट सहित स्विचेबल लाइन रिएक्टरों के लिए स्थान के साथ सिरोही पीएस में दो 765 केवी लाइन बे के लिए स्थान प्रदान करेंगे।

iii. मंदसौर पीएस के विकासकर्ता मंदसौर पीएस में 2 765 केवी लाइन बे के लिए स्थान उपलब्ध कराएंगे।

iv. ए, बी, सी, डी, ई, एफ, एच1, एच2 पैकेजों का कार्यान्वयन संरेखित किया जाएगा

v. स्विचेबल लाइन रिएक्टरों को एनजीआर बाईपास व्यवस्था के साथ कार्यान्वित किया जाएगा।

vi. ऊपर उल्लिखित कार्यान्वयन समय अवधि अस्थायी है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।

13. **राजस्थान आरईजेड चरण-IV (भाग-2: 5.5 गीगावाट) (जैसलमेर/बाड़मेर कॉम्प्लेक्स) से विद्युत निकासी के लिए पारेषण प्रणाली: भाग एफ (भाग एफ1 और एफ2 को जोड़कर)**

संभावित कार्यान्वयन समय अवधि: एसपीवी अंतरण से 24 महीने

कार्यक्षेत्र:

पीएफसी कंसल्टिंग लिमिटेड

क्र.सं.	**पारेषण स्कीम का कार्यक्षेत्र**	**क्षमता**
1.	2x240 एमवीएआर (765 केवी) बस रिएक्टर और 2x125 एमवीएआर (420 केवी) बस रिएक्टर सहित 3x1500 एमवीए, 765/400 केवी और 2x500 एमवीए, 400/220 केवी बाड़मेर-I पूलिंग स्टेशन की स्थापना **भावी प्रावधान:** **निम्नलिखित के लिए स्थान** ○ बे सहित 765/400 केवी आईसीटी -3 ○ स्विचेबल लाइन रिएक्टरों सहित 765 केवी लाइन बे -4 ○ बे सहित 765 केवी बस रिएक्टर: 1 ○ 400 केवी लाइन बे -4 ○ स्विचेबल लाइन रिएक्टर सहित 400 केवी लाइन बे -4 ○ बे सहित 400/220 केवी आईसीटी -8 ○ बे सहित 400 केवी बस रिएक्टर: 1 ○ 400 केवी सेक्शनलाइज़ेशन बे: 2 सेट	• 765/400 केवी, 1500 एमवीए आईसीटी- 3 (एक स्पेयर यूनिट सहित 10x500 एमवीए) • 765 केवी आईसीटी बे-3 • 240 एमवीएआर, 765 केवी बस रिएक्टर-2 (एक स्पेयर यूनिट सहित(7x80

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		○ आरई अनुप्रयोगों की कनेक्टिविटी के लिए 220 केवी लाइन बे -10 ○ 220 केवी सेक्शनलाइज़ेशन बे: 3 सेट ○ 220 केवी बीसी (3) और टीबीसी (3) ○ एमएससी (4x125 एमवीएआर) एवं एमएसआर (2x125 एमवीएआर) सहित स्टेटकॉम (2x±300 एमवीएआर) के साथ-साथ दो 400 केवी बे	एमवीएआर) • 765 केवी बस रिएक्टर बे-2 • 765 केवी लाइन बे- 2 (सिरोही पीएस तक डी/सी लाइन के लिए) • 400/220 केवी, 500 एमवीए आईसीटी -2 • 400 केवी आईसीटी बे- 5 • 125 एमवीएआर, 420 केवी बस रिएक्टर-2 • 400 केवी बस रिएक्टर बे- 2 • 400 केवी लाइन बे – 2 [फतेहगढ़-III (सेक्शन-2) पीएस तक डी/सी लाइन के लिए] • 220 केवी आईसीटी बे- 2 • 220 केवी लाइन बे: 4 (आरई कनेक्टिविटी के लिए) • 220 केवी बीसी (1) और टीबीसी (1)
2.	फतेहगढ़-III (सेक्शन-2) पीएस-बाड़मेर-I पीएस 400 केवी डी/सी लाइन (क्वाड)		मार्ग की लंबाई ~50 किमी
3.	प्रत्येक छोर पर प्रत्येक सर्किट के लिए 240 एमवीएआर स्विचेबल लाइन रिएक्टर सहित बाड़मेर-I पीएस- सिरोही पीएस 765 केवी डी/सीलाइन		मार्ग की लंबाई ~200 किमी • बाड़मेर-I पीएसपर 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टर - 2 • सिरोही

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			पीएस पर 765 केवी, 240 एमवीएआर स्विचेबल लाइन रिएक्टर - 2 • वाड़मेर-I पीएसपर 765 केवी 240 एमवीएआर स्विचेबल लाइन रिएक्टरों के लिए स्विचिंग उपकरण -2 • सिरोही पीएस पर 765 केवी 240 एमवीएआर स्विचेबल लाइन रिएक्टरों के लिए स्विचिंग उपकरण -2
4.	फतेहगढ़-III (सेक्शन-2) पीएस में 2,400 केवी लाइन बे	फतेहगढ़-III (सेक्शन-2) पीएस में 400 केवी लाइन बे-2	
5.	सिरोही पीएस में दो 765 केवी लाइन बे	सिरोही पीएस में 765 केवी लाइन बे -2	

टिप्पणी:

i. ऊपर उल्लिखित लाइन की लंबाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त की जाएगी

ii. सिरोही पीएस के विकासकर्ता स्विचेबल लाइन रिएक्टर के लिए स्थान के साथ-साथ सिरोही पीएस में दो 765 केवी लाइन बे के लिए स्थान प्रदान करेंगे।

iii. फतेहगढ़-III पीएस (सेक्शन-2) के विकासकर्ता, फतेहगढ़-III पीएस (सेक्शन-2) में दो 400 केवी लाइन बे के लिए स्थान उपलब्ध कराएंगे।

iv. स्विचेबल लाइन रिएक्टरों को एनजीआर बाईपास व्यवस्था के साथ कार्यान्वित किया जाएगा।

v. ए, बी, सी, डी, ई, एफ, एच1, एच2 पैकेजों का कार्यान्वयन संरेखित किया जाएगा।

vi. ऊपर उल्लिखित कार्यान्वयन समय अवधि अस्थायी है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।

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14.	**राजस्थान आरईजेड चरण-IV से विद्युत की निकासी के लिए पारेषण प्रणाली (भाग-2 : 5.5 गीगावाट) (जैसलमेर/बाडमेर कॉम्प्लेक्स): भाग एच1** संभावित कार्यान्वयन समय-सीमा: एसपीवी अंतरण से 24 माह **कार्यक्षेत्र:**	**आरईसी पावर डेवलपमेंट एंड कंसल्टेंसी लिमिटेड**

क्र. सं.	पारेषण स्कीम का कार्यक्षेत्र	क्षमता
1.	2x330 एमवीएआर 765 केवी बस रिएक्टर और 1x125 एमवीएआर, 420 केवी बस रिएक्टर के साथ 765/400 केवी (2x1500 एमवीए), 400/22 केवी (2x500 एमवीए) और 220/132 केवी (3x200 एमवीए) कुरावर एस/एस की स्थापना . **भावी प्रावधान**: निम्नलिखित के लिए स्थान • 765/400 केवी आईसीटी बे के साथ -4 • स्विचेबल लाइन रिएक्टरों बे सहित765 केवी लाइन - 8 • बे सहित 765 केवी बस रिएक्टर: 2 • 765 केवी सेक्शनलाइज़र बे: 1 – सेट • स्विचेबल लाइन रिएक्टर सहित400 केवी लाइन बे – 8 • बे सहित 400/220 केवी आईसीटी -6 • 420 केवी बस रिएक्टर बे सहित: 3 • 400 केवी सेक्शनलाइज़ेशन बे: 1- सेट • 220 केवी लाइन बे: 12 • 220 केवी सेक्शनलाइज़ेशन बे: 1सेट • 220 केवी बीसी और टीबीसी:1 • 220/132 केवी आईसीटी बे सहित: 5 • 132 केवी लाइन बे: 16 • 132 केवी सेक्शनलाइजेशन बे:1 सेट • 132 केवी टीबीसी-1 • 400 केवी बे के साथ एमएससी (2x125 एमवीएआर) एवं एमएसआर (1x125 एमवीएआर) सहित स्टेटकॉम (±300 एमवीएआर)	• 765/400 केवी, 1500 एमवीए आईसीटी – 2 (एक स्पेयर यूनिट सहित 500 एमवीए की 7 एकल यूनिटें) • 400/220 केवी, 500 एमवीए आईसीटी – 2 • 220/132 केवी, 200 एमवीए आईसीटी – 3 • 765 केवी आईसीटी बे - 2 • 400 केवी आईसीटी बे - 4 • 220 केवी आईसीटी बे – 5 • 132 केवी आईसीटी बे - 3 • 330 एमवीएआर 765 केवी बस रिएक्टर-2 • 125 एमवीएआर 420 केवी बस रिएक्टर-1 • 765 केवी रिएक्टर बे- 2 • 765 केवी लाइन बे - 4 • 400 केवी लाइन बे - 4 • 400 केवी रिएक्टर बे - 1 • 220 केवी बीसी– 1 • 220 केवी टीबीसी – 1 • 132 केवी टीबीसी – 1 • 110 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (स्पेयर यूनिट)-1 • 80 एमवीएआर, 765 केवी, 1-पीएच रिएक्टर (स्पेयर यूनिट)-1



2.	मंदसौर-कुरावर 765 केवी डी/सी लाइन	मार्ग की लंवाई: 235 किमी
3.	मंदसौर-कुरावर 765 केवी डी/सी लाइन के दोनों छोर पर प्रत्येक सीकेटी पर 240 एमवीएआर स्विचेबल लाइन रिएक्टर	• 240 एमवीएआर, 765 केवी स्विचेबल लाइन रिएक्टर - 4 (मंदसौर छोर के लिए 2 और कुरावर छोर के लिए 2) • 765 केवी लाइन रिएक्टर के लिए स्विचिंग उपकरण - 4 (मंदसौर छोर के लिए 2 और कुरावर छोर के लिए 2)
4.	मंदसौर-कुरावर 765 केवी डी/सी लाइन को समाप्त करने के लिए मंदसौर एस/एस में 765 केवी लाइन वे की 2	• 765 केवी लाइन बे – 2 (मंदसौर छोर के लिए)
5.	कुरावर में इंदौर-भोपाल 765 केवी एस/सी लाइन का लीलो	लीलो मार्ग की लंवाई: 15 किमी
6.	कुरावर-आष्टा 400 केवी डी/सी (क्वाड एसीएसआर/एएएसी/एएल59 मूस समतुल्य) लाइन	मार्ग की लंबाई : 65 किमी
7.	कुरावर-आष्टा 400 केवी डी/सी लाइन के समापन के लिए आष्टा (एमपी) एस/एस पर 400 केवी लाइन वे की 2	400 केवी लाइन बे– 2 [आष्टा (मध्य प्रदेश) छोर के लिए]
8.	आष्टा पर इंदौर-इटारसी 400 केवी डी/सी लाइन के एक सर्किट का लीलो	लीलो मार्ग की लंवाई: 30 किमी
9.	आष्टा में इंदौर-इटारसी 400 केवी डी/सी लाइन के एक सर्किट के लीलो के लिए आष्टा (एमपी) एस/एस पर 400 केवी लाइन वे की 2	400 केवी लाइन बे - 2 [आष्टा (एमपी) छोर के लिए]
10.	शुजालपुर - कुरावर 400 केवी डी/सी (क्वाड एसीएसआर/एएएसी/एएल59 मूस समतुल्य) लाइन	मार्ग की लंबाई: 40 किमी
11.	शुजालपुर-कुरावर 400 केवी डी/सी लाइन को समाप्त करने के लिए शुजालपुर (पीजी) एस/एस पर 400 केवी लाइन वे की 2	400 केवी लाइन बे - 2 [शुजालपुर (पीजी) छोर के लिए]

टिप्पणी:

I. उल्लिखित लाइन की लंवाई अनुमानित है क्योंकि सटीक लंबाई विस्तृत सर्वेक्षण के बाद प्राप्त होगी।

II. एमपीपीटीसीएल ने आष्टा (एमपी) एस/एस में 400 केवी की 2 वे के लिए और 2 अतिरिक्त वे के लिए स्थान की उपलब्धता की पुष्टि की है, एमपीपीटीसीएल ने सूचित किया है कि निकटवर्ती भूमि निजी भूमि है और परियोजना विकासकर्ता द्वारा आवश्यकता के अनुसार अपनी लागत पर खरीदी जा सकती है।

III. ए, बी, सी, डी, ई, एफ, एच1 और एच2 पैकेजों का कार्यान्वयन संरेखित किया जाएगा

IV. विषय संबंधी स्कीम का टीएसपी मंदसौर-कुरावर 765 केवी डी/सी लाइन पर इंटर-ट्रिपिंग स्कीम कार्यान्वित करेगी (मुख्य लाइन ब्रेकर के साथ मंदसौर/कुरावर छोर पर स्विचेबल लाइन रिएक्टर की ट्रिपिंग के लिए)।

V. स्विचेबल लाइन रिएक्टरों को एनजीआर बाईपास व्यवस्था के साथ कार्यान्वित किया जाएगा

VI. मंदसौर एस/एस का विकासकर्ता मंदसौर-कुरावर 765 केवी डी/सी लाइन के लिए 765 केवी लाइन की 2 वे के लिए स्थान उपलब्ध कराएगा।

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VII.	पावरग्रिड शुजालपुर-कुरावर 400 केवी डी/सी लाइन के लिए शुजालपुर एस/एस पर 400 केवी लाइन की 2 बे के लिए स्थान उपलब्ध कराएगा।
VIII.	उल्लिखित कार्यान्वयन समय अवधि अस्थायी है। अंतिम समय अवधि आरएफपी दस्तावेज़ में इंगित की जाएगी।

2. बोली प्रक्रिया समन्वयक की नियुक्ति इस संबंध में विद्युत मंत्रालय द्वारा जारी, समय-समय पर यथासंशोधित, दिशा-निर्देशों में निर्धारित शर्तों के अधीन है।

[फा. सं. 15/3/2018-ट्रांस-पार्ट (1)]

बिहारी लाल, अवर सचिव (पारेषण)

MINISTRY OF POWER

NOTIFICATION

New Delhi, the 29th August, 2023

S.O. 3894(E).—In exercise of the powers conferred by sub-para 3.2 of Para 3 of the Guidelines circulated under Section 63 of the Electricity Act, 2003 (no. 36 of 2003), the Central Government, on recommendations of 14th meeting of National Committee on Transmission, hereby appoints the following Bid-Process Coordinators (BPCs) for the Transmission Schemes, as shown against the name of the Transmission Schemes: -

<table>
<tr><th>Sl. No.</th><th>Name & Scope of the Transmission Scheme</th><th>Bid Process Coordinator</th></tr>
<tr><td>1.</td><td>Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part A
Tentative Implementation timeframe: 24 months from SPV transfer and matching with Parts B, C & D of Khavda Ph-IV (7 GW)
Scope:
<table>
<tr><th>Sl. No.</th><th>Scope of the Transmission Scheme</th><th>Capacity/ Route length</th></tr>
<tr><td>1.</td><td>Creation of 765 kV bus section-II at KPS3 (GIS) along with 765 kV Bus Sectionaliser & 1x330 MVAR, 765 kV Bus Reactors on Bus Section-II

Bus section – II shall be created at 765 kV & 400 kV level both with 3x1500 MVA, 765/400 kV ICTs at Bus Section-II</td><td>Bus Section-II at KPS3
765 kV Bus Sectionaliser – 1 set
1500 MVA, 765/400 kV ICT – 3 Nos.
330 MVAR, 765 kV Bus Reactor – 1 No.
765 kV reactor bay – 1 No.
765 kV ICT bays – 3 Nos.</td></tr>
<tr><td>2.</td><td>Creation of 400 kV bus Section-II at KPS3 (GIS) along with 400 kV Bus Sectionaliser & 1x125 MVAR, 420 kV Bus Reactors on Bus Section-II and 3 Nos. 400 kV bays at Bus Section-II for RE interconnection</td><td>Bus Section-II at KPS3
400 kV Bus Sectionaliser – 1 set
125 MVAR, 420 kV Bus Reactors – 1 No.
400 kV reactor bay – 1 No.
400 kV ICT bays – 3 Nos. (for ICTs at Sl. 1 above)
400 kV line bays – 3 Nos. (for RE interconnection)</td></tr>
<tr><td>3.</td><td>KPS3 (GIS) – Lakadia (AIS) 765 kV D/C line</td><td>Route length: 185 km</td></tr>
<tr><td>4.</td><td>2 Nos. of 765 kV line bays each at KPS3 (GIS)& Lakadia (AIS) for KPS3 (GIS) – Lakadia (AIS) 765 kV D/C line</td><td>• 765 kV line bays (GIS) – 2 Nos. (at KPS3 end Bus section-II)</td></tr>
</table></td><td>REC Power Development and Consultancy Limited</td></tr>
</table>

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			• 765 kV line bays (AIS) – 2 Nos. (at Lakadia end)
	5.	±300 MVAR STATCOM with 1x125 MVAR MSC, 2x125 MVAR MSR at KPS3 400 kV Bus section-II	• ±300 MVAR STATCOM (with 1x125 MVAR MSC, 2x125 MVAR MSR) • 400 kV bay – 1 No.
	6.	KPS1 (GIS)– Bhuj PS 765 kV 2nd D/C line	• Route length: 110 km
	7.	2 Nos. of 765 kV line bays each at KPS1 (GIS) & Bhuj PS for KPS1 (GIS) – Bhuj PS 765 kV D/C line	• 765 kV line bays (GIS) – 2 Nos. (at KPS1 end Bus section-II) • 765 kV line bays (AIS) – 2 Nos. (at Bhuj end)
	8.	330 MVAR switchable line reactors at KPS3 end of KPS3 (GIS) – Lakadia 765 kV D/C line (with NGR bypass arrangement)	• 330 MVAR, 765 kV switchable line reactor- 2 Nos. • Switching equipment for 765 kV line reactor- 2 Nos. • 1x110 MVAR spare switchable reactor unit at KPS3 (GIS) end

Note:

i. Bay(s) required for completion of diameter (GIS) in one-and-half breaker scheme, shall also be executed by the TSP.

ii. TSP of KPS3 shall provide space for work envisaged at Sl. 1, 2, 4, 5 & 8.

iii. The TSP of the present scheme shall arrange for additional land for installation of STATCOM (with MSC/MSR) as specified at Sl. No. 5 at KPS3 and TSP of KPS3 shall provide space for 1 No. 400 kV bay for termination of STATCOM.

iv. TSP of KPS1 and Bhuj PS shall provide space for work envisaged at Sl. No. 7.

v. The TSP of the present scheme shall arrange for additional land adjoining Lakadia S/s for creation of 2 Nos. 765 kV diameter consisting of 1 main bay & 1 Tie bay (for each diameter) in one-and-half breaker AIS scheme, towards implementation of 2 Nos. 765 kV line bays at Lakadia S/s (at Sl. No. 4) associated with KPS3 – Lakadia 765 kV D/c line and the same shall be extendable in future for integration of 2nd main bay (future line with switchable line reactor) for diameter completion.

vi. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey.

vii. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.

2.	**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part B** Tentative Implementation timeframe: 24 months from SPV transfer and matching with Parts A, C & D of Khavda Ph-IV (7 GW) **Scope:**	**PFC Consulting Limited**

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Sl. No.	Scope of the transmission Scheme	Capacity /km
1.	Establishment of 2x1500 MVA, 765/400 kV & 2x500 MVA, 400/220 kV GIS S/s at a suitable location South of Olpad (between Olpad and Ichhapore) with 2x330 MVAR, 765 kV & 1x125 MVAR, 420 kV bus reactors **Future Provisions**: Space for • o 765/400 kV ICT along with bays- 4 Nos. o 765 kV line bays along with switchable line reactors – 8 Nos. o 765 kV Bus Reactor along with bay: 2 Nos. o 765 kV Sectionaliser bay: 1 - set o 400 kV line bays along with switchable line reactor – 8 Nos. o 400/220 kV ICT along with bays - 8 Nos. o 420 kV Bus Reactor along with bay: 3 Nos. o 400 kV Sectionalization bay: 1- set o 220 kV line bays: 18 Nos. o 220 kV Sectionalization bay: 1 set o 220 kV BC: 1 Nos. o Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW)	765/400 kV, 1x1500 MVA ICT-2 Nos. (7x500 MVA single phase units including one spare unit) 400/220 kV, 500 MVA ICT – 2 Nos. 765 kV ICT bays- 2 Nos. 400 kV ICT bays- 4 Nos. 220 kV ICT bays- 2 Nos. 220 kV BC bay – 1 No. 330 MVAR, 765 kV bus reactor-2 Nos. 125 MVAR, 420 kV bus reactor-1 No. 765 kV reactor bay- 2 Nos. 765 kV line bay- 4 Nos. 400 kV reactor bay- 1 No. 400 kV line bay- 4 Nos. 110 MVAR, 765 kV, 1-ph reactor (spare unit for line/bus reactor)-1 No.
2.	Vadodara (GIS) –South Olpad (GIS) 765 kV D/C line	Route length: 140 km
3.	240 MVAR switchable line reactors on each ckt at Vadodara (GIS) end of Vadodara (GIS) –South Olpad (GIS) 765 kV D/C line (with NGR bypass arrangement)	• 240 MVAR, 765 kV switchable line reactor- 2 Nos. • Switching equipment for 765 kV line reactor- 2 Nos. • 1x80 MVAR spare bus reactor available at Vadodara (GIS) to be used as spare

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	4.	2 Nos. of 765 kV line bays at Vadodara (GIS)for Vadodara(GIS) – South Olpad (GIS) 765 kV D/C line	• 765 kV line bays (GIS) – 2 Nos. (at Vadodara end)
	5.	LILO of Gandhar – Hazira 400 kV D/c line at South Olpad (GIS) using twin HTLS conductor with minimum capacity of 1700 MVA per ckt at nominal voltage	LILO route length ~ 10 km.
	6.	Ahmedabad – South Olpad (GIS) 765 kV D/c line	Route length: 250 km
	7.	240 MVAR switchable line reactors on each ckt at Ahmedabad & South Olpad (GIS) end of Ahmedabad – South Olpad (GIS) 765 kV D/c line (with NGR bypass arrangement)	• 240 MVAR, 765 kV switchable line reactor- 4 Nos. [2 for Ahmedabad end and 2 for South Olpad (GIS) end] • Switching equipment for 765 kV line reactor- 4 Nos. [2 for Ahmedabad end and 2 for South Olpad (GIS) end] • 1x80 MVAR, 765 kV 1-ph spare line reactor – 1 No. (for South Olpad end) • 1x80 MVAR, 765 kV 1-ph spare line reactor being implemented for Lakadia – Ahmedabad line (under Khavda Ph-II Part B scheme) at Ahmedabad S/s to be used as spare
	8.	2 Nos. of 765 kV line bays at Ahmedabad S/sfor Ahmedabad – South Olpad (GIS) 765 kV D/c line	• 765 kV line bays (AIS) – 2 Nos. (at Ahmedabad end)
	Note: i. TSP of Vadodara S/s shall provide space for work envisaged at Sl. No. 3 & 4 given above ii. TSP of Ahmedabad S/s shall provide space for work envisaged at Sl. No. 7 & 8 given above iii. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey. iv. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.		

3.	**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part C** Tentative Implementation timeframe: 24 months from SPV transfer and matching with Parts A, B & D of Khavda Ph-IV (7 GW) **Scope**:	**REC Power Development and Consultancy Limited**



Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Establishment of 4x1500 MVA, 765/400 kV & 2x500 MVA, 400/220 kV Boisar-II (GIS) S/s with 2x330 MVAR, 765 kV bus reactors and 2x125 MVAR, 420 kV bus reactors. (2x1500 MVA, 765/400 kV ICTs shall be on each 400 kV section and 2x500 MVA, 400/220 kV ICTs shall be on 400 kV Bus Section-II. 2x125 MVAR Bus reactors shall be such that one bus reactor is placed on each 400 kV bus section. 400 kV Bus Sectionaliser to be kept under normally OPEN condition) **Future Provisions**: Space for • o 765/400 kV ICT along with bays- 2 No. o 765 kV line bays along with switchable line reactors – 8 Nos. o 765 kV Bus Reactor along with bay: 2 No. o 765 kV Sectionaliser bay: 1 - set o 400 kV line bays along with switchable line reactor – 8 Nos. o 400/220 kV ICT along with bays - 6 Nos. o 420 kV Bus Reactor along with bay: 2 No. o 220 kV line bays: 12 Nos. o 220 kV Sectionalization bay: 1 set o 220 kV BC: 1 No.	765/400 kV, 1500 MVA ICT- 4 Nos. (13x500 MVA single phase units including one spare unit) 400/220 kV, 500 MVA ICT – 2 Nos. 765 kV ICT bays- 4 Nos. 400 kV ICT bays- 6 Nos. (2 Nos. on Bus Section-I and 4 Nos. on Bus Section-II) 400 kV Bus Sectionaliser-1 set 220 kV ICT bays- 2 Nos. 220 kV BC bay – 1 No. 330 MVAR, 765 kV bus reactor-2 Nos. 125 MVAR, 420 kV bus reactor-2 Nos. 765 kV reactor bays- 2 Nos. 765 kV line bays- 6 Nos. 400 kV reactor bays- 2 Nos. (one on each bus section) 400 kV line bay- 6 Nos. (4 Nos. on bus Section-I and 2 Nos. on bus Section-II) 110 MVAR, 765 kV, 1-ph reactor (spare unit for line/bus reactor)-1 No.
2.	South Olpad (GIS) – Boisar-II (GIS) 765 kV D/c line	Route length: 225 km
3.	2 Nos. of 765 kV line bays at South Olpad (GIS) for termination of South Olpad (GIS) – Boisar-II (GIS) 765 kV D/c line	765 kV line bays (GIS) – 2 Nos. (for South Olpad end)
4.	240 MVAR switchable line reactors on each ckt at South Olpad (GIS) & Boisar-II (GIS) end of South Olpad (GIS) – Boisar-II (GIS) 765 kV D/c line (with NGR bypass arrangement)	• 240 MVAR, 765 kV switchable line reactor- 4 [2 for Boisar-II (GIS) and 2 for South Olpad (GIS)] • Switching equipment for 765 kV line reactor- 4 (2 for Boisar-II (GIS) and 2

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		for South Olpad (GIS)) • 1x80 MVAR, 765 kV 1-ph spare line reactor – 1 No. (for Boisar-II end) • 1x80 MVAR, 765 kV 1-ph spare line reactor proposed for Ahmedabad – South Olpad (GIS) 765 kV line (under Khavda Ph-IV Part B scheme) at South Olpad (GIS) S/s to be used as spare
5.	LILO of Navsari (New) – Padghe (PG) 765 kV D/c line at Boisar-II	LILO route length: 25 km.
6.	Boisar-II (Sec-II) – Velgaon (MH) 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line	Route length: 10 km.
7.	2 Nos. of 400 kV line bays at Velgaon (MH) for termination of Boisar-II – Velgaon (MH) 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line	400 kV line bays (GIS) – 2 Nos. [for Velgaon (MH) end]
8.	LILO of Babhaleswar – Padghe (M) 400 kV D/c line at Boisar-II (Sec-I) using twin HTLS conductor with a minimum capacity of 1700 MVA per ckt at nominal voltage	LILO route length: 65 km.
9.	80 MVAR switchable line reactors at Bosar-II end of Boisar-II – Babhaleswar 400 kV D/c line (with NGR bypass arrangement) formed after above LILO	• 80 MVAR, 420 kV switchable line reactor including switching equipment- 2 Nos.
10.	±200 MVAR STATCOM with 2x125 MVAR MSC, 1x125 MVAR MSR at 400 kV bus section-I of Boisar-II and ±200 MVAR STATCOM with 2x125 MVAR MSC, 1x125 MVAR MSR at 400 kV bus section-II of Boisar-II	• ±200 MVAR STATCOM (with MSC/MSR) on 400 kV Section-I • 400 kV bay – 1 No. on Section-I • ±200 MVAR STATCOM (with MSC/MSR) on 400 kV section-II • 400 kV bay – 1 No. on Section-II
11.	± 300 MVAR STATCOM with 3x125 MVAR MSC, 1x125 MVAR MSR at 400 kV level of Navsari (New)(PG) S/s with 1 No. of 400 kV bay (GIS)	• ±300 MVAR STATCOM (with MSC/MSR) • 400 kV bay – 1 No.

Note:

I. Bay(s) required for completion of diameter (GIS) in one-and-half breaker scheme shall also be executed by the TSP.

II. MSETCL shall carry out reconductoring of the balance portion of Padghe (M) – Boisar-II 400 kV D/c line (i.e. from LILO point upto Padghe (M)) and shall also carry out corresponding upgradation of 400 kV bays at Padghe (M) as

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	may be required in matching time-frame of the LILO line. MSETCL has confirmed the maximum capacity of the line which can be achieved after reconductoring considering clearances in existing towers of Babhaleswar – Padghe (M) 400 kV D/c line as 1700 MVA per ckt. III. MSETCL shall implement the LILO of both circuits of Boisar-II – Velgaon 220 kV D/c line at Boisar-II (ISTS) S/s along with 4 Nos. 220 kV GIS bays at Boisar-II in matching time-frame of Boisar-II (ISTS) S/s. IV. TSP of South Olpad (GIS) S/s shall provide space for work envisaged at Sl. No. 3 & 4. V. MSETCL shall provide space for the work envisaged at Sl. No. 7 at Velgaon S/s. VI. TSP of the subject scheme shall implement Inter-tripping scheme on South Olpad (GIS) – Boisar-II (GIS) 765 kV D/c line (for tripping of the switchable line reactor at either end along with the main line breaker). VII. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey. VIII. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.	
4.	**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part D** Tentative Implementation timeframe : 24 months from SPV Transfer **Scope:**	**PFC Consulting Limited**

Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Establishment of 2x1500 MVA, 765/400 kV & 3x500 MVA, 400/220 kV Pune-III (GIS) S/s with 2x330 MVAR, 765 kV bus reactor and 2x125 MVAR, 420 kV bus reactor. **Future Provisions**: Space for • o 765/400 kV ICT along with bays- 4 No. o 765 kV line bays along with switchable line reactors – 8 Nos. o 765 kV Bus Reactor along with bay: 2 No. o 765 kV Sectionaliser bay: 1 -set o 400 kV line bays along with switchable line reactor – 12 Nos. o 400/220 kV ICT along with bays -5 Nos. o 400 kV Bus Reactor along with bay: 2 No. o 400 kV Sectionalization	765/400 kV, 1500 MVA ICT-2 Nos. (7x500 MVA including one spare unit) 400/220 kV, 500 MVA ICT – 3 Nos. 765 kV ICT bays- 2 Nos. 400 kV ICT bays- 5 Nos. 220 kV ICT bays- 3 Nos. 220 kV BC bay – 1 No. 330 MVAR, 765 kV bus reactor-2 Nos. 125 MVAR, 420 kV bus reactor-2 Nos. 765 kV reactor bay- 2 Nos. 765 kV line bay- 6 Nos. 400 kV reactor bay- 2 Nos. 400 kV line bay- 2 Nos. 110 MVAR, 765 kV, 1-ph reactor (spare unit for line/bus reactor)-1 No.

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	bay: 1 set o 220 kV line bays: 12 Nos. o 220 kV Sectionalization bay: 1 set o 220 kV BC: 1 No. o STATCOM (±300 MVAR) along with MSC (3x125 MVAR) & MSR (1x125 MVAR): alongwith 1 No. 400 kV bay: 1 No. o 80 MVAR, 765 kV, 1-ph reactor (spare unit for line reactor)-1 No.	
2.	Boisar-II – Pune-III 765 kV D/c line	Route length: 200 km
3.	330 MVAR switchable line reactors at Pune-III end of Boisar-II – Pune-III 765 kV D/c line (with NGR bypass arrangement).	• 330 MVAR, 765 kV switchable line reactor- 2 Nos. • Switching equipment for 765 kV line reactor- 2 Nos. • 1x110 MVAR spare bus reactor available at Pune-III (GIS) to be used as spare
4.	2 Nos. of 765 kV line bays at Boisar-II for termination of Boisar-II – Pune-III 765 kV D/c line	• 765 kV line bays (GIS) – 2 Nos. (for Boisar-II end)
5.	LILO of Narendra (New) – Pune (GIS) 765 kV D/c line at Pune-III	LILO route length: 10 km.
6.	330 MVAR switchable line reactors at Pune-III end of Narendra (New) – Pune-III(GIS) 765 kV D/c line (with NGR bypass arrangement).	• 330 MVAR, 765 kV switchable line reactor- 2. • Switching equipment for 765 kV line reactor- 2 • 1x110 MVAR spare bus reactor (1-ph) available at Pune-III (GIS) to be used as spare
7.	LILO of Hinjewadi-Koyna 400 kV S/c line at Pune-III (GIS) S/s	LILO route length: 40 km.
8.	80 MVAR, 420 kV switchable Line Reactors at Pune-III (GIS) end of Pune-III (GIS) – Koyna 400 kV S/c line formed after above LILO (with NGR bypass arrangement).	• 80 MVAR, 420 kV switchable line reactor along with switching equipment- 1 No.

Note:

i. Bay(s) required for completion of diameter (GIS) in one-and-half breaker scheme, shall also be executed by the TSP.

ii. Logic for Inter-tripping scheme for tripping of the 330 MVAR switchable line reactor along with main line breaker at Pune (GIS) end of Pune (GIS) – Narendra (New) 765 kV D/c line shall be implemented by the owner of the line

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after LILO of Narendra (New) – Pune (GIS) 765 kV D/c line at Pune-III

iii. MSETCL shall implement the following 220 kV lines along with 5 Nos. 220 kV GIS bays at Pune-III (GIS) S/s in matching time-frame of Pune-III S/s:

a. LILO of both circuits of Jejuri-Phursungi 220 kV D/c line at Pune-III S/s with HTLS conductor (twin zebra equivalent) along with reconductoring of balance line section viz. LILO point to Phursungi and LILO points to Jejuri with HTLS conductor (twin zebra equivalent)

b. Nanded City - Pune PG III 220 kV S/c line with HTLS conductor (twin zebra equivalent)

iv. TSP of Boisar-II S/s shall provide space for work envisaged at Sl. No. 4.

v. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey.

vi. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.

5.	**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part E2** Tentative Implementation timeframe : 21 months from SPV Transfer **Scope:**	**REC Power Development and Consultancy Limited**

Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Augmentation of transformation capacity at KPS2 (GIS) by 2x1500 MVA, 765/400 kV ICT on Bus section-I (5th& 6th) & 2x1500 MVA, 765/400 kV ICT on Bus section-II (7th & 8th) & 2 Nos. 400 kV bays at Bus Section-I for RE interconnection and 3 Nos. 400 kV bays at Bus Section-II for RE interconnection	1500 MVA, 765/400 kV ICT – 4 Nos. 765 kV bays – 4 Nos. [2 Nos. complete Dia for 2 ICTs (one on each bus section) and balance 2 ICTs to be terminated in spare bays (one on each section)] 400 kV bays– 10 Nos. [4 Nos. ICT bays (2 on each section) & 5 Nos. line bays (2 on bus section-I & 3 on bus section-II) along with 1 No. bay on Bus Section-II for Dia completion]

Note:

i. The TSP shall implement two complete diameters (1 on Bus Section-I & 1 on bus section-II) at 765 kV level of KPS2 (GIS) consisting of 2 Main Bays & 1 Tie Bay required for completion of diameter (GIS) in one-and-half breaker scheme.

ii. The TSP shall implement five complete diameters (2 on Bus Section-I & 3 on Bus Section-II) at 400 kV level of KPS2 (GIS) consisting of 2 Main Bays & 1 Tie bay required for completion of diameter (GIS) in one-and-half breaker scheme.

iii. Further, TSP of KPS2 shall provide space to carry out the above augmentation work.

iv. 2 Nos. 400 kV bays at Bus Section-I for RE interconnection and 1 No. 400 kV bays at Bus Section-II for RE interconnection are already under implementation at KPS2.

v. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Documentt.



6.	**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part A** Tentative Implementation timeframe : 48 months for Bipole -1 and 54 months for Bipole-2 from SPV Transfer **Scope:**	**REC Power Development and Consultancy Limited**

Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Establishment of 6000 MW, ± 800 kV KPS2 (HVDC) [LCC] terminal station (4x1500 MW) along with associated interconnections with 400 kV HVAC Switchyard*.	6000 MW, ± 800 kV KPS2 (HVDC) [LCC] Terminal station
2.	Establishment of 6000 MW, ± 800 kV Nagpur (HVDC) [LCC] terminal station (4x1500 MW) along with associated interconnections with 400 kV HVAC Switchyard*	6000 MW, ± 800 kV Nagpur (HVDC) [LCC] terminal station
3.	±800 kV HVDC Bipole line (Hexa lapwing) between KPS2 (HVDC) and Nagpur (HVDC) (1200 km) (with Dedicated Metallic Return) (capable to evacuate 6000 MW with overload as specified)	Route length: 1200 km.
4.	Establishment of 6x1500 MVA, 765/400 kV ICTs at NagpurS/s along with 2x330 MVAR (765 kV) & 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser so that 3x1500 MVA ICTs are placed in each section. The bus sectionaliser shall be normally closed and may be opened based on Grid requirement. **Future Provisions at Nagpur:** **Space for:** o o 765/400 kV, 1500 MVA ICT- 4 (1 on 400 kV bus section-II & 3 on future 400 kV bus section-III) o 765 kV line bays along with switchable line reactors – 10 Nos. o 765 kV Bus Reactor along with bay: 2 No. o 765 kV Sectionaliser bay: 1 -set o 400 kV line bays along with switchable line	o o 765/400 kV, 1500 MVA ICT-6 (3 on each 400 kV section) (19 single phase units including one spare unit) o 765 kV ICT bays- 6 Nos. o 400 kV ICT bays- 6 Nos. (3 on each section) o 330 MVAR 765 kV bus reactor-2 Nos. o 125 MVAR 420 kV bus reactor-2 Nos. (one on each section) o 765 kV reactor bay- 2 Nos. o 765 kV line bay- 4 Nos. o 400 kV reactor bay- 2 Nos. (one on each section) o 400 kV Bus sectionaliser - 1 Set o 110 MVAR, 765 kV, 1-ph reactor (spare unit for line/bus

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		reactor – 12 Nos. o 400 kV Bus sectionaliser- 1 Set o 400/220 kV ICT along with bays -9 Nos. (3 Nos. on 400 kV bus sections II & 6 Nos. on future bus section-III) o 400 kV Bus Reactor along with bay: 4 No. (1 each on 400 kV bus sections I & II and 2 on future 400 kV bus section-III) o 220 kV line bays: 16 Nos. o 220 kV Sectionalization bay: 2 set o 220 kV BC & TBC: 3 Nos. o 80 MVAR, 765 kV, 1-ph reactor (spare unit for line reactor)-1	reactor) - 1 No.
5.	LILO of Wardha – Raipur 765 kV one D/c line (out of 2xD/c lines) at Nagpur	LILO route length: 30 km.	
6.	Installation of 240 MVAR switchable line reactor at Nagpur end on each ckt of Nagpur – Raipur 765 kV D/c line	• 240 MVAR, 765 kV switchable line reactors- 2 Nos. (at Nagpur end) • Switching equipment for 765 kV line reactor- 2 Nos. (at Nagpur end) • 80 MVAR, 765 kV, 1-ph reactor (spare unit for line reactor)-1 No.	

* The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC & HVAC switchyards shall be implemented by the TSP

Note:

i. The 2x1500 MW poles shall emanate from 400 kV bus section 1 of KPS2 and terminate at bus section 1 of Nagpur. Similarly, the other 2x1500 MW poles shall emanate from 400 kV bus section 2 of KPS2 and terminate at bus section 2 of Nagpur.

ii. HVDC System will be designed considering 100% power reversal capability. The rated power transmission capacity as well as the rated transmission voltage shall be defined and guaranteed at the rectifier end of the AC yard.

iii. TSP of KPS2 shall provide space for the establishment of the HVDC system as per above scope.

iv. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey.

v. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.

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<table>
<tr><td>7.</td><td colspan="2">Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C
Tentative Implementation timeframe : 48 months from SPV Transfer
Scope:
<table>
<tr><th>Sl. No.</th><th>Scope of the Transmission Scheme</th><th>Capacity</th></tr>
<tr><td>1.</td><td>Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*</td><td>2500 MW, ± 500 kV KPS3 (HVDC) [VSC] Terminal station</td></tr>
<tr><td>2.</td><td>Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*</td><td>2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station</td></tr>
<tr><td>3.</td><td>Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN.
400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.
MVAR
Future Provisions at KPS3 (HVDC) S/s
Space for:
o
o 400 kV line bays – 6 Nos. (3 on each section)
o 400 kV reactor bay- 2 Nos. (one on each section)</td><td>o
o 400/33 kV, 1x50 MVA ICT along with bays- 2 Nos.
o 125 MVAR 420 kV bus reactor-2 Nos. (one on each section)
o 400 kV reactor bay- 2 Nos. (one on each section)
o 400 kV Bus sectionaliser- 1 Set</td></tr>
<tr><td>4.</td><td>KPS3 – KPS3 (HVDC) 400 kV 2xD/c (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations</td><td>Route length- 2 km
400 kV GIS line bays - 4 Nos. at KPS3 (2 Nos. on each bus section)
400 kV GIS line bays - 4 Nos at KPS3 (HVDC) (2 Nos. on each bus section)</td></tr>
<tr><td>5.</td><td>±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)</td><td>Route length: 600 km</td></tr>
</table></td><td>PFC Consulting Limited</td></tr>
</table>



*The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC & HVAC switchyards shall be implemented by the TSP

Note:

i. The 1250 MW pole-1 shall emanate from 400 kV bus section 1 of KPS3 (HVDC) and terminate at South Olpad S/s. Similarly, the 1250 MW pole-2 shall emanate from 400 kV bus section 2 of KPS3 (HVDC) and terminate at South Olpad S/s.

ii. HVDC System will be designed with 100% power reversal capability as well as black start, automatic grid restoration & dynamic reactive power support capability.

iii. The rated power transmission capacity as well as the rated transmission voltage shall be defined and guaranteed at the rectifier end of the AC yard.

iv. TSP of KPS3 shall provide space for scope at Sl. No. 4 as per the above scope

v. TSP of South Olpad S/s shall provide space for scope at Sl. No. 2 as per above scope

vi. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey.

vii. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document

8.	**Transmission System for Evacuation of Power from Rajasthan REZ Ph-IV (Part-2 : 5.5 GW) (Jaisalmer/Barmer Complex): Part A** Tentative Implementation timeframe : 24 months from SPV Transfer **Scope:**	**REC Power Development and Consultancy Limited**

Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Establishment of 4x1500 MVA, 765/400 kV & 5x500 MVA, 400/220 kV Fatehgarh-IV (Section-2) Pooling Station along with 2x240 MVAR (765 kV) Bus Reactor & 2x125 MVAR (420 kV) Bus Reactor [Future space provisions already approved at Fatehgarh-IV in 8th NCT meeting dated 25.03.22 would be utilized for the present scheme]	• 765/400 kV, 1500 MVA ICT- 4 Nos. (13x500 MVA including one spare unit) • 765 kV ICT bays- 4 Nos. • 240 MVAR, 765 kV Bus Reactor- 2 Nos. (7x80 MVAR including one spare unit) • 765 kV Bus reactor bays-2 Nos. • 765 kV line bays - 4 Nos. [for LILO of Fatehgarh-III - Beawer 765 kV D/c (2nd) line at Fatehgarh-IV (Section-2) PS] • 400/220 kV, 500 MVA ICT -5 Nos. • 400 kV ICT bays- 9 Nos. • 400 kV line bays - 2 Nos. [For Fatehgarh-IV (Sec-2) - Bhinmal (PG) D/c line] • 125 MVAR, 420 kV Bus

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			Reactor-2 Nos. • 400 kV Bus reactor bays- 2 Nos. • 400 kV Sectionalisation bay: 1 set • 220 kV ICT bays- 5 Nos. • 220 kV line bays: 6 Nos. (for RE connectivity) • 220 kV BC (2 Nos.) and 220 kV TBC (2 Nos.) • 220 kV Sectionalisation bay: 1 set
	2.	Fatehgarh-IV (Section-2) PS – Bhinmal (PG) 400 kV D/c line (Twin HTLS*) along with 50 MVAR switchable line reactor on each ckt at each end	Route Length: 200 km • 50 MVAR, 420 kV switchable line reactors at Fatehgarh-IV (Section-2) PS – 2 Nos. • 50 MVAR, 420 kV, switchable line reactors at Bhinmal (PG) – 2 Nos. • Switching equipment for 420 kV, 50 MVAR switchable line reactors at Fatehgarh-IV (Section-2) PS – 2 Nos. • Switching equipment for 420 kV, 50 MVAR switchable line reactors at Bhinmal (PG) – 2 Nos.
	3.	LILO of both ckts of 765 kV Fatehgarh-III- Beawar D/c line at Fatehgarh-IV (Section-2) PS along with 330 MVAR switchable line reactor at Fatehgarh-IV PS end of each ckt of 765 kV Fatehgarh-IV-Beawar D/c line (formed after LILO)	LILO length: 15 km • 330 MVAR, 765 kV switchable line reactors at Fatehgarh-IV (Section-2) PS – 2 Nos. • Switching equipment for 330 MVAR, 765 kV switchable line reactors at Fatehgarh-IV (Section-2) PS – 2 Nos. • 110 MVAR (765 kV) spare reactor single phase unit at Fatehgarh-IV (Section-2) PS end – 1 No.
	4.	2 Nos. of 400 kV line bays at Bhinmal (PG)	400 kV line bays - 2 Nos.
	**with minimum capacity of 2100 MVA on each circuit at nominal voltage.*		
	Note:		
	i.	Transmission system for evacuation of about 2 GW RE power from REZ in Rajasthan (20 GW) under Phase-III Part A1 at Fatehgarh-IV (Section-1) is	

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	under bidding. ii. Transmission system under Phase-IV (Part 2) is for evacuating 4-5 GW RE potential at Fatehgarh-IV (Section 2), which is utilising the future provision (approved in 8th NCT meeting dated 25.03.22) at Fatehgarh-IV approved under Phase-III scheme. iii. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey iv. POWERGRID to provide space for 2 Nos. of 400 kV line bays at Bhinmal (PG) along with the space for switchable line reactors without any cost implications. v. Implementation of A, B, C, D, E, F, H1, H2 packages shall be aligned vi. Switchable line reactors to be implemented with NGR bypass arrangement. vii. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.	
9.	**Transmission System for Evacuation of Power from Rajasthan REZ Ph-IV (Part-2 : 5.5 GW) (Jaisalmer/Barmer Complex): Part B** Tentative Implementation timeframe : 24 months from SPV Transfer **Scope:**	**PFC Consulting Limited**

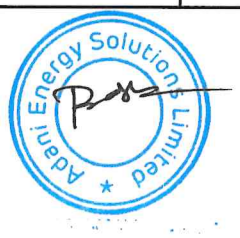
Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Establishment of 2x1500 MVA, 765/400 kV Substation at suitable location near Sirohi along with 2x240 MVAR (765 kV) & 2x125 MVAR (420 kV) Bus Reactor **Future provisions:** Space for • 765/400 kV ICT along with bays- 4 Nos. • 765 kV line bays along with switchable line reactors – 10 Nos. • 765 kV Bus Reactor along with bay: 1 Nos. • 400 kV line bays along with switchable line reactor –4 Nos. • 400 kV line bays –4 Nos. • 400 kV Bus Reactor along with bay: 1 No. • 400 kV Sectionalization bay: 2 sets • 400/220 kV ICT along with bay - 6 Nos. • 220 kV line bays -10 Nos. • 220 kV Sectionalization bay: 2 sets • 220 kV BC (3 Nos.) & TBC (3 Nos.) • STATCOM (2x±300 MVAR) along with MSC (4x125 MVAR) & MSR (2x125 MVAR) along with two number 400 kV bays.	• 765/400 kV, 1500 MVA ICT- 2 Nos. (7x500 MVA including one spare unit) • 765 kV ICT bays-2 Nos. • 240 MVAR, 765 kV Bus Reactor-2 Nos. (7x80 MVAR including one spare unit) • 765 kV Bus reactor bays-2 Nos. • 765 kV line bays- 2 Nos. [for D/c line to Fatehgarh-IV (Section-2) PS] • 400 kV ICT bays- 2 Nos. • 400 kV line bays - 2 Nos. [for D/c line to Chittorgarh (PG) S/s] • 125 MVAR, 420 kV Bus Reactor-2 Nos. • 400 kV Bus reactor bays- 2 Nos.

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	2.	Fatehgarh-IV (Section-2) PS – Sirohi PS 765 kV D/c line along with 240 MVAR switchable line reactor for each circuit at each end	Route Length – 240 km • 765 kV, 240 MVAR switchable line reactors at Fatehgarh-IV (Section-2) PS – 2 Nos. • 765 kV, 240 MVAR switchable line reactors at Sirohi PS– 2 Nos. • Switching equipment for 765 kV, 240 MVAR switchable line reactors at Fatehgarh-IV (Section-2) PS – 2 Nos. • Switching equipment for 765 kV, 240 MVAR switchable line reactors at Sirohi PS – 2 Nos.	
	3.	Sirohi PS-Chittorgarh (PG) 400 kV D/c line (Quad) along with 80 MVAR switchable line reactor for each circuit at Sirohi PS end	Route Length ~160 km • 420 kV, 80 MVAR switchable line reactors at Sirohi PS – 2 Nos. • Switching equipment for 420 kV, 80 MVAR switchable line reactors at Sirohi PS – 2 Nos.	
	4.	2 No. of 400 kV line bays at Chittorgarh (PG) S/s	400 kV line bays at Chittorgarh (PG) S/s - 2 Nos.	
	5.	2 No. of 765 kV line bays at Fatehgarh-IV (Section-2) PS	765 kV line bays at Fatehgarh-IV (Section-2) PS – 2 Nos.	
	Note: i. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey. ii. POWERGRID to provide space for 2 Nos. of 400 kV line bays at Chittorgarh (PG). iii. Developer of Fatehgarh-IV S/s (Section-2) to provide space for 2 Nos. of 765 kV line bays at Fatehgarh-IV(Section-2) PS along with the space for switchable line reactor iv. Implementation of A, B, C, D, E, F, H1, H2 packages shall be aligned v. Switchable line reactors to be implemented with NGR bypass arrangement. vi. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.			
10.	**Transmission System for Evacuation of Power from Rajasthan REZ Ph-IV (Part-2 : 5.5 GW) (Jaisalmer/Barmer Complex): Part C** Tentative Implementation timeframe : 24 months from SPV Transfer **Scope:**			**REC Power Development and Consultancy Limited**
	Sl. No.	**Scope of the Transmission Scheme**	**Capacity**	
	1.	Establishment of 3x1500 MVA, 765/400 kV & 5x500 MVA, 400/220 kV Mandsaur Pooling Station along with 2x330 MVAR (765 kV) Bus Reactors & 2x125 MVAR,	765/400 kV, 1500 MVA ICT – 3 Nos. (10x500 MVA single phase units including one spare	

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		420 kV Bus Reactor **Future Provisions**: Space for: • 765/400 kV ICT along with bays- 3 No. • 765 kV line bays along with switchable line reactors – 12 Nos. • 765 kV Bus Reactor along with bay: 2 No. • 765 kV Sectionaliser bay: 1 -set • 400 kV line bays along with switchable line reactor – 12 Nos. • 400/220 kV ICT along with bays - 5 Nos. • 400 kV Bus Reactor along with bay: 2 No. • 400 kV Sectionalization bay: 1- set • 220 kV line bays: 11 Nos. • 220 kV Sectionalization bay: 1 set • 220 kV BC and TBC: 1 Nos. • STATCOM (± 300 MVAR) along with MSC (2x125 MVAR) & MSR (1x125 MVAR) along with one 400 kV bay.	unit) 400/220 kV, 500 MVA ICT – 5 Nos. (3 Nos. on 220 kV bus section-1 & 2 Nos. on 220 kV bus section-2) 765 kV ICT bays – 3 Nos. 400 kV ICT bays – 8 Nos. 330 MVAR 765 kV bus reactor- 2 Nos. (7x110 MVAR single phase units including one spare unit) 765 kV bus reactor bay- 2 Nos. 765 kV line bay- 2 Nos. (for Indore line) 80 MVAR, 765 kV, 1-ph reactor (spare unit)-1 No. 125 MVAR, 420 kV bus reactor- 2 Nos. 400 kV reactor bay- 2 Nos. 220 kV ICT bays – 5 Nos. 220 kV line bays – 7 Nos. (4 Nos. on bus section-1 and 3 Nos. on bus section-2) 220 kV Bus Sectionaliser – 1 set 220 kV TBC bay – 2 Nos. 220 kV BC bay – 2 Nos.	
	2.	Mandsaur PS – Indore(PG) 765 kV D/c Line	Route Length ~ 200 km	
	3.	1x330 MVAR switchable line reactor (SLR) on each ckt at Mandsaur end of Mandsaur PS – Indore (PG) 765 kV D/c Line	• 330 MVAR, 765 kV switchable line reactor- 2 Nos. • Switching equipment for 765 kV line reactor- 2 Nos.	
	4.	2 Nos. of 765 kV line bays at Indore (PG) for termination of Mandsaur PS – Indore (PG) 765 kV D/c Line	• 765 kV line bays – 2 Nos. (for Indore (PG) end)	
	Note: i. The line lengths mentioned above are approximate as the exact length shall be obtained after detailed survey ii. POWERGRID to provide space for 2 Nos. of 765 kV line bays at Indore S/s iii. Implementation of A, B, C, D, E, F, H1, H2 packages shall be aligned iv. Switchable line reactors to be implemented with NGR bypass arrangement v. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.			
11.	**Transmission System for Evacuation of Power from Rajasthan REZ Ph-IV (Part-2 : 5.5 GW) (Jaisalmer/Barmer Complex): Part D**			**PFC Consulting Limited**



Tentative Implementation timeframe : 24 months from SPV Transfer

Scope:

Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Beawar- Mandsaur PS 765 kV D/c line along with 240 MVAR switchable line reactor for each circuit at each end	Route Length – 260 km • 765 kV, 240 MVAR switchable line reactors at Beawar – 2 Nos. • 765 kV, 240 MVAR switchable line reactors at Mandsaur PS – 2 Nos. • Switching equipment for 765 kV, 240 MVAR switchable line reactors at Beawar – 2 Nos. • Switching equipment for 765 kV, 240 MVAR switchable line reactors at Mandsaur PS – 2 Nos.
2.	2 No. of 765 kV line bays each at Beawar S/s & Mandsaur S/s	765 kV line bays - 4 Nos. (2 Nos. each at Beawer S/s and Mandsaur PS)

Note:

i. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey

ii. Developer of Mandsaur PS to provide space for 2 Nos. of 765 kV line bays at Mandsaur S/s along with the space for switchable line reactor.

iii. Developer of Beawar S/s to provide space for 2 Nos. of 765 kV line bays at Beawar S/s along with the space for switchable line reactor.

iv. Implementation of A, B, C, D, E, F, H1, H2 packages shall be aligned

v. Switchable line reactors to be implemented with NGR bypass arrangement

vi. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.

12. **Transmission System for Evacuation of Power from Rajasthan REZ Ph-IV (Part-2 : 5.5 GW) (Jaisalmer/Barmer Complex): Part E** — **REC Power Development and Consultancy Limited**

Tentative Implementation timeframe : 24 months from SPV Transfer

Scope:

Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Establishment of 765 kV Substation at suitable location near Rishabdeo (Distt. Udaipur) along with 2x240 MVAR (765 kV) Bus Reactor **Future Provisions:** **Space for** • o 765/400 kV ICT along with bays- 5 No. along with	• 240 MVAR, 765 kV Bus Reactor- 2 Nos. (7x80 MVAR including one spare unit) • 765 kV Bus reactor bays-2 Nos. • 765 kV line bays - 6 Nos. [for 765 kV Sirohi PS- Rishabdeo – Mandsaur D/c line and



		spare unit ○ 765 kV line bays along with switchable line reactors – 6 Nos. ○ 765 kV Bus Reactor along with bay: 1 No. ○ 400 kV line bays along with switchable line reactor – 4 Nos. ○ 400 kV line bays – 4 Nos. ○ 400 kV Bus Reactor along with bay: 3 Nos. ○ 400 kV Sectionalization bay: 2 sets ○ 400/220 kV ICT along with bay - 6 Nos. ○ 220 kV line bays -10 Nos. ○ 220 kV Sectionalization bay: 2 sets ○ 220 kV BC (3 Nos.) & TBC (3 Nos.) ○ STATCOM (2 x ±300MVAR) along with MSC (4x125 MVAR) & MSR (2x125 MVAR) along with two number 400 kV bays.	LILO of one circuit of 765 kV Chittorgarh-Banaskanta D/c line at Rishabdeo S/s]
	2.	Sirohi PS- Rishabdeo 765 kV D/c line along with 330 MVAR switchable line reactor for each circuit at Sirohi end	Route Length – 170 km • 765 kV, 330 MVAR switchable line reactors at Sirohi PS– 2 Nos. • Switching equipment for 765 kV, 330 MVAR switchable line reactors at Sirohi PS– 2 Nos. • 110 MVAR (765 kV) spare reactor single phase unit at Sirohi PS – 1 No.
	3.	Rishabdeo - Mandsaur PS 765 kV D/c line along with 240 MVAR switchable line reactor for each circuit at Rishabdeo end	Route Length – 160 km • 765 kV, 240 MVAR switchable line reactors at Rishabdeo – 2 Nos. • Switching equipment for 765 kV, 240 MVAR switchable line reactors at Rishabdeo – 2 Nos.
	4.	LILO of one circuit of 765 kV Chittorgarh-Banaskanta D/c line at Rishabdeo S/s (20 km)	LILO route length~ 20 km
	5.	2 No. of 765 kV line bays each at Sirohi PS & Mandsaur S/s	• 765 kV line bays – 4 Nos. (2 Nos. each at Sirohi PS & Mandsaur PS)

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Note:

i. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey

ii. Developer of Sirohi PS to provide space for 2 Nos. of 765 kV line bays at Sirohi PS along with the space for switchable line reactors, including spare unit.

iii. Developer of Mandsaur PS to provide space for 2 Nos. of 765 kV line bays at Mandsaur PS.

iv. Implementation of A, B, C, D, E, F, H1, H2 packages shall be aligned

v. Switchable line reactors to be implemented with NGR bypass arrangement.

vi. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.

13.	**Transmission System for Evacuation of Power from Rajasthan REZ Ph-IV (Part-2 : 5.5 GW) (Jaisalmer/Barmer Complex): Part F (By clubbing Part F1 & F2)** Tentative Implementation timeframe : 24 months from SPV Transfer **Scope:**	**PFC Consulting Limited**

Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Establishment of 3x1500 MVA, 765/400 kV & 2x500 MVA, 400/220 kV Barmer-I Pooling Station along with 2x240 MVAR (765 kV) Bus Reactor & 2x125 MVAR (420 kV) Bus Reactor **Future provisions:** Space for • o 765/400 kV ICT along with bays- 3 No. o 765 kV line bays along with switchable line reactors – 4 Nos. o 765 kV Bus Reactor along with bay: 1 No. o 400 kV line bays –4 o 400 kV line bays along with switchable line reactor –4 Nos. o 400/220 kV ICT along with bays -8 Nos. o 400 kV Bus Reactor along with bay: 1 No. o 400 kV Sectionalization bays: 2 sets o 220 kV line bays for connectivity of RE Applications -10 Nos. o 220 kV Sectionalization bay: 3 sets o 220 kV BC (3 Nos.) & TBC (3 Nos.) o STATCOM (2x±300 MVAR) along with MSC (4x125 MVAR) & MSR (2x125 MVAR) along with two number 400 kV bays	• 765/400 kV, 1500 MVA ICT- 3 Nos. (10x500 MVA including one spare unit) • 765 kV ICT bays-3 Nos. • 240 MVAR, 765 kV Bus Reactor-2 Nos. (7x80 MVAR, including one spare unit) • 765 kV Bus reactor bays-2 Nos. • 765 kV line bays- 2 Nos. (for D/c line to Sirohi PS) • 400/220 kV, 500 MVA ICT -2 Nos. • 400 kV ICT bays- 5 Nos. • 125 MVAR, 420 kV Bus Reactor-2 Nos. • 400 kV Bus reactor bays- 2 Nos.

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			• 400 kV line bays - 2 Nos. [for D/c line to Fatehgarh-III(Section-2) PS] • 220 kV ICT bays- 2 Nos. • 220 kV line bays: 4 Nos. (for RE connectivity) • 220 kV BC (1 No.) & TBC (1 No.)
	2.	Fatehgarh-III (Section-2) PS – Barmer-I PS 400 kV D/c line (Quad)	Route Length ~50 km
	3.	Barmer-I PS– Sirohi PS 765 kV D/c line along with 240 MVAR switchable line reactor for each circuit at each end	Route Length ~ 200 km • 765 kV, 240 MVAR switchable line reactors at Barmer-I PS – 2 Nos. • 765 kV, 240 MVAR switchable line reactors at Sirohi PS – 2 Nos. • Switching equipment for 765 kV 240 MVAR switchable line reactors at Barmer-I PS – 2 Nos. • Switching equipment for 765 kV 240 MVAR switchable line reactors at Sirohi PS – 2 Nos.
	4.	2 No. of 400 kV line bays at Fatehgarh-III (Section-2) PS	400 kV line bays at Fatehgarh-III (Section-2) PS - 2 Nos.
	5.	2 No. of 765 kV line bays at Sirohi PS	765 kV line bays at Sirohi PS – 2 Nos.

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Note:

i. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey

ii. Developer of Sirohi PS to provide space for 2 Nos. of 765 kV line bays at Sirohi PS along with the space for switchable line reactor.

iii. Developer of Fatehgarh-III PS (Section-2) to provide space for 2 Nos. of 400 kV line bays at Fatehgarh-III PS (Section-2).

iv. Switchable line reactors to be implemented with NGR bypass arrangement

v. Implementation of A, B, C, D, E, F, H1, H2 packages shall be aligned.

vi. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.

14. **Transmission System for Evacuation of Power from Rajasthan REZ Ph-IV (Part-2 : 5.5 GW) (Jaisalmer/Barmer Complex): Part H1**

Tentative Implementation timeframe : 24 months from SPV Transfer

Scope:

Sl. No.	Scope of the Transmission Scheme	Capacity
1.	Establishment of 765/400 kV (2x1500 MVA), 400/22 kV (2x500 MVA) & 220/132 kV (3x200 MVA) Kurawar S/s with 2x330 MVAR 765 kV bus reactor and 1x125 MVAR, 420 kV bus reactor. **Future Provisions**: Space for • 765/400 kV ICT along with bays- 4 no. • 765 kV line bays along with switchable line reactors – 8 nos. • 765 kV Bus Reactor along with bay: 2 no. • 765 kV Sectionaliser bay: 1 -set • 400 kV line bays along with switchable line reactor – 8 nos. • 400/220 kV ICT along with bays - 6 nos. • 420 kV Bus Reactor along with bay: 3 nos. • 400 kV Sectionalization bay: 1-set • 220 kV line bays: 12 nos. • 220 kV Sectionalization bay: 1set • 220 kV BC and TBC: 1 no. • 220/132 kV ICT along with bays: 5 Nos. • 132 kV line bays: 16 nos. • 132 kV Sectionalization bay: 1 set	• 765/400 kV, 1500 MVA ICT – 2 (7 single units of 500 MVA including one spare unit) • 400/220 kV, 500 MVA ICT – 2 • 220/132 kV, 200 MVA ICT – 3 • 765 kV ICT bays- 2 • 400 kV ICT bays- 4 • 220 kV ICT bays – 5 • 132 kV ICT bays - 3 • 330 MVAR 765 kV bus reactor-2 • 125 MVAR 420 kV bus reactor-1 • 765 kV reactor bay- 2 • 765 kV line bays- 4 • 400 kV line bays- 4 • 400 kV reactor bay- 1 • 220 kV BC – 1 • 220 kV TBC – 1 • 132 kV TBC – 1 • 110 MVAR, 765 kV, 1-ph reactor (spare unit)-1 • 80 MVAR, 765 kV, 1-ph reactor (spare unit)-1

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	• 132 kV TBC– 1 no. • STATCOM (±300 MVAR) along with MSC (2x125 MVAR) & MSR (1x125 MVAR) along with 400 kV bay.	
2.	Mandsaur – Kurawar 765 kV D/c line	Route length: 235 km
3.	240 MVAR switchable line reactors on each ckt at both ends of Mandsaur – Kurawar 765 kV D/c line	• 240 MVAR, 765 kV switchable line reactor- 4 (2 for Mandsaur end and 2 for Kurawar end) • Switching equipment for 765 kV line reactor- 4 (2 for Mandsaur end and 2 for Kurawar end)
4.	2 nos. of 765 kV line bays at Mandsaur S/s for termination of Mandsaur – Kurawar 765 kV D/c line	• 765 kV line bays – 2 Nos. (for Mandsaur end)
5.	LILO of Indore – Bhopal 765 kV S/c line at Kurawar	LILO route length: 15 km.
6.	Kurawar – Ashtha 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line	Route length: 65 km
7.	2 nos. of 400 kV line bays at Ashtha (MP) S/s for termination of Kurawar – Ashtha 400 kV D/c line	400 kV line bays – 2 Nos. [for Ashtha (MP) end]
8.	LILO of one circuit of Indore – Itarsi 400 kV D/c line at Astha	LILO route length: 30 km
9.	2 nos. of 400 kV line bays at Ashtha (MP) S/s for LILO of one circuit of Indore – Itarsi 400 kV D/c line at Astha	400 kV line bays – 2 Nos. [for Ashtha (MP) end]
10.	Shujalpur – Kurawar 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line	Route length: 40 km
11.	2 nos. of 400 kV line bays at Shujalpur(PG) S/s for termination of Shujalpur – Kurawar 400 kV D/c line	400 kV line bays – 2 Nos. [for Shujalpur (PG) end]

Note:

i. The line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey.

ii. MPPTCL has confirmed availability of space for 2 nos. 400 kV bays at Ashta (MP) S/s and for 2 nos. additional bays, MPPTCL has informed that adjacent land is private land and may be purchased by the project developer at their cost as per requirement.

iii. Implementation of A,B,C,D, E ,F, H1 & H2 packages shall be aligned

iv. TSP of the subject scheme shall implement Inter-tripping scheme on Mandsaur – Kurawar 765 kV D/c line (for tripping of the switchable line reactor at Mandsaur/Kurawar end along with the main line breaker).

v. Switchable line reactors to be implemented with NGR bypass arrangement

vi. Developer of Mandsaur S/s to provide space for 2 Nos. 765 kV line bays for Mandsaur – Kurawar 765 kV D/c line.

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	vii. POWERGRID to provide space for 2 Nos. 400 kV line bays at Shujalpur S/s for Shujalpur – Kurawar 400 kV D/c line. viii. The implementation timeline mentioned above is tentative. Final Timeline would be indicated in the RfP Document.	

2. The appointment of the Bid Process Coordinator is subject to the conditions laid down in the Guidelines issued by Ministry of Power in this regard, amended from time to time.

[F. No. 15/3/2018-Trans-Part(1)]
BIHARI LAL, Under Secy. (Transmission)

अधिसूचना

नई दिल्ली, 29 अगस्त, 2023

का.आ. 3895(अ).—केंद्र सरकार द्वारा, विद्युत अधिनियम, 2003 (2003 का36) की धारा 63 के तहत परिचालित दिशा-निर्देशों के उप-पैरा 3.2 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, नीचे दी गई तालिका में उल्लिखित राजपत्र अधिसूचना के माध्यम से टैरिफ आधारित प्रतिस्पर्धी बोली (टीबीसीबी) के अंतर्गत कार्यान्वयन के लिए निम्नलिखित पारेषण स्कीमों के कार्यक्षेत्र को अधिसूचित/संशोधित किया गया था:

क्र.सं.	स्कीम का नाम	राजपत्र अधिसूचना जिसके द्वारा स्कीम अधिसूचित की गई थी
1.	**चरण-III भाग बी1 के अंतर्गत राजस्थान में आरईजेड से विद्युत की निकासी (20 गीगावॉट) के लिए पारेषण प्रणाली**	का.आ.5032 (अ) दिनांक 6.12.2021 [फा.सं. 15/3/2018-ट्रांस-पार्ट(1) एवं का.आ.1724अ दिनांक 23.02.2023 [फा.सं. 15/3/2018-ट्रांस-पार्ट(1)]

2. अब, केंद्र सरकार ने राष्ट्रीय पारेषण समिति (एनसीटी) की 14वीं बैठक की सिफारिशों की जांच के बाद उपरोक्त उल्लिखित स्कीमों के कार्यक्षेत्र को संशोधित करने का निर्णय लिया है। इस प्रकार, स्कीम के कार्यक्षेत्र "चरण-III भाग बी1 के तहत राजस्थान में आरईजेड से विद्युत की निकासी (20 गीगावॉट) के लिए पारेषण प्रणाली" को निम्नानुसार संशोधित किया गया है:

क्र.सं.	संशोधित कार्यक्षेत्र
1.	2x330 एमवीएआर (765 केवी) बस रिएक्टर एवं 2x125 एमवीएआर (420 केवी) बस रिएक्टर के साथ भादला-3 में 2x1500 एमवीए, 765/400 केवी एवं3x500 एमवीए, 400/220 केवी पूलिंग स्टेशन की स्थापना • 765/400 केवी 1500 एमवीए आईसीटी: 2 (एक स्पेयर यूनिट सहित 7x500 एमवीए) • 765 केवी आईसीटी बे - 2 • 400/220 केवी, 500 एमवीए आईसीटी – 3 • 765 केवी लाइन बे -2 • 400 केवी आईसीटी बे – 5 • 220 केवी आईसीटी बे - 3 • 220 केवी लाइन बे: 5 • 330 एमवीएआर बस रिएक्टर-2 (एक स्पेयर यूनिट सहित 7x110 एमवीएआर) • 765 केवी रिएक्टर बे - 2

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	• 125 एमवीएआर, 420 केवी बस रिएक्टर- 2 • 420 केवी रिएक्टर बे - 2 **<u>भावी प्रावधान: निम्नलिखित के लिए स्थान</u>** • बे सहित 765/400 केवी आईसीटी: 2 • स्विचेबल लाइन रिएक्टर सहित 765 केवी लाइन बे: 6 • 765 केवी लाइन बे: 4 • बे सहित 765 केवी बस रिएक्टर: 2 • बे सहित 400/220 केवी आईसीटी: 10 • 400 केवी लाइन बे: 8 • **स्विचेबल लाइन रिएक्टरों सहित 400 केवी लाइन बे: 8** • बे सहित 400 केवी बस रिएक्टर: 2 • 400 केवी सेक्शनलाईजेशन बे: 2 सेट • 220 केवी लाइन बे: 12 • 220 केवी सेक्शनलाइज़ेशन बे: 2 सेट
2.	भादला-3 पीएस - सीकर-II एस/एस 765 केवी डी/सी+ लाइन के प्रत्येक छोर पर प्रत्येक सर्किट के लिए 330 एमवीएआर स्विचेबल लाइन रिएक्टर सहित भादला-3 पीएस - सीकर-II एस/एस 765 केवी डी/सी लाइन • 765 केवी 330 एमवीएआर स्विचेबल लाइन रिएक्टर के लिए स्विचिंग उपकरण – 4 • 765 केवी, 330 एमवीएआर स्विचेबल लाइन रिएक्टर - 4
3.	सीकर-II में 765 केवी लाइन बे • 765 केवी लाइन बे – 2

i. शॉर्ट सर्किट स्तर को सीमित करने के लिए भादला-3 में 400 केवी एवं 220 केवी स्तर पर उपयुक्त सेक्शन-लाइजेशन का प्रावधान रखा जाएगा।

ii. सीकर-II एस/एस के विकासकर्ता स्विचेबल लाइन रिएक्टरों के लिए स्थान के साथ-साथ सीकर-II एस/एस में 765 केवी लाइन बे में से 2 बे के लिए स्थान उपलब्ध कराएंगे।

iii. बस स्विचिंग स्कीम की आवश्यकता के लिए भविष्य में दो 220 केवी बस कपलर बे और 2 ट्रांसफर बस कपलर बे के लिए स्थान संबंधी प्रावधान रखा जाएगा।

3. मूल अधिसूचना के अनुसार, उपरोक्त स्कीम के लिए बोली प्रक्रिया समन्वयक अपरिवर्तित रहेंगे।

[फा. सं. 15/3/2018-ट्रांस-पार्ट (1)]

बिहारी लाल, अवर सचिव (पारेषण)

NOTIFICATION

New Delhi, the 29th August, 2023

S.O. 3895(E).—In exercise of the powers conferred by sub- para 3.2 of the Guidelines circulated under Section 63 of the Electricity Act, 2003 (no. 36 of 2003), the Central Government had notified/ modified scope of following transmission schemes for implementation under Tariff Based Competitive Bidding (TBCB) vide Gazette Notification mentioned below table:

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Sl. No.	Name of the Scheme	Gazette Notification by which Scheme was notified
1.	Transmission System for Evacuation of Power from REZ in Rajasthan (20 GW) under phase-III Part B1	S.O. 5032(E) dated 6.12.2021 [F.No.15/3/2018-Trans-Part(1) And S.O. 1724(E) dated 23.02.2023 [F.NO. 15/3/2018 –Trans-Part(1)]

2. Now, the Central Government has decided to modify the scope of above mentioned scheme after examining the recommendations of the 14th meeting of National Committee on Transmission (NCT). As such, the scopes of scheme "Transmission System for Evacuation of Power from REZ in Rajasthan (20 GW) under phase-III Part B1" is hereby modified as under:

Sl. No.	Revised Scope
1.	Establishment of 2x1500 MVA, 765/400 kV & 3x500 MVA, 400/220 kV pooling station at Bhadla-3 along with 2x330 MVAR (765 kV) Bus Reactor & 2x125 MVAR (420 kV) Bus Reactor • 765/400 kV 1500 MVA ICTs: 2 Nos. (7x500 MVA including one spare unit) • 765 kV ICT bays - 2 Nos. • 400/220 kV, 500 MVA ICT – 3 Nos. • 765 kV line bays -2 Nos. • 400 kV ICT bays – 5 Nos. • 220 kV ICT bays - 3 Nos. • 220 kV line bays: 5 Nos. • 330 MVAR Bus Reactor-2 Nos. (7x110 MVAR, including one spare unit) • 765 kV reactor bay- 2 Nos. • 125 MVAR, 420 kV bus reactor - 2 Nos. • 420 kV reactor bay - 2 Nos. Future provisions: Space for • 765/400 kV ICTs along with bays: 2 Nos. • 765 kV line bay along with switchable line reactor: 6 Nos. • 765 kV line bay: 4 Nos. • 765 kV Bus Reactor along with bays: 2 Nos. • 400/220 kV ICTs along with bays: 10 Nos. • 400 kV line bays: 8 Nos. • **400 kV line bays along with switchable line reactors: 8 Nos.** • 400 kV Bus Reactor along with bays: 2 Nos. • 400 kV Sectionalization bay: 2 sets • 220 kV line bays: 12 Nos. • 220 kV Sectionalization bay: 2 sets
2.	Bhadla-3 PS – Sikar-II S/s 765 kV D/c line along with 330 MVAR Switchable line reactor for each circuit at each end of Bhadla-3 PS – Sikar-II S/s 765 kV D/c line • Switching equipment for 765 kV 330 MVAR switchable line reactor – 4 Nos. • 765 kV, 330 MVAR Switchable line reactor- 4 Nos.



3.	765 kV line bays at Sikar-II • 765 kV line bays – 2 Nos.
i.	Provision of suitable sectionalization shall be kept at Bhadla-3 at 400 kV & 220 kV level to limit short circuit level.
ii.	Developer of Sikar-II S/s to provide space for 2 Nos. of 765 kV line bays at Sikar-II S/s along with space for switchable line reactors.
iii.	Space provision for future 2 Nos. 220 kV Bus Coupler bay and 2 Nos. Transfer Bus Coupler Bay shall be kept for bus switching scheme requirement.

3. Bid Process Co-ordinators for above scheme will remain unchanged, as per original notification.

[F. No. 15/3/2018-Trans-Part (1)]

BIHARI LAL, Under Secy. (Trans)

Adani Energy Solutions Limited

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STANDARD SINGLE STAGE REQUEST FOR PROPOSAL DOCUMENT

FOR

SELECTION OF BIDDER AS TRANSMISSION SERVICE PROVIDER THROUGH TARIFF BASED COMPETITIVE BIDDING PROCESS

TO

ESTABLISH INTER-STATE TRANSMISSION SYSTEM

FOR

Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C

ISSUED BY

PFC CONSULTING LTD.
(A wholly owned subsidiary of Power Finance Corporation Ltd.)

Registered Office:
1st Floor, "Urjanidhi", 1, Barakhamba Lane,
Connaught Place, New Delhi-110001

26, July, 2024

Adani Energy Solutions Limited

PFC CONSULTING LIMITED
(A wholly owned subsidiary of Power Finance Corporation Limited)

Corporate Office:
9th Floor, A-Wing, Statesman House
Connaught Place, New Delhi-110001

Request for Proposal Document for selection of Bidder as Transmission Service Provider through tariff based competitive bidding process to establish Inter-State Transmission System for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" is issued by PFC Consulting Limited.

This RFP document is issued to -

M/s. _____

_____

_____

_____

_____

General Manager
PFC Consulting Limited
9th Floor, A-Wing, Statesman House
Connaught Place, New Delhi-110001
Email: pfccl.itp@pfcindia.com
Place: New Delhi
Date:
Signature: .....



REQUEST FOR PROPOSAL NOTIFICATION

PFC Consulting Limited
(A wholly owned subsidiary of Power Finance Corporation Limited)

Corporate Office:
9th Floor, A-Wing, Statesman House
Connaught Place, New Delhi-110001

1. The Government of India, Ministry of Power, vide its notification no. **CG-DL-E-06092023-248580** dated September 04, 2023 has notified PFC Consulting Limited (PFCCL) to be the Bid Process Coordinator (BPC) for the purpose of selection of Bidder as Transmission Service Provider (TSP) to establish Inter-State transmission system for "**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C**" through tariff based competitive bidding process.

2. PFC Consulting Limited (PFCCL) (hereinafter referred to as BPC) hereby invites all prospective Bidders for issue of Request for Proposal (RFP) for selection of Bidder as Transmission Service Provider (TSP) on the basis of international competitive bidding in accordance with the "Tariff Based Competitive Bidding Guidelines for Transmission Service" and "Guidelines for Encouraging Competition in Development of Transmission Projects" issued by Government of India, Ministry of Power under section – 63 of The Electricity Act, 2003 and as amended from time to time. The responsibility of the TSP would be to establish the following Inter-State Transmission System – "**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C"** (hereinafter referred to as 'Project') on build, own, operate & transfer basis and to provide transmission service:

S. No	Transmission System for Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C	
	Name of Transmission Element	**Scheduled COD in months from Effective Date**
1.	Establishment of 2500 MW, ±500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard* • 2500 MW, ±500 kV KPS3 (HVDC) [VSC] Terminal station	48 months from SPV transfer
2.	Establishment of 2500 MW, ±500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s* • 2500 MW, ±500 kV South Olpad (HVDC) [VSC] terminal station	
3.	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC	

	Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal. ○ 400/33 kV, 1x50 MVA ICT along with bays : 2 Nos. ○ 125 MVAR 420 kV bus reactor- 2 Nos. (one on each section) ○ 400 kV reactor bay- 2 Nos. (one on each section) ○ 400 kV Bus sectionaliser- 1 Set **Future Provisions at KPS3 (HVDC) S/s Space for:** ○ 400 kV line bays – 6 Nos. (3 on each section) ○ 400 kV reactor bay- 2 Nos. (one on each section)	
4.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations • Route length- 2 km • 400 kV GIS line bays - 4 Nos. at KPS3 (2 Nos. on each bus section) • 400 kV GIS line bays - 4 Nos at KPS3 (HVDC) (2 Nos. on each bus section)	
5.	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW) • Route length: 600 km	

**The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC and HVAC switchyards shall be implemented by the TSP*

Note:

i. *The 1250 MW pole-1 shall emanate from 400 kV bus section 1 of KPS3 (HVDC) and terminate at South Olpad S/s. Similarly, the 1250 MW pole-2 shall emanate from 400 kV bus section 2 of KPS3 (HVDC) and terminate at South Olpad S/s.*

ii. *HVDC System will be designed with 100% power reversal capability as well as black start, automatic grid restoration and dynamic reactive power support capability.*

iii. *The rated power transmission capacity as well as the rated transmission voltage shall be defined and guaranteed at the rectifier DC Bus.*

iv. *TSPs of KPS3 shall provide space for scope at Sl. No. 4 as per the above scope*

v. *TSP of South Olpad S/s shall provide space for scope at Sl. No. 2 as per above scope ensuring*

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(a) indicative total space requirement for HVDC terminal station of size 400 m x 300 m. The AC switchyard connection and DC overhead line shall be from 300 m side of rectangular plot.

(b) the width of the approach road and access road shall be at least 10 m for facilitating smooth transportation of HVDC equipment including converter transformer and with access road all around the space for HVDC.

(c) the spatial arrangement for proposed space for HVDC terminal and the layout proposed for the current AC GIS transmission scheme is such that Bus duct length required for interconnection between AC GIS station and HVDC terminal is minimum to the extent possible in linear manner and the layout of the AC line termination gantries should be such that there is no crossing of present/ future AC lines and HVDC line near the termination ends of both AC and HVDC yards.

vi. *The transmission line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey.*

vii. *Implementation timeline: 48 months from SPV transfer*

3. The TSP shall ensure that design, construction and testing of all equipment, facilities, components and systems of the Project shall be in accordance with the provisions of the Transmission Service Agreement and applicable Rules/ Regulations, Orders and Guidelines issued by the Central Government.

4. **Transmission License**: The TSP shall obtain the Transmission License from the Commission.

5. **Bidding Process:** The Transmission Service Provider shall be selected through tariff based competitive bidding process for the Project based on meeting stipulated Qualification Requirements prescribed in Clause 2.1 of Section 2 of RFP and the lowest Quoted Transmission Charges discovered from Final Offers quoted during the e-reverse bidding. The selection of the TSP shall be subject to it obtaining Transmission License from the Commission, which, after expiry, may be further extended by such period as deemed appropriate by the Commission under powers vested with it to amend the conditions of the Transmission License.

   The entire bidding process shall be conducted on electronic platform created by MSTC Limited.

   The Bid shall be a single stage two envelope bid comprising the Technical Bid and the Financial Bid. The Bidders shall submit the Bid online through the electronic bidding platform. In addition to the online submission, the Bidder with lowest Final Offer will be required to submit original hard copies of Annexure 3, Annexure 4 (if applicable), Annexure 6 (if applicable) and Annexure 14 before issuance of LoI. There shall be no physical submission of the Financial Bid.

   The Technical Bid shall be opened first and the Financial Bid of only the bidder who have qualified in the Technical Bid shall be opened. The Financial Bid will comprise of two rounds. In the first round the Initial Offer of the responsive bids would be opened and Quoted Transmission Charges of Initial Offer shall be ranked on the basis of ascending order. The Bidders, in the first fifty per cent of the ranking (with any fraction rounded off to higher

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integer) or four Bidders, whichever is higher, shall qualify for participating in the electronic reverse auction stage and submit their Final Offer.

6. The objective of the bidding process is to select a Successful Bidder pursuant to this RFP, who shall acquire one hundred percent (100%) of the equity shares of KPS III HVDC TRANSMISSION LIMITED along with all its related assets and liabilities as per the provisions of the Share Purchase Agreement, at the Acquisition Price to be intimated by the BPC, twenty (20) days prior to the Bid Deadline.

   The KPS III HVDC TRANSMISSION LIMITED, of which one hundred percent (100%) equity shares will be acquired by the Selected Bidder, shall be responsible as the TSP, for ensuring that it undertakes ownership, financing, development, design, engineering, procurement, construction, commissioning, operation and maintenance of the Project, and to provide Transmission Service as per the terms of the RFP Project Documents.

   The TSP shall ensure transfer of all project assets along with substation land, right of way and clearances to CTU or its successors or an agency as decided by the Central Government after 35 years from COD of project at zero cost and free from any encumbrance and liability. The transfer shall be completed within 90 days after 35 years from COD of project failing which CTU shall be entitled to take over the project assets Suo moto.

7. **Commencement of Transmission Service**: The Bidder shall have to commence Transmission Service in accordance with the provisions of the Transmission Service Agreement.

8. **Transmission Charges**: The Transmission Charges shall be payable by the Designated ISTS Customers in Indian Rupees through the CTU as per Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations as amended from time to time. Bidders shall quote the Transmission Charges as per the pre-specified structure, as mentioned in the RFP.

9. **Issue of RFP document:** The detailed terms and conditions for qualification and selection of the Transmission Service Provider for the Project and for submission of Bid are indicated in the RFP document. All those interested in purchasing the RFP document may respond in writing to **General Manager, Tel. +91 11 23443912, Fax +91 11 23443990, Email: pfccl.itp@pfcindia.com** at the address given in para 12 below with a non-refundable fee of Rs. 5,00,000/- (Rupees Five Lakh Only) or US$ 7000/- (US Dollars Seven Thousand Only) plus 18% GST, to be paid via electronic transfer to the following Bank Account:

   Bank Account Name : PFC Consulting Limited
   Account No. : 000705036117
   Bank Name : ICICI Bank
   IFSC : ICIC0000007
   Branch : Connaught Place, New Delhi-110001

latest by 29.09.2024. Immediately after issuance of RFP document, the Bidder shall submit the Pre-Award Integrity Pact in the format as prescribed in Annexure B, which shall be applicable for and during the bidding process, duly signed on each page by any whole-time Director / Authorized Signatory, duly witnessed by two persons, and shall be submitted by the Bidder in two (2) originals in a separate envelope, duly superscripted with Pre-Award

Integrity Pact. The Bidder shall submit the Pre-Award Integrity Pact on non-judicial stamp paper of Rs. 100/- each duly purchased from the National Capital Territory of Delhi. In case the Bidder is in a consortium, the Pre-Award Integrity Pact shall be signed and submitted by each member of the Consortium separately.

The RFP document shall be issued to the Bidders on any working day from 26/07/2024 to 30/09/24 between 1030 hours (IST) to 1600 hours (IST). The BPC, on written request and against payment of the above mentioned fee by any Bidder shall promptly dispatch the RFP document to such Bidder by registered mail/ air mail. BPC shall, under no circumstances, be held responsible for late delivery or loss of documents so mailed.

10. **Receipt and opening of Bid:** The Bid must be uploaded online through the electronic bidding platform on or before 1500 hours (IST) on 30/09/24 . Technical Bid will be opened by the Bid Opening Committee on the same day at 1530 hours (IST) in the office of Central Electricity Authority, in the online presence of Bidders' representatives who wish to attend. If the Bid Deadline is a public holiday at the place of submission of Bid, it shall be opened on the next working day at the same time and venue. In addition to the online submission, the Bidder with lowest Final Offer will be required to submit original hard copies of Annexure 3, Annexure 4 (if applicable), Annexure 6 (if applicable) and Annexure 14 before issuance of LoI. Bidders meeting the Qualification Requirements, subject to evaluation as specified in Clause **3.2** to **3.4** shall be declared as "Qualified Bidders" and eligible for opening of Initial Offer.

11. The RFP document is not transferable. BPC reserves the right to reject all Bid and/or annul the process of tariff based competitive bidding for selection of Bidder as TSP to execute the Project without assigning any reason. BPC shall not bear any liability, whatsoever, in this regard.

12. **Nodal person for enquiries and clarifications**

All correspondence and clarification in respect of RFP document shall be addressed to:

General Manager
PFC Consulting Limited
9th Floor, A-Wing, Statesman House
Connaught Place, New Delhi - 110001, India
Tel. + 91-11-23443912
Fax + 91-11-23443990
Email: pfccl.itp@pfcindia.com

Adani Energy Solutions Limited

DISCLAIMER

1. This Request for Proposal (RFP) document is not an agreement or offer by the BPC to the prospective Bidders or to any other party. The purpose of this RFP document is to provide interested parties with information to assist the formulation of their Bid. The RFP document is based on material and information available in public domain.

2. This RFP, along with its Annexures, is not transferable and the information contained therein are to be used only by the person to whom it is issued. It may not be copied or distributed by the recipient to third parties (other than in confidence to the recipient's professional advisors). In the event that the recipient does not continue with its involvement in the Project in accordance with this RFP, this RFP must be kept confidential.

3. While this RFP has been prepared in good faith, neither the BPC nor its employees or advisors/consultants make any representation or warranty expressed or implied as to the accuracy, reliability or completeness of the information contained in this RFP. The Bidders shall satisfy themselves, on receipt of the RFP document, that the RFP document is complete in all respects. Intimation of any discrepancy shall be given to this office immediately. If no intimation is received from any Bidder within ten (10) days from the date of issue of this RFP document on or before the date & time mentioned in this RFP, it shall be considered that the issued document, complete in all respects, has been received by the Bidders.

   This bidding process is in accordance with the Bidding Guidelines issued by Ministry of Power, Government of India under Section 63 of the Electricity Act, 2003. Revisions or amendments in these Bidding Guidelines may cause the BPC to modify, amend or supplement this RFP document, including the RFP Project Documents to be in conformance with the Bidding Guidelines.

4. This RFP document includes statements, which reflect various assumptions arrived at by BPC in order to give a reflection of current status in the RFP. These assumptions should not be entirely relied upon by Bidders in making their own assessments. This RFP document does not purport to contain all the information each Bidder may require and may not be appropriate for all persons. It is not possible for BPC to consider the investment objectives, financial situation and particular needs of each party who reads or uses this RFP document. Certain Bidders may have a better knowledge of the Project than the others. Each Bidder should conduct its own investigations and analysis and should check the accuracy, reliability and completeness of the information in this RFP document and obtain independent advice from appropriate sources.

5. Neither BPC nor their employees or consultants make any representation or warranty as to the accuracy, reliability or completeness of the information in this RFP document.

6. Neither BPC, its employees nor its consultants will have any liability to any Bidder or any other person under the law of contract, tort, the principles of restitution or unjust enrichment or otherwise for any loss, expense or damage which may arise from or be incurred or suffered in connection with anything contained in this RFP document, any matter deemed to form part of this RFP document, the award of the Project, the information supplied by or on behalf of BPC or its employees, any consultants or otherwise arising in any way from the qualification process for the said Project.

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7. By participating in the bidding process, each of the Bidder shall have acknowledged and accepted that it has not been induced to enter into such agreement by any representation or warranty, expressed or implied, or relied upon any such representation or warranty by or on behalf of BPC or any person working in the bidding process.

8. BPC may in its absolute discretion, but without being under any obligation to do so, update, amend or supplement this RFP document. Such updations, amendments or supplements, if any, will however be circulated to the Bidders not later than 15 days prior to the last date for submission of Bid.

9. Each Bidder unconditionally agrees, understands and accepts that the BPC reserves the rights to accept or reject any or all Bids without giving any reason. Neither the BPC nor its advisers shall entertain any claim of any nature, whatsoever, including without limitations, any claim seeking expenses in relation to the preparation of Bids.

10. This RFP may be withdrawn or cancelled by the BPC at any time without assigning any reasons thereof. BPC further reserves the right, at its complete discretion to reject any or all of the Bids without assigning any reasons whatsoever.



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DEFINITIONS

Any capitalized term, used but not defined in this RFP, shall have the meaning ascribed to such term in the RFP Project Documents, or the Bidding Guidelines, in that order. In absence of availability of definitions in the foregoing references, the capitalized terms shall be interpreted in accordance with the Electricity Act 2003, Grid Code or any other relevant electricity law, rule or regulation prevalent in India, as amended or re-enacted from time to time, in that order.

The following terms are defined for use in this RFP:

"Acquisition Price" shall have the same meaning as defined in the Share Purchase Agreement;

"Affiliate" shall mean a company that either directly or indirectly

i. controls or
ii. is controlled by or
iii. is under common control with

a Bidding Company (in the case of a single company) or a Member (in the case of a Consortium) and "**control**" means ownership by one entity of at least twenty six percent (26%) of the voting rights of the entity. As an illustration a chart is annexed hereto as Annexure – 12;

"Bid" shall mean Technical Bid and Financial Bid (Initial Offer and Final Offer) submitted by the Bidder, in response to this RFP, in accordance with the terms and conditions thereof;

"Bidder" shall mean either a single company (including its permitted successors and legal assigns) or a Consortium of companies (including its permitted successors and legal assigns) submitting a Bid in response to this RFP. Any reference to the Bidder includes Bidding Company, Bidding Consortium/ Consortium, Member in a Bidding Consortium and Lead Member of the Bidding Consortium jointly and severally, as the context may require;

"Bidding Company" shall refer to such single company (including its permitted successors and legal assigns) that has submitted a Bid for the Project;

"Bidding Consortium/ Consortium" shall refer to a group of companies (including their permitted successors and legal assigns) that has collectively submitted a Bid for the Project;

"Bidding Guidelines" shall mean the "Tariff Based Competitive-Bidding Guidelines for Transmission Service" and "Guidelines for Encouraging Competition in Development of Transmission Projects" issued by Government of India, Ministry of Power under Section – 63 of Electricity Act as amended from time to time;

"Bid Bond" shall mean the unconditional and irrevocable bank guarantee for Rupees 190.99 crore (Rs. One Hundred Ninety crore and Ninety Nine Lakh only), to be submitted along with the Technical Bid by the Bidder under Clause 2.11 of this RFP, as per the format prescribed in Annexure 14;

"Bid Deadline" shall mean the last date and time for submission of online Bid in response to this RFP, specified in Clause 2.7.1;

"Bid Process Coordinator or BPC" shall mean a person or its authorized representative as notified by the Government of India, responsible for carrying out the process for selection of Bidder who will acquire Transmission Service Provider;

"Bid Security Declaration" shall mean the declaration to be submitted along with the Technical Bid by the Bidder in lieu of the Bid Bond, as per the format prescribed in Annexure 14A [only applicable for projects for which RFP has been issued before 31.12.2021];

"CEA" shall mean the Central Electricity Authority constituted under Section - 70 of the Electricity Act;

"Commission" or "CERC" shall mean the Central Electricity Regulatory Commission of India constituted under Section-76 of The Electricity Act, 2003 and any successors and assigns;

"Conflict of Interest" A Bidder shall be considered to be in a Conflict of Interest with one or more Bidders in the same bidding process if they have a relationship with each other, directly or through a common company, that puts them in a position to have access to information about or influence the Bid of another Bidder.

Provided that if two or more bidders in the bidding process have formed a Joint Venture Company or Consortium to execute another project, the Bidders will not be considered to have Conflict of Interest;

"Commercial Operation Date (COD)" shall mean the date as per Article 6.2 of the Transmission Service Agreement;

"Consents, Clearances, Permits" shall mean all authorizations, licenses, approvals, registrations, permits, waivers, privileges, acknowledgements, agreements, or concessions required to be obtained from or provided by any concerned authority for the development, execution and performance of Project including without any limitation on the construction, ownership, operation and maintenance of the transmission lines and/or sub-stations;

"Contract Performance Guarantee" shall have the meaning as per Clause 2.12 of this RFP;

"Contract Year" shall mean the period beginning on the Scheduled COD, and ending on the immediately succeeding March 31 and thereafter each period of 12 months beginning on April 1 and ending on March 31 provided that:

(i) the last Contract Year shall end on the last day of the term of the Transmission Service Agreement;

"Infrastructure sector" shall mean such sectors notified by Department of Economic Affairs in its Gazette Notification no. 13/1/2017-INF dated 14th November, 2017 and as amended from time to time;

"CTU/Central Transmission Utility" shall have same meaning as defined in the Electricity Act, 2003;

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"Designated ISTS Customers" or "DICs" shall have the meaning as ascribed in Regulation 2(l) of Central Electricity Regulatory Commission (Sharing of inter-State Transmission Charges and Losses) Regulation 2020 and as amended or modified from time to time;

"Effective Date" shall have the meaning as ascribed thereto in the Transmission Service Agreement;

"Element" shall mean-each Transmission Line or each circuit of the Transmission Lines (where there are more than one circuit) or each bay of the Sub-station or switching station or HVDC terminal or inverter station of the Project, including ICTs, Reactors, SVC, FSC, etc. forming part of the ISTS which will be owned, operated and maintained by the concerned ISTS Licensee, and which may have a separate scheduled COD as per Schedule 2 of the Transmission Service Agreement and may have a separate percentage for recovery of Transmission Charges on achieving COD as per Schedule 5 of the Transmission Service Agreement;

"National Committee on Transmission" shall mean the committee constituted by the Ministry of Power, Government of India in terms of the "Guidelines for Encouraging Competition in Development of Transmission Projects", as notified from time to time;

"Final Offer" shall mean the Quoted Transmission Charges, required to be submitted as part of the Financial Bid on the electronic bidding platform during the e-reverse bidding stage. In case, no Final Offer is received during the e-reverse bidding stage then the lowest "Initial Offer" shall be deemed to be the Final Offer;

"Financial Bid" shall mean the Initial Offer and Final Offer, containing the Bidder's Quoted Transmission Charges, as per the format at Annexure – 21 of this RFP;

"Financially Evaluated Entity" shall mean the company which has been evaluated for the satisfaction of the financial requirement set forth in Clause **2.1.3** hereof;

"Government" shall mean the Central Government;

"Grid Code" / "IEGC" or **"State Grid Code"** shall mean the Grid Code specified by the Central Commission under clause (h) of sub-section (1) of Section 79 of the Electricity Act and/or the State Grid Code as specified by the concerned State Commission referred under clause (h) of sub-section (1) of Section 86 of the Electricity Act as applicable;

"Transmission Service Agreement" or **"TSA"** shall mean the agreement entered into between Nodal Agency and the TSP, pursuant to which the TSP shall build, own, operate and transfer the Project and make available the assets of the Project on a commercial basis;

"Initial Offer" shall mean the Quoted Transmission Charges, required to be submitted as part of the Financial Bid on the electronic bidding platform along with the Technical Bid;

"Inter State Generating Station" or "ISGS" shall mean a Central / other generating station in which two or more states have shares and whose scheduling is to be coordinated by the Regional Load Despatch Centre;

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"Inter-State Transmission System" shall have same meaning as defined in the Electricity Act, 2003;

"Lead Member of the Bidding Consortium" or "Lead Member" shall mean a company who commits at least twenty six percent (26%) equity stake in the Project, meets the technical requirement as per Clause 2.1.2 and so designated by other Member(s) in Bidding Consortium;

"Letter of Intent" or "LoI" shall mean the letter to be issued by the BPC to the Bidder, who has been identified as the selected bidder, for award of the Project to such Bidder;

"Member in a Bidding Consortium/Member" shall mean each company in the Bidding Consortium;

"MOP" shall mean the Ministry of Power, Government of India;

"MOEF" shall mean the Ministry of the Environment and Forests, Government of India;

"Nodal Agency" shall mean CTU, which shall execute and implement the Transmission Service Agreement (TSA);

Provided that while taking major decisions, CTU shall consult CEA on technical matters and any other matter it feels necessary.

"Technical Bid" shall mean the bid submitted online through the electronic bidding platform, containing the documents as listed out in Clause 2.5.2 of this RFP;

"Parent Company" shall mean an entity that holds at least twenty six percent (26%) of the paid - up equity capital directly or indirectly in the Bidding Company or in the Member in a Bidding Consortium, as the case may be;

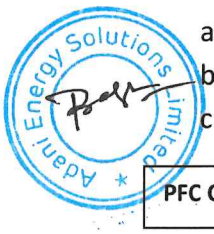
"Qualification Requirements" shall mean the qualification requirements as set forth in Section-2, Clause 2.1 of this RFP;

"Quoted Transmission Charges" shall mean the quoted single annual Transmission Charges submitted online through the electronic bidding platform by the Bidder as part of its Financial Bid as per the format in Annexure – 21 of this RFP;

"RFP" shall mean Request for Proposal document along with all schedules, formats, annexure and RFP Project Documents attached hereto, issued by BPC for tariff based competitive bidding process for selection of bidder who will acquire the TSP through e-reverse bidding to execute the Project, and shall include any modifications, amendments or alterations or clarifications thereto;

"RFP Project Documents" shall mean the following documents to be entered into in respect of the Project, by the parties to the respective agreements:

a. Transmission Service Agreement (TSA),
b. Share Purchase Agreement,
c. Agreement(s) required, if any, under Central Electricity Regulatory Commission



(Sharing of Inter-State Transmission Charges and Losses) Regulations as amended from time to time and

d. Any other agreement, as may be required;

"Scheduled COD" shall have the meaning as ascribed hereto in Clause 2.6 of this RFP;

"Statutory Auditor" shall mean the auditor appointed under the provisions of the Companies Act, 1956 / Companies Act, 2013 (as the case may be) or under the provisions of any other applicable governing law;

"Share Purchase Agreement" shall mean the agreement **PFC Consulting Limited**, KPS III HVDC TRANSMISSION LIMITED and the Successful Bidder for the purchase of one hundred (100%) per cent of the shareholding of the KPS III HVDC TRANSMISSION LIMITED for the Acquisition Price, by the Successful Bidder on the terms and conditions as contained therein;

"Successful Bidder" or **"Selected Bidder"** shall mean the Bidder selected pursuant to this RFP to acquire one hundred percent (100%) equity shares of KPS III HVDC TRANSMISSION LIMITED, along with all its related assets and liabilities, which will be responsible as the TSP to establish the Project on build, own, operate and transfer basis as per the terms of the Transmission Service Agreement and other RFP Project Documents;

"Survey Report" shall mean the report containing initial information regarding the Project and other details provided as per the provisions of Clause 1.6.2.1.1 of this RFP;

"Technical Bid" shall mean the bid submitted online through the electronic bidding platform, containing the documents as listed out in Clause 2.5.2 of this RFP;

"Technically Evaluated Entity" shall mean the company which has been evaluated for the satisfaction of the technical requirement set forth in Clause 2.1.2 hereof;

"Transmission Charges" shall mean the Final Offer quoted by Selected Bidder and adopted by the Commission, and as computed in terms of the provisions of Schedule 4 of the TSA, payable to the ISTS Licensee by the Designated ISTS Customers, and collected / disbursed by the CTU, as per Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations as amended from time to time;

"Transmission License" shall mean the license granted by the Commission in terms of the relevant regulations for grant of such license issued under the Electricity Act, 2003;

"Transmission Service Agreement" or **"TSA"** shall mean the agreement entered into between Nodal Agency and the TSP, pursuant to which the TSP shall build, own, operate and transfer the Project and make available the assets of the Project on a commercial basis;

"Transmission Service Provider" or "TSP" shall mean KPS III HVDC TRANSMISSION LIMITED which has executed the Transmission Service Agreement and which shall be acquired by the Selected Bidder;

"Ultimate Parent Company" shall mean an entity which owns at least twenty six percent (26%) equity in the Bidding Company or Member of a Consortium, (as the case may be) and in the

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Technically Evaluated Entity and/or Financially Evaluated Entity (as the case may be) and such Bidding Company or Member of a Consortium, (as the case may be) and the Technically Evaluated Entity and/or Financially Evaluated Entity (as the case may be) shall be under the direct control or indirectly under the common control of such entity.



SECTION – 1

INTRODUCTION

SECTION 1

1. INTRODUCTION

1.1 The Government of India, Ministry of Power, , vide its notification no. **CG-DL-E-06092023-248580** dated 04.09.2023 has notified PFC Consulting Limited (PFCCL) to be the Bid Process Coordinator (BPC) for the purpose of selection of Bidder as Transmission Service Provider (TSP) to establish Inter-State transmission system for **"Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"** through tariff based competitive bidding process.

The BPC hereby invites Bids from all prospective Bidders in accordance with this Request for Proposal (RFP) to select prospective Transmission Service Provider (TSP) in accordance with the "Tariff Based Competitive-Bidding Guidelines for Transmission Service" and "Guidelines for Encouraging Competition in Development of Transmission Projects" issued by Government of India, Ministry of Power under Section – 63 of the Electricity Act. The BPC shall select the Bidder having the prescribed technical and financial capability to become TSP and be responsible for establishing the Project in the state of Gujarat. The TSP will make the Project available against payment of Transmission Charges, as adopted by the Commission, payable to the TSP, as per Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations as amended from time to time.

1.2 The TSP will be required to establish the following Inter State Transmission System for Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C (hereinafter referred to as 'Project') on build, own, operate and transfer basis, and to provide transmission service.

S. No.	Inter State Transmission System for Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C	
	Name of Transmission Element	Scheduled COD in Months from Effective Date
1.	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	48 months from SPV transfer
2.	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*	
3.	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections	

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	with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.	
4.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations	
5.	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)	

** The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC and HVAC switchyards shall be implemented by the TSP*

Note:

i. *The 1250 MW pole-1 shall emanate from 400 kV bus section 1 of KPS3 (HVDC) and terminate at South Olpad S/s. Similarly, the 1250 MW pole-2 shall emanate from 400 kV bus section 2 of KPS3 (HVDC) and terminate at South Olpad S/s.*

ii. *HVDC System will be designed with 100% power reversal capability as well as black start, automatic grid restoration and dynamic reactive power support capability.*

iii. *The rated power transmission capacity as well as the rated transmission voltage shall be defined and guaranteed at the rectifier DC Bus.*

iv. *TSPs of KPS3 shall provide space for scope at Sl. No. 4 as per the above scope*

v. *TSP of South Olpad S/s shall provide space for scope at Sl. No. 2 as per above scope ensuring*

   (d) indicative total space requirement for HVDC terminal station of size 400 m x 300 m. The AC switchyard connection and DC overhead line shall be from 300 m side of rectangular plot.

   (e) the width of the approach road and access road shall be at least 10 m for facilitating smooth transportation of HVDC equipment including converter transformer and with access road all around the space for HVDC.

   (f) the spatial arrangement for proposed space for HVDC terminal and the layout proposed for the current AC GIS transmission scheme is such that Bus duct length required for interconnection between AC GIS station and HVDC terminal is minimum to the extent possible in linear manner and the layout of the AC line termination gantries should be such that there is no crossing of present/ future AC lines and HVDC line near the termination ends of both AC and HVDC yards.

vi. *The transmission line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey.*

vii. *Implementation timeline: 48 months from SPV transfer.*

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1.3 Project Description

Government of India has set a target for establishing 500 GW capacity from non-fossil energy sources by 2030. In this direction, in December 2020, Hon'ble Prime Minister laid the foundation stone of the world's largest renewable energy park in Gujarat's Kutch. This 30 GW capacity hybrid renewable energy park is being built along the Indo-Pak border at Khavda using both wind and solar energy and is expected to play a major role in fulfilling India's vision of generating 500 GW of non-fossil generation capacity by 2030.

Out of 30 GW, 15 GW RE capacity is expected to come up by 2024-25 and balance by 2026-27 timeframe and beyond. Transmission system for evacuation of up to 22 GW power from Khavda RE Park is already under implementation/bidding in 4 phases as per details below:

Phase	RE Capacity (GW)	Status of Transmission System
I	3	Under Implementation: • KPS1 S/s and KPS1 – Bhuj 765 kV D/C line: Awarded to Adani Transmission Ltd. (Commissioned). • KPS2 S/s: Awarded to POWERGRID with SCOD of Dec'24. • KPS1 – KPS2 765 kV D/C line: Awarded to Megha Engg with SCOD of Jan'25.
II	5	Under Implementation: • KPS3 S/s and KPS3 – KPS2 765 kV D/C line: Awarded to POWERGRID with SCOD of Dec'24. • Khavda Ph-II Part A - Awarded to Adani Transmission Ltd. with Expected SCOD of March'25. • Khavda Ph-II Parts B and C – Awarded to POWERGRID with Expected SCOD of March'25. • Khavda Ph-II Part D – Awarded to TPGL(RTM) with Expected SCOD of March'25.
III	7	Under Implementation: Khavda-Ph-III-Part A-Awarded to Adani Khavda-Ph-III-Part-B -Awarded to POWERGRID • Expected SCOD: Dec'25
IV	7	Under Bidding: • Agreed in 14th NCT –and expected SCOD is Jun'26

The Phase-V scheme has been planned to enable evacuation of an additional 8 GW RE power from Khavda RE park.

The subject scheme (under Part C) includes establishment of KPS3 (HVDC) S/s through KPS3 – KPS3 (HVDC) 400 kV 2xD/C line and establishment of 2500 MW, ± 500 kV HVDC [VSC] terminal station (2x1250 MW) at KPS3(HVDC) and South Olpad along with ±500 kV HVDC Bipole line with DMR between KPS3 (HVDC) and South Olpad (HVDC).

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The subject Transmission system was deliberated and approved in the 14th NCT meeting held on 09.06.2023. The Ministry of Power vide Gazette notification dated 29.08.2023 (Copy of Gazette attached) has appointed PFCCL as BPC for implementation of the subject transmission scheme through TBCB route.

1.4 Transmission Grid Map

Transmission Grid Map indicating the location of the Project is enclosed as Annexure 18 of this RFP for information and reference of the Bidders.

1.5 The objective of the bidding process is to select a Successful Bidder pursuant to this RFP, who shall acquire one hundred percent (100%) of the equity shares of KPS III HVDC TRANSMISSION LIMITED along with all its related assets and liabilities as per the provisions of the Share Purchase Agreement, at the Acquisition Price to be intimated by the BPC, twenty (20) days prior to the Bid Deadline.

The KPS III HVDC TRANSMISSION LIMITED, of which one hundred percent (100%) equity shares will be acquired by the Selected Bidder, shall be responsible as the TSP, for ensuring that it undertakes ownership, financing, development, design, engineering, procurement, construction, commissioning, operation and maintenance of the Project, and to provide Transmission Service as per the terms of the RFP Project Documents.

The TSP shall ensure transfer of all project assets along with substation land, right of way and clearances to CTU or its successors or an agency as decided by the Central Government after 35 years from COD of project at zero cost and free from any encumbrance and liability. The transfer shall be completed within 90 days after 35 years from COD of project failing which CTU shall be entitled to take over the project assets Suo moto.

1.6 Brief Scope of Work

1.6.1 Scope of Transmission Service Provider

The TSP's scope of work for the Project shall comprise, but not necessarily be limited to the following:

1.6.1.1 Establishment, operation and maintenance of the Project on build, own, operate and transfer basis and completion of all the activities for the Project, including survey, detailed project report formulation, arranging finance, project management, necessary Consents, Clearances and Permits (way leave, environment & forest, civil aviation, railway/ road/river/canal/power crossing/PTCC, etc.), land compensation, design, engineering, equipment, material, construction, erection, testing & commissioning. Further, the actual location of substations, switching stations or HVDC terminal or inverter stations in the scope of TSP shall not be beyond 3 Km radius of the location proposed by the BPC in the survey report.

Further, the actual location of Greenfield substations (Switching Stations or HVDC Terminal or Inverter Stations) for a generation pooling substation and for load serving

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substations in the scope of TSP shall not be beyond 3 Km radius of the location proposed by the BPC in the survey report. However, actual location of any Greenfield intermediate Substations in the scope of TSP shall not be beyond 10 Km radius of the location proposed by the BPC in the Survey Report.

1.6.1.2 The TSP shall ensure that design, construction and testing of all equipment, facilities, components and systems of the Project shall be in accordance with Transmission Service Agreement and applicable Rules/ Regulations, Orders and Guidelines issued by the Central Government.

1.6.1.3 The TSP shall ensure timely completion of entire scope of Project in all respects and its operation and maintenance, as shall be specified in the RFP documents.

1.6.1.4 The TSP shall seek Transmission License from the Commission, as per the provisions of the Electricity Act and regulations made thereunder.

1.6.1.5 The TSP shall seek approval under Section 164 of Electricity Act, from CEA after acquisition of KPS III HVDC TRANSMISSION LIMITED. The approval shall be granted by CEA generally within 30 days but in no case later than 45 days from the date of receipt of application (complete in all aspects).

1.6.2 **Scope of Bid Process Coordinator (BPC)**

BPC's scope of work is briefly outlined hereunder:

1.6.2.1 The BPC has initiated development of the Project and shall be responsible for the tasks in this regard as specified hereunder:

1. Provide to the Bidders a Survey Report for the Project at least forty five (45) days prior to the Bid Deadline. The Survey Report shall include the suggested route with approximate route length, type of terrain likely to be encountered and its likely implication in terms of Right of Way (ROW), statutory clearances, location of substations or converter stations and land area to be acquired for the substation or converter station.

2. To obtain approval for laying of overhead transmission lines under Section 68 of Electricity Act, from the Government at least twenty (20) days prior to Bid Deadline.

3. To initiate acquisition of land for location specific substations, switching stations or HVDC terminal or inverter stations, if required.

4. To initiate process of seeking forest clearance, if required

5. The BPC shall intimate to the Bidders, the Acquisition Price payable by the Selected Bidder to the **PFC Consulting Limited** for the acquisition of one hundred percent (100%) of the equity shareholding of KPS III HVDC TRANSMISSION LIMITED, along with all its related assets and liabilities at least twenty (20) days prior to the Bid Deadline.

6. The BPC shall ensure issuance of all finalized RFP Project Documents, at least fifteen (15) days prior to the Bid Deadline.

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Provided that for any delay in meeting the above obligations of the BPC within the specified time period above, the Bid Deadline as per Clause 2.7.1 shall be extended on a day for day basis.

1.6.2.2 The details and documents as may be obtained by the BPC/ project specific SPV in relation to the Project shall be handed over to the TSP on an as-is-where-is basis, so that it may take further actions to obtain Consents, Clearances and Permits.

1.7 All costs (including direct and indirect) incurred by the BPC/ project specific SPV in connection with the activities concerning the Project shall be recovered from the TSP, which shall be included in the Acquisition Price.

1.8 The Project is required to be completed progressively in accordance with the schedule prescribed in this RFP.

1.9 A company under the Companies Act, 2013 by the name KPS III HVDC TRANSMISSION LIMITED has been incorporated to initiate the activities for execution of the Project. The said company shall be acquired by the successful Bidder as per terms and conditions as may be prescribed in RFP.

1.10 The Ministry of Power and the appropriate state government(s) shall provide their support to the TSP, on best endeavor basis, in enabling the TSP to develop the Project.

1.11 All Bidders are required to submit their Bid in accordance with the instructions set forth in this RFP.

1.12 Once the Successful Bidder is selected, the details and documents as may be obtained by the BPC/ project specific SPV in relation to the Project, shall be handed over to the Successful Bidder on as is where basis, so that it may take further actions to obtain all necessary Consents, Clearances and Permits and the TSP shall not be entitled for any extensions in the Scheduled COD of the Project except as provided for in the TSA.

1.13 The assets of the Project shall be made available on a commercial basis as per the terms and conditions of the Transmission Service Agreement and Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations as amended from time to time.



SECTION – 2

INFORMATION AND INSTRUCTIONS FOR BIDDERS



SECTION – 2

2. INFORMATION AND INSTRUCTIONS FOR BIDDERS

2.1 Qualification Requirements

2.1.1 The Bidder should be a company duly incorporated under the relevant laws (Bidding Company) or a Consortium of companies (Bidding Consortium) with one of the companies acting as the Lead Member of the Bidding Consortium. The Bidder shall be selected on meeting the Qualification Requirements specified in Section 2 of this RFP, as demonstrated by the Bidder's Technical Bid and the lowest Quoted Transmission Charges discovered from Final Offers quoted during the e-reverse bidding. A Bidding Consortium can participate in the bidding process for the Project if any Member of the Consortium has purchased the RFP document for such Project. Bidder who agree and undertake to procure the products associated with the Transmission System as per provisions of Public Procurement (Preference to Make in India) orders issued by Ministry of Power vide orders No. 11/5/2018 - Coord. dated 28.07.2020 for transmission sector, as amended from time to time read with Department for Promotion of Industry and Internal Trade (DPIIT) orders in this regard, shall be eligible hereunder. Further, it is clarified that Procuring Entity as defined in orders shall deemed to have included Selected Bidder and/ or TSP.

Besides, Department of Expenditure, Ministry of Finance vide Order (Public Procurement No 1) bearing File No. 6/18/2019-PPD dated 23.07.2020, Order (Public Procurement No 2) bearing File No. 6/18/2019-PPD dated 23.07.2020 and Order (Public Procurement No. 3) bearing File No. 6/18/2019-PPD, dated 24.07.2020, as amended from time to time, have issued directions regarding public procurement from a bidder of a country, which shares land border with India are also applicable.

2.1.2 **Technical requirement to be met by the Bidding Company or Lead Member of Bidding Consortium**

The Bidder must fulfill any one of the following technical requirements:

(i) Experience of development of projects in the Infrastructure Sector in the last ten (10) years with aggregate capital expenditure of not less than Rs. 9549.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1). However, the capital expenditure of at least one (1) project shall not be less than Rs. 1909.92 Crore or equivalent USD and the capital expenditure of each project shall not be less than Rs. 100.00 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1).



For this purpose, capital expenditure incurred on projects that have been commissioned/completed at least seven (7) days prior to Bid Deadline shall be considered. The capital expenditure discussed above shall be as capitalized and reflected in the audited books of accounts of the Technically Evaluated Entity. In case a clearly identifiable part of a project has been put into commercial operation, the capital expenditure on such part of the project shall be considered. The Technically Evaluated Entity must have either executed such

projects itself or must have held directly or indirectly at least twenty six percent (26%) of the shareholding in the company that has executed the project(s) from the date of financial closure of the project(s) till the time of commissioning/completion of such project(s).

OR

(ii) Experience in construction of project in infrastructure sector: The Technically Evaluated Entity should have received aggregate payments not less than Rs. 9549.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1) from its client(s) for construction works fully completed during the last 10 (ten) financial years. However, the payment received from at least one (1) project shall not be less than Rs. 1909.92 Crore or equivalent USD and the payment received of each project shall not be less than Rs. 100.00 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1).

For this purpose, payments received on projects that have been commissioned/ completed at least seven (7) days prior to Bid Deadline shall be considered. Further only the payments (gross) actually received, during such 10 (ten) financial years shall qualify for purposes of computing the technical capacity. For the avoidance of doubt, construction works shall not include cost of land, supply of goods or equipment except when such goods or equipment form part of a turn-key construction contract/ EPC contract for the project. Further, in cases where different individual contracts are signed between same entities for the same project, the cumulative payments received under such individual contracts shall be considered for meeting the qualification requirement.

The Technically Evaluated Entity may be the Bidding Company or the Lead Member of a Consortium or an Affiliate or Parent of such Bidding Company or the Lead Member, as the case may be.

Bidders shall furnish documentary evidence duly certified by authorized signatory of the Bidder who has been issued Power of Attorney in support of their technical capability as defined in Clause 2.1.2 of this RFP.

2.1.3 **Financial requirement to be met by the Bidding Company/Bidding Consortium**

2.1.3.1 The Bidder must fulfill following financial requirements:

A. Networth:

Networth should be not less than Rs. **3819.84 Crore** or equivalent USD (calculated as per provisions in Clause 3.4.1**)** computed as the Networth based on unconsolidated audited annual accounts (refer to Note below) of any of the last three (3) financial years as provided in Clause 2.2.3, immediately preceding the Bid Deadline. Also, the Networth of any of the last three (3) financial years should not be negative.

Note: Audited consolidated annual accounts of the Bidder may be used for the purpose of financial criteria provided the Bidder has at least 26% equity in each company whose

accounts are merged in the audited consolidated accounts and provided further that the financial capability of such companies (of which accounts are being merged in the consolidated accounts) shall not be considered again for the purpose of evaluation of the Technical Bid. Bidders shall furnish prescribed Annexure 7 (A) duly certified by authorized signatory of the Bidder who has been issued Power of Attorney and the Statutory Auditor and separate computation sheet for Networth duly certified by Statutory Auditor in support of their financial capability as defined in Clause 2.1.3 of this RFP.

2.1.3.2 The Networth shall be computed in the following manner by the Bidder:

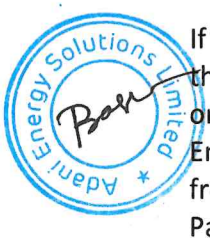
A. Networth

=	Equity share capital
Add:	Reserves
Subtract:	Revaluation Reserves
Subtract:	Intangible Assets
Subtract:	Miscellaneous expenditures to the extent not written off and carry forward losses

2.1.3.3 If the Technical Bid is submitted by a Bidding Consortium the financial requirement shall be met individually and collectively by all the Members in the Bidding Consortium. The financial requirement to be met by each Member of the Bidding Consortium shall be computed in proportion to the equity commitment made by each of them for investment in the Project.

2.1.4 The Bidder may seek qualification on the basis of technical and financial capability of its Parent and/ or its Affiliate(s) for the purpose of meeting the Qualification Requirements. However, in the case of the Bidder being a Consortium, the Lead Member has to meet the technical requirement on its own or by seeking the technical capability of its Parent and/or its Affiliate(s). Authorization for use of such technical or financial capability shall have to be provided from its Parent and/or Affiliate(s) as per Annexure 9. The technical and financial capability of a particular company/ particular project, including its Parents and/or Affiliates, shall not be used directly or indirectly by more than one Bidder/ Member of a Bidding Consortium/ Bidding Company. However, development and construction experience of a particular project may be used by more than one company.

The determination of the relationship of Parent or Affiliate with the Bidding Company or with the Member of the Bidding Consortium, including the Lead Member, shall be on the date at the most seven (7) days prior to the last date of submission of the Bid. Documentary evidence to establish such relationship shall be furnished by the Bidder along with the Technical Bid.



If the Technically Evaluated Entity and/or Financially Evaluated Entity is an entity other than the Bidding Company or a Member in a Bidding Consortium, the Bidding Company or Member relying on such Technically Evaluated Entity and/or Financially Evaluated Entity will have to submit a legally binding undertaking supported by a board resolution from the Technically Evaluated Entity and/or Financially Evaluated Entity or its Ultimate Parent Company, that all the equity investment obligations of the Bidding Company or the Member of the Consortium shall be deemed to be equity investment obligations of

the Technically Evaluated Entity and/or Financially Evaluated Entity or its Ultimate Parent Company, and in the event of any default the same shall be met by such evaluated entity or by or the Ultimate Parent Company. The Bidding Company or the Consortium Member shall have to provide information and documents relating to its relationship with such Technically Evaluated Entity and/or Financially Evaluated Entity including details about the equity shareholding between them as per Annexure 7(C).

2.1.5 A Bidder shall submit only one Bid in the same bidding process, either individually as Bidding Company or as a Member of a Bidding Consortium (including the Lead Member). It is further clarified that any of the Parent/ Affiliate/Ultimate Parent of the Bidder/ Member in a Bidding Consortium shall not separately participate directly or indirectly in the same bidding process. Further, if any Bidder is having a Conflict of Interest with other Bidders participating in the same bidding process, the Bids of all such Bidders shall be rejected.

2.1.6 Notwithstanding anything stated above, BPC reserves the right to verify the authenticity of the documents submitted for meeting the Qualification Requirements and request for any additional information and documents. BPC reserves the right at its sole discretion to contact the Bidder's bank and project references and verify the Bidder's information and documents for the purpose of bid evaluation.

2.1.7 The Qualified Bidder(s) will be required to continue to maintain compliance with the Qualification Requirements throughout the bidding process and till execution of the Transmission Service Agreement. Where the Technically Evaluated Entity and/or the Financially Evaluated Entity is not the Bidding Company or a Member in a Bidding Consortium, as the case may be, the Bidding Company or Member shall continue to be an Affiliate of the Technically Evaluated Entity and/or Financially Evaluated Entity till the execution of the Transmission Service Agreement. Failure to comply with the aforesaid provisions shall make the Bid liable for rejection at any stage.

2.1.8 The Selected Bidder will be required to continue to maintain compliance with the Qualification Requirements till the COD of the Project. Where the Technically Evaluated Entity and/or the Financially Evaluated Entity is not the Bidding Company or a Member in a Bidding Consortium, as the case may be, the Bidding Company or Member shall continue to be an Affiliate of the Technically Evaluated Entity and/or Financially Evaluated Entity till the COD of the Project. Failure to comply with the aforesaid provisions shall be dealt as per provisions of Transmission Service Agreement.

2.1.9 On the Bid Deadline, for the Bidder to be eligible to participate in the bidding process:

a. the Bidder & any of its Affiliate including any Consortium Member & any of its Affiliate, their directors or key personnel should not have been barred or included in the blacklist by any government agency or authority in India, the government of the jurisdiction of the Bidder or Members where they are incorporated or the jurisdiction of their principal place of business, any international financial institution such as the World Bank Group, Asian Development Bank, African Development Bank, Inter-American Development Bank, Asian Infrastructure Investment Bank etc or the United Nations or any of its agencies; or

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b. the Bidder & any of its Affiliate including any Consortium Member & any of its Affiliate or their directors should not have been convicted of any offence in India or abroad.

In case any investigation is pending against the Bidder, including any Consortium Member or Affiliate, or CEO or any of the directors/ manager/key managerial personnel of the Bidder /Consortium /Member or their Affiliates, full details of such investigation including the name of the investigating agency, the charge/offence for which the investigation has been launched, name and designation of persons against whom the investigation has been launched and other relevant information should be disclosed while submitting the Bid.

The Bidders shall confirm the above though a notarized affidavit as per Annexure 22.

2.2 Submission of Bid by the Bidder

2.2.1 The information and documents in Technical Bid will be submitted by the Bidder as per the formats specified in Section – 4 (Formats for RFP) of this document

2.2.2 Strict adherence to the formats wherever specified, is required. Wherever, information has been sought in specified formats, the Bidder shall refrain from referring to brochures/ pamphlets. Non-adherence to formats and/ or submission of incomplete information may be a ground for declaring the Technical Bid as non-responsive. Each format has to be duly signed and stamped by the authorized signatory of Bidder.

2.2.3 The Technical Bid shall contain unconsolidated/consolidated audited annual accounts (consisting of unabridged Balance Sheet, Profit and Loss Account, profit appropriation account, Auditors Report, etc.), as the case may be, of Bidding Company or each Member in Consortium including Lead Member or the Financially Evaluated Entity for the last three (3) financial years immediately preceding the last date for submission of Bid for the purpose of calculation of Networth.

In case the annual accounts for the financial year immediately preceding the Bid Deadline is not audited, the Bidder shall give declaration in this regard duly certified by its statutory auditor. In such a case, the Bidder shall provide the audited annual accounts for the three (3) financial years preceding the financial year as above for which the annual accounts have not been audited.

2.2.4 <u>Bid submitted by a Bidding Consortium:</u>

2.2.4.1 The Technical Bid shall contain a legally enforceable Consortium Agreement entered amongst the Members in the Bidding Consortium, designating one of the Members to be the Lead Member (as per Annexure 6). There shall be only one Lead Member which shall continue to hold twenty six percent (26%) equity in the TSP and cannot be changed upto one (1) year from the Commercial Operation Date (COD) of the Project. Each Member in Bidding Consortium shall duly sign the Consortium Agreement making it liable for raising the required funds for its respective equity investment commitment as specified in the Consortium Agreement. In absence of Consortium Agreement, the Technical Bid will not be considered for evaluation and will be rejected.

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Provided that the Lead Member of the Bidding Consortium will be required to be liable to the extent of 100% of the total proposed commitment of equity investment of the Bidding Consortium i.e. for both its own equity contribution as well as the equity contribution of other Members.

Provided further that the Consortium Agreement shall not be amended without the explicit approval of the BPC.

The Lead Member of the Consortium will be the single point of contact for the purposes of the bid process before the date of signing of Share Purchase Agreement. Settlement of any dispute amongst the Consortium Members shall not be the responsibility of the BPC and/or the CTU and the BPC and/or the CTU shall not bear any liability whatsoever on this account.

2.2.4.2 The Lead Member should designate at the most two persons to represent the Consortium in its dealings with the BPC. The person(s) designated by the Lead Member should be authorized through a Power of Attorney (as per Annexure 3) to perform all tasks including, but not limited to providing information, responding to enquiries, signing of Technical Bid on behalf of the Consortium, etc. The Bidding Consortium shall provide board resolutions from their respective Boards for committing their respective portion of equity requirement for the Project. Additionally, the Lead member shall provide a Board resolution committing to make good any shortfall in the equity for the project, in case of any member not meeting its equity commitment.

2.2.4.3 The Technical Bid should also contain signed Letter of Consent (as per Annexure 2) from each Member in Consortium confirming that the entire Technical and Financial Bids has been reviewed and each element of the Technical and Financial Bids is agreed to by them including investment commitment for the Project.

In addition, the Technical Bid should also contain Board Resolution from each Member of the Consortium other than the Lead Member in favour of their respective authorized representatives for executing the POA, Consortium Agreement and signing of the requisite formats.

2.2.5 Bid submitted by a Bidding Company

2.2.5.1 The Bidding Company should designate at the most two persons to represent the Bidding Company in its dealings with BPC. The person(s) should be authorized to perform all tasks including, but not limited to providing information, responding to enquiries, signing of Technical and Financial Bids etc. The Bidding Company should submit, along with Technical Bid, a Power of Attorney (as per Annexure 3), authorizing the signatory of the Technical and Financial Bids. The Bidding Company shall submit the board resolution committing 100% of equity requirement for the Project, in the Technical Bid.

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2.3 Clarifications & Pre-Bid Meeting

2.3.1 The Bidders may seek clarifications or suggest amendments to the RFP by sending an email to the BPC at the email id indicated in Clause 2.14 within the date and time

mentioned in Clause 2.7.2. For any such clarifications or amendments, the Bidders should adhere to the format as per Annexure – 19.

2.3.2 Only those Bidders or their authorized representatives, who have purchased the RFP documents are invited to attend the pre-bid meeting(s), which will take place on date as specified in Clause 2.7.2, or any such other date as notified by the BPC. The time and address of this would be intimated later.

2.3.3 The purpose of the pre-bid meeting will be to clarify any issues regarding the RFP, including in particular, issues raised in writing by the Bidders as per the provisions of Clause 2.3.1.

2.3.4 Non-attendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.

2.3.5 The BPC is not under any obligation to entertain / respond to suggestions made or to incorporate modifications sought for.

2.3.6 In case Bidders need any further clarifications not involving any amendments in respect of final RFP, they should ensure that request for such clarification is submitted through e-mail to the BPC at least ten (10) days prior to the Bid Deadline as mentioned in Clause 2.7.1. The BPC may issue clarifications only, as per its sole discretion, which is considered reasonable by it. Any such clarification issued shall be sent to all the Bidders to whom the RFP has been issued. Clarifications sought after this date shall not be considered in any manner and shall be deemed not to have been received. There shall be no extension in Bid Deadline on account of clarifications sought as per this clause 2.3.6.

2.4 Amendment of RFP

2.4.1. At any time before the timeline mentioned in Clause 2.7.1, the BPC may, for any reason, whether at its own initiative or in response to clarifications requested by any Bidder modify or amend the RFP, including the timelines specified in Clause 2.7.2 by issuance of addendum/modification/errata and/or revised document. Such document shall be notified in writing through a letter or fax or e-mail to all the entities to whom the RFP has been issued and shall be binding on them. In order to ensure that Bidders have reasonable time to take the modification into account in preparing their Bid, or for any other reasons, BPC may at its discretion, extend the due date for submission of Bid. Late receipt of any addendum/modification/errata and/or revised document will not relieve the Bidder from being bound by that modification.

2.4.2. All modifications shall become part of the terms and conditions of this RFP. No interpretation, revision or communication regarding this RFP is valid, unless made in writing.

2.4.3. The amendment to the RFP shall be notified to all the Bidders through the electronic bidding platform and shall be binding on them.

2.5 The Bidding Process



The entire bidding process shall be conducted on electronic bidding platform created by **MSTC Limited**. The Bid shall comprise of the Technical Bid and the Financial Bid. The Bidders shall submit the Technical Bid & Financial Bid through the electronic bidding platform. In addition to the online submission, the Bidder with lowest Final Offer will be required to submit original hard copies of Annexure 3, Annexure 4 (if applicable), Annexure 6 (if applicable) and Annexure 14 before issuance of LoI. There shall be no physical submission of the Financial Bid.

Evaluation of Technical Bid will be carried out considering the information and documents furnished by the Bidders as required under this RFP. This step would involve responsiveness check, technical and financial evaluation of the details/ documents furnished by the Bidding Company / Bidding Consortium in support of meeting the Qualification Requirements. Bidders meeting the Qualification Requirements, subject to evaluation as specified in Clause **3.2** to **3.4** shall be declared as "Qualified Bidders" and eligible for opening of Initial Offer. The BPC shall also upload the list of all Qualified Bidders and Non-Qualified Bidders on the bidding portal along with the reasons for non-qualification. Also, the Financial Bids of Qualified Bidders shall be opened after at least 24 hours from the date of declaration of the Technically Qualified Bidders.

The Financial Bid will comprise of two rounds. In the first round the Initial Offer (submitted online along with the Technical Bids) of the responsive bids would be opened and Quoted Transmission Charges of Initial Offer shall be ranked on the basis of ascending order for determination of the Qualified Bidders as provided in Section-III of RFP. The Qualified Bidders, in the first fifty per cent of the ranking (with any fraction rounded off to higher integer) or four Qualified Bidders, whichever is higher, shall qualify for participating in the electronic reverse auction stage and submit their Final Offer.

Provided however, in case only one Bidder remains after the evaluation of Technical Bid as per Clause 3.2, 3.3 and Clause 3.4, the Initial Offer of such Bidder shall not be opened and the matter shall be referred to the Government.

Provided that in the event the number of qualified Technical Bids is between two and four, then each of the qualified Bidder shall be considered as "Qualified Bidders".

Provided that in the event of identical Quoted Transmission Charges discovered from the Initial Offer having been submitted by one or more Bidders, all such Bidders shall be assigned the same rank for the purposes of determination of Qualified Bidders. In such cases, all the Qualified Bidders who share the same rank till 50% of the rank (with any fraction rounded off to higher integer) determined above, shall qualify to participate in the electronic e-reverse auction stage. In case 50% of the ranks (with any fraction rounded off to higher integer) is having less than 4 (four) Bidders and the rank of the fourth (4^{th}) Bidder is shared by more than one (1) Bidder, then all such Bidders who share the rank of the fourth (4^{th}) Bidder shall qualify to participate in the electronic reverse auction.



The applicable ceiling for electronic reverse bidding shall be the lowest Quoted Transmission Charges discovered from the Initial Offer received from the Qualified Bidders. The Qualified Bidders shall be permitted to place their Final Offer on the

electronic bidding platform, which is lower than zero point two five (0.25) % of the prevailing lowest Quoted Transmission Charges.

The initial period for conducting the e-reverse bidding should be 2 hours which will be extended by 30 minutes from the last received bid time, if the bid is received during the last 30 minutes of the scheduled or extended bid time. Subsequently, it will be extended again by 30 minutes from the latest received bid time.

The technical details with respect to access to such electronic platform are provided in Annexure-A (Technical Details with respect to electronic reverse auction).

In case of any technical clarification regarding access to the electronic reverse auction platform or conduct of the auction process, the Bidders may contact MSTC directly at the address provided in Annexure-A.

2.5.1 Bid Formats

The Bids in response to this RFP will be submitted online through the electronic bidding platform by the Bidders in the manner provided in Clause 2.9. The Bids shall comprise of the following:

2.5.2 Technical Bid comprising of:

1. Covering Letter (as per prescribed format enclosed as **Annexure 1**);

2. Letter of Consent from Consortium Members in **Annexure 2;**

3. Power of attorney issued by the Bidding Company or the Lead Member of the Consortium, as the case may be, in favour of the person signing the Bid, in the format attached hereto as **Annexure 3**.

   Additionally, in case of a Bidding Consortium, the power of attorney in favour of the Lead Member issued by the other Members of the Consortium shall be provided in as per format attached hereto as **Annexure 4**. Further, the Lead Member shall furnish Board resolution(s) from each Member of the Consortium other than the Lead Member in favour of their respective authorized representatives for executing the POA and signing of the requisite formats.

   Provided that in the event the Bidding Company or the Lead Member of the Consortium or any Member of the Bidding Consortium, as the case may be, is a foreign entity, it may issue Board resolutions in place of power of attorney for the purpose of fulfilling these requirements.

4. Bidder's composition and ownership structure in **Annexure 5**

5. Format for Authorization submitted in Non-Judicial stamp paper duly notarized as per **Annexure 5** from the Bidding Company / each Member of the Consortium authorizing the BPC to seek reference from their respective bankers & others.

6. In case of Bidding Consortium, the Consortium Agreement shall be provided in as per format attached hereto as **Annexure 6**

7. Format of Qualification Requirement (**Annexures 7A, 7B, 7C and 7D)**

8. Bidders Undertakings and details of equity investment in Project (as per prescribed formats 1 and 2 of **Annexure 8**);

9. Authorization from Parent / Affiliate of Bidding Company / Member of Bidding Consortium whose technical / financial capability has been used by the Bidding Company / Member of Bidding Consortium **(Annexure 9)**.

10. Undertaking from the Technically / Financially Evaluated Entity(ies) **OR** Undertaking from the Ultimate Parent Company, for total equity investment commitment, in the prescribed format in **Annexure – 10**, to meet any shortfall in the equity investment by the Selected Bidder in the KPS III HVDC TRANSMISSION LIMITED.

    Note: The effective Equity holding of the Selected Bidder in the KPS III HVDC TRANSMISSION LIMITED, as specified in Clause 2.5.8.1 shall be computed as per the provisions of Clause 2.5.8.3 of this RFP.

    Provided further, in case the Bidding Company or Member of a Consortium, (as the case may be) holds at least twenty six percent (26%) equity in such Technically/ Financially Evaluated Entities, whose credentials have been considered for the purpose of meeting the Qualification Requirements as per the RFP, no such Undertaking shall be required from the Technically / Financially Evaluated Entities.

11. Board resolutions, as per prescribed formats enclosed as Annexure – 11, duly certified by the Company Secretary or any Whole-time Director / Manager (supported by a specific Board Resolution), as applicable to the Bidder and mentioned hereunder,

    (a) Board resolution from the Bidding Company (and any investing Affiliate / Parent Company / Ultimate Parent Company) committing one hundred percent (100%) in aggregate of the equity requirement for the Project - Format-1 of **Annexure 11**;

    (b) Board resolutions from each of the Consortium Member of the Bidding Consortium (and any investing Affiliate / Parent Company / Ultimate Parent Company) together committing to one hundred percent (100%) in aggregate of equity requirement for the Project, in case Bidder is a Bidding Consortium - Format-1 of **Annexure 11**;

    (c) In either of the cases as in (a) or (b) above as applicable, Board resolutions as per Format 2 of **Annexure 11** for total equity investment commitment from the Technically / Financially Evaluated Entity(ies) whose technical / financial credentials had been considered for the purpose of meeting Qualification Requirements as per the RFP

    OR

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Board resolutions as per Format 2 of **Annexure 11** from the Parent Company or the Ultimate Parent Company for total equity investment commitment.

Provided that such Board resolutions, as specified in (a) or (b) or (c) above, in case of a foreign entity, shall be supported by an unqualified opinion issued by an independent legal counsel practicing in the relevant country, stating that the Board resolutions are in compliance with the applicable laws of the respective jurisdictions of the issuing company and the authorizations granted therein are true and valid.

For clarity sake, illustrations identifying which Board Resolution shall be applicable in typical cases are provided in **Annexure 11A**.

12. Format for Illustration of Affiliates at the most seven (7) days prior to Bid Deadline, duly certified by Company Secretary and supported by documentary evidence **(Annexure 12)**.

    Certified copy of the Register of Members / Demat Account Statement, Share Certificate, Annual Return filed with ROC etc. submitted as documentary evidence along with **Annexure 12.**

13. Disclosure as per **Annexure 13** regarding participation of any related companies in this bidding process.

14. Bid Bond, as per the prescribed format at **Annexure 14 or** Bid Security Declaration as per prescribed format at **Annexure-14A (as applicable)**;

15. Checklist for Technical Bid submission requirements as per **Annexure 16**.

16. Last three (3) financial years' unconsolidated / consolidated audited annual accounts / statements, as the case may be, of the Financially Evaluated Entity / Technical Evaluated Entity

17. Unconsolidated audited annual accounts of both the TEE and the Bidding Company/Lead member, as applicable, for the financial years in which financial closure was achieved and the financial year in which the said project was completed / commissioned.

18. Copy of the Memorandum and Articles of Association and certificate of incorporation or other organizational document (as applicable), including their amendments, certified by the Company Secretary of Bidding Company or each Member in case of a Consortium including Lead Member.

19. For each project listed in Annexure 7(D), certified true copy of the certificates of final acceptance and / or certificates of good operating performance duly issued by owners or clients for the project, duly signed by duly signed by authorized signatory.

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In addition to the online submission of above formats through the electronic platform, the Bidder with lowest Final Offer will be required to submit original hard copies of Annexure 3, Annexure 4 (if applicable), Annexure 6 (if applicable) and Annexure 14 before issuance of LoI. In case, there is a discrepancy between the online submission and physical documents, the bid would be out rightly rejected and the bidder shall be construed to have engaged in the fraudulent practice as defined in Clause 2.19.3 with consequences as mentioned in Clause 2.19.2.

2.5.3 Financial Bid (as per prescribed format at Annexure-21)

Financial Bid shall comprise of: (i) the Initial Offer; and (ii) the Final Offer. The Initial Offer is required to be submitted along with the Technical Bid. It is hereby clarified that the Financial Bid will comprise of two rounds. In the first round the Initial Offer of the responsive bids would be opened and Quoted Transmission Charges of Initial Offer shall be ranked on the basis of ascending order for determination of the Qualified Bidders as provided in Section-III of RFP.

In accordance with clause 2.5 of this RFP, the qualified Bidders shall be eligible to participate in the electronic reverse auction and submit their Final Offer.

The applicable ceiling for electronic reverse bidding shall be the lowest Quoted Transmission Charges discovered from the Initial Offer received from the Qualified Bidders. The Qualified Bidders shall be permitted to place their Final Offer on the electronic bidding platform, which is lower than zero point two five (0.25) % of the prevailing lowest Quoted Transmission Charges.

The initial period for conducting the e-reverse bidding should be 2 hours which will be extended by 30 minutes from the last received bid time, if the bid is received during the last 30 minutes of the scheduled or extended bid time. Subsequently, it will be extended again by 30 minutes from the latest received bid time.

The Bidders shall inter-alia take into account the following while preparing and submitting the Initial Offer and Final Offer of Financial Bid :-

a. The Bidders shall quote single annual Quoted Transmission Charges for a period of 35 years commencing from the Scheduled COD of the Project.

b. The Quoted Transmission Charges as per the format at Annexure-21 shall be inclusive of all charges and no exclusions shall be allowed. The Bidders shall take into account all costs including capital and operating, statutory taxes, duties, levies. Availability of the inputs necessary for operation and maintenance of the Project should be ensured by the TSP at the Project site and all costs involved in procuring the inputs (including statutory taxes, duties, levies thereof) at the Project site must be included in the Quoted Transmission Charges.

c. Annexure 21 duly digitally signed by authorized signatory.

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2.5.4 Wherever information has been sought in specified formats, the Bidders shall fill in the details as per the prescribed formats and shall refrain from referring to any other document

for providing any information required in the prescribed format.

2.5.5 Transmission Charges

2.5.5.1. The Transmission Charges shall be specified in the Transmission Service Agreement and shall be payable to the TSP in Indian Rupees only. The Bidders shall quote single Transmission Charges as per the format at Annexure – 21.

2.5.5.2. The Transmission Charges of the Selected Bidder shall be inserted in Schedule 5 of the Transmission Service Agreement.

2.5.6 Bidders may note that:

a) All the information and documents in Bid shall be submitted in English language only.

b) Bidders shall mention the name, designation, telephone number, fax number, email address of the authorized signatory and complete address of the Bidder in the covering letter.

c) All pages of the Bid submitted shall be initialed and stamped by the authorized signatory on behalf of the Bidder.

d) A Bidder shall submit only one Bid in the same bidding process, either individually as Bidding Company or as a Member of a Bidding Consortium.

e) The technical and financial capability of a particular company / particular project (Parent and/ or Affiliate) shall not be used directly or indirectly by more than one Bidder/ Member of a Bidding Consortium including Lead Member / Bidding Company.

f) This Request for Proposal (RFP) document is not transferable. The RFP document and the information contained therein is for the use only by the Bidder to whom it is issued. It may not be copied or distributed by the recipient to third parties (other than in confidence to the recipient's professional advisors). In the event that the recipient does not continue with its involvement in the Project, this RFP document must be kept confidential.

g) Though adequate care has been taken while preparing this RFP document, the Bidder shall satisfy himself that the document is complete in all respects. Intimation of any discrepancy shall be given to the BPC immediately. If no intimation is received from any Bidder within ten (10) days from the date of issue of RFP document, it shall be considered that the RFP document is complete in all respects and has been received by the Bidder.

h) Bids submitted by the Bidder and opened on scheduled date and time as stipulated in this RFP shall become the property of the BPC and BPC shall have no obligation to return the same to the Bidder.

i) If any Bidder conceals any material information or makes a wrong statement or misrepresents facts or makes a misleading statement in its Bid, in any manner

whatsoever, the BPC reserves the right to reject such Bid or cancel the Letter of Intent, if issued. If such event is discovered after the Effective Date, consequences specified in Transmission Service Agreement shall apply.

j) If for any reason the Bid of the Bidder with the lowest Quoted Transmission Charges is not selected or Letter of Intent issued to such Selected Bidder is cancelled or such Bidder withdraws its Bids, the BPC may :-

i. Invite all the remaining Bidders to revalidate or extend their respective Bid Security, as necessary, and match the Bid of the Bidder with the lowest Quoted Transmission Charges (the "second round of bidding") with following cases:

- If in the second round of bidding, only one Bidder matches the Bid of the Bidder with lowest Quoted Transmission Charges, it shall be the Selected Bidder.

- If two or more Bidders match the Bid of the Bidder with the lowest Quoted Transmission Charges in the second round of bidding, then the Bidder whose Quoted Transmission Charges was lower as compared to other Bidder(s) in the first round of bidding shall be the Selected Bidder. For example, if the third and fifth lowest Bidders in the first round of bidding offer to match the Bid of the Bidder with lowest Quoted Transmission Charges in the second round of bidding, the said third lowest Bidder shall be the Successful Bidder.

- In the event that no Bidder offers to match the Bid of the Bidder with the lowest Quoted Transmission Charges in the second round of bidding, the BPC may, in its discretion, invite fresh Bids (the "third round of bidding") from all Bidders except the Bidder which quoted the lowest Quoted Transmission Charges in the first round of bidding. In case the Bidders are invited for the third round of bidding to revalidate or extend their Bid Security, as necessary, and offer fresh Bids, they shall be eligible for submission of fresh Bids provided, however, that in such third round of bidding only such Bids shall be eligible for consideration which are lower than the Quoted Transmission Charges of the second lowest Bidder in the first round of bidding; or;

ii. Annul the bid process; or

iii. Take any such measure as may be deemed fit in the sole discretion of the BPC[1]

k) The BPC may, at its sole discretion, ask for additional information / document and/or seek clarifications from a Bidder after the Bid Deadline, inter alia, for the purposes of removal of inconsistencies or infirmities in its Bid. However, no change in the substance of the Quoted Transmission Charges shall be sought or permitted by the BPC.

l) Non submission and/or submission of incomplete data/ information required under the provisions of RFP shall not be construed as waiver on the part of BPC of the obligation of the Bidder to furnish the said data / information unless the waiver is in writing.

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[1] **BPC shall record reasons for the same.**

m) Bidders shall familiarize itself with the procedures and time frames required to obtain all Consents, Clearances and Permits.

n) All Bidders are required to ensure compliance with the standards and codes mentioned in Clause 1.6.1.2.

o) BPC reserves the right to reject all Bids and/or annul the process of tariff based competitive bidding for selection of Bidder as TSP to execute the Project without assigning any reason. BPC shall not bear any liability, whatsoever, in this regard.

p) Foreign companies submitting the Bid are required to follow the applicable law in their country for execution of POA, Consortium Agreement and affixation of Common Seal (wherever required) and in such cases, their Bid should be supported by an unqualified opinion issued by an independent legal counsel practicing in the relevant country, stating that execution of such POA, Consortium Agreement and the authorizations granted therein are true and valid. Foreign companies executing POA outside India shall necessarily pay the adequate stamp charges in India as per the provisions of Stamp Act.

2.5.7 Bidders to inform themselves fully

2.5.7.1. The Bidders shall make independent enquiry and satisfy themselves with respect to all the required information, inputs, conditions and circumstances and factors that may have any effect on his Bid. Once the Bidders have submitted their Bids, the Bidders shall be deemed to have inspected and examined the site conditions (including but not limited to its surroundings, its geological condition and the adequacy of transport facilities to the site), the laws and regulations in force in India, the transportation facilities available in India, the grid conditions, the adequacy and conditions of roads, bridges, railway sidings, ports, etc. for unloading and/or transporting heavy pieces of material and has based its design, equipment size and fixed its price taking into account all such relevant conditions and also the risks, contingencies and other circumstances which may influence or affect the transmission of power. Accordingly, each Bidder acknowledges that, on being selected as Successful Bidder and on acquisition of one hundred percent (100%) of the equity shares of the KPS III HVDC TRANSMISSION LIMITED, the TSP shall not be relieved from any of its obligations under the RFP Project Documents nor shall the TSP be entitled to any extension in Scheduled COD mentioned in this RFP or financial compensation for any reason whatsoever.

2.5.7.2. In their own interest, the Bidders are requested to familiarize themselves with all relevant laws of India, including without limitation, the Electricity Act 2003, the Income Tax Act 1961, the Companies Act, 1956 / Companies Act, 2013 (as the case may be), Environment Protection Act 1986 and Forest (Conservation) Act, 1980, the Customs Act, the Foreign Exchange Management Act, Land Acquisition Act, 1894, the Indian Telegraph Act 1885, Labour & Employment Laws of India, [Insurance Act] the regulations/standards framed by the Commissions and CEA, all other related acts, laws, rules and regulations prevalent in India, as amended from time to time.

In addition to the above, the Bidders are required to familiarize themselves with all

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relevant technical codes and standards, including but not limited to the Grid Code / State Grid Code, Central Electricity Authority (Installation and Operations of Meters) Regulations, 2006, Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007, Central Electricity Regulatory Commission Grant of Connectivity, Long-term Access and Medium - Term Open Access in Inter-State Transmission and related matters) Regulations, 2009, Central Electricity Authority (Technical Standards for construction of Electrical Plants and Electric Lines) Regulation, 2010, Central Electricity Authority (Technical Standards for Communication System in Power System Operation) Regulations, 2020, Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020 and other relevant Rules/ Regulations/ Guidelines issued by the Central Government, the CERC and the CEA and amendments thereof.

The BPC shall not entertain any request for clarifications from the Bidders regarding the above laws / acts / rules / regulations / standards. Non-awareness of the same shall not be a reason for the Bidder to request for extension in Bid Deadline. The Bidders undertake and agree that, before submission of their Bid, all such factors as generally brought out above, have been fully investigated and considered while submitting their Bids.

2.5.7.3. The Survey Report has been prepared in good faith, and on best endeavor basis. Neither BPC & Nodal Agency nor their employees or advisors/consultants make any representation or warranty, express or implied, or accept any responsibility or liability, whatsoever, in respect of any statements or omissions made in the Survey Report, or the accuracy, completeness or reliability of information contained therein, and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability or completeness of such Survey Report, even if any loss or damage is caused to the Bidders by any act or omission on their part.

2.5.7.4. Bidders shall make best efforts and carry out its own due diligence upon survey report provided by BPC and shall consider all possible techno-commercial factors before submission of Bid. Bidders may also visit the route of the Transmission Lines associated with the Project and the surrounding areas and obtain / verify all information which they deem fit and necessary for the preparation of their Bid. Bidders may also carry out required surveys and field investigation for submission of their Bid. Bidders may also opt for any other route and is not bound to follow the route suggested in survey report provided by BPC.

2.5.7.5. Failure to investigate, examine and to inspect site or subsurface conditions fully shall not be grounds for a Bidder to alter its Bid after the Bid Deadline nor shall it relieve a Bidder from any responsibility for appropriately eliminating the difficulty or costs of successfully completing the Project.

2.5.7.6. The Selected Bidder shall obtain all necessary Consents, Clearances and Permits as required. The Bidders shall familiarize itself with the procedures and time frame required to obtain such Consents, Clearances and Permits.



2.5.7.7. The technical requirements of integrated grid operation are specified in the Indian Electricity Grid Code (IEGC). The Bidders should particularly acquaint themselves with the

requirements of connection conditions, operating code for regional grids, scheduling and dispatch instructions/codes, etc. The Bidders are also advised to fully familiarize themselves with the real time grid conditions in the country. Information regarding grid parameters such as voltage and frequency is available on the websites of Regional / State Load Despatch Centres.

2.5.8 Minimum Equity holding/Equity Lock-in

2.5.8.1. (a) The aggregate equity share holding of the Selected Bidder, in the issued and paid up equity share capital of KPS III HVDC TRANSMISSION LIMITED shall not be less than Fifty one percent (51%) up to a period of (1) one year after COD of the Project;

(b) In case the Selected Bidder is a Bidding Consortium, then any Member (other than the Lead Member) of such Bidding Consortium shall be allowed to divest its equity as long as the other remaining Members (which shall always include the Lead Member) hold the minimum equity specified in (a) above.

(c) If equity is held by the Affiliates, Parent Company or Ultimate Parent Company, then subject to the second proviso of this Clause 2.5.8.1 (c), such Affiliate, Parent Company or Ultimate Parent Company shall be permitted to transfer its shareholding in KPS III HVDC TRANSMISSION LIMITED to another Affiliate or to the Parent Company / Ultimate Parent Company. If any such shareholding entity, qualifying as an Affiliate / Parent Company / Ultimate Parent Company, is likely to cease to meet the criteria to qualify as an Affiliate / Parent Company / Ultimate Parent Company, the shares held by such entity shall be transferred to another Affiliate / Parent Company / Ultimate Parent Company.

Provided that in case the Lead Member or Bidding Company is holding equity through Affiliate/s, Ultimate Parent Company or Parent Company, such restriction shall apply to such entities.

Provided further, that the aggregate equity share holding of the Bidding Consortium or a Bidding Company in the issued and paid up equity share capital of KPS III HVDC TRANSMISSION LIMITED shall not be less than fifty one percent (51%) up to a period of one (1) year after COD of the Project and the lead Member of the Consortium shall have the equity share holding not less than twenty six percent (26%). In case the Selected Bidder is a Bidding Consortium, then any Member (other than the Lead Member) of such Bidding Consortium shall be allowed to divest its equity as long as the other remaining Members (which shall always include the Lead Member) hold the minimum equity specified in (a) above.

(d) All transfer(s) of shareholding of KPS III HVDC TRANSMISSION LIMITEDby any of the entities referred to above, shall be after prior written intimation to the Nodal Agency.

2.5.8.2. The Selected Bidder may invest in the equity share capital of KPS III HVDC TRANSMISSION LIMITED through its Affiliate(s) or Ultimate Parent Company or Parent Company. Details of such investment will have to be specified in the Technical Bid as per Format 2 of Annexure 8 of the RFP. If the Selected Bidder so invests through any Affiliate(s) or Ultimate Parent Company or Parent Company, the Selected Bidder shall be

liable to ensure that minimum equity holding/lock-in limits specified in Clause 2.5.8.1 and as computed as per the provisions of Clause 2.5.8.3 are still maintained.

2.5.8.3. For computation of effective Equity holding, the Equity holding of the Selected Bidder or its Ultimate Parent Company in such Affiliate(s) or Parent Company and the equity holding of such Affiliate (s) or Ultimate Parent Company in KPS III HVDC TRANSMISSION LIMITED shall be computed in accordance with the example given below:

If the Parent Company or the Ultimate Parent Company of the Selected Bidder A directly holds thirty percent (30%) of the equity in KPS III HVDC TRANSMISSION LIMITED] then holding of Selected Bidder A in KPS III HVDC TRANSMISSION LIMITED shall be thirty percent (30%);

If Selected Bidder A holds thirty percent (30%) equity of the Affiliate and the Affiliate holds fifty percent (50%) equity in KPS III HVDC TRANSMISSION LIMITED, then for the purposes of ascertaining the minimum equity/equity lock-in requirements specified above, the effective holding of Bidder A in KPS III HVDC TRANSMISSION LIMITED shall be fifteen percent (15%), (i.e., 30%* 50%);

2.5.8.4. The provisions as contained in this Clause 2.5.8 and Article 19.1 of the Transmission Service Agreement shall override the terms of the Consortium Agreement submitted by the Bidder as part of the RFP.

2.6 Project Schedule

2.6.1. All Elements of the Project are required to be commissioned progressively as per the schedule given in the following table;

Sl. No.	Name of the Transmission Element	Scheduled COD	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
1.	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	48 months from SPV transfer	100%	All Elements are required to be commissioned simultaneously as their utilization is dependent on commissioning of each other.
2.	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*			

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Sl. No.	Name of the Transmission Element	Scheduled COD	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
3.	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.			
4.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations			
5.	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)			

2.7 Due dates

2.7.1. The Bidders should submit the Bids online through the electronic bidding platform before the Bid Deadline i.e. on or before 30.09.2024. In addition to the online submission, the Bidder with lowest Final Offer will be required to submit original hard copies of Annexure 3, Annexure 4 (if applicable), Annexure 6 (if applicable) and Annexure 14 before issuance of LoI.

2.7.2. Important timelines are mentioned below:

Date	Event
26-07-2024	Issuance of RFP
16-08-2024	Submission of written clarifications/amendments, if any, on the RFP / RFP Project Documents by Bidders so as to reach BPC by 1700 hours. Such written clarifications/amendments shall be in the format provided in Annexure-20.
23-08-2024	Pre-Bid meeting(s)
03-09-2024	Issue of written clarifications and revised RFP documents

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Date	Event
13-09-2024	Issue of final RFP Project Documents
30-09-2024	Submission of Bid (Online submission of Bid through electronic bidding portal)
30-09-2024	Opening of Technical Bid
08-10-2024	Shortlisting and announcement of Qualified Bidders on bidding portal
09-10-2024	Opening of Financial Bid - Initial Offer
10-10-2024	Electronic reverse auction (Financial Bid – Final Offer) for the Qualified Bidders.
13-10-2024	Submission of original hard copies of Annexure 3, Annexure 4, Annexure 6, as applicable and Annexure 14 by the bidder with lowest Final Offer
18-10-2024	Selection of Successful Bidder and issue of LOI
28-10-2024	Signing of RFP Project Documents and transfer of SPV

2.7.3. To enable BPC to meet the schedule, all Bidders are expected to respond expeditiously during the bidding process. If any milestone/activity falls on a day which is not a working day or which is a public holiday then the milestone/activity shall be achieved/ completed on the next working day.

2.8 Validity of the Bid

2.8.1. The Bid shall remain valid for a period of one hundred and eighty (180) days from the Bid Deadline. The BPC reserves the right to reject any Bid which does not meet aforementioned validity requirement.

2.8.2. The BPC may solicit the Bidders' consent for an extension of the period of validity of the Bid. The request and the response, thereafter, shall be in writing. In the event any Bidder refuses to extend its Bid validity as requested by the BPC, the BPC shall not be entitled to invoke the Bid Bond. A Bidder accepting the BPC's request for validity extension shall not be permitted to modify its Bid and such Bidder shall, accordingly, extend the validity of the Bid Bond as requested by the BPC within seven (7) days of such request, failing which the Bid shall not be considered as valid.

2.9 Method of Submission

2.9.1. Both the Technical and Financial Bids duly filled in, all formats and supporting shall be scanned and uploaded online through electronic bidding platform in the manner specified in Annexure A

2.9.2. It may be noted that Technical Bid shall not contain any information/document relating to Financial Bid. If Technical Bid contains any such information/documents, the BPC shall not be responsible for premature opening of the Financial Bid.



All pages of the Bid, except for the Bid Bond (Annexure 14) and any other document executed on non-judicial stamp paper, forming part of the Bid and corrections in the Bid, if any, must be signed by the authorized signatory on behalf of the Bidder. It is clarified

that the same authorized signatory shall sign all pages of the Bid. However, any published document submitted in this regard shall be signed by the authorized signatory at least on the first and last page of such document.

2.9.3. No change or supplemental information to a Bid already submitted will be accepted after the Bid Deadline, unless the same is requested for by the BPC as per Clause 2.5.6 (k).

Provided that a Bidder shall always have the right to withdraw / modify its Bid before the Bid Deadline. No Technical Bid or Initial Offer shall be modified, substituted or withdrawn by the Bidder on or after the Bid Deadline.

2.10 Preparation cost

2.10.1. The Bidders shall be responsible for all the costs associated with the preparation of the Bid and participation in discussions and attending pre-bid meetings, and finalization and execution of the RFP Project Documents (other than the TSA), etc. BPC shall not be responsible in any way for such costs, regardless of the conduct or outcome of the process of tariff based competitive bidding for selection of Bidder as TSP as per Bidding Guidelines.

2.10.1 The cost of this RFP is **Rupees Five Lakh (Rs.5,00,000/-) or U.S. Dollar Seven Thousand Only (US$7,000 /-) plus GST** as per applicable rate, which shall be non-refundable. This amount shall be paid via electronic transfer to the following Bank Account:

Bank Account Name: PFC Consulting Limited

Account No.	**: 000705036117**
Bank Name	**: ICICI Bank**
IFSC	**: ICIC0000007**
Branch	**: Connaught Place, New Delhi-110001**

Immediately after issuance of RFP document, the Bidder shall submit the Pre-Award Integrity Pact in the format as prescribed in Annexure B, which shall be applicable for and during the bidding process, duly signed on each page by any whole-time Director / Authorized Signatory, duly witnessed by two persons, and shall be submitted by the Bidder in two (2) originals in a separate envelope, duly superscripted with Pre-Award Integrity Pact. The Bidder shall submit the Pre-Award Integrity Pact on non-judicial stamp paper of Rs. 100/- each duly purchased from the National Capital Territory of Delhi. In case the Bidder is in a consortium, the Pre-Award Integrity Pact shall be signed and submitted by each member of the Consortium separately.

2.11 Bid Bond

2.11.1. Each Bidder shall submit the Bid accompanied by Bid Bond issued by any of the Banks listed in Annexure-17. The Bid Bond shall be valid for a period of thirty (30) days beyond the validity of the Bid.

2.11.2. Subject to the provisions of Clause 2.15.5, the Bid Bond may be invoked by the BPC or its authorized representative, without any notice, demure, or any other legal process upon occurrence of any of the following:

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- Bidder withdraws during the period of Bid Validity as specified in this RFP or as extended by mutual consent of the respective Bidder(s) and the BPC
- Failure to execute the Share Purchase Agreement as per the provisions of Clause 2.15.2; or
- Failure to furnish the Contract Performance Guarantee as per Clause 2.12; or
- Failure to acquire one hundred percent (100%) equity shares of KPS III HVDC TRANSMISSION LIMITED, along with all its related assets and liabilities, in accordance with the provisions of Clause 2.15.2; or
- Failure to comply with the provisions of Clause 2.15.5 and Clause 2.15.6, leading to annulment of the award of the Project.
- Bidders submitting any wrong information or making any misrepresentation in their Bid as mentioned in Clause 2.5.6.

Intimation of the reasons of the invocation of the Bid Bond shall be given to the Selected Bidder by the BPC within three (3) working days after such invocation.

2.11.3. The Bid Bond of the Selected Bidder shall be returned on submission of the Contract Performance Guarantee as per Clause 2.12 and the relevant provisions of the Transmission Service Agreement.

2.11.4. The Bid Bond of all the Bidders, whose Bids are declared non-responsive, shall be returned within a period of thirty (30) days after the date on which the Financial Bids are opened.

2.11.5. The Bid Bond of all unsuccessful Bidders shall be returned and released by the BPC on the same day on which the KPS III HVDC TRANSMISSION LIMITED is transferred to the Selected Bidder. The Bid Bond of the Successful Bidder shall be returned on submission of Contract Performance Guarantee as per Clause 2.12 of this RFP and the provisions of the Transmission Service Agreement.

2.12 Contract Performance Guarantee

2.12.1. Within ten (10) days from the date of issue of the Letter of Intent, the Selected Bidder, on behalf of the TSP, will provide to the Nodal Agency the Contract Performance Guarantee for an amount of Rs. 477.48 Crore (Rupees Four Hundred Seventy Seven Crore and Fourty- Eight Lakh Only). The Contract Performance Guarantee shall be initially valid for a period up to three (3) months after the Scheduled COD of the Project and shall be extended from time to time to be valid for a period up to three (3) months after the COD of the Project and thereafter shall be dealt with in accordance with the provisions of the Transmission Service Agreement. The Contract Performance Guarantee shall be issued by any of the banks listed in Annexure-17.

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2.12.2. In case the Selected Bidder is unable to obtain the Contract Performance Guarantee for the total amount from any one bank specified in Annexure-17, the Selected Bidder may

obtain the same from not more than three (3) banks specified in Annexure-17.

2.13 Opening of Bids

2.13.1. Technical Bid will be opened by the Bid Opening Committee as per the following time schedule and in the office of Central Electricity Authority, in the online presence of Bidders' representatives who wish to attend:

Opening of Envelope (Technical Bid): 1500 hours (IST) on 30.09.2024 or such other dates as may be intimated by BPC to the Bidders.

In the event of any of above dates falling on a day which is not a working day or which is a public holiday, then the bids shall be opened on the next working day at the same venue and time.

Opening of Initial Offer: Initial Offer shall be opened by the Bid Opening Committee in presence of the Bid Evaluation Committee at 1530 hours (IST) on 30.09.2024 in the office of CEA.

2.13.2. The following information from each Bid will be read out to all the Bidders at the time of opening of Technical Bid:

- Name of the Bidding Company / Consortium Members in case of Bidding Consortium.

Information to be provided after opening of Initial Offer:

Only the lowest Initial Offer (s) shall be communicated to all the Qualified Bidders to participate in the e-reverse bidding process. During the e-reverse bidding process only the lowest prevailing bid should be visible to all the bidders on the electronic platform.

2.14 Enquiries

Written clarifications on the RFP and other RFP Project Documents as per Clause 2.3 and 2.4 may be sought from:

General Manager
PFC Consulting Limited
9th Floor, Wing-A, Statesman House,
Connaught Place, New Delhi - 110001
Tel. + 91 11 23443912
Fax + 91 11 23443990
Email: pfccl.itp@pfcindia.com

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2.15 Other Aspects

2.15.1. The draft of the Transmission Service Agreement has been attached to this RFP. In addition

to above, the following documents have also been attached to this RFP:

a) Share Purchase Agreement

When the drafts of the above RFP Project Documents are provided by the BPC, these RFP Project Documents shall form part of this RFP as per Formats – 1 & 2 of Annexure 20.

Upon finalization of the RFP Project Documents after incorporating the amendments envisaged in Clause 2.4 of this RFP, all the finalized RFP Project Documents shall be provided by BPC to the Bidders at least fifteen (15) days prior to the Bid Deadline.

The Transmission Service Agreement and Share Purchase Agreement shall be signed in required number of originals so as to ensure that one (1) original is retained by each party to the Agreement(s) on the date of transfer of SPV.

2.15.2. Within ten (10) days of the issue of the Letter of Intent, the Selected Bidder shall:

a) provide the Contract Performance Guarantee in favour of the Nodal Agency as per the provisions of Clause 2.12;

b) execute the Share Purchase Agreement and the Transmission Service Agreement;

c) acquire, for the Acquisition Price, one hundred percent (100%) equity shareholding of KPS III HVDC TRANSMISSION LIMITED from PFC Consulting Limited, who shall sell to the Selected Bidder, the equity shareholding of KPS III HVDC TRANSMISSION LIMITED, along with all its related assets and liabilities;

Stamp duties payable on purchase of one hundred percent (100%) of the equity shareholding of KPS III HVDC TRANSMISSION LIMITED, along with all its related assets and liabilities, shall also be borne by the Selected Bidder.

Provided further that, if for any reason attributable to the BPC, the above activities are not completed by the Selected Bidder within the above period of ten (10) days as mentioned in this Clause, such period of ten (10) days shall be extended, on a day for day basis till the end of the Bid validity period.

2.15.3. After the date of acquisition of the equity shareholding of KPS III HVDC TRANSMISSION LIMITED, along with all its related assets and liabilities, by the Selected Bidder,

i. the authority of the BPC in respect of this Bid Process shall forthwith cease and any actions to be taken thereafter will be undertaken by the Nodal Agency,

ii. all rights and obligations of KPS III HVDC TRANSMISSION LIMITED, shall be of the TSP,

iii. any decisions taken by the BPC prior to the Effective Date shall continue to be binding on the Nodal Agency and

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iv. contractual obligations undertaken by the BPC shall continue to be fulfilled by the TSP.

v. Further, the TSP shall execute the Agreement(s) required, if any, under Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations as amended from time to time.

2.15.4. Within five (5) working days of the issue of the acquisition of the SPV by the Successful Bidder, the TSP shall apply to the Commission for grant of Transmission License and make an application to the Commission for the adoption of Transmission Charges, as required under Section – 63 of The Electricity Act 2003.

2.15.5. If the Selected Bidder / TSP fails or refuses to comply with any of its obligations under Clauses 2.15.2, 2.15.3 and 2.15.4, and provided that the other parties are willing to execute the Share Purchase Agreement and PFC Consulting Limited is willing to sell the entire equity shareholding of KPS III HVDC TRANSMISSION LIMITED, along with all its related assets and liabilities, to the Selected Bidder, such failure or refusal on the part of the Selected Bidder shall constitute sufficient grounds for cancellation of the Letter of Intent. In such cases, the BPC / its authorized representative(s) shall be entitled to invoke the Bid Bond of the Selected Bidder.

2.15.6. If the TSP fails to obtain the Transmission License from the Commission, it will constitute sufficient grounds for annulment of award of the Project.

2.15.7. The annulment of award, as provided in Clauses 2.15.5 and 2.15.6 of this RFP, will be done by the Government on the recommendations of National Committee on Transmission. However, before recommending so, National Committee on Transmission will give an opportunity to the Selected Bidder / TSP to present their view point.

2.15.8. The annulment of the award, under Clause 2.15.5 or 2.15.6 of this RFP, shall be sufficient grounds for blacklisting the bidder, whose award has been annulled, for a period of five years or more, as decided by the National Committee on Transmission, provided that the blacklisting shall be done only after giving the bidder an opportunity for showing cause.

2.16 Confidentiality

2.16.1. The parties undertake to hold in confidence this RFP and RFP Project Documents and not to disclose the terms and conditions of the transaction contemplated hereby to third parties, except:

a) to their professional advisors;

b) to their officers, contractors, employees, agents or representatives, financiers, who need to have access to such information for the proper performance of their activities;

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c) disclosures required under Law, without the prior written consent of the other parties of the concerned agreements.

Provided that the TSP agrees and acknowledges that the Nodal Agency may at any time, disclose the terms and conditions of the RFP and RFP Project Documents to any person, to the extent stipulated under the Law or the Bidding Guidelines.

2.17 Right of the BPC to reject any Bid

BPC reserves the right to reject all or any of the Bids/ or cancel the RFP without assigning any reasons whatsoever and without any liability.

2.18 Non submission and/or submission of incomplete data/ information required under the provisions of RFP shall not be construed as waiver on the part of BPC of the obligation of the Bidder to furnish the said data / information unless the waiver is in writing.

2.19 Fraudulent and Corrupt Practices

2.19.1. The Bidders and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the Bid process and subsequent to the issue of the LoI Notwithstanding anything to the contrary contained herein, or in the LoI, the BPC shall reject a Bid, withdraw the LoI, as the case may be, without being liable in any manner whatsoever to the Bidder, if it determines that the Bidder has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice in the Bid process. In such an event, the BPC shall forfeit the Bid Bond, without prejudice to any other right or remedy that may be available to the BPC hereunder or otherwise.

2.19.2. Without prejudice to the rights of the BPC under Clause 2.19.1 hereinabove and the rights and remedies which the BPC may have under the LoI, if a Bidder is found by the BPC to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice during the Bid process, or after the issue of the LoI, such Bidder & its Affiliates shall not be eligible to participate in any tender or RFP issued by any BPC for an indefinite period from the date such Bidder is found by the BPC to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practices, as the case may be.

2.19.3. For the purposes of this Clause 2.19, the following terms shall have the meaning hereinafter respectively assigned to them:

a) **"corrupt practice"** means (i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the actions of any person connected with the Bid process (for avoidance of doubt, offering of employment to or employing or engaging in any manner whatsoever, directly or indirectly, any official of the BPC who is or has been associated or dealt in any manner, directly or indirectly with the Bid process or the LoI or has dealt with matters concerning the Transmission Service Agreement or arising there from, before or after the execution thereof, at any time prior to the expiry of one year from the date such

official resigns or retires from or otherwise ceases to be in the service of the BPC, shall be deemed to constitute influencing the actions of a person connected with the Bid Process); or (ii) engaging in any manner whatsoever, whether during the Bid Process or after the issue of the LoI or after the execution of the Transmission Service Agreement, as the case may be, any person in respect of any matter relating to the Project or the LoI or the Transmission Service Agreement, who at any time has been or is a legal, financial or technical adviser of the BPC in relation to any matter concerning the Project;

b) **"Fraudulent practice"** means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bid process;

c) **"Coercive practice"** means impairing or harming, or threatening to impair or harm, directly or indirectly, any person or property to influence any person's participation or action in the Bid process;

d) **"undesirable practice"** means (i) establishing contact with any person connected with or employed or engaged by the BPC with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Bid process; or (ii) having a Conflict of Interest; and

e) **"Restrictive practice"** means forming a cartel or arriving at any understanding or arrangement among Bidders with the objective of restricting or manipulating a full and fair competition in the Bid process.

SECTION - 3

EVALUATION OF THE TECHNICAL AND FINANCIAL BID



SECTION 3

1. EVALUATION OF BID

3.1. The evaluation process of Technical Bid comprises the following five steps:

Step I –	Responsiveness check
Step II-	Compliance with submission requirements
Step III–	Evaluation of Technical Bids
Step IV–	Evaluation of Financial Bids
Step V –	Bidder Selection

3.2. STEP I – Responsiveness check

The Technical Bid submitted by the Bidder shall be initially scrutinized to establish "Responsiveness". Subject to clause 2.5.6 (k), any of the following conditions shall cause the Technical Bid to be "Non-responsive":

a) Technical Bid that are incomplete.

b) Technical Bid not signed by authorized signatory and / or stamped in the manner indicated in this RFP.

c) All pages of the Technical Bid submitted but not initialed by the authorized signatories on behalf of the Bidder.

d) Technical Bid not including the covering letter as per Annexure 1.

e) Technical Bid submitted by a Bidding Consortium not including the Consortium Agreement.

f) Technical Bid contains material inconsistencies in the information and documents submitted by the Bidder, affecting the Qualification Requirements.

g) Bidder submitting or participating in more than one Bid either as a Bidding Company or as a Member of Bidding Consortium.

h) More than one Member of the Bidding Consortium or a Bidding Company using the credentials of the same Parent/Affiliate.

i) Information not submitted in formats specified in the RFP.

j) Applicable Board resolutions, or any other document, as provided in Clause 2.5.2, not being submitted;

k) Bid not accompanied by a valid Bid Bond or Bid Security Declaration, as applicable;

l) Non submission of power of attorney, supported by a Board resolution;

m) Bid validity being less than that required as per Clause 2.8 of this RFP;

n) Bid not containing Format-1 (Bidders' Undertakings) of Annexure-8;

o) Bidder having Conflict of Interest

p) The Bidder has not submitted a disclosure as per Annexure 13.

q) Bidders delaying in submission of additional information or clarifications sought by the BPC.

r) If the Bidder makes any misrepresentation as specified in Clause 3.7.

s) Bid being conditional in nature.

t) More than one Member of the Bidding Consortium or a Bidding Company using the credentials of the same Parent/Affiliate.

3.3. STEP II - Compliance with submission requirements

Each Bidder's Technical Bid shall be checked for compliance with the submission requirements set forth in this RFP before the evaluation of Technical Bid is taken up. Annexure 16 and Annexure 11A shall be used to check whether each Bidder meets the stipulated requirements.

3.4. STEP III -Evaluation of Technical Bid

Evaluation of Technical Bid will be carried out considering the information and documents furnished by the Bidders as required under this RFP. This step would involve technical and financial evaluation of the details/ documents furnished by the Bidding Company / Bidding Consortium in support of meeting the Qualification Requirements

3.4.1. Interpolation of financial data.

For the Qualification Requirements data provided by the Bidders in foreign currency, equivalent rupees of Networth will be calculated using bills selling exchange rates (card rate) USD/INR of State Bank of India prevailing on the date of closing of the accounts for the respective financial year as certified by their Banker.

For the purpose of calculating the aggregate capital expenditure/construction experience of the projects completed/ commissioned where such projects are executed outside India and capital expenditure is denominated in foreign currency, bills selling exchange rates (card rate) USD/INR of State Bank of India prevailing on the date of closing of the financial year in which the projects were completed and as certified by their Banker shall be considered.



For the projects executed in the current financial year bills selling (card rate) USD/INR of State Bank of India prevailing on seven (7) days prior to the last date of submission of Technical Bid and as certified by their Banker shall be considered.

For currency other than USD, Bidders shall convert such currency into USD as per the

exchange rates certified by their Banker prevailing on the relevant date and used for such conversion. Such Bidders shall submit necessary certification from their Banker for the exchange rate used in the conversation.

If the exchange rate for any of the above dates is not available, the rate for the immediately available previous day shall be taken into account.

3.4.2. Bidders meeting the Qualification Requirements, subject to evaluation as specified in Clauses 3.2 to 3.4 shall be declared as Qualified Bidders and eligible for opening of Initial Offer.

3.4.3. The BPC shall upload the list of all Qualified Bidders and Non-Qualified Bidders on the bidding portal along with the reasons for non-qualification.

3.5. STEP IV - Evaluation of Financial Bids

3.5.1. The Bids which have been found Qualified by the BPC, based on the Steps I to III as specified above in Clauses 3.2.to 3.4, shall be opened and Quoted Transmission Charges of such Initial Offer shall be ranked on the basis of the ascending Initial Offer submitted by each Qualified Bidder.

Based on such ranking of the Qualified Bidders, in the first fifty per cent of the ranking (with any fraction rounded off to higher integer) or four Qualified Bidders, whichever is higher, shall qualify for participating in the electronic reverse auction.

Provided however, in case only one Bidder remains after the Evaluation of Technical Bid (Steps 1 to III) as per Clause 3.2 to 3.4, the Initial Offer of such Bidder shall not be opened and the matter shall be referred to the Government.

Provided that in the event the number of Qualified Bidders is between two and four, then each of the responsive Bidder shall be considered as Qualified Bidders.

Provided that in the event of identical Quoted Transmission Charges discovered from the Initial Offer having been submitted by one or more Bidders, all such Bidders shall be assigned the same rank for the purposes of determination of Qualified Bidders. In such cases, all Qualified Bidders who shares the same rank till 50% of the rank (with any faction rounded off to higher integer) determined above, shall qualify to participate in the electronic reverse auction stage. In case 50% of the rank is having less than four (4) Bidders and the rank of the fourth (4^{th}) Bidder is shared by more than one Bidder, then all such all such Bidders who share the rank of the fourth Bidder shall qualify to participate in the electronic reverse auction.

3.5.2. The Financial Bids comprising of both Initial Offer and Final Offer submitted by the Bidders shall be scrutinized to ensure conformity with the provisions of Clause 2.5.3 of this RFP. Any Bid not meeting any of the requirements as per Clause 2.5.3 of this RFP may cause the Bid to be considered "Non-responsive", at the sole decision of the BPC. Financial Bid not in conformity with the requirement of Sl. No. (c) of Clause 2.5.3 of this RFP shall be rejected.

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3.5.3 The Bidders shall quote the single annual Quoted Transmission Charges as specified in the format at Annexure – 21.

3.6. STEP V - Bidder Selection

3.6.1. The prevailing lowest Quoted Transmission Charges discovered from Final Offers shall only be displayed during the e-reverse bidding and the Bidder quoting such Final Offer will always remain anonymous during the e-reverse bidding. The Bidder with the prevailing lowest Quoted Transmission Charges discovered from Final Offers at the close of the scheduled or extended period of e-reverse bidding as mentioned in clause 2.5 shall be declared as the Successful Bidder, subject to verification of the original hard copies of Annexure 3, Annexure 4 (if applicable), Annexure 6 (if applicable) and Annexure 14. The Letter of Intent shall be issued to such Successful Bidder in two (2) copies.

However, if no bid is received during the e-reverse bidding stage then the Bidder with lowest quoted initial transmission charges ("Initial Offer") during e-bidding stage shall be declared as the Successful Bidder, subject to verification of the original hard copies of Annexure 3, Annexure 4 (if applicable), Annexure 6 (if applicable) and Annexure 14. The Letter of Intent shall be issued to such Successful Bidder in two (2) copies.

In case, there is a discrepancy between the online submission and physical documents, the bid would be out rightly rejected and the bidder shall be construed to have engaged in the fraudulent practice as defined in Clause 2.19.3 with consequences as mentioned in Clause 2.19.2. Further, in such a case, the provisions of Clause 2.5.6 (j) shall apply.

3.6.2. The Selected Bidder shall unconditionally accept the LoI, and record on one (1) copy of the LoI, "Accepted unconditionally", under the signature of the authorized signatory of the Successful Bidder and return such copy to the BPC within seven (7) days of issue of LoI.

3.6.3. If the Successful Bidder, to whom the Letter of Intent has been issued, does not fulfill any of the conditions specified in Clauses 2.15.2, 2.15.3 and Clause 2.15.4, then subject to Clause 2.15.5, the BPC reserves the right to annul the award of the Project and cancel the Letter of Intent. Further, in such a case, the provisions of Clause 2.5.6 (j) shall apply.

3.6.4. The BPC, in its own discretion, has the right to reject all Bids if the Quoted Transmission Charges are not aligned to the prevailing prices.

3.7. Misrepresentation by the Bidder

If the Bidder conceals any material information or makes a wrong statement or misrepresents facts or makes a misleading statement in the Technical Bid or Bid, as the case may be, in any manner whatsoever, in order to create circumstances for the acceptance of its Technical Bid/Bid, the BPC reserves the right to reject such Technical Bid/Bid, and/ or cancel the Letter of Intent, if issued. Further, in case Letter of Intent is cancelled, consequences as per provisions of the RFP shall follow.



3.8. Disposition of Technical Bid

3.8.1. Technical Bid found to be Non-responsive as per Clause **3.2,** due to any of the following

conditions, shall be liable for rejection.

- Technical Bid that is incomplete.
- Technical Bid not signed by authorized signatory and / or stamped in the manner indicated in this RFP.
- All pages of the Technical Bid submitted but not initialed by the authorized signatories on behalf of the Bidder.
- Technical Bid not including the covering letter as per Annexure 1.
- Technical Bid contains material inconsistencies in the information and documents submitted by the Bidder, affecting the Qualification Requirements.
- Information not submitted in formats specified in the RFP.
- The Bidder has not submitted a disclosure as per Annexure 13.
- Bidders delaying in submission of additional information or clarifications sought by the BPC.

3.8.2. Technical Bid found to be Non-responsive as per Clause **3.2,** due to any of the following conditions, shall be rejected.

- Technical Bid not received by the scheduled date and time.
- Technical Bid submitted by a Bidding Consortium not including the Consortium Agreement.
- Bidder submitting or participating in more than one response either as a Bidding Company or as a Member of Bidding Consortium.
- More than one Member of the Bidding Consortium or a Bidding Company using the credentials of the same Parent/Affiliate.
- Technical Bid having Conflict of Interest.
- If the Bidder makes any misrepresentation as specified in Clause **3.7.**

3.9. BPC reserves the right to interpret the Bid in accordance with the provisions of this RFP document and make its own judgment regarding the interpretation of the same. In this regard, BPC shall have no liability towards any Bidder and no Bidder shall have any recourse to BPC with respect to the qualification process.

BPC shall evaluate Bid using the process specified in Clause 3.1 to 3.6, at its sole discretion. BPC's decision in this regard shall be final and binding.



SECTION - 4

ANNEXURES FOR BID



SECTION – 4

I. Formats for Bid

The following formats are required to be included in the Bidder's Technical and Financial Bid. These formats are designed to demonstrate the Bidder's compliance with the Qualification Requirements set forth in Clause 2.1 of Section – 2.

Technical Bid

1. Format for the Covering Letter
2. Format for Letter of Consent from Consortium Members
3. Format for evidence of authorized signatory's authority (Power of Attorney)
4. Format for Power of Attorney from to be provided by each of the other Members of the Consortium in favor of the Lead Member
5. Format for Bidder's composition and ownership structure and Format for Authorization
6. Format for Consortium Agreement
7. Formats for Qualification Requirement
8. Format of Bidders Undertaking and details of Equity Investment
9. Authorization from Parent/Affiliate of Bidding Company/Member of Bidding Consortium whose technical/financial capability has been used by the Bidding Company/Member of Bidding Consortium.
10. Undertaking from the Technically / Financially Evaluated Entity(ies) or from Ultimate Parent Company for equity investment
11. Format of Board Resolutions
12. Format for Illustration of Affiliates
13. Format for Disclosure
14. Format for Bid Bond

14A. Format for Bid Security Declaration

15. Format for Contract Performance Guarantee
16. Checklist for Technical Bid submission requirements

22. Format for Affidavit

In addition to the online submission, the Bidder with lowest Final Offer will be required to submit original hard copies of Annexure 3, Annexure 4 (if applicable), Annexure 6 (if applicable) and Annexure 14 before issuance of LoI.

Financial Bid

21. Format for Financial Bid

The following formats are for the information to the Bidders to enable them to submit their Bid.

11A. Illustration For Applicable Board Resolution Requirements Under Clause 2.5.2

17. List of Banks
18. GRID Map of the Project
19. Format for clarification/amendments on the RFP/RFP Project Documents
20. Formats for RFP Project Documents

Bidder may use additional sheets to submit the information for its detailed Bid.



ANNEXURE 1 - COVERING LETTER

(The covering letter should be on the Letter Head of the Bidding Company/ Lead Member of the Consortium)

Date: .....
From: .....
.....
.....
Tel. No.: .....
Fax No.: .....
E-mail address: .....

To,
PFC Consulting Limited
9thFloor, Wing-A, Statesman House,
Connaught Place, New Delhi - 110001

Dear Sir,

Sub: **Bid for selection of Bidder as Transmission Service Provider to establish Inter-State Transmission System for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" through tariff based competitive bidding process.**

1. Being duly authorized to present and act on behalf of M/s ..... (insert name of Bidding Company / Bidding Consortium) (hereinafter called the "Bidder") and having read and examined in detail the Request for Proposal (RFP) document, the undersigned hereby submit our Technical Bid with duly signed formats and Financial Bid (Initial Offer) as stipulated in RFP document for your consideration.

2. It is confirmed that our Bid is consistent with all the requirements of submission as stated in the RFP document and subsequent clarifications/amendments as per Clause 2.3 and 2.4 of RFP.

3. The information submitted in our Bid is complete, is strictly as per the requirements stipulated in the RFP document and is correct to the best of our knowledge and understanding. We would be solely responsible for any errors or omissions in our Bid.

4. We hereby agree and undertake to procure the products associated with the Transmission System as per provisions of Public Procurement (Preference to Make in India) orders issued by Ministry of Power vide orders No. 11/5/2018 - Coord. dated 28.07.2020 for transmission sector, as amended from time to time read with Department for Promotion of Industry and Internal Trade (DPIIT) orders in this regard.

   We hereby also agree and undertake to comply with Department of Expenditure, Ministry of Finance vide Order (Public Procurement No 1) bearing File No. 6/18/2019-PPD dated 23.07.2020, Order (Public Procurement No 2) bearing File No. 6/18/2019-PPD

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dated 23.07.2020 and Order (Public Procurement No. 3) bearing File No. 6/18/2019-PPD, dated 24.07.2020, as amended from time to time, regarding public procurement from a bidder of a country, which shares land border with India.

5. We hereby agree to comply with Ministry of Power order no. 25-11/6/2018 – PG dated 02.07.2020 as amended from time to time.

6. We are herewith submitting legally binding board resolution for the total equity requirement of the Project.

7. We hereby confirm that in accordance with Clause 2.1.4 of the RFP, we are herewith submitting legally binding undertaking supported by a board resolution from the .....(Insert name of Technically Evaluated Entity and/or Financially Evaluated Entity or its Ultimate Parent Company, as the case may be) that all the equity investment obligations of ..... (Insert name of the Bidding Company) shall be deemed to be equity investment obligations of the ..... (Insert name of Technically Evaluated Entity and/or Financially Evaluated Entity or its Ultimate Parent Company, as the case may be) and in the event of any default by..... (Insert name of the Bidding Company), the same shall be met by ..... (Insert name of Technically Evaluated Entity and/or Financially Evaluated Entity or its Ultimate Parent Company, as the case may be).

[Sl. No 7 to be inserted only in case the Bidder is a Bidding Company / Lead Member of a Consortium and has sought qualification on the basis of technical and financial capability of its Affiliate(s) and/or its Parent]

8. We confirm that there are no litigations or disputes against us, which materially affect our ability to fulfill our obligations with regard to the Project.

9. We hereby confirm that we shall continue to maintain compliance with Qualification Requirements till the execution of the Transmission Service Agreement. Further, in case we emerge as Selected Bidder for the Project, we shall continue to maintain compliance with Qualification Requirements till the COD of the Project.

10. We confirm that we have studied the provisions of relevant Indian laws and regulations required to enable us to build, own, operate and transfer the said Project and to prepare this Bid.

11. We hereby confirm that we shall abide unreservedly with BPC's decision in the qualification process for selection of Qualified Bidder and further warrant that under no circumstances we shall challenge either the BPC's decision or its right to make such decision at any time in the future.

12. We confirm that the Bid shall remain valid for a period of one eighty (180) days from the Bid Deadline.

13. The details of contact person are furnished as under:
Name: .....
Designation: .....

Name of the Company: .....
Address of the Bidder: .....
Phone Nos.: .....
Fax Nos.: .....
E-mail address: .....

14. Bid Bond

We have enclosed a Bid Bond of Rupees ..... Crores (Rs. .....) only or US$ ..... (.....US Dollars), in the form of bank guarantee no.....[Insert number of the Bank Guarantee] dated.....[Insert Date of the Bank Guarantee] as per your proforma (Annexure-14) from.....[Insert name of bank providing Bid Bond] and valid up to .....in terms of Clause 2.11 of the RFP.

Or

We have enclosed a Bid Security Declaration as per your proforma (Annexure-14A) [To be inserted for projects wherein RFP has been issued before 31.12.2021 otherwise to be deleted]

15. Acceptance

We hereby unconditionally and irrevocably agree and accept that the decision made by the BPC on any matter regarding or arising out of the RFP shall be binding on us. We hereby expressly waive any and all claims in respect of Bid process.

16. Familiarity With Relevant Indian Laws & Regulations

We confirm that we have studied the provisions of relevant Indian laws and regulations as required to enable us to submit this Bid and execute the RFP Project Documents (other than TSA), in the event of our selection as the TSP. We further undertake and agree that all such factors as mentioned in Clause 2.5.7 of RFP have been fully examined and considered while submitting the Bid.

It is confirmed that our Bid is consistent with all the requirements of submission as stated in the RFP and subsequent communications from BPC.

The information submitted in our Bid is complete, strictly as per the requirements stipulated in the RFP and is correct to the best of our knowledge and understanding. We would be solely responsible for any errors or omissions in our Bid.

We confirm that we have not taken any deviation so as to be deemed non-responsive with respect to the provisions stipulated at Clause 2.5.1, of this RFP.

Thanking you,

Yours sincerely,

Adani Energy Solutions Limited

.....

(Name and Signature of the authorized signatory in whose name Power of Attorney/ Board Resolution as per Clause 2.5.2 is issued)

Name: .....
Designation: .....
Address: .....

Date: .....
Place: .....

Company Rubber Stamp



ANNEXURE 2 - LETTER OF CONSENT FROM CONSORTIUM MEMBERS

(On the letter head of each Member of the Consortium including Lead Member)

Date: .....
From: .....
.....
.....
Tel. No.: .....
Fax No.: .....
E-mail address: .....

To,
PFC Consulting Limited
9thFloor, Wing-A, Statesman House,
Connaught Place, New Delhi - 110001

Dear Sir,

Sub: **Bid for selection of Bidder as Transmission Service Provider to establish Inter-State Transmission System for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" through tariff based competitive bidding process.**

We, the undersigned Member of ..... (Insert name of the Bidding Consortium) have read, examined and understood the RFP document for the short-listing of Bidders as prospective TSP to establish Inter-State Transmission System for **"Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"** through tariff based competitive bidding process. We hereby confirm our concurrence with the Bid including in particular the Consortium Agreement submitted by ..... (Insert name of the Lead Member) in response to the RFP document.

We hereby confirm our commitment to participate in the said Bidding Consortium and invest ..... % of the total equity requirement for the Project as per the terms of the Consortium Agreement dated ..... and board resolution for such investment commitment is enclosed herewith.

We hereby confirm that in accordance with Clause 2.1.4 of the RFP, we are enclosing legally binding undertaking supported by a board resolution from the ..... (Insert name of Technically Evaluated Entity and / or Financially Evaluated Entity or its Ultimate Parent Company, as the case may be) that all the equity investment obligations of ..... (Insert name of the Member) shall be deemed to be equity investment obligations of the ..... (Insert name of Technically Evaluated Entity and / or Financially Evaluated Entity or its Ultimate Parent Company, as the case may be) and in the event of any default by..... (Insert name of the Member), the same shall be met by..... (Insert name of Technically Evaluated Entity and / or Financially Evaluated Entity or its Ultimate Parent Company, as the case may be). [Insert if applicable]

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[To be inserted by the Lead Member only] We are also enclosing legally binding board resolution for the total equity requirement of the Project in case of any breach of any of the equity investment commitment by any of the Consortium Members, in line with the provisions of the Consortium Agreement dated ..... [Bidder to insert date of Consortium Agreement].

The details of contact person are furnished as under:

Name: .....
Designation: .....
Name of the Company: .....
Address: .....
Phone Nos.: .....
Fax Nos.: .....
E-mail address: .....

Dated the ..... day of ..... of 20...

Thanking you,

Yours faithfully,

.....
(Signature)

Name: .....
Designation: .....

(Signature, Name, Designation of Authorized Signatory of Consortium Member and Company's Seal)

Adani Energy Solutions Limited

ANNEXURE 3 - FORMAT FOR EVIDENCE OF AUTHORIZED SIGNATORY'S AUTHORITY (POWER OF ATTORNEY)

POWER OF ATTORNEY

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution. Foreign companies submitting bids are required to follow the applicable law in their country)

Know all men by these presents, We .....(name and address of the registered office of the Bidder) do hereby constitute, appoint and authorize Mr./Ms.....(name and residential address) who is presently employed with us and holding the position of ..... as our attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to our Bid for selection of Bidder as Transmission Service Provider to establish Inter-State Transmission System for **"Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"** through tariff based competitive bidding process in the country of India, including signing and submission of all documents related to the Bid, including, undertakings, letters, certificates, acceptances, clarifications, guarantees, etc., making representations to the BPC, and providing information / responses to the BPC, representing us in all matters before the BPC, and generally dealing with the BPC in all matters in connection with our Bid for the said Project till the completion of the bidding process in accordance with the RFP and signing of the Share Purchase Agreement by all the parties thereto.

We hereby agree to ratify all acts, deeds and things lawfully done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us.

All the terms used herein but not defined shall have the meaning ascribed to such terms under the RFP.

For ..... [Insert name of the Bidder on whose behalf PoA is executed]

.....
(Signature)

Name: .....
Designation: .....

Accepted

.....
(Signature of the Attorney)

Name: .....
Designation: .....
Address: .....
.....

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(Name, Designation and Address of the Attorney)

Specimen signatures of attorney attested by the Executant

.....
(Signature of the Executant)

.....
(Signature of Notary Public)

Place: .....
Date: .....

Notes:

1) To be executed by Bidding Company or the Lead Member, in the case of a Bidding Consortium, as the case maybe.

2) The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal of the executant affixed in accordance with the applicable procedure. Further, the person whose signatures are to be provided on the power of attorney shall be duly authorized by the executant(s) in this regard.

3) Also, wherever required, the executant(s) should submit for verification the extract of the charter documents and documents such as a Board resolution / power of attorney, in favour of the Person executing this power of attorney for delegation of power hereunder on behalf of the executant(s).

4) In case of foreign Bidders, refer to clause 2.5.6 (p)



ANNEXURE 4 - FORMAT FOR POWER OF ATTORNEY TO BE PROVIDED BY EACH OF THE OTHER MEMBERS OF THE CONSORTIUM IN FAVOUR OF THE LEAD MEMBER

POWER OF ATTORNEY

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution. Foreign companies submitting bids are required to follow the applicable law in their country)

KNOW ALL MEN BY THESE PRESENTS THAT M/s....., having its registered office at ....., ...,.....and M/s ..... having its registered office at ..... , (Insert names and registered offices of all Members of the Consortium), the Members of Consortium, have formed a Bidding Consortium named ..... (insert name of the Consortium) (hereinafter called the **"Consortium"**) vide Consortium Agreement dated..... and having agreed to appoint M/s..... as the Lead Member of the said Consortium do hereby constitute, nominate and appoint M/s.....a company incorporated under the laws of .....and having its Registered / Head Office at .....as our duly constituted lawful Attorney (hereinafter called as **"Lead Member"**) which is one of the Members of the Consortium, to act as the Lead Member and our true and lawful attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to submission of Consortium's Bid for the Project, including signing and submission of the Bid and all documents related to the Bid, including, undertakings, letters, certificates, acceptances, clarifications, guarantees, etc, making representations to the BPC, and providing information / responses to the BPC, representing us and the Consortium in all matters before the BPC, and generally dealing with the BPC in all matters in connection with our Bid for the said Project, till completion of the bidding process in accordance with the RFP and signing of the Share Purchase Agreement by all the parties thereto.

It is expressly understood that in the event of the Consortium being selected as Successful Bidder, this Power of Attorney shall remain valid, binding and irrevocable until the Bidding Consortium achieves execution of all RFP Project Documents.

We, as the Member of the Consortium, agree and undertake to ratify and confirm all whatsoever the said Attorney/Lead Member has done on behalf of the Consortium Members pursuant to this Power of Attorney and the same shall bind us and deemed to have been done by us.

All the terms used herein but not defined shall have the meaning ascribed to such terms under the RFP.

IN WITNESS WHEREOF M/s ....., as the Member of the Consortium have executed these presents on this..... day of .....



For and on behalf of
Consortium Member

.....
(Signature of the Authorized Signatory)

Name: .....
Designation: .....
Place: .....
Date: .....

Name: .....
Designation: .....
Place: .....
Date: .....

Accepted
Specimen signatures of attorney attested

.....
(Signature)

.....

.....
.....
(Name, Designation and Address of the Attorney)

(Signature of Notary Public)

Place: .....
Date: .....

Notes:

1. The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal of the executant affixed in accordance with the applicable procedure. Further, the person whose signatures are to be provided on the power of attorney shall be duly authorized by the executant(s) in this regard.

2. Also, wherever required, the executant(s) should submit for verification the extract of the charter documents and documents such as a Board resolution / power of attorney, in favour of the Person executing this power of attorney for delegation of power hereunder on behalf of the executant(s).

3. In case of foreign Bidders, refer to clause 2.5.6 (p)



ANNEXURE 5 - FORMAT FOR BIDDER'S COMPOSITION AND OWNERSHIP STRUCTURE

1. **Corporate Details:**
Please provide the following information for the Bidder. If the Bidder is a Consortium, please provide this information for each Member including the Lead Member:

a. **Company's Name, Address, and Nationality:**

Name: .....

Address: .....
.....
.....

Website Address: .....

Country of Origin: .....

b. **Year Organized:** .....

c. **Company's Business Activities:** .....
.....

d. **Status as a Bidder:**
i. Bidding Company
ii. Lead Member of the Bidding Consortium
iii. Member of the Bidding Consortium
Note: tick the applicable serial number

e. **Company's Local Address in India (if applicable):**

.....
.....
.....

f. **Name of the Authorized Signatory:** .....

g. **Telephone Number:** .....

h. **Email Address:** .....

i. **Telefax Number:** .....

j. **Please provide the following documents:**

i. Copy of the Memorandum and Articles of Association and certificate of incorporation or other equivalent organizational document (as applicable), including their amendments, certified by the Company Secretary as

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Attachment 1 for Bidding Company / each Member of Bidding Consortium including Lead Member.

ii. Authority letter (as per format for authorization given below) in favour of BPC from the Bidder/every Member of the Consortium authorizing BPC to seek reference from their respective bankers & others as **Attachment 2** as per Clause 2.1.6 of the RFP.

2. Details of Ownership Structure:

Equity holding of Bidding Company/ each Member of Bidding Consortium including Lead Member owning 10% or more of total paid up equity.

Name of the Bidding Company / Consortium Member: .....
Status of equity holding as on .....

Name of the Equity Holder	Type and No. of Shares owned	Extent of Voting Control (%)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
....		

Notes:

1. The above table is to be filled in separately for each Consortium Member.
2. Status of equity holding should be provided not earlier than thirty (30) days prior to Bid Deadline.

For and on behalf of Bidding Company / Lead Member of the Bidding Consortium
M/s.....

.....
(Signature of authorized representative)
Name: .....
Designation: .....

.....
(Stamp)

Date: .....
Place: .....

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FORMAT FOR AUTHORISATION

(In case of Bidding Consortium, to be given separately by each Member)
(On Non – judicial stamp paper duly attested by notary public. Foreign companies submitting bids are required to follow the applicable law in their country)

The undersigned hereby authorize(s) and request(s) all our Bankers, including its subsidiaries and branches, any person, firm, corporation or authority to furnish pertinent information deemed necessary and requested by **PFC Consulting Limited** to verify our Bid for selection of Bidder as Transmission Service Provider to establish Inter-State Transmission system for **"Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"** through tariff based competitive bidding process or regarding our project development experience, financial standing and general reputation.

For and on behalf of M/s..... (Insert Name of Bidding Company or Member of the Consortium)

.....
(Signature)

Name of Authorized Signatory: .....

(Signature and Name of the authorized signatory of the Company)

Place: .....
Date: .....

.....
(Company rubber stamp/seal)

.....
(Signature of Notary Public)

Place: .....
Date: .....



ANNEXURE 6 - FORMAT FOR CONSORTIUM AGREEMENT

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution. Foreign companies submitting bids are required to follow the applicable law in their country)

THIS CONSORTIUM AGREEMENT executed on this..... day of .....Two thousand.....between M/s....., a company incorporated under the laws of ..... and having its Registered Office at ..... (hereinafter called the "Party 1", which expression shall include its successors, executors and permitted assigns) and M/s.....a Company incorporated under the laws of ..... and having its Registered Office at ..... (hereinafter called the "Party n", which expression shall include its successors, executors and permitted assigns) and for the purpose of submitting the Bid, acquisition of KPS III HVDC TRANSMISSION LIMITED (in case of award) and entering into other Agreement(s) as specified in the RFP (hereinafter referred to as "Agreements") as may be entered into with the Nodal Agency.

WHEREAS, the BPC had invited Bid in response to RFP issued to ..... (insert the name of purchaser of RFP) for selection of the bidder as the Transmission Service Provider to establish Inter-State Transmission System for **"Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"**.

AND WHEREAS, Clause 2.2.4 of the RFP document stipulates that the Bidders qualifying on the strength of a Bidding Consortium will have to submit a legally enforceable Consortium Agreement in a format specified in the RFP document wherein the Consortium Members have to commit equity of a specific percentage in the Project.

AND WHEREAS, Clause 2.2.4 of the RFP document also stipulates that the Bidding Consortium shall provide along with the Bid, a Consortium Agreement as per prescribed format whereby the Consortium Members undertake to be liable for raising the required funds for its respective equity investment commitment as specified in Consortium Agreement.

NOW THEREFORE, THIS INDENTURE WITNESSTH AS UNDER:

In consideration of the above premises and agreement all the parties in this Consortium do hereby mutually agree as follows:

1. In consideration of the selection of the Consortium as the selected bidder by the BPC, we the Members of the Consortium and parties to the Consortium Agreement do hereby unequivocally agree that M/s..... (Insert name of the Lead Member), shall act as the Lead Member as defined in the RFP for self and agent for and on behalf of ....., ..., ..., ... (the names of all the other Members of the Consortium to be filled in here).

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2. The Lead Member is hereby authorized by the Members of Consortium and parties to the Consortium Agreement to bind the Consortium and receive instructions for and on behalf of the Members.

3. Notwithstanding anything contrary contained in this Consortium Agreement, the Lead Member shall always be liable for the equity investment obligations of all the Consortium Members, i.e., for both its own equity contribution as well as the equity contribution of other Members.

4. The Lead Member shall be liable and responsible for ensuring the individual and collective commitment of each of the Members of the Consortium in discharging all their respective equity obligations. Each Consortium Member further undertakes to be individually liable for the performance of its part of the obligations without in any way limiting the scope of collective liability envisaged in this agreement.

5. Subject to the terms of this agreement, the share of each Member of the Consortium in the "issued equity share capital of the project company" shall be in the following proportion: (if applicable)

Name	Percentage of equity holding in the Project
Party 1	.....
.....	.....
Party n	.....
Total	**100%**

[**Note:** The percentage equity holding for any Consortium Member in the Project cannot be zero in the above table]

6. The Lead Member shall inter alia undertake full responsibility for liaising with lenders and mobilizing debt resources for the Project and achieving financial closure.

7. In case of any breach of any of the equity investment commitment by any of the Consortium Members, the Lead Member shall be liable for the consequences thereof.

8. Except as specified in the Agreement, it is agreed that sharing of responsibilities as aforesaid and equity investment obligations thereto shall not in any way be a limitation of responsibility of the Lead Member under these presents.

9. It is further specifically agreed that the financial liability for equity contribution of Lead Member shall, not be limited in any way so as to restrict or limit its liabilities. The Lead Member shall be liable irrespective of their scope of work or financial commitments.

10. It is expressly understood and agreed between the Members that the responsibilities and obligations of each of the Members shall be as delineated as annexed hereto as **Appendix-I,** forming integral part of this Agreement. It is further agreed by the Members that the above sharing of responsibilities and obligations shall not in any way be a limitation of joint

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and several responsibilities and liabilities of the Members, with regards to all matters relating to the Project.

11. It is clearly agreed that the Lead Member shall ensure performance under the Agreements and if one or more Consortium Members fail to perform its /their respective obligations under the Agreement(s), the same shall be deemed to be a default by all the Consortium Members.

12. This Consortium Agreement shall be construed and interpreted in accordance with the Laws of India and courts at **Delhi** alone shall have the exclusive jurisdiction in all matters relating thereto and arising there under.

13. It is hereby agreed that, the Lead Member shall furnish the bid bond, as stipulated in the RFP, on behalf of the Consortium Members.

Or

It is hereby agreed that, the Lead Member shall furnish the bid security declaration, as stipulated in the RFP, on behalf of the Consortium Members. [To be inserted for projects wherein RFP has been issued before 31.12.2021 otherwise to be deleted]

14. It is hereby agreed that in case of selection of Bidding Consortium as the selected bidder, the parties to this Consortium Agreement do hereby agree that they shall furnish the contract performance guarantee on behalf of the TSP in favor of the Nodal Agency, as stipulated in the RFP and Transmission Service Agreement.

15. It is further expressly agreed that the Consortium Agreement shall be irrevocable and shall form an integral part of the RFP Project Document and shall remain valid till the execution of the Share Purchase Agreement, unless expressly agreed to the contrary by the Nodal Agency. Over the term of the Transmission Service Agreement, Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations as amended from time to time shall apply on the Consortium Members.

16. The Lead Member is authorized and shall be fully responsible for the accuracy and veracity of the representations and information submitted by the Consortium Members respectively from time to time in response to the RFP and for the purposes of the Project.

17. It is hereby expressly agreed between the parties to this Consortium Agreement that neither party shall assign or delegate its rights, duties or obligations under this Agreement except with the prior written consent of the Nodal Agency.

THIS CONSORTIUM AGREEMENT:

a. has been duly executed and delivered on behalf of each party hereto and constitutes the legal, valid, binding and enforceable obligation of each such party,

b. sets forth the entire understanding of the parties hereto with respect to the subject matter hereof;

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c. may not be amended or modified except in writing signed by each of the parties and with prior written consent of the Nodal Agency.

IN WITNESS WHEREOF, the parties to the Consortium Agreement have, through their authorized representatives, executed these present on the Day, Month and Year first mentioned above.

For and on behalf of Consortium Member 1 (Party 1)
M/s.....

.....
(Signature of authorized signatory)

Name: .....
Designation: .....
Place: .....
Date: .....

For and on behalf of Consortium Member n (Party n)
M/s.....

.....
(Signature of authorized signatory)

Name: .....
Designation: .....
Place: .....
Date: .....

Attested:
.....
(Signature)
(Notary Public)

Place: .....
Date: .....

Note: In case of foreign Bidders, refer to clause 2.5.6 (p)

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Appendix 1 to the Consortium Agreement:

Name of the Consortium Member	Responsibilities under the Consortium Agreement
M/s ..... (Party 1)	
M/s	
M/s ..... (Party n)	



ANNEXURE 7 A - FORMAT FOR QUALIFICATION REQUIREMENT

A. NET WORTH

To,
PFC Consulting Limited
9th Floor, Wing-A, Statesman House,
Connaught Place, New Delhi - 110001

Dear Sir,

Sub: Bid for selection of Bidder as Transmission Service Provider to establish Inter-State Transmission System for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" through tariff based competitive bidding process

1. [Note: Applicable in case of Bidding Company]

We certify that the Financially Evaluated Entity(ies) had a Networth of Rs. ..... Crore or equivalent USD* computed as per instructions in this RFP based on unconsolidated audited annual accounts (refer Note-2 below) of any of the last three (3) financial years as provided in Clause 2.2.3, immediately preceding the Bid Deadline. Also, the Networth of any of the last three (3) financial years is not negative.

Name of Financially Evaluated Entity(ies)	Relationship with Bidding Company**	Financial Year	Networth (Rs. Crore)
1.			
2.			
3.			
....			
Total Networth			

*Equivalent USD shall be calculated as per provisions of Clause 3.4.1.
** The column for "Relationship with Bidding Company" is to be filled in only in case financial capability of Parent/Affiliate has been used for meeting Qualification Requirements.

2. [Note: Applicable in case of Bidding Consortium]

We certify that the Financially Evaluated Entity(ies) had a minimum Networth of Rs. ..... Crore or equivalent USD* computed as per instructions in the RFP and based on unconsolidated audited annual accounts (refer Note-2 below) of any of the last three (3) financial years as provided in Clause 2.2.3, immediately preceding the Bid Deadline. Also, the Networth of any of the last three (3) financial years is not negative.

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Name of Consortium Member	Equity Commitment in the Project (%)	Networth of Member (Rs. Crore)	Networth Requirement to be met by Member in proportion to the Equity Commitment (Rs. Crore)	Whether the Member meets the Networth Requirement
(1)	(2)	(3) (As per table below)	(4)= (2 x Total Networth requirement for the Project)	(5)
1.				Yes / No
2.				Yes / No
..				Yes / No
Total Networth for financial requirement				

Member – I (Lead Member)

[Note: Similar particulars for each Member of the Consortium is to be furnished, duly certified by the Member's Statutory Auditors]

i. Name of Member: .....

ii. Total Networth requirement: Rs ..... Crore

iii. Percentage of equity commitment for the Project by the Member: .....%

iv. Networth requirement for the Member***: Rs. ..... Crore

v. Financial year considered for the Member: .....

Name of Financially Evaluated Entity(ies)	Relationship** with Member of Consortium	Financial Year	Networth (Rs. Crore)
1.			
2.			
3.			
Total Networth			

* Equivalent USD shall be calculated as per provisions of Clause 3.4.1;

** The column for "Relationship with Member of Consortium" is to be filled in only in case the financial capability of Parent / Affiliate has been used for meeting Qualification Requirements;

*** Networth requirement to be met by Member should be in proportion to the equity commitment of the Member for the Project.

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Yours faithfully

.....

(Signature and name of the authorized signatory of the Company and Stamp)

Name: .....
Date: .....
Place: .....

.....

(Signature and Stamp of statutory Auditors of Bidding Company / each Member of Consortium)

Name: .....
Date: .....
Place: .....

Date: .....

Notes:

1. Along with the above format, in a separate sheet, please provide details of computation of Networth of last three (3) financial years duly certified by Statutory Auditor.

2. Audited consolidated annual accounts of the Bidder may be used for the purpose of financial criteria provided the Bidder has at least 26% equity in each company whose accounts are merged in the audited consolidated accounts and provided further that the financial capability of such companies (of which accounts are being merged in the consolidated accounts) shall not be considered again for the purpose of evaluation of the Bid.

3. In case Bidder or a Member of Consortium takes recourse to its Parent/Affiliate for meeting technical / financial requirements, then the financial years considered for such purpose should be same for the Bidder / Member of Consortium and their respective Parent / Affiliate.



ANNEXURE 7B - FORMAT FOR TECHNICAL REQUIREMENT

To,
PFC Consulting Limited
9th Floor, Wing-A, Statesman House,
Connaught Place, New Delhi - 110001

Dear Sir,

Sub: Bid for selection of Bidder as Transmission Service Provider to establish Inter-State Transmission System for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" through tariff based competitive bidding process

1. To be used by Bidder using the development experience in infrastructure sector

We certify that M/s. ..... (Insert name of Technically Evaluated Entity(ies)) have experience of development of projects in the Infrastructure sector in the last ten (10) years whose aggregate capital expenditure is Rs. ..... Crore or equivalent USD*. We further certify that the capital expenditure of at least one (1) project shall not be less than Rs. 1909.92 Crore or equivalent USD and the capital expenditure of each project shall not be less than Rs. 100.00 Crore or equivalent USD*. For this purpose, capital expenditure incurred on projects which have been either wholly completed / commissioned or partly completed projects put under commercial operation and for which operation has commenced till at least seven (7) days prior to the Bid Deadline has been considered.

The project(s) considered for the purpose of technical experience (as per table given below) have been executed and owned to the extent as indicated in the table below (to be atleast twenty – six percent (26%)) by the Bidding Company / Lead Member of the Consortium / our Parent / our Affiliate(s) [strike off whichever is not applicable] on operation of the projects.

This technical requirement has been calculated as per the instructions provided in the RFP on the basis of following projects:



Name of Company (which has executed the project at (3)) whose technical capability has been used for Qualification Requirement	Relationship** with Bidding Company / Lead Member	Project name	Nature of Project (BOOT, BOT, BOOM, DBFOT etc.)	Relevant Infrastructure sector	Date of Financial Closure of the Project (in DD / MM / YYYY)	Date of Completion / Commissioning / Commercial Operation of partly completed projects	Project cost (Rs. Crore)	Percentage Equity Holding of Company at (1) in Completed project(s)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
.....		..... (Project 1)						
.....		.....						
Total (Rs. Crore)								

* Equivalent USD shall be calculated as per provisions of Clause ____

** The column for "Relationship with Bidding Company / Lead Member" is to be filled in only in case technical capability of Parent/Affiliate has been used for meeting Qualification Requirements.

We further certify that the Company(ies) as indicated in column (1) of the above table, whose technical capability has / have been used for meeting the qualification requirement, has / have held shareholding respectively of atleast twenty – six percent (26%)from the date of financial closure till the date of commissioning / completion of the above project(s).

2. To be used by Bidder using construction experience in infrastructure sector.

We certify that M/s. ..... (Insert name of Technically Evaluated Entity(ies)) have received aggregate payments not less than Rs. ..... Crore or equivalent USD (calculated as per provisions in Clause 3.4.1) from its client(s) for construction works fully completed during the last 10 (ten) financial years. We further certify that the payment received from at least one (1) project shall not be less than Rs. 1909.92 Crore or equivalent USD and the payment received of each project shall not be less than Rs. 100.00 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1). For this purpose, payments received on projects that have been commissioned/completed at least seven (7) days prior to the Bid Deadline shall be considered. Further only the payments (gross) actually received, during such 10 (ten) financial years shall qualify for purposes of computing the technical capacity.

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We also confirm that construction works does not include cost of land supply of goods or equipment except when such goods or equipment form part of a turn-key construction contract/ EPC contract for the project.

This technical requirement has been calculated as per the instructions provided in the RFP on the basis of following projects:

Name of Company (which has executed the project at (3)) whose technical capability has been used for Qualification Requirement	**Relationship ** with Bidding Company / Lead Member**	**Project name**	**Nature of Project (EPC, Turnkey etc)**	**Relevant Infrastructure sector**	**Date of award of contract (in dd/mm/yy)**	**Date of Completion / Commissioning**	**Payment received (Rs. Crore)**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
.....		..... Project 1					
.....		.....					
.....		.....					
	Total (Rs. Crore)						

Yours faithfully

.....

(Signature and name of the authorized signatory of the Company and stamp)

Name: .....
Date: .....
Place: .....

.....

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(Signature and Stamp of statutory Auditors of Bidding Company/ Lead Member of Consortium)

Name: .....

Date: .....

Place: .....

Date: .....

Notes:

1. Along with the above format, in a separate sheet, please provide details of computation of capital expenditure of projects duly certified by Statutory Auditor of the project company. In addition, the Statutory Auditor of the project company should also certify that the capital expenditure of projects commissioned or completed 7 days prior to Bid Deadline has been capitalized in the books of accounts.

   Additionally, in case construction experience is used, a certificate(s) from the statutory auditors stating the payments received and the concerned client(s) stating the works commissioned during the past 10 years in respect of the projects specified above. In case a particular job/ contract has been jointly executed by the Bidder (as part of a consortium), it should further support its claim for the share in work done for that particular job/ contract by producing a certificate from its statutory auditor or the client.

2. In case the accounts for the financial year in which the project claimed for meeting qualification requirement has been commissioned are not audited, the Bidder shall give declaration in this regard duly certified by its statutory auditor. In such a case, Bidder shall provide details of computation of capital expenditure of such project(s) duly certified by Statutory Auditor of the project company and the Statutory Auditor of the project company should also certify that the capital expenditure of projects commissioned or completed shall be capitalized in the books of accounts upon finalization.

3. The unconsolidated audited annual accounts of both the TEE and the Bidding Company / Lead Member for the respective financial years (financial years in which financial closure was achieved to the financial year in which the said project was completed / commissioned) should be submitted.



ANNEXURE 7C - FORMAT FOR TECHNICAL & FINANCIAL REQUIREMENT – RELATIONSHIP & DETAILS OF EQUITY SHAREHOLDING

[To be filled by Bidding Company / each Member of the Bidding Consortium including Lead Member if credentials of Parent and / or Affiliates have been used by them]

To,
PFC Consulting Limited
9th Floor, Wing-A, Statesman House,
Connaught Place, New Delhi - 110001

Dear Sir,

Sub: Bid for selection of Bidder as Transmission Service Provider to establish Inter-State Transmission System for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" through tariff based competitive bidding process

We certify that M/s. ..... (insert name of the **Bidding Company / Consortium Members**) have considered the technical and financial capability of its Parent and / or Affiliates, for the purpose of meeting Qualification Requirements as per the instructions provided in the RFP. The name of Parent and / or Affiliate, nature of relationship(s) with such Parent and / or Affiliate and details of equity holding are as follows:

Name of Company whose credentials considered	Type of credentials considered (technical and / or financial)	Relationship with Bidding Company / Consortium Member (Parent / Affiliate)	Details of equity shareholding (refer notes below)
Company 1			
.....			
.....			
.....			
.....			

NOTES:

i. In case of Parent, the equity holding of the Parent in the Bidding Company / Member of the Bidding Consortium, including the Lead Member of the Consortium, need to be specified.

ii. In case of Affiliate under direct control of Bidder, the equity holding of the Bidding Company / Member of the Bidding Consortium, including the Lead Member of the Consortium in the Affiliate, needs to be specified.

iii. In case of Affiliate under common control of Parent, the equity holding of the Parent in the Affiliate of the Bidding Company / Member of the Bidding Consortium, including the Lead Member of the Consortium, needs to be specified.

iv. Relationship of Parent / Affiliate with Bidding Company / Member of Consortium to be at the most seven (7) days prior to the Bid Deadline (as per Clause 2.1.4 of RFP)

Adani Energy Solutions Limited

Yours faithfully

.....

(Signature and name of the authorized signatory of the Company and stamp)

Name: .....
Date: .....
Place: .....

.....

(Signature and Stamp of statutory Auditors of Bidding Company / each Member of Bidding Consortium)

Name: .....
Date: .....
Place: .....
Date: .....



ANNEXURE 7D - ADDITIONAL INFORMATION FOR VERIFICATION OF FINANCIAL AND TECHNICAL CAPABILITIES OF BIDDERS.

.....

(Name of Bidder (Bidding Company/ Bidding Consortium or Technically/Financially Evaluated Entity(ies))

(Note: In case of Consortium, details to be filled in by Lead Member for each Member of the Consortium including the Lead Member and in case of the qualification requirements of Technically / Financially Evaluated Entity(ies) being used, to be filled by each of such entity(ies)

i. Financial capability (Attachment 1):

1. Bidders shall attach unconsolidated / consolidated audited annual accounts, statements, as the case may be, (refer Clause 2.1.3) for the last three (3) financial years as Attachment 1. Such unconsolidated audited annual accounts shall include a Balance Sheet, Profit and Loss Account, Auditors Report and profit appropriation account.

ii. Technical capability (Attachment 2):

a. This attachment shall include details of projects completed/commissioned or partly completed projects for which commercial operation has commenced to be considered for the purpose of meeting Qualification Requirements.

1. To be used by Bidder using development experience in infrastructure sector

Particulars	Year 1	Year 2	.....	Year 9	Year 10
Name(s) of project(s) from Infrastructure sectors					
Location(s) including country(s) where project was set up					
Nature of Project					
Voltage level (if any)					
Capital cost of project(s) Rs. in Crore					
*Status of the project					
% of equity owned in the project(s)					

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***Note 1:** Date of completion/commissioning/commercial operation to be mentioned

Note 2: For each project listed in the table, the Bidder shall furnish an executive summary including the following information:

- Project model, i.e., BOO, BOOT, BOOM;

- Debt financing and equity raised and provided by Bidder/Bidder's Parent/Bidder's Affiliate for the project, including names of lenders and investors;
- Size and type of installation;
- Technical data/information on major equipment installed
- Description of role performed by the Bidder/Bidder's Parent/Bidder's Affiliate on the project
- Clearances taken by the Bidder/Bidder's Parent/Bidder's Affiliate including but limited to right-of-way (RoW), forest clearance and other statutory / Govt. clearances.
- Cost data (breakdown of major components)
- Name of EPC and/or other major contractor
- Construction time for the project
- Names, addresses and contact numbers of owners of the projects
- Operating reliability over the past five (5) years or since date of commercial operation
- Operating environmental compliance history
- Names of supervisory entities or consultant, if any
- Date of commercial operation
- Total duration of operation

2. To be used by Bidder using construction experience in infrastructure sector

Particulars	Year 1	Year 2	....	Year 9	Year 10
Name(s) of project(s) from Infrastructure sectors					
Location(s) including country(s) where project was set up					
Nature of Project					
Voltage level (if any)					
Revenue received Rs. in Crore					
*Status of the project					
% of equity owned in the project(s)					

***Note 1:** Date of completion/commissioning/commercial operation to be mentioned

Note 2: For each project listed in the table, the Bidder shall furnish an executive summary including the following information:

- Project model, i.e., EPC, Turnkey;
- Size and type of installation;
- Technical data/information on major equipment installed
- Description of role performed by the Bidder/Bidder's Parent/Bidder's Affiliate on the project

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- Cost data (breakdown of major components)
- Name of sub-contractor
- Construction time for the project
- Names, addresses and contact numbers of owners of the projects
- Operating reliability over the past five (5) years or since date of commercial operation
- Operating environmental compliance history
- Names of supervisory entities or consultant, if any
- Date of commercial operation
- Total duration of operation

iii. Attachment-3:

a. For each project listed in Attachment 2 above, certificates of final acceptance and/or certificates of good operating performance duly issued by owners for the project and the same shall be certified as true by authorized signatory of the Bidding Company or the Lead Member of Consortium). In case the project listed in Attachment 2 is under BOOT / DBFOT mechanism, the certificates of final acceptance and/or certificates of good operating performance must be issued by the authority / independent engineer of the project as defined in the respective project agreement.

For and on behalf of Bidding Company/Consortium

M/s.....

.....

(Signature of authorized signatory)

Name: .....
Designation: .....
Date: .....
Place: .....

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ANNEXURE 8 -UNDERTAKING AND DETAILS OF EQUITY INVESTMENT

Format 1: Bidders' Undertakings

[On the Letter Head of the Bidding Company/Lead Member of Bidding Consortium]

Date: .....

To,

PFC Consulting Limited
9th Floor, Wing-A, Statesman House,
Connaught Place, New Delhi - 110001

Dear Sir,

Sub: Bidders' Undertakings in respect of Bid for selection of Bidder as TSP to establish Inter-State transmission system for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"

We hereby undertake on our own behalf and on behalf of the TSP, that if selected as the Successful Bidder for the Project:

1. The Project shall comply with all the relevant electricity laws, codes, regulations, standards and Prudent Utility Practices, environment laws and relevant technical, operational and safety standards, and we shall execute any agreements that may be required to be executed as per law in this regard.

2. We confirm that the Project shall also comply with the standards and codes as per Clause 1.6.1.2 of the RFP and the TSP shall comply with the provisions contained in the Central Electricity Regulatory Commission Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-state Transmission and related matters Open Access) Regulations, 2009.

3. We give our unconditional acceptance to the RFP dated 26.07.2024 issued by the BPC and the RFP Project Documents, as amended, and undertake to ensure that the TSP shall execute all the RFP Project Documents, as per the provisions of this RFP.

4. We have submitted the Bid on the terms and conditions contained in the RFP and the RFP Project Documents. Further, the Financial Bid submitted by us is strictly as per the format provided in Annexure 21 of the RFP, without mentioning any deviations, conditions, assumptions or notes in the said Annexure.

5. Our Bid is valid up to the period required under Clause 2.8 of the RFP.

6. Our Bid has been duly signed by authorized signatory and stamped in the manner and to the extent indicated in this RFP and the power of attorney / Board resolution in requisite format as per RFP has been enclosed with this undertaking.

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7. We have assumed that if we are selected as the Successful Bidder, the provisions of the Consortium Agreement, to the extent and only in relation to equity lock in and our liability thereof shall get modified to give effect to the provisions of Clause 2.5.8 of this RFP and Article 18.1 of the Transmission Service Agreement. ***(Note:** This is applicable only in case of a Bidding Consortium)*

8. We confirm that our Bid meets the Scheduled COD of each transmission Element and the Project as specified below:

Sl. No.	Name of the Transmission Element	Scheduled COD	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
1.	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	48 months from SPV transfer	100%	All Elements are required to be commissioned simultaneously as their utilization is dependent on commissioning of each other.
2.	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*			
3.	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.			
4.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations			
5.	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with			

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	Dedicated Metallic Return) (capable to evacuate 2500 MW)			

We agree that the payment of Transmission Charges for any Element irrespective of its successful commissioning on or before its Scheduled COD shall only be considered after the successful commissioning of Element(s) which are pre - required for declaring the commercial operation of such Element as mentioned in the above table.

Scheduled COD for the Project: 48 months from the SPV Transfer Date

9. We confirm that our Financial Bid conforms to all the conditions mentioned in this RFP, and in particular, we confirm that:

   a. Financial Bid in the prescribed format of Annexure 21 has been submitted duly signed by the authorized signatory.

   b. Financial Bid is unconditional.

   c. Only one Financial Bid has been submitted.

10. We have neither made any statement nor provided any information in this Bid, which to the best of our knowledge is materially inaccurate or misleading. Further, all the confirmations, declarations and representations made in our Bid are true and accurate. In case this is found to be incorrect after our acquisition of KPS III HVDC TRANSMISSION LIMITED, pursuant to our selection as Selected Bidder, we agree that the same would be treated as a TSP's Event of Default under Transmission Service Agreement, and relevant provisions of Transmission Service Agreement shall apply.

11. We confirm that there are no litigations or other disputes against us which materially affect our ability to fulfill our obligations with regard to the Project as per the terms of RFP Project Documents.

12. Power of attorney/ Board resolution as per Clause 2.5.2 is enclosed.

Signature and name of the authorized signatory of the Company and stamp of Bidding Company or Lead member of Consortium

Note:

1. In case of foreign Bidders, refer to clause 2.5.6 (p)

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Format 2: Details of equity investment in Project

1.1.a Name of the Bidding Company/ Bidding Consortium:

1.1.b Name of the Lead Member in the case of a Bidding Consortium:

1.2 Investment details of the Bidding Company/Member of the Bidding Consortium investing in KPS III HVDC TRANSMISSION LIMITED as per Clause 2.5.8.2.

S. No.	Name of the Bidding Company/ Member in case of a Bidding Consortium	Name of the Company investing in the equity of the _____[Name of SPV]	Relationship with Bidding Company /Member of the Bidding Consortium	% of equity participation in the _____[Name of SPV]
(1)	(2)	(3)	(4)	(5)
TOTAL				100%

* In case the Bidder proposes to invest through its Affiliate(s) / Parent Company / Ultimate Parent Company, the Bidder shall declare shareholding pattern of such Affiliate(s) / Parent Company / Ultimate Parent Company and provide documentary evidence to demonstrate relationship between the Bidder and the Affiliate(s) / Parent Company / Ultimate Parent Company. These documentary evidences could be, but not limited to, demat account statement(s) / Registrar of Companies' (ROC) certification / share registry book, etc duly certified by Company Secretary.

Members of the Consortium or the Bidding Company making investment in the equity of the _____[Name of SPV] themselves to fill in their own names in the column (3)

Signature and Name of authorized signatory in whose name power of attorney has been issued

Signature of authorized signatory

Name: .....

Designation: .....

Date.....

Company rubber stamp



ANNEXURE 9 -AUTHORISATION FROM PARENT / AFFILIATE OF BIDDING COMPANY / MEMBER OF BIDDING CONSORTIUM WHOSE TECHNICAL / FINANCIAL CAPABILITY HAS BEEN USED BY THE BIDDING COMPANY / MEMBER OF BIDDING CONSORTIUM.

[On the Letter Head of the Parent /Affiliate]

Name: .....
Full Address: .....
Telephone No.: .....
E-mail address: .....
Fax / No.: .....

To
PFC Consulting Limited
9th Floor, Wing-A, Statesman House,
Connaught Place, New Delhi – 110001.

Dear Sir,

Sub: Authorization for use of Technical / Financial Capability of M/s..... (Insert name of Parent / Affiliate) by M/s ..... (Insert name of Bidding Company / Member of Bidding Consortium).

We refer to the RFP dated 26.07.2024 ('RFP') issued by you for selection of Bidder as Transmission Service Provider for establishing the Inter-State Transmission System for "**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C**".

We confirm that M/s. ..... (Insert name of Bidding Company/ Consortium Member) has been authorized by us to use our technical and/or financial capability [strikeout whichever is not applicable] for meeting the Qualification Requirements for "**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C**".

We have carefully read and examined in detail the RFP including in particular, Clause 2.1.4 of the RFP, and we are also submitting legally binding undertaking supported by a board resolution that all the equity investment obligations of M/s..... (Insert Name of Bidding Company / Consortium Member), shall be deemed to be our equity investment obligations and in the event of any default the same shall be met by us.

For and on behalf of M/s..... (Insert Name of Parent / Affiliate)

.....
(Signature and Name of the authorized signatory of the Company and stamp)

Name: .....
Date: .....

Place: .....

Notes:

1. The above undertaking can be furnished by Ultimate Parent of Technically Evaluated Entity or Financially Evaluated Entity, as the case maybe, if legally binding undertaking is also furnished by the Ultimate Parent on behalf of such Financially Evaluated Entity/Technically Evaluated Entity.



ANNEXURE 10- FORMAT OF UNDERTAKING BY TECHNICALLY / FINANCIALLY EVALUATED ENTITY / ULTIMATE PARENT COMPANY

[On the Letter Head of the Technically / Financially Evaluated Entity / Ultimate Parent Company]

Name: .....

Full Address: .....

Telephone No.: .....

E-mail address: .....

Fax/No.: .....

To:
Chief Executive Officer
PFC Consulting Limited
9thFloor, Wing-A, Statesman House,
Connaught Place, New Delhi – 110001

Sub: **Undertaking for equity investment**

Dear Sir,

We refer to the Request for Proposal dated 26.07.2024 ('RFP') issued by you regarding setting up of Inter-State transmission system for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" Project on build, own, operate and transfer basis.

We have carefully read and examined in detail the RFP and the RFP Project Documents, including in particular, Clause 2.1.4 of the RFP and Clauses 2.5.2 and 2.5.8 of the RFP, regarding submission of an undertaking regarding the investment in the equity share capital of KPS III HVDC TRANSMISSION LIMITED and provisions for minimum equity holding and equity lock-in. We have also noted the amount of the equity investment required to be made in KPS III HVDC TRANSMISSION LIMITED by the ..... [Insert the name of the Bidder or the Consortium Member] for the Project.

In view of the above, we hereby undertake to you and confirm that in the event of failure of .....[Insert the name of the Bidder or the Consortium Member] to invest in full or in part, in the equity share capital of KPS III HVDC TRANSMISSION LIMITED as specified in the Bid, we shall invest the said amount not invested by.....[Insert the name of the Bidder or the Consortium Member] in KPS III HVDC TRANSMISSION LIMITED by purchase of existing shares or subscribing to the new shares of KPS III HVDC TRANSMISSION LIMITED, as stipulated by you.

We have attached hereto certified true copy of the Board resolution whereby the Board of Directors of our Company has approved issue of this Undertaking by the Company.

All the terms used herein but not defined, shall have the meaning as ascribed to the said terms under the RFP.

Certified as true.

.....

(Signature and Name of the authorized signatory of the Company and stamp)

Note:

1. Wherever required, extract of the charter documents and documents such as a Board resolution should be submitted for verification.



ANNEXURE 11 - FORMATS FOR BOARD RESOLUTIONS

Format 1

Format of the Board resolution for the Bidding Company / each Member of the Consortium / investing Affiliate / Parent Company / Ultimate Parent Company, where applicable

[Reference Clause 2.5.2 of the RFP and the illustrations in Annexure 11A]

[Note: The following resolution no.1 needs to be passed by the Boards of each of the entity/(ies) making equity investment]

The Board, after discussion, at the duly convened Meeting on ..... [Insert date], with the consent of all the Directors present and in compliance of the provisions of the Companies Act, 1956/2013, passed the following Resolution:

1. **RESOLVED THAT** pursuant to the provisions of the Companies Act, 1956 / Companies Act 2013 (as the case may be) and compliance thereof and as permitted under the Memorandum and Articles of Association of the company, approval of the Board be and is hereby accorded for investment of.....% (.....per cent) of the total equity share capital of KPS III HVDC TRANSMISSION LIMITED representing the entire amount proposed to be invested by the company for the transmission system for **Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C**, partly by acquisition of the existing equity shares from PFC Consulting Limited and / or partly by subscribing to the new equity shares, as per the terms of the RFP.

[Note: Equity investment obligations by the Bidding Company/each Member of the Bidding Consortium/investing Affiliate or Parent or Ultimate Parent should add up to 100%.]

[Note: In the event the Bidder is a Bidding Consortium, the following Board resolution no. 2 also needs to be passed by the Lead Member of the Bidding Consortium]

2. **RESOLVED THAT** approval of the Board be and is hereby accorded to contribute such further amount over and above the ;..... percentage (__%) limit to the extent becoming necessary towards the total equity share in the _____[Name of SPV], obligatory on the part of the company pursuant to the terms and conditions contained in the Consortium Agreement dated .....executed by the company as per the provisions of the RFP.

[Note: In the event, the investing entity is an Affiliate or Parent or Ultimate Parent of the Bidder, the following Board resolution no. 3 shall also be passed by the Bidder]

3. **FURTHER RESOLVED THAT** the Board hereby acknowledges the Board Resolution(s) passed by the..... [Name of the Affiliate(s)/ Parent / Ultimate Parent] regarding the investment of.....(....%) of the equity share capital requirements of KPS III HVDC TRANSMISSION LIMITED, which is to be invested by the .....[Name of the Affiliate(s)/ Parent / Ultimate Parent] for the KPS III HVDC TRANSMISSION LIMITED, partly by acquisition of the existing equity shares from PFC Consulting Limited and partly by subscribing to the new equity shares, as per the terms of the RFP.

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[Note: The following resolution no. 4 is to be provided by the Bidding Company / Lead Member of the Consortium only]

4. FURTHER RESOLVED THAT MR/MS .....be and is hereby authorized to take all the steps required to be taken by the Company for submission of the Bid, including in particular, signing of the Bid, making changes thereto and submitting amended Bid, all the documents related to the Bid, certified copy of this Board resolution or letter or undertakings etc, required to be submitted to BPC as part of the Bid or such other documents as may be necessary in this regard.

Certified True Copy

Company rubber stamp to be affixed

[Notes:

1) This certified true copy should be submitted on the letterhead of the Company, signed by the Company Secretary or any Whole Time Director/ Manager (supported by a specific board resolution) of the Bidding Company or the Lead Member of Consortium.

2) The contents of the format may be suitably re-worded indicating the identity of the entity passing the resolution, i.e., the Bidding Company, each Member of the Bidding Consortium.

3) This format may be modified only to the limited extent required to comply with the local regulations and laws applicable to a foreign entity submitting this resolution. For example, reference to Companies Act 1956 / Companies Act 2013 (as the case may be) may be suitably modified to refer to the law applicable to the entity submitting the resolution. However, in such case, the foreign entity shall submit an unqualified opinion issued by the legal counsel of such foreign entity, stating that the Board resolutions are in compliance with the applicable laws of the respective jurisdictions of the issuing company and the authorizations granted therein are true and valid.]



Format 2

Format for the Board resolution of Technically / Financially Evaluated Entity / Ultimate Parent Company (in case credentials of such TEE/ FEE has been utilized by the Bidding Company or Bidding Consortium)

The Board, after discussion, at the duly convened Meeting on ..... [Insert date], with the consent of all the Directors present and in compliance of the provisions of the Companies Act, 1956 / 2013, passed the following Resolution:

RESOLVED THAT pursuant to the provisions of the Companies Act, 1956 / Companies Act, 2013 (as the case may be) and compliance thereof and as permitted under the Memorandum and Articles of Association of the company, approval of the Board be and is hereby accorded for issuing an Undertaking to the BPC, in the format specified in the RFP issued by the BPC, draft of which is attached hereto and initialed by the Chairman whereby the company undertakes to invest .....percent (.... %) of the total equity share capital of KPS III HVDC TRANSMISSION LIMITED representing the entire amount proposed to be invested by .....[insert the name of the Bidder or Member] for the said Project, in case of failure of .....[Insert the name of the Bidder or Member] to make such investment".

FURTHER RESOLVED THAT .....,be and is hereby authorized to take all the steps required to be taken by the Company, including in particular, signing the said Undertaking, submitting the same to the BPC through .....[Insert name of Bidding Company/Lead Member of the Consortium] of all the related documents, certified copy of this Board resolution or letter, undertakings etc, required to be submitted to BPC as part of the Bid or such other documents as may be necessary in this regard.

Certified True Copy

Company rubber stamp to be affixed

Note:

1. This certified true copy should be submitted on the letterhead of the Company, signed by the Company Secretary or any Whole-time Director/Manager (supported by a specific board resolution) of Bidding Company or Lead Member of the Consortium.

2. The contents of the format may be suitably re-worded indicating the identity of the entity passing the resolution.

3. This format may be modified only to the limited extent required to comply with the local regulations and laws applicable to a foreign entity submitting this resolution. For example, reference to Companies Act 1956 / Companies Act 2013 (as the case may be) may be suitably modified to refer to the law applicable to the entity submitting the resolution. However, in such case, the foreign entity shall submit an unqualified opinion issued by the legal counsel of such foreign entity, stating that the Board resolutions are in compliance with the applicable laws of the respective jurisdictions of the issuing company and the authorizations granted therein are true and valid.

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ANNEXURE 11A – ILLUSTRATION FOR APPLICABLE BOARD RESOLUTION REQUIREMENTS UNDER CLAUSE 2.5.2

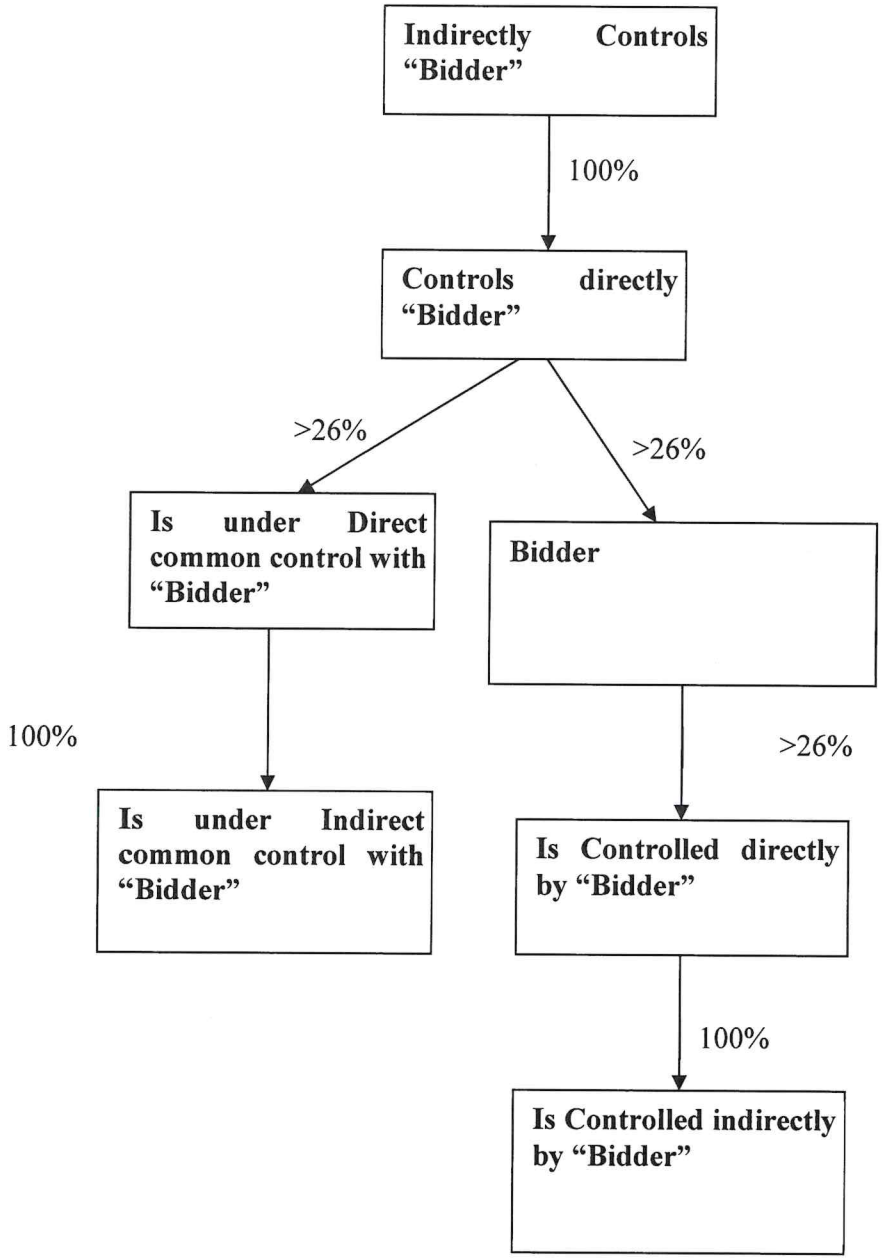
Investor in the TSP	Entities (other than Bidder) whose credentials (financial and/or technical) used by the Bidder for meeting RFP criteria	Applicable Board Resolutions	Requirement of Undertaking (Annexure 10)
Bidder himself for 100% equity	None	a) Format 1 of Annexure 11 - Resolution: 1, 2 and 4 from the Bidder	None
Bidder himself for 100% equity	Affiliate and/or Parent Company and/or Ultimate Parent	a) Format 1 of Annexure 11 - Resolution: 1, 2, and 4 from the Bidder b) Format 2 of Annexure 11 by either Technically/ Financially Evaluated Entity(ies) whose credentials have been used, or Ultimate Parent. Provided, if the Bidder himself is the Ultimate Parent, then Format 2 need not be provided.	Yes, by either Technically / Financially Evaluated Entity(ies) Affiliate(s) whose credentials have been used, or Ultimate Parent. Provided, if the Bidder himself is the Ultimate Parent, then the undertaking need not be provided.
Bidder himself + others (Affiliate and/or Parent Company and/or Ultimate Parent) in aggregate holding 100% equity	None	a) Format 1 of Annexure 11 - Resolution: 1,2, 3 and4 from the Bidder. b) Format 1 of Annexure 11 - Resolution: 1 from the Affiliate and /or Parent and /or Ultimate Parent investing in the equity	None
Bidder himself + others (Affiliate and/or Parent	Affiliate and/or Parent Company and/or Ultimate Parent	a) Format 1 of Annexure 11 - Resolution: 1,2, 3 and 4 from the Bidder. b) Format 1 of	Yes, by either Parent/ Affiliate(s) whose credentials have been used, or Ultimate Parent

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Investor in the TSP	Entities (other than Bidder) whose credentials (financial and/or technical) used by the Bidder for meeting RFP criteria	Applicable Board Resolutions	Requirement of Undertaking (Annexure 10)
Company and/or Ultimate Parent) in aggregate holding 100% equity		Annexure 11 - Resolution: 1 from the Affiliate and/or Parent and/or Ultimate Parent investing in the equity c) Format 2 of Annexure 11 by either Parent / Affiliate(s) whose credentials have been used and /or Ultimate Parent investing in the equity	



ANNEXURE 12 - FORMAT FOR ILLUSTRATION OF AFFILIATES



NOTE: **Bidder to provide the illustration, as applicable in their case, duly certified by the Company Secretary and supported by documentary evidence in this regard.**

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ANNEXURE 13 - FORMAT FOR DISCLOSURE

[On the letter head of Bidding Company / Each Member in a Bidding Consortium]

Date: .....

DISCLOSURE

We hereby declare that the following companies with which we/ have direct or indirect relationship are also separately participating in this Bid process as per following details

S. No.	Name of the Company	Relationship
1.		
2.		
3.		

In case there is no such company please fill in the column "name of the company" as Nil.

Further we confirm that we don't have any Conflict of Interest with any other company participating in this bid process.

Certified as True

.....

(Signature)

Name: .....

Signature & Name of authorized signatory of the Company and Stamp

The above disclosure should be signed and certified as true by the authorized signatory of the Bidding Company or of the Member, in case of a Consortium).



ANNEXURE 14 - FORMAT OF THE BID BOND

FORMAT OF THE UNCONDITIONAL AND IRREVOCABLE BANK GUARANTEE FOR BID BOND

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution.)

In consideration of the .....[Insert name of the Bidder] submitting the Bid inter alia for establishing the Inter-State transmission system for **"Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"** on build, own, operate and transfer basis, in response to the RFP dated 26.07.2024 issued by PFC Consulting Limited , and the Bid Process Coordinator (hereinafter referred to as BPC) agreeing to consider such Bid of ..... [Insert the name of the Bidder] as per the terms of the RFP, the [Insert name and address of the bank issuing the Bid Bond, and address of the Head Office] (hereinafter referred to as "Guarantor Bank") hereby agrees unequivocally, irrevocably and unconditionally to pay to _____[Name of BPC] or its authorized representative at _____[Address of BPC] forthwith on demand in writing from _____[Name of BPC] or any representative authorized by it in this behalf, any amount up to and not exceeding Rupees _____ Only (Rs _____ Crore),on behalf of M/s.....[Insert name of the Bidder].

This guarantee shall be valid and binding on the Guarantor Bank up to and including ..... [Date to be inserted on the basis of Clause 2.11 of this RFP] and shall not be terminable by notice or any change in the constitution of the Guarantor Bank or by any other reasons whatsoever and our liability hereunder shall not be impaired or discharged by any extension of time or variations or alternations made, given, or agreed with or without our knowledge or consent, by or between concerned parties.

Our liability under this Guarantee is restricted to Rupees _____ Only (Rs ____ Crore). Our Guarantee shall remain in force until .....[Date to be inserted on the basis of Clause 2.11 of this RFP]. _____[Name of BPC] or its authorized representative shall be entitled to invoke this Guarantee until ..... [Insert Date, which is three sixty five days (365) days after the date in the preceding sentence]. The Guarantor Bank hereby expressly agrees that it shall not require any proof in addition to the written demand from _____[Name of BPC] or its authorized representative, made in any format, raised at the above mentioned address of the Guarantor Bank, in order to make the said payment to _____[Name of BPC] or its authorized representative.

The Guarantor Bank shall make payment hereunder on first demand without restriction or conditions and notwithstanding any objection, disputes, or disparities raised by the Bidder or any other person. The Guarantor Bank shall not require _____[Name of BPC] or its authorized representative to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse against _____[Name of BPC] or its authorized representative in respect of any payment made hereunder.

This BANK GUARANTEE shall be interpreted in accordance with the laws of India.

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The Guarantor Bank represents that this BANK GUARANTEE has been established in such form and with such content that it is fully enforceable in accordance with its terms as against the Guarantor Bank in the manner provided herein.

This BANK GUARANTEE shall not be affected in any manner by reason of merger, amalgamation, restructuring or any other change in the constitution of the Guarantor Bank.

This BANK GUARANTEE shall be a primary obligation of the Guarantor Bank and accordingly _____[Name of BPC] or its authorized representative shall not be obliged before enforcing this BANK GUARANTEE to take any action in any court or arbitral proceedings against the Bidder, to make any claim against or any demand on the Bidder or to give any notice to the Bidder to enforce any security held by _____[Name of BPC] or its authorized representative or to exercise, levy or enforce any distress, diligence or other process against the Bidder.

Notwithstanding anything contained hereinabove, our liability under this Guarantee is restricted to Rupees _____ Only (Rs ____ Crore) and it shall remain in force until ..... [Date to be inserted on the basis of Clause 2.11 of RFP], with an additional claim period of three hundred sixty five (365) days thereafter. We are liable to pay the guaranteed amount or any part thereof under this BANK GUARANTEE only if _____[Name of BPC] or its authorized representative serves upon us a written claim or demand.

In witness whereof the Bank, through its authorized officer, has set its hand and stamp on this..... day of ..... at.....

Witness:

1.....
Name and Address

2. .....
Name and Address

Signature: .....
Name: .....

Designation with Stamp:

Signature .....

Attorney as per power of attorney No.....

For:
..... [Insert Name of the Bank]

Adani Energy Solutions Limited

Banker's Stamp and Full Address:

Dated this.....day of..... 20.....

Notes:

5. The Stamp Paper should be in the name of the Executing Bank.

ANNEXURE 15 - FORMAT FOR CONTRACT PERFORMANCE GUARANTEE

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution. Foreign entities submitting Bids are required to follow the applicable law in their country)

In consideration of the ..... [Insert name of the SPV or Selected Bidder on behalf of SPV or Lead Member in case of the Consortium, with address] agreeing to undertake the obligations under the Transmission Service Agreement dated ..... and the other RFP Project Documents and the Nodal Agency and ....._[Name of BPC], agreeing to execute the RFP Project Documents with the Selected Bidder, regarding setting up the Project, the.....[Insert name and address of the bank issuing the guarantee and address of the head office] (hereinafter referred to as "Guarantor Bank") hereby agrees unequivocally, irrevocably and unconditionally to pay to the Nodal Agency at..... [Insert Place and Address of the Nodal Agency indicated in TSA] forthwith on demand in writing from the Nodal Agency or any Officer authorized by it in this behalf, any amount up to and not exceeding Rupees.....Crores (Rs.....) only [Insert the amount of the bank guarantee] on behalf of M/s..... [Insert name of the Selected Bidder / SPV].

This guarantee shall be valid and binding on the Guarantor Bank up to and including .....and shall not be terminable by notice or any change in the constitution of the Bank or the term of the Transmission Service Agreement or by any other reasons whatsoever and our liability hereunder shall not be impaired or discharged by any extension of time or variations or alternations made, given, or agreed with or without our knowledge or consent, by or between parties to the respective agreement.

Our liability under this Guarantee is restricted to Rupees ..... Crores (Rs.....) only. Our Guarantee shall remain in force until..... [Insert the date of validity of the Guarantee as per Clause 2.12.1 of the RFP]. The Nodal Agency shall be entitled to invoke this Guarantee up to three hundred sixty five (365) days of the last date of the validity of this Guarantee.

The Guarantor Bank hereby expressly agrees that it shall not require any proof in addition to the written demand from the Nodal Agency, made in any format, raised at the above mentioned address of the Guarantor Bank, in order to make the said payment to the Nodal Agency.

The Guarantor Bank shall make payment hereunder on first demand without restriction or conditions and notwithstanding any objection by KPS III HVDC TRANSMISSION LIMITED, ... [Insert name of the Selected Bidder], ... [Insert name of the TSP] and/or any other person. The Guarantor Bank shall not require the Nodal Agency to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse against the Nodal Agency in respect of any payment made hereunder.

This BANK GUARANTEE shall be interpreted in accordance with the laws of India.



The Guarantor Bank represents that this BANK GUARANTEE has been established in such form and with such content that it is fully enforceable in accordance with its terms as against the Guarantor Bank in the manner provided herein.

This BANK GUARANTEE shall not be affected in any manner by reason of merger, amalgamation, restructuring, liquidation, winding up, dissolution or any other change in the constitution of the Guarantor Bank.

This BANK GUARANTEE shall be a primary obligation of the Guarantor Bank and accordingly the Nodal Agency shall not be obliged before enforcing this BANK GUARANTEE to take any action in any court or arbitral proceedings against KPS III HVDC TRANSMISSION LIMITED or the Selected Bidder, to make any claim against or any demand on KPS III HVDC TRANSMISSION LIMITED or the Selected Bidder, as the case may be, or to give any notice to KPS III HVDC TRANSMISSION LIMITED or the Selected Bidder, as the case may be, or to enforce any security held by the Nodal Agency or to exercise, levy or enforce any distress, diligence or other process against KPS III HVDC TRANSMISSION LIMITED or the Selected Bidder, as the case may be.

The Guarantor Bank acknowledges that this BANK GUARANTEE is not personal to the Nodal Agency and may be assigned, in whole or in part, (whether absolutely or by way of security) by Nodal Agency to any entity to whom the Nodal Agency is entitled to assign its rights and obligations under the Transmission Service Agreement.

The Guarantor Bank hereby agrees and acknowledges that the Nodal Agency shall have a right to invoke this Bank Guarantee either in part or in full, as it may deem fit.

Notwithstanding anything contained hereinabove, our liability under this Guarantee is restricted to Rupees .....Crores (Rs .....) only and it shall remain in force until [Date to be inserted on the basis of Article 3.1.2 of TSA], with an additional claim period of three hundred sixty five (365) days thereafter. This BANK GUARANTEE shall be extended from time to time for such period, as may be desired by..... [Insert name of the Selected Bidder or Lead Member in case of the Consortium or SPV]. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only if the Nodal Agency serves upon us a written claim or demand.

In witness where of:

Signature.....

Name: .....

Power of attorney No.: .....

For:

..... [Insert Name of the Bank]
Banker's Seal and Full Address, including mailing address of the Head Office

Notes:

1. The Stamp Paper should be in the name of the Executing Bank.

ANNEXURE 16 – FORMAT OF CHECKLIST FOR TECHNICAL BID SUBMISSION REQUIREMENTS

[This format needs to be duly filled in, signed by the authorized signatory of the Bidder (Bidding Company / Lead Member in case of a Bidding Consortium) and submitted along with the Bidder's Technical Bid]

Technical Bid Submission Requirements			Response (Yes / No)
1.	Format for the Covering Letter on the letterhead of Bidding Company or Lead Member of the Consortium, as applicable;		
2.	Format for Letter of Consent from each Consortium Member, including Lead Member, on their respective letterheads;		
3.	Format for evidence of authorized signatory's authority ;		
4.	Board resolution from the Bidding Company / Lead Member of the Consortium in favour of the person executing the Power of Attorney as per **Annexure 3**;		
5.	Power of Attorney from each Consortium Member in favour of Lead Member to be provided by each of the other Members of the Consortium as per **Annexure 4**;		
6.	Board Resolution from each Member of the Consortium, other than the Lead Member, in favour of their respective authorized representatives for executing the POA, Consortium Agreement and signing of the requisite formats;		
7.	Format for Bidder's composition and ownership structure, along with status of equity holding (owning ten percent or more of the total paid up equity) not earlier than thirty (30) days prior to the Bid Deadline as per **Annexure 5**;		
8.	Consortium Agreement duly signed as per **Annexure 6**, along with Appendix-1, indicating the responsibilities and obligations of each Member of the Consortium;		
9.	Format for Qualification Requirement:		
	a.	Calculation sheets, detailing computation of Networth considered for meeting Qualifying Requirements, duly signed and stamped by the Statutory Auditor of the Bidding Company / each Member in case of a Bidding Consortium / FEE in cases where credentials of FEE is taken;	
	b.	Calculation sheets, detailing computation of capital expenditure of projects and revenue received in construction projects considered for meeting	

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Technical Bid Submission Requirements			Response (Yes / No)
		Qualification Requirements, duly signed and stamped by the Statutory Auditor of the Bidding Company / Lead Member in case of Bidding Consortium / TEE in cases where credentials of TEE is taken;	
	c.	Last financial year unconsolidated / consolidated audited annual accounts / statements, as the case may be, of the Financially Evaluated Entity / Technical Evaluated Entity	
	d.	Unconsolidated audited annual accounts of both the TEE and the Bidding Company/Lead member, as applicable, from the financial years in which financial closure was achieved till the financial year in which the said project was completed / commissioned.	
10.	Copy of the Memorandum and Articles of Association and certificate of incorporation or other organizational document (as applicable), including their amendments, certified by the Company Secretary of Bidding Company or each Member in case of a Consortium including Lead Member.		
11.	Attachment of **Annexure 7(D)**, detailing projects completed / commissioned and for which commercial operation has commenced including Executive Summary for each project.		
12.	For each project listed in the attachment above, certified true copy of the certificates of final acceptance and / or certificates of good operating performance duly issued by owners or clients for the project, duly signed by authorized signatory in support of technical capability as defined in Clause 2.1.2 of RFP.		
13.	Authority letter in favour of BPC from the Bidder/every Member of the Consortium authorizing the BPC to seek reference from their respective bankers & others.		
14.	Authorization from Parent / Affiliate of Bidding Company / Member of Bidding Consortium whose technical / financial capability has been used by the Bidding Company / Member of Bidding Consortium.		
15.	Initialing of all pages of Technical Bid by the Authorized Signatory in whose favour the POA (**Annexure 3**) has been executed.		
16.	Format for Illustration of Affiliates at the most seven (7) days prior to the Bid Deadline, duly certified by Company Secretary and supported by documentary evidence.		

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Technical Bid Submission Requirements		Response (Yes / No)
17.	Certified copy of the Register of Members / Demat Account Statement, Share Certificate, Annual Return filed with ROC etc. submitted as documentary evidence along with **Annexure 12**.	
18.	Format for Disclosure by Bidding Company / each Member of the Consortium.	
19.	Format for Affidavit by the Bidding Company / each Member of the Consortium	
20.	Format for Authorization submitted in Non-Judicial stamp paper duly notarized.	
21.	Bidders Undertaking and details of Equity Investment	
22.	Proof of Payment of RFP Fees	
23.	Bid Bond/ Bid Security Declaration (As applicable)	
24.	Board Resolution as per Annexure 11 (If required)	

[**Note:** The checklist is not exhaustive. Bidders are required to submit all the information/documents as per requirement of RFP]

For and on behalf of Bidder

M/s. .....

.....
(Signature of authorized signatory)

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ANNEXURE 17 – LIST OF BANKS

The list of banks shall include all Scheduled Commercial Banks as per Second Schedule of RBI Act-1934 and any amendments thereof.

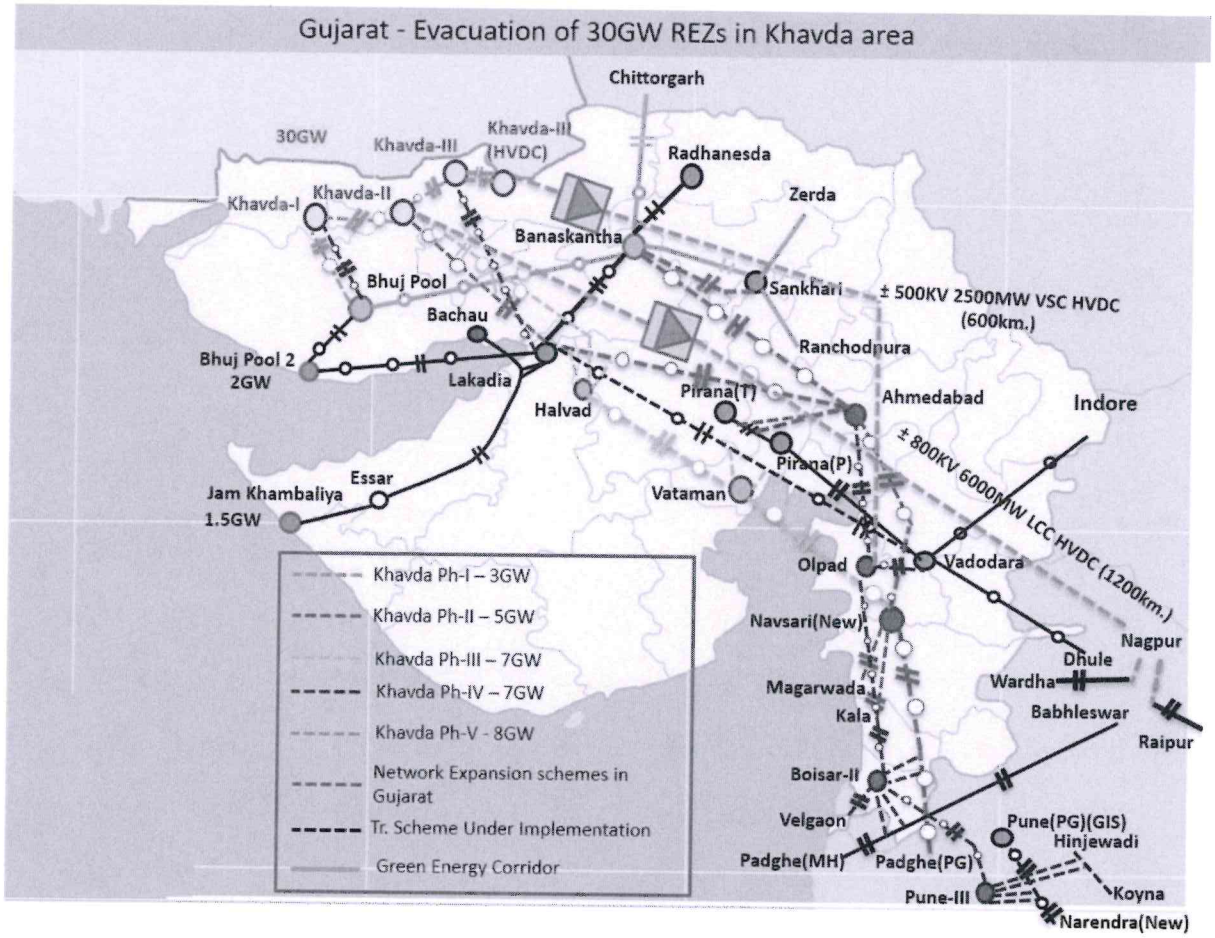
Note:
The above list of banks is indicative and can be modified by the BPC as required and any such change shall not be construed as a deviation from this document.

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ANNEXURE 18 - GRID MAP OF THE PROJECT

Transmission Grid Map indicating the details of the Project is given below:

Transmission Grid Map



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Location details of existing / proposed substations:

a. **South Olpad substation:**

Substation is under bidding under separate scheme.

b. **KPS3 Substation:**

24°12'26.58'N, 69°29'41.53"E

Note: *The above coordinates/location of substation indicated is approximate in the substation area. Exact coordinates for the corresponding bays/gantry for termination of the respective line may be verified and finalized in coordination with actual site.*

ANNEXURE 19 - FORMAT FOR CLARIFICATIONS / AMENDMENTS ON THE RFP / RFP PROJECT DOCUMENTS

S. No.	Name of the Document	Clause No. and Existing provision	Clarification required	Suggested text for the amendment	Rationale for the Clarification or Amendment

Signature .....

Name.....

For

Bidder's Rubber Stamp and Full Address.

(Note: This format shall be used for submission of requests for clarifications/ amendments on the draft RFP Project Documents as per the provisions of Clause 2.3.1)

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ANNEXURE 20 - LIST FOR RFP PROJECT DOCUMENTS

ENCLOSURE 1: TRANSMISSION SERVICE AGREEMENT (Provided separately)

ENCLOSURE 2:SHARE PURCHASE AGREEMENT (Provided Separately)

.....

[To be inserted by the BPC]



ANNEXURE 21 - FORMAT FOR FINANCIAL BID

[To be uploaded online]

Quoted Transmission Charges .....

Notes

1. The Bidders are required to ensure compliance with the provisions of Clause 2.5.3 of this RFP.
2. Quotes to be in Rupees Millions and shall be up to two (2) decimal points.
3. The contents of this format shall be clearly typed.
4. The Financial Bid shall be digitally signed by the authorized signatory in whose name power of attorney as per Clause 2.5.2 is issued.
5. Ensure only one value for annual Transmission Charges is quoted. The same charge shall be payable every year to TSP for the term of TSA.



ANNEXURE 22 – FORMAT FOR AFFIDAVIT

[On non-judicial stamp paper. Foreign companies submitting bids are required to follow the applicable law in their country]

AFFIDAVIT

We [including any of our Affiliate and Consortium Member & any of its Affiliate], hereby declare that as on Bid Deadline:

a. the Bidder & any of its Affiliate including any Consortium Member & any of its Affiliate, their directors or key personnel have not been barred or included in the blacklist by any government agency or authority in India, the government of the jurisdiction of the Bidder or Members where they are incorporated or the jurisdiction of their principal place of business, any international financial institution such as the World Bank Group, Asian Development Bank, African Development Bank, Inter-American Development Bank, Asian Infrastructure Investment Bank etc. or the United Nations or any of its agencies; or

b. the Bidder & any of its Affiliate including any Consortium Member & any of its Affiliate or their directors have not been convicted of any offence in India or abroad.

We further declare that following investigations are pending / no investigation is pending [strike off whichever is not applicable] against us [including any of our Consortium Member or Affiliate or Parent or Ultimate Parent or Affiliate] or CEO or any of our directors/ manager/key managerial personnel of the Applicant /Consortium Member or their Affiliates.

We further undertake to inform the BPC of any such matter as mentioned above on its occurrence after the date of this affidavit till the Effective Date.

We undertake that, in case, any information provided in relation to this affidavit is found incorrect at any time hereafter, our BID / Letter of Intent / contract (if entered) would stand rejected / recalled / terminated, as the case may be.

.....
Signature and Name of the authorized signatory of the Company Bidding Company / Lead Member of the Bidding Consortium

.....
(Signature of Notary Public)

Place: .....
Date: .....

Note: In case any investigation is pending against the Applicant, including any Consortium Member or Affiliate, or CEO or any of the directors/ manager/key managerial personnel of the Applicant

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/Consortium /Member or their Affiliates, full details of such investigation including the name of the investigating agency, the charge/offence for which the investigation has been launched, name and designation of persons against whom the investigation has been launched and other relevant information should be disclosed under this affidavit.



ANNEXURE A
Technical Details with respect to electronic bidding

Registration Methodology

In order to submit online bids in the e-bidding process for selection of Transmission Service Provider, interested Bidders are required to register themselves with the e-procurement website of MSTC limited namely www.mstcecommerce.com/eprochome/tsp/index.jsp. To register with the website, the Bidder is required to fill up the online form available under the link Register as Vendor in the above website and fill up the same and click on Submit.

During this process, the Bidder shall create his user id and password and keep note of the same. The Bidder shall ensure that the secrecy of his user id and password is maintained at all time and he/she shall alone be responsible for any misuse of the user id and password.

The Bidder may check the details entered by it before final submission. On successful submission of the online registration Form, the Bidder shall receive a confirmation mail in the registered email address advising the Bidder to submit the following documents.

i. Self-attested Income Tax PAN Card. In case of a registered Company or Firm, the Firm's PAN card and in case of a proprietorship firm, proprietor's personal PAN card is required. In case of partnership firm, PAN of the firm and that of the authorized partner are to be submitted.

ii. Copy of the confirmation email Letter received from MSTC after successful completion of on-line registration.

iii. A non-refundable registration fee of Rs.10,000/- plus GST as per applicable rate to be paid online. The account details will be available in the System generated email sent by MSTC post registration.

Please provide details of payment made like UTR No, remitting bank name, date of payment and amount in the covering letter.

The Bidder shall have to submit all the above documents to MSTC Limited for verification and activation of their login ids. The Bidders should send scanned copies of the above documents to the designated email id only which is given below.

tsp@mstcindia.co.in

It may be noted that Bidders need not visit any of the offices of MSTC Limited for submission of the documents.

Contact persons of MSTC Limited:

Ms. Archana Juneja
9990673698

Mr. Setu Dutt Sharma
7878055855

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Once the complete set of documents and requisite registration fee are received from a Bidder, MSTC shall activate the Bidder's login after verification / scrutiny of the documents. MSTC Limited reserves the right to call for additional documents from the Bidder if needed and the Bidder shall be obliged to submit the same.

On completion of the above stated registration process, a Bidder shall be able to login to MSTC's website.



ANNEXURE B
Draft Pre-Award Integrity Pact

GENERAL

This pre-bid contract Agreement (herein after called the Integrity Pact) is made on ..... day of the month of ..... 20....., between, on one hand, ... [Insert name of BPC] through Shri ..... [Insert Name & designation of representative of BPC] (hereinafter called the "Bid Process Coordinator/ BPC", which expression shall mean and include, unless the context otherwise requires, his successors in the office and assigns) of the First Part and M/s ..... represented by Shri ..... [Insert Name & Designation of Authorized Signatory of the Bidder/ Lead Member of Consortium] (hereinafter called the "Bidder" which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns) of the Second Part.

WHEREAS the BPC is conducting the bidding process for selection of bidder as Transmission Service Provider (TSP), who will be responsible to set up the transmission project on build, own, operate and transfer (BOOT) basis and to provide Transmission Service.

WHEREAS the Bidder is a Private Company/Public Company/Government Undertaking/ Partnership, constituted in accordance with the relevant law in the matter and the BPC is a Public Sector Undertaking (PSU) performing its function on behalf of the Ministry of Power, Government of India.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings during the complete bidding process with a view to:-

Enabling the BPC to select the bidder as TSP in conformity with the defined procedures by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling Bidder to abstain from bribing or indulging in any corrupt practice in order to emerge as selected bidder by providing assurance to them that their competitors will also abstain from bribing and other practices and the BPC will commit to prevent corruption, in any form, by its officials by following transparent procedures.

The parties hereto hereby agree to enter into this Integrity Pact and agree as follows:

Commitments of BPC

1.1 The BPC undertakes that no official of the BPC, connected directly or indirectly with

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the bidding process, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any person, organization or third party related to the bidding process in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.

1.2 The BPC will, during the bidding stage, treat all bidders alike, and will provide to all bidders the same information and will not provide any such information to any particular bidder which could afford an advantage to that particular bidder in comparison to the other bidders.

1.3 All the officials of the BPC will report the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.

2. In case of any such preceding misconduct on the part of such official(s) is reported by the Bidder to the BPC with the full and verifiable facts and the same is *prima facie* found to be correct by the BPC, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the BPC and such a person shall be debarred from further dealings related to the bidding process. In such a case while an enquiry is being conducted by the BPC the proceedings under the bidding process would not be stalled.

Commitments of Bidder

3. The Bidder commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre award stage in order to emerge as Selected Bidder or in furtherance to secure it and in particular commits itself to the following:-

3.1 The Bidder will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BPC, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the bidding process in exchange for any advantage in the bidding, evaluation, contracting and implementation of the bidding process.

3.2 The Bidder further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BPC or otherwise in bidding process or for bearing to do or having done any act in relation to bidding process or any other contract with the Government for showing or forbearing to show favour or disfavour to any person in relation to the

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bidding process or any other contract with the Government.

3.3 The Bidder shall disclose the name and address of agents and representatives and Indian Bidder shall disclose their foreign principals or associates.

3.4 The Bidder shall disclose the payments to be made by them to agents/brokers or any other intermediary, in connection with this bid.

3.5 The Bidder further confirms and declares to the BPC that the Bidder has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the BPC or any of its functionaries, whether officially or unofficially for selection of Bidder as TSP, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.

3.6 The Bidder, either while presenting the bid or during pre-award negotiations or before signing the Share Purchase Agreement, shall disclose any payments he has made, is committed to or intends to make to officials of the BPC or their family members, agents, brokers or any other intermediaries in connection with the bidding process and the details of services agreed upon for such payments.

3.7 The Bidder will not collude with other parties interested in the bidding process to impair the transparency, fairness and progress of the bidding process.

3.8 The Bidder will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

3.9 The Bidder shall not use improperly, for purpose of competition or personal gain, or pass on to others, any information provided by the BPC as part of the business relationship, regarding plans, technical proposal and business details, including information contained in any electronic data carrier. The Bidder also undertakes to exercise due and adequate care lest any such information is divulged.

3.10 The Bidder commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.

3.11 The Bidder shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.

3.12 The Bidder shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the BPC.

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4 Previous Transgression

4.1 The Bidder declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact, with any other company in any

country in respect of any corrupt practices envisaged hereunder or with any Public Sector Enterprise in India or any Government Department in India that could justify Bidder's exclusion from the bidding process.

4.2 The Bidder agrees that if it makes incorrect statement on this subject, Bidder can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

5 Bid Bond (Security Deposit)/ Bid Security Declaration (as applicable)

5.1 Along with the technical bid, the Bidder shall submit Bid Bond for an amount of Rs..... (as per the amount specified in Request for Proposal (RFP) Document) issued by any Banks from the list provided in RFP Document as Earnest Money/Security Deposit, with the BPC.

5.2 The Earnest Money/Security Deposit shall be valid & retained by the BPC for such period as specified in the RFP Document.

5.3 No interest shall be payable by the BPC to the Bidder on Earnest Money/Security Deposit for the period of its currency.

6 Sanctions for Violations

6.1 Any breach of the aforesaid provisions by the Bidder or any one employed by it or acting on its behalf (whether with or without the knowledge of the Bidder) shall entitle the BPC to take all or anyone of the following actions, wherever required:-

(ii) To immediately call off the pre-award negotiations without assigning any reason or giving any compensation to the Bidder. However, the proceedings with the other Bidder (s) would continue.

(iii) The Bid Bond (in pre-award stage) shall stand forfeited either fully or partially, as decided by the BPC and the BPC shall not be required to assign any reason therefore.

(iv) To immediately cancel the award, if already awarded, without giving any compensation to the Bidder.

(v) To cancel all or any other contracts with the Bidder. The Bidder shall be liable to pay compensation for any loss or damage to the BPC resulting from such cancellation/rescission.

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(vi) To debar the Bidder from participation in any tender or RFP issued by any BPC for an indefinite period.

(vii) To recover all sums paid in violation of this Pact by Bidder to any middleman or agent or broker with a view to securing the award.

6.2 The BPC will be entitled to take all or any of the actions mentioned at para 6.1 (i) to (vi) of this Pact also on the Commission by the Bidder or anyone employed by it or acting on its behalf (whether with or without the knowledge of the Bidder), of an offence as defined in Chapter IX of the Indian Penal code, 1860 or Prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption.

6.3 The decision of the BPC to the effect that a breach of the provisions of this Pact has been committed by the Bidder shall be final and conclusive on the Bidder. However, the Bidder can approach the Independent Monitor(s) appointed for the purposes of this Pact.

7 Independent Monitors

7.1 The BPC has appointed Independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation with the Central Vigilance Commission (Names and Addresses of the Monitors to be given).

7.2 The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.

7.3 The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.

7.4 Both the parties accept that the Monitors have the right to access all the documents relating to the project/procurement, including minutes of meetings.

7.5 As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he will so inform the Authority designated by the BPC.

7.6 The Bidder accepts that the Monitors has the right to access without restriction to all Project documentation of the BPC including that provided by the Bidder. The Monitor shall be under contractual obligation to treat the information and documents of the Bidder /Subcontractors(s) with confidentially. [As all the bid documents are with BPC only]

7.7 The BPC will provide to the Monitors sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the monitor the option to participate in such meetings.

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7.8 The Monitor will submit a written report to the designated Authority of the

BPC/Secretary in the Department within 8 to 10 weeks from the date of reference or intimation to him by the BPC / Bidder and, should the occasion arise, submit proposals for correcting problematic situations.

8 Facilitation of Investigation

In case of any allegation of violation of any provisions of this Pact or payment of commission, the BPC or its agencies shall be entitled to examine all the documents including the Books of Accounts of the Bidder and the Bidder shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination.

9 Law and Place of Jurisdiction

This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the BPC.

10 Other Legal Actions

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the any extent law in force relating to any civil or criminal proceedings.

11 Validity

11.1 The validity of this Integrity Pact shall be from date of its signing and upto 6 months from the date of transfer of project specific SPV i.e. signing of Share Purchase Agreement with BPC. In case Bidder is unsuccessful, this Integrity Pact shall expire after 15 days from the date of transfer of project specific SPV to successful bidder.

11.2 Should one or several provisions of this Pact turn out to be invalid, the remainder of this Pact shall remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

12. The Parties hereby sign this Integrity Pact at_____ on _____.

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Bid Process Coordinator (BPC)	**BIDDER**
Name of the Officer Designation Name of the BPC with address Witness: 1._____ 2. _____	Name of Whole time Director/Authorized Signatory Name of the Bidder with address Witness: 1._____ 2. _____



ANNEXURE-C
SPECIFIC TECHNICAL REQUIREMENTS FOR TRANSMISSION LINE

Annexure-A

Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC [Type: Voltage Source Converter (VSC)]

1. General

The proposed HVDC link shall be ±500 kV, 2500 MW HVDC line between KPS 3 (Gujarat) and South Olpad (Gujarat) using Dedicated metallic return and consist of Bipole (2x1250 MW). The bipole shall consist of Pole-1 (1250 MW) and Pole-2 (1250 MW). The HVDC terminals shall be implemented with 100% power reversal capability.

The system shall generally conform to the requirements of the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, Central Electricity Authority (Safety requirements for construction, operation and maintenance of electrical plants and electric lines) Regulations, 2011 as amended from time to time and any other relevant Rules/ Regulations/ Standards/ Guidelines.

2. Abbreviations

The following terminology shall apply at various places of this specification:

DMR:	Dedicated Metallic Return
DMRTB:	Dedicated Metallic Return Transfer Breaker
DPS:	Dynamic Performance Studies
ESCR:	Effective Short Circuit Ratio
FAT:	Factory Acceptance Tests
HMI:	Human Machine Interface
HVAC:	High Voltage Alternating Current
HVDC:	High Voltage Direct Current
HVRT:	High Voltage Ride Through
IBR:	Inverter Based Resources
Id:	Direct current (any defined value)
LCC:	Line Commutated Converter
VSC:	Voltage Source Converter
LI/SI:	Lightning Impulse/Switching Impulse
LVRT:	Low Voltage Ride Through

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NBS:	Neutral Bus Switch
NGBS:	Neutral Ground Bus Switch
PCC:	Point of Common Coupling
POI:	Point of Interconnection
PMR:	Pole Metallic Return
PMRTB:	Pole Metallic Return Transfer Breaker
RPC:	Reactive Power Control
SAS:	Substation Automation System
SCADA:	Supervisory Control and Data Acquisition
SCR:	Short Circuit Ratio
SSTI:	Sub-synchronous Torsional Interaction
TSP:	Transmission Service Provider
Ud:	Direct voltage (any defined value)

3. Definitions

Bipole: A pair of two (2) poles which are connected to opposite polarities (positive and negative). For power transmission in one Bipole, two such pairs are required.

Forward Power flow direction: Active power transmission from Khavda PS3 to South Olpad HVDC.

Inverter: HVDC terminal which is receiving the power.

MMC: (**Modular Multi-level Converter**): Multi-level converter in which each valve arm consists of multiple power modules connected in series.

MMC building block: self-contained, two-terminal controllable voltage source together with D.C. capacitor(s) and immediate auxiliaries, forming part of a MMC.

PCC (Point of Common Coupling)/ POI (Point of Interconnection): The connection point between the HVDC and the power system at which performance requirements are defined.

Reverse Power flow direction: Active power transmission from South Olpad to Khavda PS3

VSC phase unit: Equipment used to connect the two DC terminals to one AC terminal.

VSC unit: Three VSC phase units, together with VSC unit control equipment, essential protective and switching devices, DC storage capacitors, phase reactors and auxiliaries, if any, used for conversion

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VSC converter unit: Individual operative unit comprising all equipment between the point of connection on the AC side and the point of connection on the DC side, essentially one or more VSC converters, together with one or more interface/converter transformers, converter unit control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion.

VSC converter station (HVDC Substation): Part of VSC HVDC system which consists of one or more VSC converter units including DC switchgear, DC fault current controlling devices, if any, installed in a single location together with buildings, reactors, filters, reactive power supply, control, monitoring, protective, measuring and auxiliary equipment.

VSC HVDC system: High-voltage direct current transmission system connecting two VSC converter stations transferring energy in the form of HVDC including related transmission lines and/or cables, switching stations, if any, as well as other equipment and sub-systems needed for operation

STATCOM operation: Mode of operation of a converter when only reactive power (capacitive or inductive) is exchanged with the AC system [Ref: IEC 62747:2019]

SCR: Ratio of the AC network short-circuit level (in MVA) at 1 p.u. voltage at the point of connection to the AC bus of the HVDC substation, to the rated DC power of the HVDC substation (in MW) [Ref: IEC 62747:2019]

Operating state: Condition in which the HVDC substation is energized and the converters are de-blocked [Ref: IEC 62747:2019].

Valve blocking: State condition of a valve when all IGBTs are turned off [Ref: IEC 62747:2019] In reading of this RfP, term "BIGT" can be used interchangeably for "IGBT".

Converter blocking: Operation to initiate a mode change from operating state to blocked state of a VSC unit [Ref: IEC 62747:2019].

Converter deblocking: Operation to initiate a mode change from blocked state to operating state of a VSC unit [Ref: IEC 62747:2019].

Inductive operation: Operation in which the converter consumes reactive power from the AC system with or without exchanging active power [Ref: IEC 62747:2019].

Capacitive operation: Operation in which the converter feeds reactive power into the AC system with or without exchanging active power [Ref: IEC 62747:2019].

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For Definition, relevant standards as mentioned in the clause 51 of this Annexure may be

referred.

VSC Transmission configuration:

± 500 kV HVDC Bipole system between KPS3 (HVDC) and South Olpad (HVDC) shall be VSC transmission in bipolar configuration with dedicated metallic return as indicated in Fig.1 below.

The PCC points shall be connection of Pole 1 and Pole 2 to 400 kV AC Bus sections at KPS-3 (HVDC) substation and connection of Pole 1 and Pole 2 to 400 kV AC Bus at South Olpad.

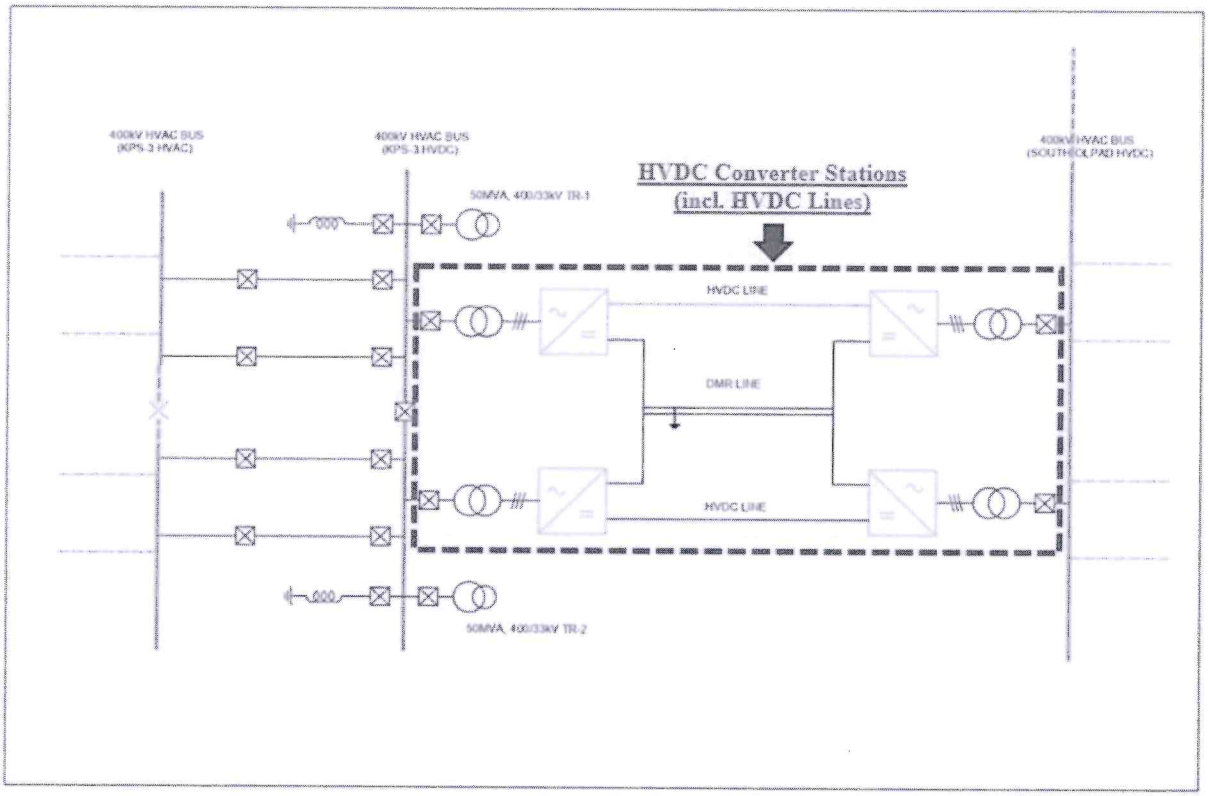


Fig.1: VSC transmission in bipolar configuration with dedicated metallic return

Design Consideration:

The salient technical features for HVDC terminals shall be as follows (Table 1):

Table 1

Sl. No.	Item Description	Parameters
1.	Rectifier station location (Forward direction power)	Near KPS3 (Gujarat) [If the power direction is reversed, Khavda becomes inverter]
2.	Inverter station location (Forward direction power)	South Olpad (Gujarat) [If the power direction is reversed, South Olpad will become rectifier]
3.	Rated DC voltage (1.0 pu)	± 500 kV DC at Rectifier HVDC Pole Bus

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Sl. No.	Item Description	Parameters
4.	Rated power (1.0 pu)	2500 MW at Rectifier DC Bus
5.	Minimum DC Power	0 MW
6.	AC system frequency	Nominal 50 Hz
7.	Fault Current level AC system	63 kA for 1 sec for Khavda (HVDC) Near KPS3 63 kA for 1 sec for South Olpad
8.	Minimum Short circuit level (MVA) at 400 kV Khavda KPS3 (both rectifier and inverter operation)	14400 MVA# for both Sec-I and Sec-II (with IBR) 12600 MVA# for both Sec-I and Sec-II (without IBR) *(Considering outage of 2x1500 MVA ICTs on each section, with 400 kV bus sectionaliser kept open)*
9.	Minimum Short circuit level (MVA) at 400 kV South Olpad (both rectifier and inverter operation)	15400 MVA# *(Considering outage of 1x1500 MVA ICT)*
10.	Reverse power rating	100% of rated forward direction power transfer rating$
11.	Reduced voltage	80% of rated DC voltage [Applicable for both power flow directions]
12.	Converter transformer	Single phase two winding design
13.	IGBT/BIGT Valve	Water cooled
14.	Valve cooling system	Dry type design
15.	HVDC control system*	Main + hot standby
16.	HVDC protection system*	Duplicated Protection
17.	Auxiliary supply source	Two supplies shall be fetched from the 33 kV side of 2 Nos. of 400/33 kV transformer (50 MVA) at KPS3 HVDC and 33 kV tertiary of 2 Nos. 765/400/33 kV ICT at South Olpad.
18.	DC Harmonic filter	DC filter for each pole at each HVDC terminal station, if required as per TSP/OEM design
19.	AC Network Impedance	5th Harmonic 1.5% 7th Harmonic 1.0% Other Harmonics 0.5% (each) Further, Relevant CIGRE/ IEC document shall be used for the Network harmonic impedance together with information in PSSE network files

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Sl. No.	Item Description	Parameters
		provided by CTU.
20.	Negative sequence voltage (fundamental frequency)	1% for Performance 1.5% for rating of equipment
21.	Online fault locator for HVDC pole lines	One No. per pole at each terminal station [when not integrated with Control and Protection System]
22.	Blocking filter	As per requirement
23.	Reliability and Availability Design Targets	As per Table 10
24.	Station Loss evaluation criteria	Methodology as per IEC 61803 and IEC 62751 and Target figures stated in Table 10
25.	System Grounding	Solidly grounded or Resistive Grounding as per OEM Practice

 # The values of short circuit level are based on available network topology and generalized parameters for various network elements.

** TSP can provide integrated Control and Protection system as well meeting functional requirements.*

$ The power reversal in HVDC links shall be possible from the maximum active power transmission capacity from KPS3 (HVDC) to South Olpad (HVDC) to the maximum active power transmission capacity from South Olpad (HVDC) to KPS3 (HVDC) within 60 minutes.

The criteria for the design and control of the network shall be as follows:

- 400 kV AC bus voltages shall normally be within ±5.0% of nominal voltage (400 kV). Bus voltages outside this range may occur from time to time and may exist for long periods due to abnormal loads and/or contingencies. Unless otherwise stated, all equipment shall be rated to operate safely for AC voltages between 360 kV – 440 kV at the converter stations.

- AC system frequency shall normally be within 48.5 Hz to 51 Hz and the HVDC system shall operate in this range without any restrictions on power transfer. However, equipment shall be rated for 47.5 Hz to 52.5 Hz band except AC/ DC filters, if any.

- For calculating reactive power exchange and filter performance (if any), the 400 kV AC voltage variations to be taken, shall be from 380 kV to 420 kV and the frequency shall be from 49.0 Hz to 50.5 Hz. Frequency range for AC/DC filter (if any) rating shall be 48.5 Hz to 51 Hz.

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5. Environmental Data

The environmental data shall be considered as per following Table-2:

Table 2

Sr. No.	System data	Khavda (HVDC) Near KPS3	South Olpad
1	Max/ min Ambient temperature (dry bulb one-hour average) Max dry bulb 24 hr average	50 deg C max 0 deg C min 40 deg C	50 deg C max 0 deg C min 40 deg C
2	Relative Humidity (%, max)	100	100
3	Average annual rainfall	As per rainfall map of IMD	As per rainfall map of IMD
4	Iso-keraunic level	As applicable	As applicable
5	Wind Zone	As per National Building Code 2016	As per National Building Code 2016
6	Seismic Level	As per Seismic zone of the site	As per Seismic zone of the site
7	Altitude above sea level	< 1000 m	< 1000 m
8	Pollution level (IEC 60815)	Heavy	Heavy

6. System Performance

The HVDC system shall be designed to meet all performance requirements and shall be compatible with the existing power system. The HVDC system shall not cause instability to the existing AC network. Also, it shall not cause adverse effects to other HVDC system(s) in vicinity, solar based generation plants (near Khavda KPS-3) as well as other Generating Units. This shall be verified by stability, multi-infeed and Sub Synchronous Resonance (SSR) studies and any other Study required, if applicable. The steady state, dynamic, HVRT, LVRT, Harmonic and flicker performance requirements as per applicable Rule/ Regulations/ Standards/ Guidelines shall be applicable.

The rated power transmission capacity shall be defined and guaranteed at Rectifier DC Bus and rated transmission voltage shall be defined at the rectifier DC bus. In the calculation of the power transmission capability, the most unfavourable combination of control and measurement tolerances shall be considered and without redundant cooling and submodules. All components of the transmission system shall be rated to meet the requirements given in this section and other requirements specified elsewhere in this Specification.

HVDC system performance and rating requirements for high voltage equipment and other critical equipment shall be determined taking into account the extreme values of environmental and AC and DC system parameters as applicable for performance/rating requirements given in this specification and manufacturing and measuring tolerances.

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TSP shall determine the PQ diagram of the individual converters as well as the total DC transmission system. The PQ diagram shall be valid for all 400 kV AC bus voltages in the range of 380 kV to 420 kV and for all frequencies in the range of 48.5 Hz to 51.0 Hz. The PQ diagram shall also show, where applicable, different limits for 47.5 Hz to 52.5 Hz and for bus bar voltages in the range of 360 kV to 440 kV.

Mode	Power Range	Min Capacitive Reactive power per pole (MVAr)	Min Inductive reactive power per pole (MVAr)
Pole Power	0-1250 MW	410	410
Pole in STATCOM mode	0	625	625

There shall be no restriction on connecting, starting and operating the HVDC link if frequency and AC voltage at rectifier station are within 48.5-51.0 Hz and 380 - 420 kV respectively. Khavda end of link shall be operated as a grid forming facility that provides 50 Hz power frequency and controls the AC voltage level at 400 kV bus.

For calculations, the maximum line resistance shall be taken at a maximum conductor temperature of 85°C with minimum wind velocity and maximum solar radiation while for minimum line resistance the conductor temperature shall be taken as 0°C.

7. DC Voltage:

The nominal direct voltage at the Rectifier converter station shall be ± 500 kV relative to neutral. This voltage shall be maintained within ± 10 kV by tap changer and modulation index control for all power flows with balanced current between the poles/converters for all AC bus bar voltages between 380 kV and 420 kV and for all AC system frequencies between 49.0 Hz and 50.5 Hz.

In any monopolar operation, the rectifier Pole Voltage to Ground may be decreased by equivalent Voltage drop in DMR line.

In the event that the AC system voltage is below 380 kV, down to 360 kV, the DC line voltage may be correspondingly reduced.

If the AC system voltage at Rectifier or Inverter end is above 420 kV but not exceeding 440 kV, the DC line voltage to ground may be increased but shall not exceed 525 kV at Rectifier.

The above references to DC pole voltages shall be interpreted as extremes and shall not be exceeded due to measurement error, tap changer control dead band, tolerances in the manufacture or in the control system, harmonics or for any other reason.



Reduced DC Line Voltage

The HVDC system shall be capable of operating continuously at a nominal pole voltage of 400

kV relative to neutral at rectifier DC bus in bipolar as well as in monopole modes. Rectifier station shall be capable of transmitting power flows upto 2000 MW in bipolar link and 1000 MW in Monopole. Redundant cooling may be in service. The pole voltage shall be within 10 kV of the above, provided that the AC bus voltage is below 400 kV.

It shall also be possible to set DC voltage reference between 400 kV to 500 kV in either pole in the steps of 1 kV by the operator action.

Power levels in this voltage range shall be as permitted by the main circuit rating of the equipment. However, reduced voltage attempt by DC line protection shall directly first achieve 400 kV. The reduced voltage may be achieved by a combination of tap changer and modulation index control.

Reduced voltage operation shall be possible to be ordered by operator from either station. The change from normal to reduced voltage operation and vice versa shall not require a converter block or reduction in power below that achievable with the reduced voltage. It shall be possible to start the transmission in reduced voltage mode.

9. Converters Operating modes

The HVDC equipment at both Converter Stations shall be designed and rated to operate with different DC power orders. Necessary facilities shall be provided to permit these modes of operation and to allow the individual Pole power and/or voltage to be set as per below.

Each Pole and Bipole shall be capable of transmitting power for the system short circuit levels specified in this specification. These operating modes shall also be available for reverse power and reduced voltage operation. The poles should have the facility to operate independently with capability to transfer any excess power requirement from one pole to the other in the event of a trip of one pole. The healthy pole shall be limited to its rated capacity.

The minimum operating modes are as follows:

(a) **Balanced Bipolar**: This mode is the normal mode of operation for the link. In this mode DC currents in the two poles should be balanced and any small unbalance current between the poles should flow through DMR.

(b) **Unbalanced bipolar operation**: Two poles running at different power levels and difference in pole currents flowing through DMR.

(c) Monopolar operation with Dedicated Metallic Return (DMR i.e., D1 or D2 or D1||D2) mode

(d) Monopolar operation with Pole Metallic Return (PMR) mode.

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(e) **Constant frequency and AC voltage control mode**: HVDC station at Khavda is connected to HVAC network integrated with renewable solar and wind generators. During disturbances HVAC network at Khavda may get isolated therefore the HVDC station at rectifier shall always operate as a grid forming facility that provides 50 Hz power frequency and control the AC voltage at 400 kV level. The operator shall be able to set an appropriate droop in the AC voltage control to achieve a reasonable contingency reserve and sharing of reactive power with other reactive power in the system

(f) **Reactive Power and AC voltage control mode:** each Converter Station shall be designed and able to independently control the reactive power or the AC voltage. The operator shall be able to select between the reactive power and AC voltage control modes and shall also be able to select the reference values for Q/ U_{ac}. The voltage control strategy should not result in excessively high tap changer operations of converter transformers. AC voltage and reactive power control of each converter station shall operate stably with nearby reactive power compensation devices. Any oscillations of power and voltage at the HVDC converter shall be well damped and eliminated.

(g) **STATCOM mode:** In case HVDC pole is not transmitting power, healthy converter shall be capable of operating independently under Statcom Mode. The operator shall be able to activate Statcom mode separately for each converter station.

(h) **Black start:** Facility for Black start capability shall be possible for both the stations. TSP shall determine and provide any additional equipment such as diesel back up, batteries, etc. that is required to be able to carry out black start in both directions. This shall include any hardware and all the necessary control functions to perform the black start.

10. System Studies

The TSP shall be responsible for overall system engineering and detailed design of all elements, systems, facilities and equipment. The TSP shall have to carry out following studies and shall submit the study reports for this purpose for both directions of power flow. The TSP may note that the following list is only indicative and if any other studies, calculations etc. are required the same shall have to be done by TSP.

(a) Main circuit parameters

(b) Transient Current Requirement and Short circuit studies

(c) Thermal Rating Study for Key Equipment

(d) Studies for Overvoltage Protection and Insulation co-ordination for AC and DC systems

(e) AC, DC Harmonics (if applicable, required as per OEM's design) filter design, rating and

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performance

(f) Temporary overvoltage (TOV) and Fundamental Frequency Temporary Over Voltage-(FFTOV) and Ferro Resonance Overvoltage Studies

(g) AC and DC Transient overvoltage Study, surge arrester stress

(h) Runback and run up studies (the Last Line/ Last Breaker logic (if required) shall be limited to the AC lines and AC breakers within the HVDC stations)

(i) AC breaker Transient Recovery Voltage (TRV) and rate of rise of recovery voltage (RRRV) studies

(j) DC High Speed Switch Requirement Study (as applicable)

(k) AC equivalent study

The equivalents to be prepared for peak load, light load and extremely weak (minimum SCR) network scenarios. The dynamic network equivalent shall be prepared with full machine models having exciters, governor-turbine, generators, stabilizer models instead of voltage source models, up to a minimum of two buses away. These dynamic equivalent networks shall be used in PSCAD DPS, Real Time Digital Simulator (RTDS) DPS, with actual control and Protection panels.

(l) DC Commutation switch requirements (as applicable)

(m) Load flow, stability, modulation and frequency controller design study

(n) LVRT, HVRT, harmonic resonance and other dynamic studies

(o) Black start islanded operation studies at both ends

(p) Electrical interference (RI and PLC) study , filter design, rating and performance

(q) Reliability and availability study

(r) Audible noise study

(s) Loss calculations/study

(t) Studies for deciding the operational logic and sequences considering Dedicated Metallic Return Conductor (DMR) operation and Metallic return with pole conductor, in case of monopolar Operation

(u) Impact of parallel AC lines

(v) Real Time Simulator-based studies for testing of actual HVDC Controls (Factory Acceptance Test or Factory System Test)

(w) AC/ DC system interaction studies

(x) Interaction studies between this VSC HVDC and other nearby HVDC stations and nearby Inverter Based Resources (IBR)

(y) Studies to determine the requirements for communication between the converter stations and remote Load Despatch Centres (LDCs).

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(z) Studies for designing the equipment for Dedicated Metallic Return Conductor (DMR) operation and metallic return with pole conductor, in case of monopolar operation up to rated power.

(aa) Sub synchronous Resonance and Self Excitation Studies

These studies shall be carried out to demonstrate that the HVDC system does not excite the torsional modes of oscillations and self-excitation of the generators and Sub-synchronous Resonance in thermal/gas turbine generators near Converter Stations under all defined system operating conditions. The study shall demonstrate that the HVDC system has positive damping for all sub synchronous torsional modes of the generators.

(bb) Studies of DC Current flowing through Windings of Converter Transformers

(cc) Studies of DC Current flowing through breakers on AC side of converter transformer for earth faults on converter side of transformer at locations as applicable and sizing of auxiliary resistor to ensure zero crossings in the total current in the AC breaker.

(dd) AC line and other bays protection co-ordination studies in grid forming mode.

(ee) Studies for the Control, Protection and Communication Systems

(ff) DC over voltage studies

(gg) Low frequency characteristics

(hh) High frequency characteristics

(ii) Station earthing

The study reports shall include the following study results:

(i) Dynamic Performance Study including the RE Resources near Converter Stations

(ii) Hierarchical Structure of the Control and Protection

(iii) Redundancy of the Control and Protection Systems

(iv) DC Power and Voltage Control Modes and Features

(v) Switching Sequences and interlocking

(vi) AC and DC System Protections

For each protection, the report shall include the following:

a) Purpose of the protection

b) Principle of protection operation

c) Required accuracy of measuring signals

d) Fault detection and coordination between the DC controls and the protection and AC protection.

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e) Consequences of protection operation, such as DC control and sequence control initiated at both converter stations

f) Redundancy of protection and operation of backup protection

g) Detailed calculations of the protection settings together with limiting fault cases and/or criteria that determine these settings.

h) Description of the applicable protection in case of loss of telecommunication.

(vii) Reactive Power Control

The study shall include at least the following:

a) Reactive power control principles for converter operation during steady state and transient conditions including STATCOM mode of operation

b) Switchover and control feature between AC voltage/reactive power controls

c) Reference variable control criteria

d) Criteria for switching of reactive power sub banks, as applicable.

e) Operator operation, including control and monitoring features

f) Equipment description, emphasizing reliability/availability and maintenance features

g) Validity checking of signals

(viii) Telecommunication Interface Requirements

(ix) Station Control and SCADA System

(x) Control for Converter Transformer Tap changer

(xi) Additional Control Study

The report, as applicable shall include the studies of the following control modes with the AC network condition of Khavda and South Olpad and actual performance of converter equipment and possible fault condition being taken into account.

a) Power ramp down

b) Power ramp up

c) Damping of sub-synchronous oscillations

d) Abnormal AC voltage and frequency control

e) Supplementary modulation signals

f) Fault current infeed studies

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g) Negative sequence current infeed studies

(xii) Multi Infeed Interaction Study with nearby HVDC Systems

(xiii) Black Start Mode network studies.

(jj) Any other studies as deemed necessary by TSP

TSP shall carry out necessary studies for performance under this RfP considering the 400 kV Bus-sectionalizer at KPS-3 (S/s) in both Open and closed condition.

The load flow and dynamic file shall be provided to the TSP in PSS/E 34 or newer version format. This will include maximum and minimum fault contribution from conventional generation and IBRs considering full power, reduced dc voltage power, black Start modes and other network scenarios which can lead to highest possible dynamic overvoltage variations. Necessary Generic Models for IBRs or modelling assumptions shall also be provided for studies requiring the same. Conventional generator, lumped mass model and controller models in vicinity shall also be provided. For sharing User defined Models (UDMs) TSP and Solution Providers will be required to abide with the statutory requirements of the UDM provider if required.

In case of absence of detailed models of nearby inverters and 6000 MW LCC HVDC, the harmonic distortions shall be considered as per the relevant CEA Regulations. The impedance of RE Park at the Pooling station PCC will be provided to the TSP. The rest of the network may be modelled by the harmonic impedance and the rating and performance studies shall be done accordingly. Harmonic impedance shall take into account all contingencies in base file, N-1, N-2 and other PSS/E scenarios for network for full power and reduced DC power.

PSS/E files shall be provided based on the data available at the time of issuance of the RfP. The TSP is required to validate the data before carrying out simulation. However, clarification, if any, may be sought before the bid submission. CEA/ CTU shall endeavour to give clarification to the extent possible. In case of any discrepancy observed/ non-availability of data for any of the machines and other control devices, typical values may be used in the studies with the intimation to CEA/ CTU.

11. Digital Models

TSP shall provide to CTU following models of all supplied circuit components and control and protection of the HVDC Systems. The models shall be up to date with all the design features implemented in the Project.

(a) PSCAD
(b) PSS/E

TSP shall provide both UDM and Generic model for RMS based stability model (in PSS/E V36 or above) and EMT (PSCAD). All appropriate control features shall be modelled in the above

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models and necessary documentation on the theory and use of model should be provided. Further, a generic model, benchmarked to the extent possible to the UDM PSS/E and PSCAD model, shall also be furnished. Generic models can be shared by the CEA, CTU and Grid-India with the concerned stakeholders/**external party(ies)** e. g. STUs etc. **on need basis**. For User Defined model, confidentiality shall be maintained by the CEA, CTU and Grid-India. For PSCAD, User Defined model shall be provided by the TSP for which confidentiality shall be maintained by the CEA, CTU and Grid-India. Both UDM (PSCAD and PSS/E) and Generic model (PSSE) shall be provided by OEMs to CEA/CTU/GRID-INDIA without any NDA (Non-Disclosure Agreement)

Data sharing requirements as per Procedure for First Time Charging/ Energization (FTC) and Integration of New or Modified Power System Element to Grid Controller of India Ltd. (GRID-INDIA) shall also be done by the TSP. All the requisite data/ reports/ models including User defined models/ documents as required as per the CEA/CTU/Grid India Standards/ Guidelines shall be provided by the TSP. Data sharing format will be subject to the agreement or other statutory requirements mandated by HVDC Solution Providers if required.

12. DC power circuit switching requirement:

The TSP shall provide all DC switching devices as per the requirements of this Specification to enable the smooth and efficient operation of the HVDC system. TSP may decide at which end DMR shall be connected to earth based on the practices being followed by the Original Equipment Manufacturer (OEM).

All disconnectors or isolators which are used to provide isolation for maintenance on any equipment shall have visible breaks. If a visible break is not inherent then an additional separate isolator having a visible break shall be provided.

The equipment arrangement shall be designed to ensure that no single contingency, fault or loss of any piece of equipment except common equipment to both the poles can cause or result in a bipolar shutdown or transient reduction in power transfer to less than the rating of one Pole.

High speed switches for discharge of the DC line shall be provided with disconnector.

The station layout shall provide safe access to all equipment for service and maintenance. The DC power circuit arrangement shall provide at least the following functions:

(a) Isolating and grounding Converter Station Pole for maintenance.

(b) Isolating and grounding either or both DC transmission line Poles for maintenance.

(c) Isolating and grounding the DMR conductor at the Converter Station for maintenance when operating in bipolar mode with balanced DC currents. All primary equipment, control, protection and measuring equipment necessary to achieve this function shall be provided. All the studies and design engineering necessary for the HVDC System to operate in such modes shall be performed.

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(d) Clearing of a Pole for maintenance without affecting the power flow on the other Pole.

(e) Switching between active power transmission and STATCOM mode

(f) Grounding of the neutral bus through a high-speed switch (NBGS) during bipolar operation balanced current mode.

(g) Clearing neutral bus fault on one Pole.

13. Insulation co-ordination

(a) HVDC System shall be suitably protected against Impulses and disturbances external and internal to the system such as switching impulses, lighting impulses, steep front impulses, dynamic over voltages and load rejection (1 pu power). The insulation of all equipment shall be properly protected and coordinated with surge arresters and/or surge capacitors. Insulation coordination shall be done keeping in mind the minimum electrical clearances, safety clearances and maintenance clearances as per Switching Impulse Withstand Level (SIWL). Insulation coordination shall be done as per relevant IS/ IEC Standards.

(b) The insulation of the equipment and protection levels of Surge Arresters connected to the converter AC bus bars of the converter stations at both rectifiers and inverter shall be coordinated with the insulation and surge arrester characteristics of the connected AC systems to which the converter stations are to be connected without exceeding the discharge duty of these arresters so as not to overload these existing arresters of the network. Only 336 kV surge arrester (rated voltage) shall be used on 400 kV AC incoming line side.

(c) The tripping action for lines shall be initiated if the fundamental frequency over voltage exceeds 1.1 pu for 5 seconds and if 1.5 pu fundamental frequency voltage persists for more than 100 milliseconds. The HVDC over voltage strategy shall be coordinated with such setting.

(d) The minimum **insulation levels** for 500 kV DC transmission line to ground shall be as per CEA Regulations:

- Lightning impulse withstand voltage (1.2/50 micro sec) (kVp): 1800 kV
- Switching surge withstand voltage under wet condition (kVp): 1000 kV

(e) The ratio of **impulse withstand voltage** to impulse protective level shall be in line with Table 3 of IEC-60071-11.

(f) The TSP shall carry out insulation coordination studies for the Project. The TSP shall perform all necessary HVDC digital simulator studies and shall keep detailed report(s) on

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insulation coordination in its record. The TSP shall carry out insulation coordination studies for rating of all arresters supplied for the project, establishing the required insulation level for supplied equipment and the clearances between energized parts and between energized parts and the ground. The arrester arrangement and protective levels shall be selected such that, generally, the overvoltage on the AC side is protected by arresters on the AC side, and overvoltage on the DC side are adequately limited by an arrangement of arresters on the DC side. Critical components of the supplied converter equipment shall be directly protected by arresters connected closest to them. The arresters installed shall be rated such that these arresters are not overstressed for all operating modes and configurations. The studies must show that any existing 420 kV equipment including any existing surge arrestors will not be overstressed for all modes of operation and configurations of either Converter Station when HVDC station is extension of an existing AC station.

The report(s) shall detail the characteristics of the surge arresters, energy ratings and shall demonstrate that the selected insulation protective and withstand levels, discharge and coordinating currents, and arrester ratings and discharge capabilities are adequately coordinated and comply with the requirements of this Specification. It shall also detail all insulation and air clearances and leakage distances and shall justify the selected values based on the present Specifications. The report(s) shall include all assumptions made for the study parameters and describe the types of events modeled (i.e. AC and DC faults, transformer bushing faults, converter valve or control mis-operations, etc.) and identify the decisive cases that establish the insulation design.

(g) **Temporary Overvoltage**

High voltages at the converter buses can occur due to load rejections or other cause. The HVDC system shall remain connected and provide dynamic voltage control to mitigate the voltage rise within the capability of the equipment. The requirement for ac system voltage control during an overvoltage has highest priority and therefore it is permissible to run back the active power transfer to limit the overvoltage.

The converter valves shall be capable of continuing to operate under the temporary overvoltage conditions specified below, which could occur with the valves deblocked and also that the valves are capable of deblocking under the highest temporary over voltage conditions within five (5) cycles of the initiation of a fault or disturbance. The equipment shall be designed for the applicable short circuit ratio and overvoltage arising thereby.



Temporary Overvoltage caused by Bipole link HVDC transmission shall be controlled to 1.4 pu or below. Temporary overvoltage caused by other equipment in the AC network shall be controlled within the limits of the capability of the deblocked converter. In case of DC line permanent fault, the converters should restart in STATCOM mode for AC grid support. In case the converter is tripped, and not possible to restart within seconds, filter tripping shall be allowed to limit overvoltage as applicable.

The actual temporary overvoltage shall be determined by the TSP, but the equipment shall be designed for temporary over voltage not less than the values given above. In addition, so as to prevent operation and overstressing of the arresters, the TSP shall limit the temporary over voltages including harmonic, resonant, and ferro-resonant effects on the 400 kV AC bus bars so that:

- **705 kV crest phase to ground is not exceeded by more than 3 peaks;**
- **565 kV crest phase to ground is not exceeded by more than 10 cycles;**
- **510 kV crest phase to ground is not exceeded by more than 20 cycles.**

In the calculation of temporary over voltages on the AC side the TSP shall allow for blocking of the complete Bipole from up to the highest steady state transmission capability of the installation. On the DC side the TSP shall allow for the maximum load rejection which could occur and which leaves converter deblocked.

The converter Equipment shall be designed to withstand temporary over voltages corresponding to AC Side which are not less than 1.5 times 400 kV upto 100ms at converter stations with the converter blocked

The TSP shall provide and commission all equipment necessary to limit the temporary over voltages on the AC bus bars to the levels specified above. The actual temporary overvoltage shall be determined by the TSP but AC equipment shall be designed for temporary overvoltage not less than the values given above.

The connected AC harmonic filter shall be assumed to be that with the highest MVAr applicable to the mode of operation which does not exceed the maximum reactive power exchange with the AC system as specified in this specification.

The converter equipment shall be rated for continued operation under the maximum over voltage conditions to be defined by the TSP taking into consideration the dynamic over voltage profiles as determined by the design studies to be performed by the TSP. Irrespective of the over voltage profile derived by the TSP, the equipment shall be rated to withstand an over voltage according to above figures following deblocking.

DC withstand voltage design of equipment shall take due consideration of the temporary voltage stresses that the respective equipment may be exposed to based on studies of different disturbances as applicable.

Any switching equipment within the scope of supply of the TSP which may be called upon to operate at this voltage in either a main or backup role shall have the appropriate capability.

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HVRT Strategy:

The HVDC Station shall enter into HVRT mode (exit from continuous operating region) when the Voltage at AC bus i.e. 400 kV side (RMS) is above 1.1p.u. due to faults/control actions/or any other cause.

The HVDC Station shall remain connected to the grid when voltage at the interconnection point (AC bus), on any or all phases (symmetrical or asymmetrical overvoltage conditions) rises above the specified values given below for specified time:

Over voltage (pu#)	**Minimum time to remain connected and Deliver the rated reactive support (Second) at POI**
V > 1.50	Instantaneous trip
1.50 ≥ V > 1.30	100 ms
1.30 ≥ V > 1.10	10 sec
1.10 ≥ V > 1.05	15 minutes
V ≤ 1.05	Continuous

 # 1 pu = 400 kV (3 phase RMS voltage at POI)

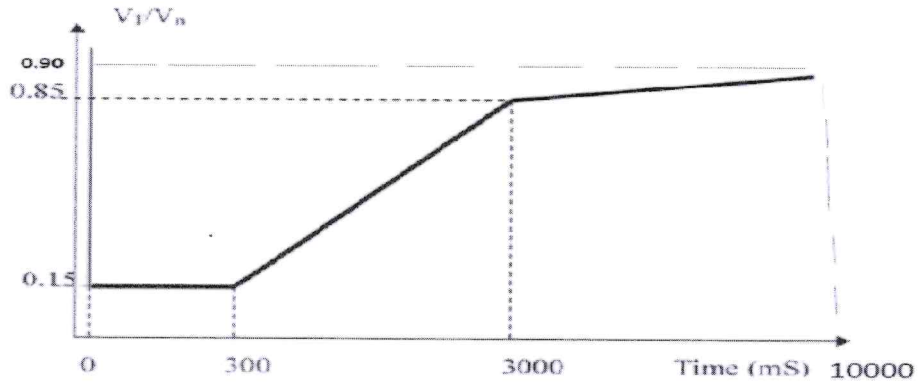
During HVRT mode, HVDC Station shall provide reactive power support (absorption) at POI proportional to Voltage at POI (inductive operation). There shall be maximum VSC current (up to 0.8 p.u..) during inductive operation considering voltage of 1.3 p.u. at AC side (POI). 1 p.u. of VSC current is the current corresponding to 1 p.u. of apparent power (1250 MW per pole active power and 410 MVAr per pole reactive power) under nominal system condition.

LVRT Strategy:

The HVDC Station shall enter into LVRT mode (exit from continuous operating region) when the Voltage at AC bus i.e. 400 kV side (RMS) is below 0.9 p.u. due to faults/control actions/or any other cause.

The HVDC Station must remain connected to the grid when voltage at the interconnection point (AC bus), on any one, two or all phases (symmetrical or asymmetrical overvoltage conditions) dips up to the level depicted by the thick lines in the following curve:





1 p.u. = 400 kV (3 phase RMS voltage at POI)

During the voltage dip, the supply of reactive power has first priority, while the supply of active power has second priority. Restoration of voltage shall be said to be achieved when the voltage at PoI settles within ±5% of pre fault voltage. Active power shall be restored to at least 90% of the pre-fault level within 1 sec of restoration of voltage.

During LVRT mode, HVDC Station shall withstand all above low voltage conditions and needs to be coordinated to provide reactive power support (injection) at POI with a maximum VSC current of 0.8 p.u. (capacitive operation). 1 p.u. of VSC current is the current corresponding to 1 p.u. of apparent power (1250 MW per pole active power and 410 MVAr per pole reactive power) under normal system condition.

(h) **Transient and Temporary over voltages**

In the calculation of transient over voltages the TSP shall consider at least:

(i) Lightning surges propagating down the AC and DC overhead lines, including direct strike to line conductors and back flashover.

(ii) Lightning surges due to direct strike within the converter station in the event of shielding failure

(iii) Steep fronted waves resulting from flashovers or faults, including those to ground from the valve windings of the converter transformers with tripping of bipole or monopole based on feasibility of survival of healthy pole.

(iv) Over voltages due to switching of converter transformers, AC filters and shunt capacitors, shunt reactors, 765 kV and 400 kV transmission lines, 765 kV and 400 kV class transformers or other equipment.

(v) For re-closure of AC filters, residual voltage on the capacitors shall be considered.

(vi) The saturation effects of converter transformer due to presence of remnant flux shall also be considered.

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(vii) Application and clearing of single phase and three-phase to ground faults which may be cleared by AC circuit breakers; Possibilities of breaker re-strikes shall also be considered although the breaker should be designed as restrike free.

(viii) Faults within converter equipment, including control and telecommunication malfunctions.

(ix) Over-voltages due to blocking of converter of monopole or bipole.

(x) Over-voltages due to DC and DMR line resonance.

(xi) Uneven distribution of over-voltages, particularly within the converter valves.

(xii) Arrester location relative to protected equipment and arrester characteristics.

(xiii) For determination of maximum transient and temporary overvoltages at converter bus with a sequence of clearance of three phase /single phase AC bus fault along with the following scenarios shall be checked and highest value shall be considered for suitable protection actions:

a. Blocking of one pole or both poles running at full load with appropriate AC filters remaining connected OR

b. Highest temporary overvoltage as mentioned in clause 13 g above

(xiv) Single pole to ground and Pole to Pole fault at DC line or at either station followed by tripping of pole/bipole as applicable.

(i) **Limitation of Overvoltage**

Blocking of the converter valves to protect them and other DC side equipment from sustained over voltages as per table under HVRT Strategy appearing on the AC system shall not be permitted. The use of converter valve group controls to limit temporary (dynamic) over voltages shall be permitted provided that the valves and other converter equipment are adequately rated.

(j) **Determination of Overvoltage**

The TSP shall determine the highest transient and temporary over voltages, which can occur with the equipment parameters selected and with the AC system and DC line as defined in this Specification.

(k) **Arrester Protective Levels**



The transient overvoltage imposed across insulation shall be limited by surge arresters. Dynamic over voltages may also be limited by surge arresters but only if the arresters are adequately rated for such duty.

The discharge current (coordinating current) shall be determined by the TSP appropriate to the arrester location and line and equipment parameters. For arresters connected to the 400 kV AC bus bars, the 8/20 microsecond wave coordinating discharge current shall be 10 kA, 15 kA or 20 kA as appropriate. Where multicolumn arresters are used or where arresters in separate housings are connected in parallel, unequal sharing of the discharge current shall be considered.

The TSP shall design the converter equipment to withstand a maximum continuous AC system voltage of 440 kV. The calculations for determination of arrester energy requirement shall be based on a maximum pre-fault voltage of 440 kV.

(l) **Lightning shield**

The TSP is responsible for the design of the lightning shield. The system shall also be designed to provide "effective shielding" to ensure that almost no insulation flashover can result from atmospheric discharges striking the overhead shielding.

Effective and adequate lightning protection shall be provided to protect all converter equipment including wall bushings and the Converter Station buildings from damage due to atmospheric discharges and shall ensure that any lightning strikes shall not cause flashover or mal-operation of any equipment which can affect the power transmission capability of the Converter Station.

14. Radio Interference (RI), Acoustic Noise (AN) and DC field

(a) All the necessary precautions shall be made during HVDC design to ensure that there shall be no mal-operation, damage or danger to any equipment, system or personnel due to electromagnetic or electrostatic interference effects. The converter terminal(s) shall neither damage nor cause mal-operation of the DC control and protection system or the DC tele-control system.

(b) All the necessary precautions shall be taken in the form of noise suppression techniques, shielding and filtering devices to prevent harmful interference, which may be generated by the converter terminals, with the Power Line Carrier (PLC) systems, Radio communication systems, Television systems, VHF, UHF and microwave radio systems.

(c) The audible noise shall be limited to the following values for various areas of the converter station and buildings. It is to be demonstrated by calculation and site measurement that the specified sound pressure levels are not be exceeded.



Table 5

Valve hall (in places where long term access is required during normal operation) Mechanical equipment indoor areas requiring long term access (measured at 2 meter distance)	90 dBA
Equipment in outdoor areas (measured at 15 meter distance) except converter transformers	75 dBA
Office area*	45 dBA
Control rooms*	45 dBA
Diesel generator (Operating area)	75 dBA
Compressor areas (measured at 2 meter distance)	90 dBA
At the station boundary (Outside wall or fence)	70 dBA

* *"Background" noise from the ventilation system.*

(d) For area with permanent access, the total calculated electric field at ground level shall not exceed 20 kV/m in the DC outdoor yard. For areas with permanent access in DC outdoor yard, calculated Ion current density shall be less than 20 nA/m^2 at ground level.

(e) Radio Interference (RI)

The TSP shall take the necessary precautions in the form of valve hall and building shielding to meet his own requirements plus the following:

(i) With the Bipole operating at any of the specified operating modes and power levels and within the design range of IGBT switching, the Radio Interference Level (RIL) from electromagnetic radiation generated by the converter shall not exceed 100 micro volt/m under fair weather conditions at any point outside station fence which are:

500 meters or more from the nearest bus connecting the valve to the converter transformers within the station

and

at a lateral distance of 30 m for the conductors of any outgoing AC line, HVDC line and DMR line.

This RIL criterion shall be achieved at all frequencies within the range of 150 kHz to 300 MHz.

(ii) The valve hall design shall incorporate the screening requirements. The use of a mesh screen external to the building, covering all or part of the switchyard shall not be permitted.

(iii) The shielding shall be designed so that the specified radio interference levels

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shall not be exceeded assuming any earth resistivity between 10 and 1000 ohm-meter.

(iv) Maximum radio interference voltage for frequency between 0.5 MHz to 2 MHz at 1.1 times of maximum DC voltage for 500 kV DC system, 266 kV RMS for 400 kV system and 156 kV RMS for 220 kV system and 92 kV RMS for 132 kV system shall be 2500, 1000, 1000 and 500 micro-Volt respectively.

(f) Television Interference (TVI)

The Television Interference Level (TVIL) shall not exceed 10 micro volts/m at the locations/contour line specified above.

(g) Interference with Power-Line Carrier Systems

The TSP shall take the necessary precautions in the form of noise suppression techniques and filtering devices to prevent harmful interference from the converter stations to Power Line Carrier (PLC) systems operating on the HVAC transmission line networks connected to each station and also to other power line carrier systems located adjacent to the HVDC bipolar line such that PLC systems shall operate reliably in fair weather conditions. The frequency spectra to be protected for PLC system is 40 kHz to 500 kHz.

15. Dynamic Performance

(a) The purpose of dynamic performance design is to determine the control parameters for HVDC system and to ensure that the HVDC system shall have smooth, stable and fast operation for both steady state and transient conditions without adversely affecting the connected AC grid.

The principal objectives of the design shall include:

1. Optimal response of HVDC controls following step change in ordered parameters like current, power, DC voltage etc.
2. Stable operation of the DC system following major disturbances.
3. Stabilization of the ac system following major disturbances.
4. Control of temporary over voltages and avoidance of self-excitation of the generators.
5. Control of frequency following quasi-static (slow) and fast changes in ac system load / generation at the rectifiers and/or inverter ends.
6. Control of power levels depending on the system configuration. Such a control may require ac line load control (ACLLC) and Run Back control features.

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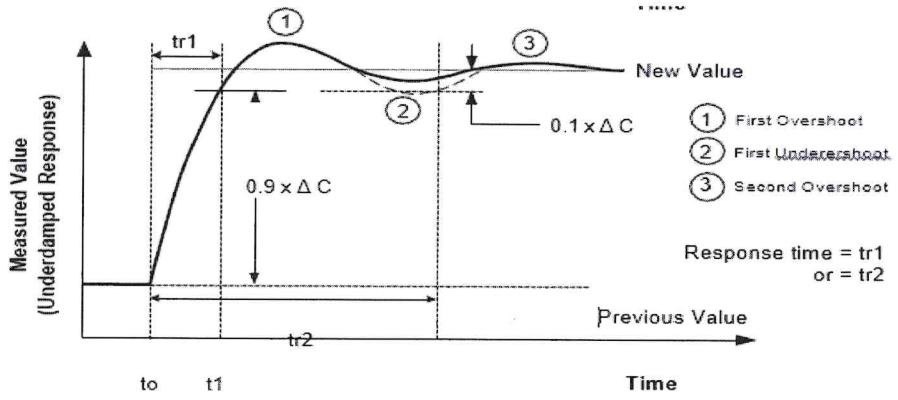
(b) The HVDC system shall recover to 90% of the pre-fault DC power transfer level consistently within 100 ms from the instant of fault clearing, without subsequent

sustained oscillation for all inverter AC system fault conditions. For all rectifiers AC system fault conditions, the recovery time, to 90% pre-fault power level, shall be within 100 ms from the instant of fault clearing. The TSP shall verify that such response time does not give rise for any risk of AC system instability in any system configuration. If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the recovery times other than those specified shall also be acceptable, subject to review.

(c) HVDC should continue operation at reduced power if conditions get outside the voltage, frequency and short circuit capacity ranges specified in system data as much as possible with its inherent capability.

HVDC terminal Characteristic and Step responses: The response time (tr1) is defined as the time from the initiation of the order change to the time when 90% of the ordered change has been accomplished, subject to the condition that the measured value remains at the new order within a tolerance of +10% of the ordered change at rectifiers DC terminal after the first overshoot. If the measured value exceeds the tolerance of +10% of the ordered change after the first overshoot, then the response time (tr2) shall be defined to be the interval from the initiation of the order change to the time when the measured value returns to and thereafter remains at the new order within a tolerance of +10% of the ordered change. The first overshoot shall not exceed 30% of the ordered change and the measured value shall settle at the new order within a tolerance of +2% by the second overshoot. For an over damped system, the response times (tr3) is defined as the time from initiation of the order change to the time when 90% of the ordered change has been accomplished. The measured value shall settle at the new order within a tolerance of +2% by four times tr3. Step response to changes in power (current) order shall be executed in the following manner:

When the ordered change is *positive*:



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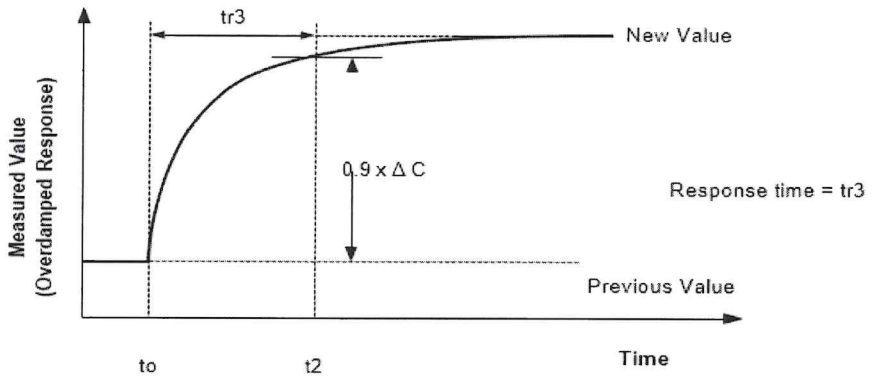
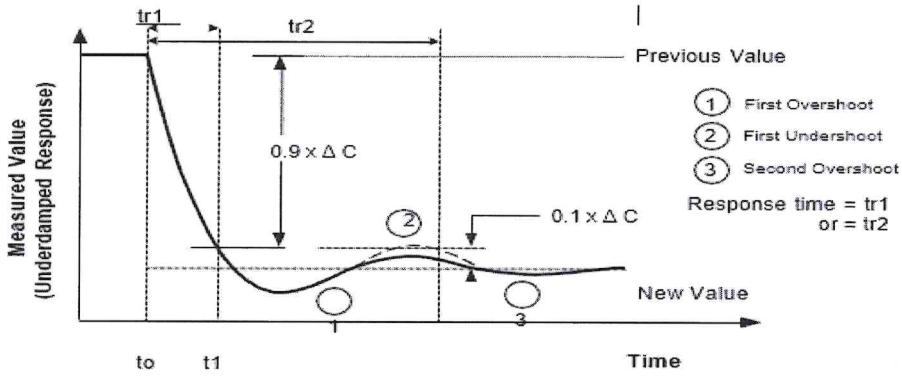


Fig 2- Definition of response to positive step change

When the ordered change is *negative*:



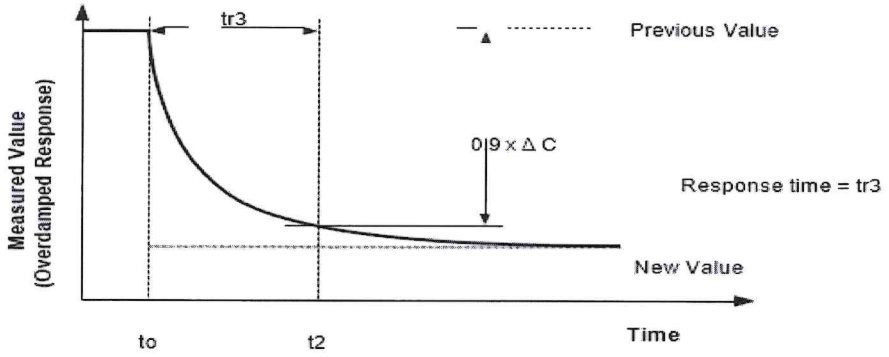


Fig 3- Definition of response to negative step change

(d) Power Order Step Response

The HVDC controls, when in power control mode or any other mode where the DC power transfer is controlled, shall respond to maintain the power transfer of the Poles at the ordered or desired level at any power level between minimum and rated capacity of the HVDC system.

When operating at any power order between the minimum and rated power transfer, the DC power controller shall respond to either a step increase or a step decrease in

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DC power order such that 90% of the ordered change is achieved within 150 milliseconds of the power order change at the rectifier. The TSP shall verify that such response time does not give rise for any risk of AC system instability in any system configuration. If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the recovery times other than those specified above shall also be acceptable.

(e) Response to AC Bus Voltage Change

The TSP shall demonstrate the response of the power controls to sudden changes in AC bus voltages of -5.0% to + 2.0% from its nominal value and ensure that it is stable.

(f) Power Voltage Instability

HVDC links operating in constant DC power control and weak AC system conditions can lead to power voltage instability under certain disturbances. To prevent such power voltage instability, the TSP shall provide control measures to prevent AC system collapse during AC system disturbance due to the action of the HVDC control. The TSP may adopt change over to grid forming mode and a power reduction or a dynamic gain supervision function in the control system to avoid such instability if the short circuit MVA changes during a particular power transmission level.

16. Main Circuit Design

The purpose of Main Circuit design is mainly to determine the operating characteristics and rating of converter valves and converter transformers (MVA, tap changer range etc.) It also forms the input for AC Filter and Reactive compensation design. The main circuit arrangement and circuit shall depend on type of HVDC system, Power Transmission requirements, DC Voltage Levels, connected AC voltage levels, Reactive Power requirements and AC and DC Harmonic requirements. The system shall meet various harmonic performance parameters, as specified elsewhere in this specification, on both AC Side and DC side. This requirement along with those given in Table-2, shall be met simultaneously by the AC/DC filters.

17. HVDC Station Equipment

The function blocks of converter station are Converter area (converter valves, converter transformer, smoothing reactor(if required)), DC yard (DC filters (if required), DCCT, DC Voltage Divider, PLC filters of DC side (if required), DC pole arresters, Disconnectors and ground switches), AC filter yard (as per design requirement), AC yard and auxiliaries. A typical VSC based HVDC station shall consist of the following main equipment:



(a) IGBT/BIGT valves and its accessories e.g. damping and grading circuits, converter cooling system etc.;

(b) Converter transformers;

(c) Arm Reactors/Phase reactors
(d) Smoothing reactors (if required);
(e) DC filters; (if required);
(f) AC filters (Harmonic filters and PLC filters) and shunt compensation; (if required);
(g) Control and protection of AC and DC side;
(h) Electrical and mechanical auxiliaries;
(i) Dedicated Metallic Return (DMR);
(j) AC switchyard equipment;
(k) DC switchyard equipment;
(l) AC and DC Surge arresters;
(m) AC and DC Measuring instruments;
(n) Communication system between converter stations (OPGW)
(o) DC wall bushings
(p) AC wall bushings (if applicable)
(q) Auxiliary Power System
(r) Key interlocking system for valve hall, DC filters (if applicable), AC filter (if applicable)
(s) Fundamental frequency blocking filter, if required
(t) Pre -insertion resistors with bypass breaker for charging of converter module capacitors.
(u) High speed DC discharge switch and resistor to allow fast DC line fault discharge if required for fast dc line fault recovery.

18. Converter Station AC Yard, Transformer yard and valve hall

(a) AC commutating bus equipment

The AC circuit breakers, disconnectors, instrument transformers and other switchyard equipment shall be similar to that of the equipment specified under Regulation 46 of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022. The bus rating shall be adopted according to the calculation considering single bus outage. The switching duties of the AC circuit breakers will be decided based on transient over voltage study, insulation co-ordination, AC filters and protection studies.

Insertion resistors:

Insertion resistors shall be used to limit inrush currents during energization of the converter. They shall be located on the primary or converter side of the converter transformer. After the energization process is completed, the resistor shall be bypassed by a disconnector or bypass switch.



(b) AC harmonic filters and shunt compensation, if required

State-of-the-art Voltage-Sourced Converters (VSC) in modular multi-level converter (MMC) topologies generate nearly no or only a small amount of harmonics. The need of ac harmonic filters shall be evaluated based on study results. Suitable redundancy shall be provided in the filters to avoid reduction of transmission capacity of the station due to outage of any particular sub-bank for maintenance.

The AC harmonic filters shall be switched in and out by circuit breakers in FIFO logic to increase lifetime of switchgear. Based on the studies, reactive power requirement for the terminal and bank or sub-bank size shall be determined such that reactive power exchange with the AC bus shall remain within specified limits.

System Contribution:

Bidder may suitably model nearby different RE generators as all these generators are required to meet harmonics requirement under "CEA Technical standards for Connectivity to the grid" regulations.

At Converter station ac bus, combined converter and static compensator (if used) harmonic currents as calculated for rating purposes shall be increased to allow for harmonic currents from the ac system *(if applicable)* in following manner:

a) At 3rd and 5th Harmonics the increase in current to be allowed shall be calculated based on the assumption that the existing distortion shall be considered as 2% with respect to nominal voltage at converter bus. This is to be considered for 3rd and 5th harmonic Filter component rating

b) At all even order harmonics and at all other non-characteristic or theoretically cancelled harmonics the increase in current to be allowed shall be not less than 50 (fifty) percent provided that the contribution of the harmonic in question to any rating parameter, in the absence of the above increase, is not greater than 10 (ten) percent of the total harmonic rating.

c) At all characteristic harmonics or at any other harmonic which is effectively filtered (i.e. the harmonic contributes more than 10% of the total harmonic rating of a component in the absence of the increase) the increase in current to be allowed shall not be below 20 (twenty) percent.

(c) If filters are required, the main filter equipment namely capacitors, reactors and resistors shall comply with the requirements of following IEC or Equivalent IS as follows:

A. Capacitors-IEC 60871;
B. Reactors - IEC 60076-6;
C. Resistors - IEC 62001/As per owner's specification.
D. Only air-core reactors shall be used in AC and DC filters for harmonic filtration.

(d) If study results confirm the need for power line carrier (PLC) filtering, PLC filters shall

be installed close to converter transformers to mitigate high frequency harmonic currents generated during IGBT/BIGT switching.

Performance Requirement

The AC harmonic performance shall be better or equal to as defined by following performance parameters:

A. The individual harmonic distortion, D_n, shall not exceed 1.5%
Individual Harmonic Distortion, $D_n = V_n/V_1$

B. The Telephone Influence Factor (TIF) shall not exceed 50.
Telephone Influence Factor, TIF = $\sqrt{(\Sigma (V_n * F_n/V_1)^2)}$
Where Fn: Weighting factor for nth harmonic according to EEI publication - 60-68(1960) corrected to 50 Hz operation by graphical interpolation

C. The Total Effective Distortion, Deff , as defined below shall not exceed 3%:

$$\mathbf{Deff} = \sqrt{\sum_{n=2}^{n=50} \frac{V_n^2}{V_1^2}} X100$$

'1' refers to fundamental frequency (50 Hz)
'n' refers to the harmonic of n^{th} order (corresponding frequency is 50 x n Hz)

The active impedance presented by VSC HVDC at AC bus shall have no undamped or negative impedance region for all harmonics included inter harmonic based on IEC 62001-5, clause 9.2 and 9.3. In case, certain network harmonic impedance cannot be addressed by VSC HVDC, required solution should be included.

The performance of the AC harmonic shall be determined by calculation and shall be based on either as-tested parameters of components or the extreme values of manufacturing tolerances if as-tested values are not available. Performance requirements are to be met for all operating modes. In all Modes of operation, except the reduced DC line voltage modes, the performance requirement shall be met up to rated power with one larger size filter sub-bank and one characteristic harmonic sub-bank (largest) being out of service. All filter banks, sub-banks and branches shall be rated such that the remaining filter components are not overloaded due to detuning or resonance within the filters or between the filters, the generators, and the AC system for any combination of AC system voltage and/or frequency and configuration, or for any operating condition of the converters, or combination thereof, for which the converter valves are capable of continuous operation, or switching time between de-energized and energized states and there is no restriction on the operating power level for any operating conditions with one filter bank outage for power level up to 1.0 p.u. Short-time and transient conditions as well as operation with discontinuous DC current must be fully taken into account.

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(e) Shunt Reactor Banks

Shunt reactors, if required, of suitable size shall be provided to meet reactive power

exchange requirements derived from the studies. The shunt reactor must be switched in or out by a circuit breaker. The shunt reactor shall conform to CEA's Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above voltage class). The shunt reactor shall be covered under automatic switching under the reactive power control strategy.

(f) Converter transformers

(i) The converter transformer shall be designed in accordance with IEC- 60076-57-129. The converter transformers shall be single phase two winding units. The maximum flux density in any part of the core and yoke at the rated MVA, voltage and frequency shall be such that under 10% continuous over voltage condition it does not exceed 1.9 Tesla. The Converter transformer shall be capable of withstanding minimum DC current of 10 A per single phase transformer entering through the neutral.

(ii) Transformers shall withstand combined voltage and frequency fluctuations which produce the following over fluxing conditions:

a. 110 % for continuous

b. 125 % for 1 minute

c. 140 % for 5 seconds

(iii) It shall be demonstrated in design that the converter transformer shall not move to saturation beyond the design limit for overvoltage magnitude and duration applicable for the project.

(iv) The insulation level for the transformer AC (line side) windings and bushings shall be as given at Regulation 45 of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 and insulation levels of the valve side windings shall be determined in accordance with studies. The impedance of the transformer shall be determined as in accordance with studies and variations in impedance shall be as per the requirement of relevant standards.

(v) Converter transformers shall be equipped with On Load Tap Changer (OLTC) and Metal Oxide Varistor (MOV) devices shall be provided between tap leads of the OLTC. The OLTC tap steps shall be determined in accordance with the operating strategy of both the converters. The OLTC shall be designed for a minimum 2,50,000 operations without repair or change of any part including oil. The OLTC shall be designed for a contact life of minimum 6,00,000 operations.

(vi) The requirements of soak pits and firewalls shall be in line with Regulation 46 of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022.



(vii) The converter transformer bushing shall be designed in accordance with IEC-60137/ IEC-65700, as applicable.

19. Converter valves and valve cooling system

(a) The converter valve assembly shall be designed and tested as per relevant IEC 62501. The valve shall be designed and protected during operating conditions for various over voltage and over current stresses to which it may be subjected to due to faults occurring in various parts of the station.

(b) The converter valve modules, used for converting AC to DC or vice versa, shall be complete with associated electronic IGBT switching system; protection, monitoring and damping system, auxiliaries and cooling system. Adequate redundant devices shall be provided to enable continued operation in case of failure of an individual component. Advanced converter topologies shall be used to reduce losses of VSC based HVDC converters.

(c) The IGBT power modules shall be water cooled, air insulated and indoor type. The valves shall be either suspended type or floor mounted type depending upon the operating DC voltage and seismic requirements.

(d) Necessary control and monitoring including tripping of the HVDC system in case of cooling system failure shall be provided.

(e) The valves shall be placed in the valve hall which shall have a positive pressure over atmospheric pressure and humidity control feature through HVAC system.

(f) No oil immersed part is permitted to be used inside the valve as well as valve hall. The electronic components located within the valve shall be designed to eliminate overheat and arcing. Only components of low flammability, high reliability and adequate ratings in margins can be used.

(g) Description of Valve Cooling System:

(i) **Fine Water Circuit**

The fine water circuit shall consist of a main circuit and a water treatment circuit. The cooling medium in the fine water circuit shall be deionised water with low conductivity.

(ii) **Main Water Circuit**

The main cooling circuit shall consist of water within the converter valves, a de-aeration vessel /venting, pumps and filters.



The main circuit shall be provided with an expansion vessel with level transducers and or pressurised with nitrogen, as per requirement of OEM design. The level transducers shall be used for control of the make-up water for the system, if applicable, and for detection of leakages.

There shall be two water pumps. One of the two water pumps shall circulate the 100% water through the main cooling circuit and the water treatment circuit. The

other pump shall be included for redundancy purpose. The operation shall be automated and arranged into alternative weeks between these two pumps. Upon failure of the unit in service, the redundant shall be automatically activated.

(iii) **Water Treatment Circuit**

A part of the main flow shall be circulated in the water treatment circuit. The water treatment circuit shall consist of oxygen removers (if required), ion exchangers and mechanical filter. Sensors shall be provided for measuring conductivity of the water, both in the main cooling circuit and in the treatment circuit at the exit side of the ion-exchanger. The water treatment circuit shall have provision to connect makeup pump and associated valves and strainers. The water pipe for fine water make up shall be connected to main fine water circuit through the water treatment circuit.

(iv) **Air Cooled Liquid Coolers**

The air-cooled dry type liquid coolers shall cool the water from the converter valves. At least one cooler unit or minimum 10% of total cooler units required to achieve the operating water temperatures for rated power (whichever is more), shall be provided by the TSP as redundant over and above the quantity required.

All the stations shall have dry type coolers. Each cooler shall consist of cooling fans with separated air channels.

Suitable protection against corrosion, oxidation etc. shall be provided for all cooling equipment.

(v) **Mechanical Design**

The cooling system shall be pre-fabricated. There shall be three main parts:

- fine water pump unit;
- air cooled liquid coolers;
- piping.

The fine water pump unit shall be mounted on a frame and shall be placed in the valve cooling room. The air-cooled liquid coolers shall be placed outdoors, near to the valve cooling rooms. The piping shall be especially designed stainless steel and adapted to the station building.

(vi) **Control Equipment**



The valve cooling control equipment shall be specially designed for application to the cooling system for converter valves. There shall be two computer-based control systems such that either both are in ACTIVE mode, or when one system is in ACTIVE mode the other system shall be in ACTIVE STANDBY mode. Each computer-based system shall be self-checking and an automatic changeover to

the other system shall take place in the case of failure of the active system.

(vii) **Design Criteria for the Cooling System**

Features to ensure high reliability, proper function and prolonged life time for the cooling system and converter valves shall be included. The following main components shall be supplied with redundancy in order to increase the availability:

- main circulation water pump
- air cooled liquid cooler (with redundant cooler as provided in (iv) above)
- bypass valves
- transducers
- nitrogen bottles, if applicable

(viii) **Design Cooling Requirements**

Separate cooling system shall be designed to cool the heat generated in each monopole for converter stations.

Cooling system shall be capable to operate and guarantee the design temperature specified under steady state conditions, up to max specified design dry bulb ambient temperature. Redundant Uninterrupted Power System/drive for valve cooling for each pole shall be rated for 2 minutes.

(ix) **Ambient conditions**

Ambient Conditions are specified in Table 2 of the specification.

(x) **Materials**

The materials in contact with the cooling water as well as for manufacturing of the air-cooled liquid cooler shall be selected in order to minimize the risk of corrosion.

(xi) **Measure Against Water Leakage**

The design of the valve cooling system shall be made to minimise leakages. The following precautions shall be taken to minimize the risk of water leakage from the system:

- choice of water pipe joint
- number of water pipe joints in the system shall be kept as low as possible, particularly in the IGBT based converter ;
- velocity of de-ionized water in the pipes and in the IGBT based converter submodules heat sinks shall be kept low
- water circulation within the pipes shall be free from trapped air bubbles



(xii) **Valve Cooling Control and Monitoring**

The valve cooling control systems shall be redundant and be equipped with an

integrated data collecting unit that is connected to the station sequential event recorder system.

(xiii) **Cooling Capacity Control**

The water temperature to and from the Converter/IGBT valves are used as an input to the cooling capacity control.

In order to avoid condensation at the pipe lines within the Converter/IGBT valves the inlet fine water temperature shall be kept in an appropriate range.

(xiv) **Protections**

The following protections/monitoring shall be included:

- Temperature of the water from the valves
- Temperature of the water to the valves
- Water flow through the valves
- Water level in the expansion vessel
- Conductivity of the water from the water processing unit
- Conductivity of the water in the main circuit
- Pressure in the expansion vessel, if required
- Pressure in the nitrogen bottle, if required.

(xv) **Leakage Detection**

There shall be three leakage detection methods used in parallel by the cooling control system. These methods can, depending on the nature of the leakage, generate trip of the converter and cooling system. However, one of the methods of leakage detection shall generate a leakage alarm if volume of leakage exceeds the reference volume, during the last 24 hours.

Besides these detection methods alarms for frequent make up and for long make up when automatic make-up of cooling water is used, generated by the cooling control program shall be provided. The total schematic of valve cooling system with valve position, flow, temperature, make up details, conductivity, pump running etc. shall be made available to the SCADA system of HVDC terminal.

20. Converter Station DC Outdoor Yard

(a) The DC yard shall comprise of equipment such as HVDC bushings, smoothing reactors (if required), DC filters (as required), DC current and voltage measuring instruments and switchgear, surge arrester, insulators, clamps and connectors.

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(b) The specific creepage distance (corresponding to highest DC voltage) for DC yard and other areas shall be maintained as follows:

Table 6

Insulator type	Under light and medium pollution	Under heavy and very heavy pollution
Indoor porcelain or composite insulators for valve hall (other than valves) and indoor smoothing reactor area (if any)	20 mm/ kV	
IGBT Valves	14 mm/ kV	
Outdoor porcelain insulators or bushings with RTV# coating	50 mm/ kV	60 mm/KV
Outdoor composite insulators or bushings	50 mm/ kV	

 # RTV silicon coating shall be in accordance with IS 11310.

Note: Specific creepage distances less than 50 mm/ kV but not less than 45mm/ kV can be accepted for outdoor silicone rubber bushings due to manufacturing limitations and for HVDC equipment requiring necessary internal/ external insulation co-ordination. However, specific creepage distance less than 50 mm/kV and flash distance less than 12 mm/kV shall not be acceptable for outdoor jointed bushing.

(c) **DC wall bushing**

DC wall bushing shall be designed as per IEC-65700. DC wall bushings, used for electrical connection between the equipment inside the valve hall and the outdoor DC yard shall be of polymer housing as per relevant standards. All bushings inside the valve hall including HVDC wall bushing shall be dry type/SF_6 gas filled or combination of both. There shall be no oil filled components inside valve hall.

(d) **DC reactors**

The smoothing reactor/Arm reactor/phase reactor/ DC filter reactor (as applicable) shall be designed as per IEC-60076-6. The reactors shall be of air core type. The reactors shall comply with relevant standards and shall have successfully passed DC tests as per their application. Each converter station shall be provided with one spare coil of each reactor with all fitments, hardware and accessories. Minimum four Nos. of insulators of each type for reactors shall be provided as spare.



The reactor shall be designed for Class H for inter turn insulation as per IEC 60085, however, the maximum allowed hot-spot temperature rise shall be limited to one class lower i.e. Class F insulation.

(e) **DC Voltage and Current Measuring Devices**

The DC voltage and DC Current measuring equipment shall be installed at each pole. These equipment can be optical type or conventional type. The DC measuring equipment at pole and neutral bus shall be suitably located based on the control philosophy and different protection zones such that complete pole and neutral equipment are protected. The details of DC Measuring Equipment shall be as per ***'Appendix C.1'***.

(f) **DC Filters (if required)**

Suitable numbers of DC filter per pole per station shall be provided in DC yard to limit harmonic voltages present on the DC lines (pole lines and DMR line) as required by HVDC OEM design.

The design shall be based on passive DC filters. The DC Filters shall consist of Low order filters, Harmonic Filters and High Frequency Filters as per the requirement of project specific studies. The main filter equipment like capacitors, reactors and resistors shall comply with the requirements of relevant IS/IEC standards/ CIGRE documents. A fundamental frequency series blocking filter shall be provided, as per requirement. The required switches shall be provided. It shall be possible to connect and isolate a single DC filter arm without causing any reduction in transmitted power on the affected Pole.

The calculation of DC filter performance and rating shall be based on values of components, detuning, and harmonic voltages and currents. The TSP shall use model as per CIGRE TB 766 and 811 or equivalent for calculating performance and rating of DC filters.

There shall be no limitation on the energization of the DC filter arms by reason of either ambient temperature, frequency, initial mistuning or DC voltage within the ranges defined in this Specification. The DC filter components shall not become overloaded due to detuning or resonance within the DC filter or between the DC filter arms and the HVDC circuit, or the DMR, for any combination of conditions for which the converters are capable of continued operation.

TSP shall ensure that fundamental and 2^{nd} harmonic resonance and adverse amplification does not occur on DC side. A parallel low order (2^{nd} Harmonic) DC Filter shall be provided across each converter of each station. Earth resistivity along the DC line route will be considered as 250 ohm-m.

DC filter Performance:

The individual harmonic current (In) at any harmonic shall not exceed the value which could cause mal-operation of the HVDC system control and protection equipment supplied. The maximum equivalent disturbing current (Ieq), up to rated power in forward power direction, without any filter outage, for balanced bipolar and monopolar mode with metallic return or Dedicated Metallic Return (DMR) modes of operation shall be as follows:

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Table 7

Operating Mode	Ieq
Balanced bipolar operation	1500 mA
Monopolar mode with metallic or DMR mode	2200 mA

The equivalent disturbing current includes not only the harmonics which flow in the DC Pole conductors and DMR lines but also the harmonics which are induced into the ground wires of the DC transmission line.

Mutual impedance calculation algorithms require that the ground wires be "eliminated" for this configuration; however, as specified herein, the current flow in the ground wires must be eventually taken into account in the calculation of equivalent disturbing current.

In Bipolar operation, the equivalent disturbing current shall be the psophometric weighted residual current of all harmonics of fundamental frequency from the 2nd to the 60th (i.e. 100-3000 Hz) according to the following formula:

$$Ieq(x) = \sqrt{[IeC(x)^2 + IeS(x)^2]}$$

Where,

Ieq(x) is the equivalent disturbing current in milliamps (mA) psophometrically weighted at any point along the transmission corridors specified herein

$IeC\ (x)$ is the magnitude of the RSS equivalent disturbing current component due to harmonic voltage sources at Khavda (mA)

IeS(x) is the magnitude of the RSS equivalent disturbing current component due to harmonic voltage sources at South Olpad Converter Station (mA)

x denotes the relative location along the transmission corridors.

The equivalent disturbing current at any point along the corridor due to harmonics from either Khavda or South Olpad Converter Stations shall be calculated as follows:

$$Ie(x) = \sqrt{\sum_{n=1}^{n=60}\{Ir(n,x) * P(n) * Hf\}^2}$$

Where,

$Ir\ (n, x)$ is the magnitude of the equivalent residual rms current at each harmonic in milliamps.

(n) is the psophometric weighting at harmonic "n" as per Consultative Committee for International Telephony and Telegraphy (CCITT)

n denotes the harmonic number.

Hf is the coupling factor which represents the normalized frequency dependent effects of typical coupling impedances to open wire circuits. The coupling factor Hf will be assumed as per table below:

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Table 8

Frequency (Hz)	Coupling Factor (Hf)
40-500	0.70
600	**0.80**
800	1.00
1200	1.30
1800	1.75
2400	2.15
3000	2.55
3600	2.80

As defined above, all harmonics up to the 60th shall be included in the calculation of equivalent disturbing current. The equivalent disturbing current shall be based on a "worst consistent set" of harmonic voltages at either end of the line.

The "worst consistent set" is defined as that set of harmonic driving voltages which could occur at any particular operating condition which results in the highest value of equivalent disturbing current that could occur for a period of longer than ten minutes.

A particular operating condition is defined in terms of:

a) The mode of operation, i.e. bipolar or monopolar in any specified mode of operation.

b) The DC voltage anywhere within the normal range for the mode of operation.

c) Reduced DC voltage operation on both Poles and reduced DC voltage on one Pole with the other Pole at nominal DC voltage.

d) The modulation index anywhere within the range applicable to the mode of operation as defined above which shall include modulation index associated with reactive power control.

e) Worst case induced voltage from any parallel lines.

f) The converter AC bus voltages anywhere within the normal range specified.

g) The maximum 50Hz negative phase sequence voltage of 1.5% for achievement of performance limits.

h) The DC current anywhere within the range applicable to the mode of operation.

i) Ambient temperature as defined in Table 2.

j) Differences in the smoothing reactor (if installed) harmonic impedances of the Poles



DC filter rating

The rating of the DC filter components shall be based on the assumption that the per pole harmonic voltage is individually maximized at each harmonic for any particular operating mode, and the filter component currents due to the harmonic voltages at the terminals shall be assumed to add as RSS (Root Sum Squared) at each harmonic.

For the rating of the DC filter components, it shall be assumed that any one DC filter arm can be out of service in any converter Pole The possible impact of reduced voltage operation and increased reactive absorption on the ratings of the DC filters shall also be considered.

Short time and transient conditions as well as operation with discontinuous DC current must be fully taken into account. Due allowances shall be made for possible current amplification resulting from resonances between the arms of the DC filters. In the calculation of the impedance of the DC transmission system when used for calculation of DC filter component rating, ±10% tolerance in the respective line length shall be included. AC system voltage and frequency variations as functions of duration specified in Table 2 shall be allowed in the calculation of harmonic voltages and DC filter detuning. In addition, capacitor unit or element failures appropriate to the duration for which the DC filter has to remain connected, shall be allowed for in the calculation of DC filter detuning.

(g) **Surge Arrester**

Surge arresters shall be gapless Metal Oxide arresters and shall be designed and tested as per relevant IS/IEC. The arresters shall be designed to absorb the desired amount of energy during a system disturbance and shall be coordinated with recovery of DC system following a disturbance as applicable. Arresters at appropriate places may be provided as per requirement.

(h) **Fundamental frequency blocking filter:**

A fundamental frequency blocking filter may be installed, if found necessary, to block the 50 Hz induced current in DC line in order to minimize the risk of converter transformer saturation due to possible induced fundamental frequency current from parallel AC lines

This induced current usually results from AC side second harmonic positive sequence voltage and from AC lines running parallel to DC line.



For design purpose, 50 km of parallel un-transposed 765 kV AC Double Circuit line and 50 km of parallel un-transposed 400 kV AC Double circuit line within a radial distance of 70 m to be considered by the TSP to consider any possible inductive and capacitive coupling between the lines. The parallel section of AC lines shall be considered to be located at a point that results in maximum fundamental frequency current at each

converter station.

Such a filter is formed of capacitor, reactor, resistor and arrester. Internal arrangement of these components is left to designer but the overall filter should offer significant impedance to 50 Hz current flowing in DC circuit. Blocking filter reactor shall be designed for Class H for inter turn insulation as per IEC 60085, however, the maximum allowed hot-spot temperature rise shall be limited to one class lower i.e. Class F insulation. The reactor may preferably have similar design as smoothing reactor (if any) to share common spare. The AC/DC/PLC/RI reactor shall be designed for Class F insulation as per IEC 60085, however, the maximum allowed hot-spot temperature rise shall be limited to one class lower i.e. Class B insulation.

(i) **DC commutation switches:**

These switches are required for commutating the DC current from one path to the other. They comprise of Dedicated Metallic Return Transfer Breaker (DMRTB), Pole Metallic Return Transfer Breaker (PMRTB), Neutral Bus Grounding Switch (NBGS). These switches shall be rated for transfer of the full load current online without converter trip or block leading to power loss. Neutral Bus Switch (NBS) shall also be provided suitably at both ends in all the poles.

21. Dedicated Metallic Return (DMR)

The neutral current return path for bipolar configuration or monopolar configuration shall be via a Dedicated Metallic Return (DMR) conductor connecting both converter terminals.

22. Control and Protection System

It shall be demonstrated that the HVDC control system is stable under all operating conditions and cannot excite oscillations, such as sub-synchronous oscillations, between the HVDC and AC system. The control system shall be tuned for optimal overall performance for all conditions and configurations of the AC system. The details of operator Control and Monitoring are mentioned in ***'Appendix C.2'.***

It shall also be demonstrated, by applying system faults and step responses in current order and power order during the factory acceptance testing (FAT), that the as-built control system does not excite low order harmonic resonance(s) in the AC system and/or between HVDC and AC systems for any system configuration.

The performance of the integrated DC and AC systems shall also be demonstrated using an EMT-type program (such as PSCAD) in order to validate the system performance requirements. In the DPS program, all the HVDC protections shall be modelled. All feeders in the ac converter bus should have the required protections modelled for DPS studies with network equivalent.

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DPS studies shall be done with DPS model of Khavda LCC HVDC, DPS model of Khavda Pooling station and RE Park in vicinity. DPS models shall be provided for the LCC HVDC and Khavda Pooling station including RE park shall be provided to TSP.

Software based controls and protection shall be used to permit flexibility in effecting modifications. Protection and controls shall be duplicated for reliability. The control and protection shall provide fast controllability of the HVDC system.

(a) Control System:

(i) The control system shall have redundancy with hot standby. Transfer of controls from Active Control system to Hot standby control system shall be seamless and there shall be no power interruption during this transition. Outage of one control system or part thereof, shall not result in any power reduction.

(ii) The control shall be designed to give fast, stable and proper response to normal control actions as well as during disturbances such as AC and DC faults.

(iii) DC converter terminals shall be either manned by operator or controlled by remote operation of SCADA system. The control system hierarchy shall be as follows:

1. Master Control
2. Station/Bipole Control
3. Pole/ Converter Control
4. Valve Control

(iv) The HVDC Station/Bipole shall have control features including but not limited to the following:

1. AC Voltage and Reactive power control
2. DC Voltage and Active power control
3. Frequency control
4. Power modulator, pole power compensation. The modulator, if required, shall have feature which shall provide positive damping of AC network oscillations over the range of frequencies considered during system studies.
5. A. Sub Synchronous Resonance (SSR) Damping Controller (if required) based on studies.



All necessary studies shall be carried out to ensure that the DC system shall not excite the mechanical, electromechanical or other natural frequencies of the nearby region generators and turbines under any operating mode. It shall be demonstrated by studies that the nearby generators shall not be adversely affected by the HVDC system, particularly with regard to Sub Synchronous

Oscillation (SSO)/Sub Synchronous Resonance (SSR) and harmonic injection and self-excitation. Sub Synchronous Damping (SSD) Controller shall be provided for converter stations near Generating stations.

B. Power Oscillation Damping (POD) Controller in STATCOM mode of operation.

6. RE Park Sub synchronous control interaction studies, Temporary and Transient overvoltage checks, harmonic interactions, stability, HVRT, LVRT etc.

7. Interaction studies among various HVDC links and STATCOMs (planned/ execution) which are electrically coupled nearby e.g. LCC based ±800 kV, 6000 MW converter at KPS-2;, STATCOMS as per following table:

Sr. No.	Capacity of STATCOM	Name of Substation
1	±300 MVAr	KPS-1 (Section-I)
2	±300 MVAr	KPS-1 (Section-II)
3	±300 MVAr	KPS-3 (Section-I)
4	±300 MVAr	KPS-3 (Section-II)
5	±200 MVAr	Boisar-II (Section-I)
6	±200 MVAr	Boisar-II (Section-II)
7	±300 MVAr	Navsari (New)

8. The TSP shall study all interaction aspects between these converter stations, STATCOMs and devise control strategies to ensure that no adverse interaction takes place among the above stations during steady state and fault recovery. Various fault cases for the purpose of this study shall be finalized with the employer during detailed engineering.

9. The HVDC system shall conform to the performance requirements specified herein. It shall be designed to optimally co-ordinate all aspects of its controls to ensure safe and reliable operation without adversely affecting the connected ac system and shall assist the latter following disturbances. The performance requirements shall be met under all specified ambient conditions, modes of operation, ac system conditions andother parameters as given in this specification

10. Run back/Run up controller (10 points) with provision to be linked to Special protection Scheme (SPS) of System Operator.

11. AC system stability function, such as power swing damping function.

12. Any other Controller as deemed required for stable HVDC system operation with connected AC network.

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(b) Protection System

The protection system shall be designed in Main-I and Main-II set up.

(i) HVDC system protection shall consist of two parts:

(A) **AC side protection**

AC side protection function shall cover the zone for converter transformer, AC filters(as applicable), shunt capacitors, shunt reactors, and busbars. These protections shall generally follow the same philosophy as in a typical AC substation i.e. detection of fault by relay and tripping of circuit breaker or may be dealt in similar way as described for DC side protection.

(B) **DC side protection**

DC side protection shall cover the zones consisting of HVDC AC PLC Area to Converter transformer Primary, Converter Transformer, Area between converter transformer, Phase reactor and the valve hall, Converter Protection Zone, DC Bus bar Protection Zone, DC switchyard including smoothing reactor (if applicable) and DC filters (as applicable), DC line, and DMR line. The protection equipment shall be designed to be fail safe and shall ensure high security to avoid mal-operation/ unwanted shutdown due to protection equipment failures. 'Main-I and Main-II' or 'Main and Standby' protection philosophy shall be adopted for HVDC equipment and system.

(ii) Following a DC Line fault, the HVDC System shall have the facility to restart. The DC transmission system shall be capable of recovery in a controlled and stable manner during recovery following AC and DC system faults. The post fault power order shall be equal to the pre-fault power order unless AC/ DC systems dictate otherwise.

(iii) Protection system shall have two redundant systems with following protections (Some protection can be combined).

a) Converter differential protection
b) Converter Protection
c) AC, DC over current/under current protection
d) AC, Overload Protection.
e) AC, DC bus differential protection
f) AC conductor ground fault protection
g) DC filter protection, if applicable
h) Converter transformer valve winding protection
i) DC line differential protection
j) DC under voltage/ over voltage protection
k) DC line ground fault protection with restarts
l) High Impedance DC ground fault Protection
m) Harmonic Protection on AC side and DC side.
n) Negative Sequence Protection.

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o) Phase current unbalance.
p) Dedicated Metallic Return (DMR) protection
q) DMR monitoring
r) AC filter protections, as applicable
s) Protection Block Failure or Repetitive Blocking failure protection
t) Converter arm harmonic protection
u) DC Line Overcurrent Protection
v) DC Line harmonic protection
w) Power module failure monitoring
x) SSTI Protection (corresponding to POWER Plants)
y) SSDC Control Interaction Protection. (Corresponding to RE Plants).

Other Protections required for successful operation of VSC HVDC with HVDC LCC and RE Park in vicinity like transfer trips to RE Park 400 kV bus and LCC HVDC Converter. Provision for transfer Trip options shall be available in TSP's own Protection panels in digital and analog hardware form. Necessary assistance for integrating with OPGW shall also be included.

23. DC Line fault locator

DC online fault locators shall be provided to monitor the entire DC line length and give location of the fault with good accuracy in the range of + 1000 meters for pole conductors. DC line Fault Locators shall utilize a method of measurement of time of arrival at each end of the HVDC line of the steep wave fronts, resulting from a fault on the HVDC, affected by the accuracy of the time measurements. Since the wave fronts shall propagate along the lines at $3x10^8$ m/sec (or 300 metres per microsecond), the time measurements must be in microseconds with an accuracy of ±3 microseconds in order to achieve a location accuracy of approximately ±1 km. Greater precision of fault location would be desirable. The DC online Fault Locator equipment at each station shall be time synchronized to the master clock system at the station in order to facilitate analysis of system disturbances recorded on the DC Line Fault Locators, the transient fault recorders and the alarm monitoring and recording system. Manually re-settable fault counter shall be provided as part of the equipment.

ELECTRIC CHARACTERISTICS

1) Control Panels

Identical control panels shall be provided for each DC Line Fault Locator within its own cubicle(s). The control panel shall include, but not be limited to the following facilities.

- Equipment on/ off control and indication;
- Equipment alarm or failure indications;
- Fault location readout display for the last detected line fault;
- Manual initiation of automatic self-test routines;
- Any other controls or indications

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2) Printers

A printer shall be provided for each DC Line Fault Locator or it may be integrated with operator control and monitoring system. The printer shall print the day, hour, minute, second and millisecond of each fault or manual or automatic system test. The printer shall also print the location of each fault in kilometres from the respective station.

If fault locator is integrated with operator control and monitoring system that all these details shall be displayed on Video Display Unit (VDU) and stored in archives in the backup memory.

3) Power Requirements

The equipment shall be suitable for operation from the station battery supply. There shall be no loss of accuracy within specified variations of DC input voltage.

Note: Alternatively, TSP may also propose an integrated solution with the fault locator integrated into the HVDC Control and Protection system meeting the system requirements. If fault locator is integrated with operator control and monitoring system then all these details shall be displayed on Video Display Unit (VDU) and stored in archives in the backup memory.

24. Operations supervision and control

a) The TSP shall provide the control facilities from the operator control desk through a monitor and keyboard/mouse system. These facilities shall include all control operations, digital setting, indicating devices, Station single line diagram and symbols, any other special control devices and meters required for control and monitoring of the complete HVDC system.

b) The layout of the station single line diagram, together with control, indicating and metering devices on the control desk shall be logical, compact, of pleasing appearance, and shall facilitate efficient supervision and operation of the station(s) by the operator. Every detected change of position shall immediately be displayed in the single-line diagram on the station screen, recorded in the event list and printable.

c) Graphic representation of Converter valves and valve cooling piping network shall be provided on station monitoring system. The graphical representation shall also display indicating faulty valve submodules position.

d) The 'Sequence of events' recorder, transient fault recorder, on-line DC Line fault locator, GPS system, Station Master Clock, visual display system, operator control protection and monitoring system shall be a part of the HVDC system.



The details of operator control and monitoring system are provided at 'Annexure-Operator Control and Monitoring System'. The Transient Fault Recorder provided for the HVDC system shall be as per '***Appendix C.3***'

25. Telecommunication

For smooth operation of the HVDC system, communication network with high reliability and availability shall be provided for transmission of control and protection signals between the two or more (in case of multi-terminal DC) HVDC terminals. The communication system design shall be as per ***'Annexure- Specific Technical Requirements for communication'.***
A limited remote data transfer of the HVDC system from the Load dispatch centers shall be provided by TSP. All required remote control and remote monitoring facilities shall be provided at each converter station. Complete remote monitoring of each converter station shall be possible from opposite converter station.

Synchro phasor measurement using Phasor Measurement Units (PMUs) along with fibre optic connectivity, Global Positioning System Receiver and communication equipment shall be provided for monitoring AC side of converter bays of HVDC station.

26. Valve Hall

The valve hall shall mainly contain BIGT/IGBT valve, its associated structure, cooling and arresters. No oil filled equipment shall be present inside the valve hall. In case the turret of converter transformers (having oil) is protruding inside the valve hall, suitable fire barrier matching with adjacent valve hall wall fire rating shall be provided. The valve halls shall be provided with interference screening, if required by OEM. In addition, the control cable and cable termination rooms shall be suitably screened to minimize radio interference. Necessary measures shall be taken to take care of high frequency noise emission from valves.

The valve halls shall have ample clearances such that the inspection of valves can be possible and allow access of mobile valve servicing equipment without any dismantling. The valve hall building shall be pressurized to prevent the ingress of unfiltered air. In addition, the building shall be properly sealed to minimize the flow of outside air into it and vice versa. Openings for equipment and services shall be weather proof. The Valve Hall building shall consist of steel framed structure. The steel building shall be pre-engineered building fabricated in the factory and shall be assembled at site. Minimum two Nos. scissor lift for erection and maintenance of valve modules shall be provided per station. Proper cable sealing shall be provided for cable entry into valve hall and control room to avoid entry of water and moisture.

27. Ventilation System and air conditioning for Valve Hall

Each valve hall shall have an independent ventilation and/or air conditioning system. Each ventilation systems shall consist of two 100% capacity systems, one operating and one stand-by.



The ventilation of the valve hall shall be of a positive pressure type. Once through ventilation system will not be acceptable. The ventilation system shall be a closed cycle with fresh air

intake limited to a maximum of 20% of the total air requirement. Fresh outdoor air shall be filtered and dehydrated before being blown into the valve hall by the air fans to avoid dust accumulation and condensation on components present in the valve hall. Suitable measures shall be taken to minimise stagnant air. Each valve hall shall be provided with remotely operated motorized exhaust dampers which shall be normally closed and will be opened under high pressure/emergency conditions only.

Air-conditioning of valve hall for reducing the operating temperature of Converters may be used if required. Airconditioning units will be provided with minimum one redundant unit (atleast 25% capacity).

To ensure that the air being supplied to the valve hall is free from dust particles, a minimum three stage dust filtration process shall be supplied. This shall consist of at least the following:

1. Pre-Filters: To remove dust particles down to 10 microns in size with at least 95% efficiency.
2. Fine Filters: To remove dust particles down to 5 microns in size with at least 99% efficiency.
3. Absolute Filters: To remove dust particles down to 0.3 microns in size with at least 99.5% efficiency.

All the filters shall be panel type. Easy access should be available to the filters for replacement/cleaning.

It shall be possible to maintain specified conditions continuously inside the valve hall, both automatically and manually controllable from the station service panel (located in the control room) as well as from the local control panel.

In addition to the alarms for particular parameters like pressure, temperature and relative humidity etc., indicating instruments shall be provided for each valve hall. These parameters shall be integrated with station monitoring system also.

The valve hall shall be kept at a pressure above the atmospheric pressure under all conditions. The test shall be conducted at site to measure the pressure inside the valve hall for 48 hours.

Adequate numbers of de-humidifiers shall be provided for each valve hall as per design requirement.

28. Air Conditioning System

Air conditioning shall be provided on a continuous basis in the control room, bay kiosks, valve module workshop and storage rooms, control and protection workshops, offices, first aid room, conference room, entrance halls, corridors etc. and all rooms containing electronic equipment.



The air conditioning system for the control room shall consist of two (2) systems each of 100% capacity; one operating and one stand-by. Both units shall be interconnected so that, in the event of breakdown of one unit, the stand-by unit can be placed into service. Stand-by and operating units shall be alternated monthly for regular operation. The operation of the units shall be automatically controlled including sequential start and stop with single command.

If valve base electronics and/or valve cooling control cubicles are located at places other than in the station control room, these areas can be cooled by using split Air Conditioning units of appropriate capacity. At least two units shall be provided, one operating and one stand-by with the facility of automatic changeover after operator assigned time period.

A separate air conditioning system shall be provided for other areas of the service building. This shall also consist of two (2) Nos. each of 100% capacity; one operating and one stand-by.

29. Visual monitoring system (VMS) for watch and ward of station premises:

Visual monitoring system for effective watch and ward of substation premises shall cover all the transformers and reactors, outdoor DC yard, valve halls, indoor and outdoor isolators, earth switches, breakers, AC and DC capacitors, all other major AC Equipment (such as CB, isolators, CT, CVT, SA etc. as applicable), panel room, all entrance doors for the service building, other buildings, all the gates of switchyard and all entry and exit points of control room building and accordingly the location of cameras shall be decided. The camera shall be high definition colour CCD camera with night vision feature. The VMS data partly/completely shall be recorded (minimum for 30 days) at least @25fps (or better) and stored on network video recorder and followed by transfer of the data to a juke box. The system shall use video signals from various cameras installed at different locations, process them for viewing on workstations/monitors in the control room and simultaneously record all the cameras. The operation of cameras shall be integrated with the Network server placed in Control room of HVDC station. Sensors shall also be placed on boundary walls to prevent intrusion from outside and shall be connected to the CCTV system. The VMS data should go only to the intended personnel/ facility and not to the remote server of the Camera (VMS supplier)

Mouse/ keyboard controllers shall be used for pan, tilt, zoom and other functions of the desired camera. The Visual Monitoring System shall have provision of WAN connectivity for remote monitoring.

All camera recordings shall have Camera ID and location/area of recording as well as date/time stamp. The equipment should generally conform to Electromagnetic compatibility requirement for outdoor equipment in EHV substation.

At existing HVAC substations, the visual monitoring system if available shall be augmented as per existing or better specification as required.

30. Building Management System

A fully computerized and automatic Building Management System (BMS) shall control the operation of the mechanical systems serving the valve hall and service building and other systems as detailed below.

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Scope of Work

The scope of work shall cover all necessary system provisions (including hardware and software) for synchronizing/integrating the BMS with the control and monitoring of

- Air Conditioning system,
- Valve hall ventilation and air conditioning system
- Fire Fighting Systems including Fire Spray and Hydrant systems, water level in Fire Water Tanks etc.
- Utility Services i.e. Water Storage and Supply,
- Access Control including Motorised Gate at the entrance to the station and for all entrance doors for the control room building including provision of electromagnetic door locks, card readers etc.
- Fire Detection and Alarm System.
- Illumination systems
- VMS

31. Water Supply and Distribution System

The water supply and distribution system shall include the supply, distribution and storage of water in the HVDC Station at least the following purposes.

a) storage of water for the firefighting system;

b) storage of water sufficient for 24 hours of continuous operation of HVDC converter in the event of interruption of water supply to the tanks;

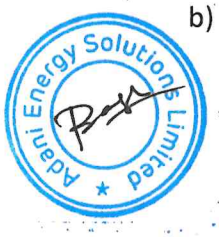
c) water supply for the valve cooling system;

d) water supply for sanitary services;

Two Nos. 100% capacity water storage RCC tanks shall be provided. Each tank shall be constructed in such a way that there shall be segregation between requirement for fire water storage and water for other purposes such that fire water is not used for other purpose. Both the tanks shall have interconnection piping with isolation valves for both tanks. Separate piping as per IS/IEC standard for firefighting, valve cooling and other purposes shall be provided from the tanks from independent headers.

32. Grounding and Safety:

a) The design of the grounding system shall be based on relevant IS/IEC/IEEE standards.



b) In order to prevent adverse effect (i.e. overheating due to induced circulating current) of magnetic field of air core reactors, special care shall be taken e.g. no closed loops are formed by the earthing conductors and in reinforcement bars of the foundation or other necessary mitigation measure to be provided. Air core reactor manufacturer's guidelines shall be followed.

c) The electrical safety clearances for the DC side shall not be less than the clearances

applicable for an AC switchyard at the equivalent BIL level.

d) The total electric field at ground level shall be as prescribed in relevant standards.

e) Fencing and electrical interlocking and mechanical key arrangements shall be provided for all non-accessible areas, for valve halls, and for areas where for equipment mounted directly on ground without suitable height of steel structure, e.g. smoothing reactor area, AC and DC filter areas, as applicable.

f) Safety precautions in regards to gas/oil pipe lines in vicinity of HVDC/ AC lines shall be taken coordination with gas/ petroleum authorities.

33. Cables:

All cables shall be FRLSH type. The High Voltage (6.6 kV to 33 kV) power cables shall be XLPE insulated conforming to IS-7098 Part-2. The Low Voltage power cables shall be 1.1 kV XLPE insulated conforming to IS-7098 Part 1 or relevant IEC standards and/or PVC insulated conforming to IS-1554 Part 1. The control cables shall be 1.1 kV PVC insulated conforming to IS-1554 Part-1. The rating and size of cables shall be determined by TSP. All cables shall be armored except cables used for special purpose as per OEM recommendation. Fibre optic cables conforming to IEC– 60793 and 60794 shall be used to transmit the signals to and from various equipment and panels located in the AC/DC switchyards, Valve Halls, control rooms, valve cooling rooms etc.

34. Auxiliary Power Supply System:

The auxiliary power supply system shall have the following:

a) Highly reliable duplicated supply sources from two separate sources with automatic change-over facilities. These sources of auxiliary power shall be from 33 kV side of 2 Nos. of 400/33 kV transformers (50 MVA) at KPS3 HVDC and 33 kV tertiary of existing 2 Nos. 765/400/33 kV ICT at South Olpad. This source shall be stepped down to 433 V by means of station service transformer of minimum 2000 kVA capacity and rated 33/ 0.433 kV.

b) Completely separated secondary distribution (415 V) systems for the auxiliaries of each converter.

c) Duplicated supply by two different 415 V power sources to essential loads

d) Diesel Generator (DG) Set of minimum 1500 kVA capacity per pole shall be provided to meet essential loads. This generator set shall start automatically and cater load immediately in case of loss of all the normal and standby supply sources. The DG sets

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shall be designed and rated so as to meet the load time characteristics of the essential loads of the entire station as determined by the TSP with a 10% margin on the load.

e) Parallel operation between station service transformers shall not be permitted at any voltage level in order to limit fault currents, prevent back feed into the AC bus and to ensure independence of supply sources. Also, parallel operation shall not be permitted between transformers and the DG set.

f) Suitable protection on all primary MV and LV supply connections shall be provided.

g) The 220 V DC supply system(s) per pole shall consist of at least two independent DC systems; each system consisting of one float-cum-boost charger, one battery bank and one distribution panel. A 48 V DC system consisting of two battery sets, two battery chargers and two distribution boards shall also be supplied for communication panels (wherever supplied). If desired, 48 V supply may be obtained from 220 V DC battery bank by use of adapters, without compromising backup time.

(i) The station services DC system shall cater to the DC loads of HVAC and HVDC switchyards, auxiliary services control, valve and pole control, protection circuits, communication system loads etc.

(ii) Minimum lighting load shall be connected to the station DC system.

(iii) Sizing of 220 V battery and battery charger shall be done based on the number of bays specified (including future bays) as per CEA Regulations and relevant IS. 2 sets of 48 V battery banks for PLCC and communication equipment for present and future scope shall be provided at each new Substation with at least 10-hour battery backup and extended backup, if required.

h) All auxiliaries shall give rated output at voltage variation of ±10% and frequency variation of -5% to +3%. Sizing of LT Switchgear shall be suitable to cater the requirement for all present and future bays. AC and DC distribution boards shall have modules for all the feeders (including future as specified).

i) For substation extensions, existing facilities shall be augmented as required.

An indicative SLD for the Auxiliary Supply System is enclosed at ***'Appendix-C.5'.***

For the requirement of the Auxiliary Power as described above, Essential Load is defined as per below: -

Essential loads: *These are the loads whose failure shall affect the conversion capability of the HVDC system. These loads shall include, but not be limited to, the cooling and other auxiliaries of the converters, the cooling of transformers and reactors, valve hall cooling, etc. In addition, loads that must remain working in case of complete loss of the AC power supply shall also be included in essential loads. These loads shall include, but not be limited to, the station battery*

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chargers, disconnecting switching and circuit breakers operating mechanism, the emergency lighting, fans to keep over pressure in valve halls, etc.

35. Fire Detection, Alarm and Protection system:

A comprehensive fire detection, alarm and protection system as per Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations, 2023 shall be provided. Valve Hall shall have Air aspiration system (fast and early smoke detection system). Suitable Infra-Red (IR) and Ultra Violet (UV) detector to detect the flashover inside the Valve Hall shall also be provided. The Valve hall wall towards converter transformers shall be suitable for minimum 3-hour fire rating.

Suitable fire detection system using smoke detectors and/or heat detectors shall be provided in HVDC Station for all room and areas. These smoke fire detection systems shall be connected to a separate Fire annunciation system clearly identifying the zone.

Hydrant System:

Suitable No. of hydrants shall be provided for protection of HVDC Station equipment in the yard and HVDC Station building.

HVWS System:

High Velocity Water Spray (HVWS) system shall be provided for converter transformer, ICTs and Shunt Reactors.

36. Testing and trial operation

All equipment/ components including IGBT valves, Converter Transformers, smoothing reactors, EHV DC Transformer bushings and wall bushings shall be subjected to Type tests, Routine tests, Factory Acceptance Test (FAT), Site Acceptance Test (SAT) as per relevant IS / IEC/ IEEE as applicable. The SAT shall consist of sub-system and system tests and shall be carried out after installation of equipment at site. The sub-system tests cover the major sub-system like valve cooling, AC and DC filters, HVDC converter, auxiliary systems, communication etc. After completion of sub-system tests, system tests covering power transmission tests, transient and dynamic control tests, measurement of electric field and RFI etc. shall be conducted. After completion of all system tests, final trial operation of the HVDC System shall be carried out for continuous period of normal operation of not less than 10 days for each Pole/Bipole separately. The HVDC System shall be declared under Commercial Operation after the successful completion of its Trial Operation.

37. Reactive power exchange



The 400 kV Bus sectionaliser at KPS3 is planned to be normally open. However, the design should also consider the possibility of 400 kV Bus sectionaliser to be kept open/closed based on system conditions.

Each monopole shall have a capability of providing dynamically varying reactive power between 0.95 leading power factor to 0.95 lagging power factor at PCC for any active power between -1250 MW to +1250 MW. This capability shall be achieved at all AC voltages within the continuous operating limits and ambient temperature limits. For voltages outside the continuous operating limits, the reactive power support shall be provided as per LVRT/HVRT strategy.

The control of reactive power exchange with AC grid in response to Q mode or V mode of RPC shall be fully automatic and shall be continuously monitored. The control equipment, however, shall allow both automatic and operator-initiated switching. In the former case, adequate annunciation shall be provided to the operator.

Fault infeed during faults shall be 1 p.u. of rated AC current for dead short circuit at Converter transformer AC bus. Dynamic reactive power support shall be over and above the steady state reactive power support.

The studies of DC Current flowing through breakers on AC side of converter transformer for earth faults on converter side of transformer at locations as applicable and sizing of auxiliary resistor to ensure zero crossings in the total current in the AC breaker.

Each breaker used for switching shunt reactive elements shall have point-on-wave switching control for energizing its branch, to minimize voltage disturbances while switching capacitors and filters, and minimize DC offset current while switching shunt reactors. Breakers used for switching shunt reactive and filter elements must be capable of de-energizing their branch at the maximum temporary overvoltage conditions specified in this specification, or as determined by the TSP's studies, including full load rejection studies, whichever is greater. The reactive compensation and overvoltage limiting equipment shall be designed such that at any power transfer level up to rated power in either direction, a complete or partial interruption of DC power transfer shall not result in a fundamental frequency over voltage beyond the values specified in this specification.

All the necessary studies of reactive compensation and voltage control shall be performed. The calculations of reactive power exchange and of voltage control shall be based on the most unfavorable combination of tolerances on equipment, connected system configuration and of changes in operating conditions.

38. Pole Blocking



The HVDC System shall recover to 90% of the pre-fault DC power transfer level consistently within about 300 milliseconds from the instant of fault clearing, without sustained oscillation for all inverter system fault conditions. For all rectifier AC system fault conditions, the recovery

time, to 90% pre-fault power level, shall be within 100 milliseconds from the instant of fault clearing. This recovery time shall be achieved for all short circuit levels as defined in this specification.

If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the recovery times other than those specified shall also be acceptable, subject to review

39. Pole Deblocking and Converter Start-up

A coordinated sequence of starting an HVDC Pole shall be established and demonstrated during FAT. The sequence shall be in a such a manner that it will not impact the connected AC system beyond steady state abnormal voltage limits. It shall be possible to start and deblock at minimum DC power specified in this specification earlier while maintaining all the AC and DC filter performance requirements.

40. AC bus fault

The TSP shall demonstrate the response of the power controller to DC voltage changes in the rectifiers and inverter for solid converter AC bus faults, both single phase-to-ground and three phase-to-ground.

The HVDC system shall recover to 90% of the pre-fault DC power transfer level consistently within 120 ms from the instant of fault clearing, without sustained oscillation for all inverter AC system fault conditions. For all rectifiers AC system fault conditions, the recovery time, to 90% pre-fault power level, shall be within 100 ms from the instant of fault clearing. This recovery time shall be achieved for the fault levels above the minimum specified in Table-1. Recovery times greater than specified above shall be acceptable only if the higher recovery times results in the overall AC and DC system improvement.

The response time shall be determined in accordance with the general criteria defined in this specification. The specified response for the rectifier AC system and inverter AC system faults shall be demonstrated [400 kV level at KPS3 (HVDC), 400 kV and 765 kV level at KPS3, 765 kV level at KPS2, 765 kV level at Lakadia, 400 kV level at South Olpad HVDC, 400 kV and 765 kV level at South Olpad, 765 kV level at Vadodara, 765 kV level at Ahmedabad, 765 kV level at Boisar-II] for the following conditions:

(i) Single phase-to-ground faults, for five cycle, ten cycle, and twenty cycle fault clearing and with fault levels resulting in voltage reduction to 90%, 70%, 50%, 30%, 20%, and 5% of nominal converter AC bus voltage.

(ii) Three Phase-to-ground faults, for five cycle fault clearing, with fault levels resulting in voltage reduction to 90%, 70%, 50%, 30%, 20% and 0% of nominal converter AC bus voltage.

(iii) Zero impedance three phase 400 kV AC busbar faults at Khavda and South Olpad which are cleared after five cycles and which result in the loss of one DC pole.

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(iv) Three phases to ground, five cycle, and Single line to ground, ten cycle faults. The outage of components would include 400 kV single circuits, 400 kV double circuits if these are on same tower, generator, filter bank etc.

(v) Three phase to ground, five cycle, and Single line to ground, ten cycle faults following conditions when system is already running under single contingency and which result in outage of further system components. The outage of components would include 400 kV single circuits, 400 kV double circuits if these are on same tower, generator, filter bank etc. Under such conditions it shall be shown that the system stability is maintained although the time required for recovery may exceed the values given above. For certain cases if there is a need for run back condition on HVDC the same shall be evolved by the TSP.

(vi) TSP shall demonstrate LVRT and HVRT Capability as per the performance criteria mentioned in this document.

41. DC Line Faults

The DC line fault protection sequence shall detect the fault, de-energize the faulted line Pole by control action, allow a time period for fault deionization (settable between 50 ms to 1000 ms), and then automatically attempt restoration of the DC power transfer on the Pole.

For pole to ground faults, the TSP shall provide a sequence to de-ionize the fault and restart the monopole automatically after a predetermined programmable time. The first restart attempt shall be at pre-fault DC voltage and second restart attempt shall be at reduced DC voltage. The third attempt shall be in STATCOM mode. This constitutes one complete recovery sequence.

All equipment shall be dimensioned considering these 3 restart attempts.

The first restart attempt including fault clearing time and achieving pre-fault power level, shall not exceed 2 seconds for pole to ground faults, however, it shall be endeavor to mininise the fault recovery time. During second restart attempt tap changer may be used to achieve reduced DC voltage. The maximum time for the second restart attempt shall be limited to time taken by tap changer or the time taken by the drive of the breaker/switch to recharge. In case the second attempt fails then the converters shall automatically go into STATCOM mode of operation

The system shall be designed and capable of the following:

a) During the DC line fault the power transfer on the non-faulted Pole shall be completed as quickly the extent possible in order to minimize the impact on the DC power transfer. This should be possible even when telecommunication is out of service.

b) In case a fault occurs within 15 minutes of the last fault then both these faults shall be counted as attempts within single DC line fault recovery sequence. A fault that occurs after 15 minutes of the last fault shall be treated as start of new DC line fault recovery sequence. Maximum cooling period between two consecutive DC line fault recovery

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sequences shall be 60 minutes during which tripping may be allowed.

The clearing and recovery of a DC line Pole fault shall be demonstrated in bipolar and monopolar mode at 1.0 p.u. power transfer prior to the fault for the particular mode. Faults shall be applied at the line ends and at the line midpoint in both power directions. The demonstration shall include the influence of the function provided to transfer power from the faulted Pole to the other Pole.

Suitable modeling of the DC line, which takes into account the electro-magnetic coupling between the Poles, shall be considered in the above studies.

All high voltage equipment in the VSC station including charging resistors and neutral bus arresters shall have adequate thermal capacity to support an unsuccessful automatic restarts. In case DC line is tripped due to line fault, affected pole shall be left in a state ready for manual restart in STATCOM mode.

42. Operation During Reduced AC Voltage Conditions

To assist in the recovery of the network, the Converter Stations shall be able to continue operation with reduced AC bus bar voltages.
In addition to the requirements of operation under over voltage conditions specified in this specification, the converter equipment shall be able to continue operating without blocking of converters with AC bus voltage reduced below 15% of nominal voltage during three phase faults, and to zero on one phase during single line to ground faults, for a period of 1 second followed by voltage recovery to 80%. In this condition, reactive power feed to fault shall be prioritized. The converters shall continue to transmit power to the extent possible under the above reduced voltage conditions. The valves as well as all the cooling equipment shall be rated for these conditions. The cooling system shall not trip during AC system faults.

43. Controlled Shutdown

Each Pole shall be able to be shut down in a controlled manner by the automatic reduction in the power order accompanied by appropriate AC harmonic filter bank switching. The block and isolation of a Pole shall be done without the block or shutdown of other Pole converters.

44. Power Runback

The controls shall be capable of achieving 90% of any step change requested by run-back modulation signals including within 200 milliseconds of receipt of the run-back signal.

45. Cyber security

The designed system shall be compliant with:

a) IEC-27001 Information security management

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b) IEC-62443

c) CEA (Cyber Security in Power Sector) Guidelines, 2021

Cyber security shall be incorporated in the overall design of the HVDC controls, protection, communications, HMI and SCADA systems. The TSP shall propose a secure and robust design in the control and LAN systems, using next generation firewalls, dual firewall communication designs, routers, gateways, data diodes, etc. that have built in cyber secure measures.

46. Performance Guarantee for Converter Station (excluding HVDC line)

a) HVDC Station losses: The Guaranteed losses of HVDC converter stations shall include the no load operating state loss and load losses during Operation with 100% rated active power(1250 MW / pole) and 100% rated reactive power (410 MVAr / pole). The Guaranteed losses shall be verified as per IEC 61803 and IEC 62751. The above losses shall be guaranteed at nominal DC voltage (±500 kV at rectifier end) and nominal AC system Voltage (400 kV, 50 Hz) at ambient temperature of 40 deg C and relative humidity of 50%.

b) No load loss shall be guaranteed corresponding to converter transformer set at principal tap## with nominal AC system voltage and nominal frequency. Also refer maximum guaranteed loss figures in table below:

c) The system shall meet various harmonic performance parameters on both AC side and DC side.

Design targets for HVDC station Reliability and Availability^^ and station guaranteed losses shall be as per Table-10.

Table - 10

1	Overall Energy availability of HVDC scheme (a) Overall Performance (b) Excluding transformer	 Not less than 97% Not less than 98%
2	Forced Energy Unavailability (FEU)	Not more than 0.6%
3	Schedule Energy Unavailability (SEU)	Not more than 1%
4	Single Pole outage per station per year	Not more than 8 (with average outage duration of 7.5 hours)
5	Bipole outage per station per year	Not more than 0.2 (with average outage duration of 8 hours)
6	No-load operating state losses	0.2 % of Bipole Rating per station
7	Load losses at operation with 100% rated active power and 100% rated reactive power at nominal DC Voltage	Max–1.0–% of Bipole Rating per station



##Principal tap is the Tap Position of converter transformers when HVDC converters shall be delivering 1 p.u. power (2500 MW, 0 MVAR) at nominal DC voltage at rectifier (± 500 kV) keeping AC system voltage 400 kV, 50 Hz at 40 deg C ambient temperature and humidity of 50%.

^^The details for calculating Availability are mentioned in ***'Appendix C.4'.***

For the loss guarantee stated above, following equipment/systems shall be considered:

a) Determination of losses

The total losses of the HVDC converter station other than HVDC valves shall be calculated as the sum of the losses determined for each individual equipment in line with IEC 61803. The major components to be included in the loss calculation and guarantees and the method of assessment for each component shall be as follows, as applicable:

1. Converter Transformers as per IEC 60076-57-129
2. Phase/ valve reactors
3. DC Smoothing Reactors
4. Converter Valves as per IEC 62751
5. High frequency damping circuits (if applicable)
6. Reactive Power Equipment, AC Filter
7. Auxiliary Power Transformers
8. DC Filters and 50 Hz blocking filter as per IEC 61803
9. Losses for RI and PLC filters
10. All items covered in IEC 61803

Specific Exclusion:

Equipment specifically excluded from the loss calculations shall be the oil treatment plant and firefighting load, station auxiliary system energy consumption (such as illumination of indoor and outdoor services, Air conditioning and ventilation system for control room, service building, kiosk, battery and battery charger etc.) except auxiliary power consumption required by Converter transformer cooling and Valve cooling system.

b) Guaranteed Failure Rate of Power module.

The maximum annual guaranteed Power module failure rate shall not exceed 1.0 % per pole per station. The failure rate shall not include failures directly attributable to operating and maintenance errors.

c) AC/DC HV Filter Capacitor Failure Rate Guarantee (If applicable)

The maximum guaranteed annual capacitor failure rate shall not exceed 0.15% except first unit failure. The capacitor shall be considered as failed if its Capacitance value varies more than ±5% of the (actual measured) name plate value or as indicated by manufacturer. Leakage of oil from the capacitor and deformation of the capacitor unit shall be considered as a failure even if the capacitance value is within the tolerance limits. Failure rate shall be

monitored on per pole per station basis.

d) Flashover Guarantee

Flashover is defined as breakdown of insulation for self-restoring insulation media which leads to outage as defined elsewhere in this specification. TSP shall guarantee that there shall be not more than two pollution related flashovers per station per year for DC yards (base environmental conditions as given in this specification will be considered). In case of a flashover, TSP shall make necessary investigations to establish the cause of the same, propose mitigation measures and implement the same.

e) Guaranteed Failure Rate of Relay Module/ C&P Module/Component

The guaranteed failure rate of relay module/ C&P module/ component shall not be more than 0.5% (except 1st unit failure). This will include individual circuit boards but not computers. The failures directly attributable to operation and maintenance errors and other incidents unrelated to the DC system shall not be included in the calculation. The relay module/ C&P module/ component failure rate shall be monitored on per pole per station basis.

47. Commissioning and start of operation

The purpose of commissioning period is to demonstrate to the Nodal Agency/Independent Engineer's satisfaction that the equipment is ready for its purpose and it functions satisfactorily under normal operating conditions. The testing and commissioning period will have the necessary duration to demonstrate the proper functioning of all the Project equipment and systems.

a) Site Testing

After the installation and preliminary adjustments of equipment, the Site tests shall be performed in the following stages:

- Erection checks
- Commissioning tests
- Sub-system tests
- Sub-system energization tests
- System tests



The site testing has been categorized in above stages for the sake of convenience only. There may be overlapping of two or more stages for particular tests. The TSP shall perform the site testing with complete responsibility.

The TSP shall provide all instruments, equipment and facilities required to perform these site tests. Calibration certificates for the test equipment shall be made available at site prior to the start of the testing.

All special and test equipment necessary to simulate devices or switching sequences and required for commissioning shall be provided by the TSP. Results of the site tests shall be well documented and shall form a part of plant documentation.

48. Mandatory Spares:

The mandatory spares for the HVDC Station shall be as per 'Annexure-B, 4. Mandatory spares for HVDC stations (substation/switchyard level)' of CEA's 'Guidelines for availability of spares and inventories for power transmission system, transmission lines and substation/switchyard) assets, 2020'.

The specific exclusion to the above list is Sl. No. 2.1, Converter Transformer. Other Converter Transformer spares from Sl. No. 2.2. to Sl. No. 2.41 to be provided.

Minimum one No. (single phase two winding) spare Converter transformers of each type and rating per station, shall be provided. The spare Converter Transformers shall be inclusive of all fitments, hardware, bushings, as well coolers if mounted on the tank, accessories and oil complete in all respect.

49. HVDC building:

The Building shall comprise of but not limited to the following facilities:

1. Control and Relay Panel room
2. ACDB and DCDB room
3. Battery room
4. Service Room cum workshop
5. Valve hall
6. Cooling system room
7. AHU Room
8. Valve Hall Ventilation Room
9. Any Other room/facilities as per functional requirement

50. For Type Test requirement of equipment, CEA's 'Guidelines for the Type Tests for major equipment of Power Sector' is to be followed.

51. TSP shall supply complete VSC HVDC control and protection replica system without

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redundancy along with a real time simulator for both the poles based on project specification mentioned in this document. The software and hardware design philosophy of control and protection replica shall be based on the design of ± 500 kV, 2500 MW Khavda - South Olpad VSC HVDC system for the purpose of dynamic performance testing, commissioning, troubleshooting and optimization during operation and training. Figure-4 shows a general diagram of the scope of Control Replica.

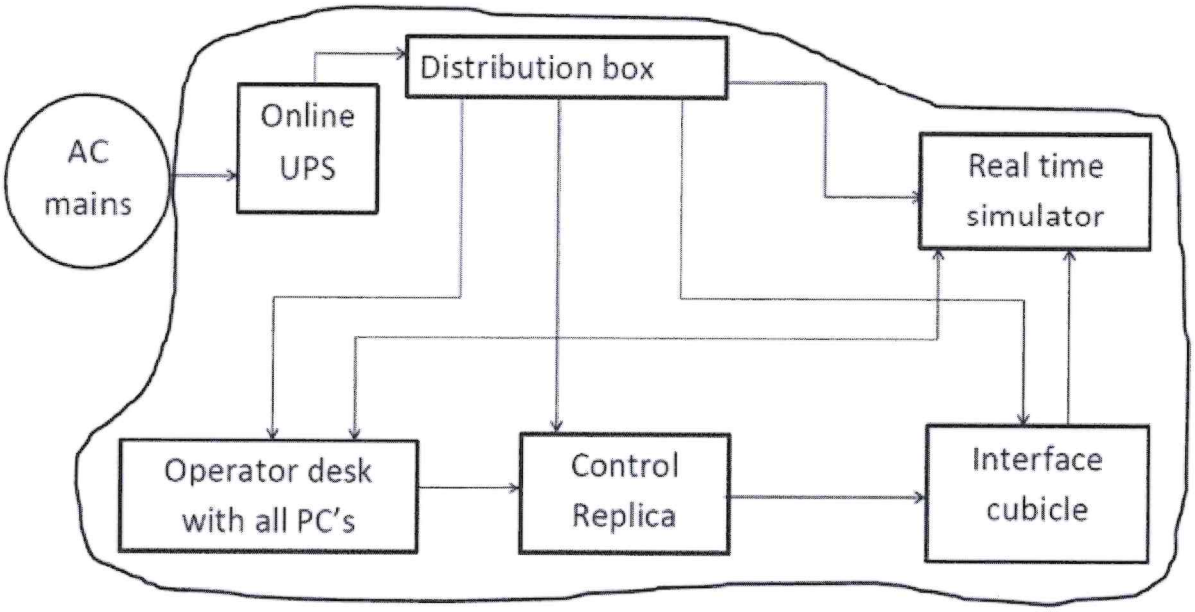


Fig 4 : Scope of contractor for Control Replica

As show in Figure-4, the supply shall include simulator interface panel, station HMI, Transient Fault Recorder, Station GPS clock, network equipment, Uninterrupted Power Supply (UPS) system, communication cables, cable trays/racks, tools and tackles, suitable furniture including operator desk, spares and other accessories required to implement the Control Replica. The dynamic performance test for 2500 MW Khavda – South Olpad HVDC VSC Bipole may be carried out with Control Replica, and the same shall be delivered to site after completion of site acceptance tests. The simulator shall contain AC network modelled as both voltage sources behind short circuit impedance and detailed AC equivalent network as provided to enable TSP to carry out test cases with both options.

52. Applicable Standards:

All equipment and material shall be designed, manufactured, tested and commissioned in accordance with latest Indian Standards / IEC or IEEE standards, / CIGRE guidelines and the Acts, Rules, Laws and Regulations of India. Some of them are as follows:

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Table 11

Sr. No.	Description	Standard
1	Terminology for HVDC transmission	IEC 62747
2	High-voltage direct current (HVDC) power transmission using voltage sourced converters (VSC)	IEC TR 62543
3	Performance of voltage sourced converter (VSC) based high-voltage direct current (HVDC) transmission – Part 1: Steady-state conditions	IEC TR 63363-1
4	High-Voltage Direct Current (HVDC) installations - System tests	IEC 61975
5	High-Voltage Direct Current (HVDC) systems - Guidance to the specification and design evaluation of reactive power exchanges	IEC 62001 (1-5)
6	Bushings for DC Applications	IEC 65700
7	Insulation Coordination	IEC 60071 (1- 4,11,12)
8	Application guide for metal oxide arresters without gaps for HVDC converter stations	CIGRE report 33/14-05
9	Converter transformers	IEC 60076-57-129
10	Power transformers - Part 6: Reactors	IEC 600076-6
11	Shunt capacitors for AC power systems having a rated voltage above 1000 V	IEC 60871-(1-4)
12	Guidelines for the system design of HVDC project	IEC/TR 63127 Ed. 1.0
13	SYSTEMS WITH MULTIPLE DC INFEED	CIGRE 364
14	Guidelines on Asset Management for HVDC Installations	IEC/TR 62978 Ed. 1.0
15	Transformer for HVDC applications	IEC:60076-57-129
16	Surge Arresters – Metal Oxide Surge Arresters without gaps for HVDC converter stations	IEC: 60099-9-Part -9
17	Instrument Transformers	IEC 61869
18	Disconnectors and Earthing Switches	IEC 62271
19	Cyber Security	IEC 62443 IEC 27001
20	UPS, SMPS and Other Power supply units	IEC 62040 IEC 61558
21	Terminology for Voltage Source Converters for high-voltage direct current (HVDC) transmission.	IEC 62747
22	Power losses in voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) systems - Part 2: Modular multilevel converters	IEC 62751
23	Voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) power transmission - electrical testing	IEC 62501
24	Power losses in voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) systems -: Modular multilevel converters- Part 1	IEC 62747

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25	Testing and commissioning of VSC HVDC systems	CIGRE 697
26	Dynamic characteristics of inverter-based resources in bulk power systems	IEC 63401
27	IEEE Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems	IEEE P2800-2022
28	Wind Energy Generation Systems	IEC-61400
29	TESTING AND MEASUREMENT TECHNIQUES - POWER QUALITY MEASUREMENT METHODS	IEC 61000-4-30
30	Other items as per relevant and prevailing standards specified elsewhere in the specification for substation works.	

i) CERC (Indian Electricity Grid Code) Regulations, 2023

ii) Manual on Transmission Planning Criteria, 2023

iii) CEA Technical Standards for Construction of Electrical Plants and Electric Lines Regulations, 2022

iv) CEA Technical Standards for Connectivity to Grid, Regulations, 2007 (including subsequent amendments)

Appendix- C.1

DC Voltage Measuring Equipment

A proven type of voltage divider shall be provided for DC voltage measurement. The accuracy of the device shall not vary more than 0.5% with an ambient temperature change of 50° C. The overall voltage measuring system shall have an accuracy of at least 1.0% of full scale. The response time shall not be longer than 150 micro seconds, accepting an overshoot of up to 20% at that rise time. The measuring system shall achieve proper operation of the control and protection system to which it is connected.

The measurement range shall be sufficient to measure voltages up to 1.5 p.u. Preference shall be given to devices which provide isolation between the HV primary connection and the output signal. If the output signal is not completely isolated from the HV connection, protection shall be provided to limit the possible output signal voltages to less than 2 kV in the event of a fault on the device.

All low-level signals shall be cabled separately from high level signals. The divider shall be so arranged that no leakage current on the surface of the insulator can pass to the measuring circuit. The insulator shall for this reason be continuous without any metallic intermediate flanges. Furthermore, the interior of the divider shall be so arranged that interior leakage currents do not influence the measurement.

For voltage measuring equipment to be erected in the outdoor switchyard, it shall be ensured that discharge activity on the housing shall not cause interference with the output signal.

For each voltage measuring device furnished, all necessary auxiliary power plus any equipment necessary for the transformation of the auxiliary power to an acceptable form shall be provided. Such transformation equipment shall be mounted in the control cubicles.

For power quality measurement compatibility, the transducers including its interface with control and protection panels and display like Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given above.

Direct Current Measuring Equipment

Direct Current Transducers supplied shall be mounted in bushings, if available. In locations where bushings are not available, free-standing transducers shall be provided. For each transducer furnished, the all-necessary auxiliary power plus any equipment necessary for the transformation of the auxiliary power to an acceptable form shall be provided.

The design of the measuring system shall be based on maximum interchangeability where any electronic module shall be compatible with any of the core and coil assemblies.

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The transducer output signal shall be of sufficient magnitude to ensure that the content of the signal is usable at all levels of primary current from 1% to 300% of the rated current, with a measurement output possible up to 600% before saturation of the output signal occurs.

In the event of high current (up to 0.2s short circuit current), the DC CT shall remain unsaturated for 20 ms or longer. This time shall be measured from the instant the current attains 10 pu. The DC CT shall be provided with interlock circuits that indicate saturation of the DC CT, as well as DC CT faults.

It shall be ensured that any low-level signals generated are kept shielded from interference due to other higher voltage circuits. The low-level signals shall be cabled separately from high level signals.

It shall be ensured that all DC current measurement outputs are accurately calibrated with all the respective loads connected. Sufficient buffered outputs shall be provided at the time of the initial installation for all future output signal requirements. If required, on-site adjustments to output calibration shall be possible. The sensitivity of the devices supplied for such calibration shall be appropriate for setting the required accuracy.

The electronic module shall be provided with interlock circuits to indicate that the measuring system is fully operable.

Each transducer shall be provided with a capacitive tap.

In case of Optical DC measuring system, the materials used in it shall be non-corrosive in nature.

For power quality measurement compatibility, the transducers including its interface with control and protection panels and display like Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given in this specification.

Stationary Accuracy

The composite accuracy of all DC current measurement systems used for protective purposes shall be equal to or better than ±2% of rated DC current up to 120% of the maximum rated current and ±10% of rated DC current up to 1.2 times peak calculated fault DC current.

All DC current measuring system used for control purposes shall have a composite accuracy of ±0.75% of rated DC current from minimum rated current to 120% of the maximum rated current and ±10% of rated DC current from 120% up to 300% of the rated current.

All transducers used for corresponding functions, e.g. pole differential protection etc shall have matching accuracies equal to or better than ±2% of rated current up to 300% of the rated current.

Dynamic Accuracy

The response of the measuring systems shall be such that a linear current change within 150%

of maximum rated current and with a rise time of 45 ms, is tracked by the transducer output with an error which does not exceed +0%, -2% of rated current on any point of the curve. The rise time is defined as the time required for the current to change from 10 to 90% of the full current change. The frequency response shall be within +3% at 1500 Hz.



Appendix C.2

Operator's Control, Monitoring and Support Systems

A. General Requirements

All hardware such as computers, computer peripherals/printers/ accessories, testing equipment etc and networking products shall conform to latest products based on industry standard. It shall be possible to fully monitor and control both stations as described below-

- Operation control of both converter station (from monitors) from Khavda
- Operation control of both converter stations (from monitors) from South Olpad
- In separate operation control mode, all the terminals shall be able to control their own station individually.

The above selection modes shall be separately provided for control of the DC system and the AC systems of either station.

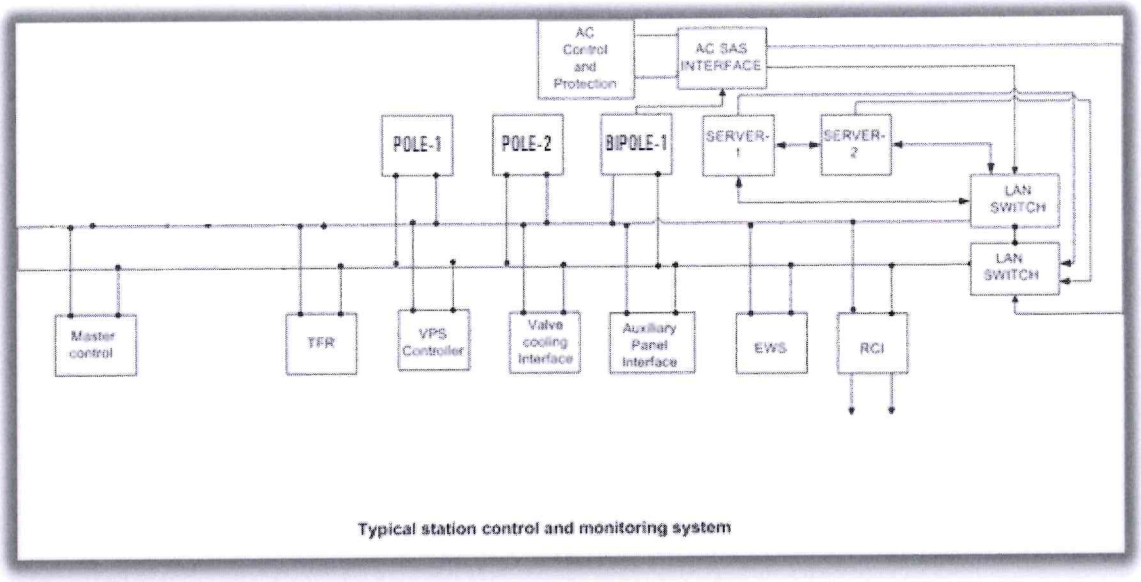
A Station operator desk to be supplied at each converter station shall be able to control the stations. The control shall be possible from TFT Monitors and operator key board/ mouse. In the event of failure of the system, control and monitoring shall be by means of direct control at the Bipole control panels, circuit breaker controls panels etc. generally as shown in 'Figure-A'. This control could be made from PC connected to these control panels and necessary interface shall be provided to achieve this. The control functions to be provided from the equipment control panels shall include at least those listed under 'Table-A' and 'Table -B'. It shall also be possible for operator to know individual alarms by selecting the particular panel on the display monitor.

The TSP shall provide the equipment necessary for the purpose of control, status indication and metering of all equipment (keeping in view the intermediate Bay Kiosks to be provided in AC and DC yard,) Khavda and South Olpad.

The control room shall generally house the following equipment:

- Operator control, monitoring and support system
- DC line fault location equipment, if not integrated within C&P system.
- Transient fault recorders, if not integrated within C&P system.
- Master controller equipment, if not integrated within C&P system.
- Station fire alarm, control and monitoring panel





Typical station control and monitoring system

'Figure – A'

(System shall be redundant with system A and system B. Only one system has been represented.)

i. HVDC Controls

The station control room at each converter station shall have facilities that include, but not be limited to, the functions shown on Table-A and B

A description of major HVDC control functions is outlined below:

1. **Controlling Station (Master Station) Selector Switch**

Control location selector switches shall be provided in each station control room. These selector switches shall enable the operator to control the HVDC system and/or the HVAC yard of any converter station from either Khavda and South Olpad stations. HVDC and HVAC yard control and monitoring of other converter station shall be provided from TFT Monitors.

2. **Bipole Controls**

Bipole controls shall refer to the common control functions that affect both poles in a Bipole. These functions are typically Bipole power order, power direction, power limit and power ramp rate.

The power flow over the Bipole shall be maintained at the Bipole power order as set by the operator.

The power ramp rate shall control the timing sequence for loading Bipole at a pre-selected rate (within specified range) set by the operator.

The power limit control shall enable the operator to set different limits to Bipole loading. It shall also be possible to operate each pole separately from Bipole Controls.

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3. **Pole/Converter Current Order/Limit**

The power setting divided by voltage shall determine the current order to either pole. However, this shall not preclude the ability to control each pole, by means of a directly entered manual current order signal.

The pole current limit set point shall enable the operator to raise/ lower current limits to optimize link capabilities under varying conditions such as ambient temperature, temporary reduction in capability etc.

4. **HVDC System Control Mode Selection (Per Pole)**

The following basic control modes shall be provided:

a) Active Power Control Mode
b) DC Voltage Control Mode

Disturbance free transfer of any pole from one control mode to another shall be possible.

5. **Miscellaneous Operator Controls**

a) DMR (Dedicated Metallic Return) Line Current Null Control

This control shall enable the operator to null the current flowing in the DMR (Dedicated Metallic Return) Line resulting from unequal sharing of load between poles during balanced operation.

b) Block/ Deblock

This control shall enable the operator to stop (block) or start (deblock) a converter. Automatic sequences shall be provided to fulfil preconditions for deblock. A normal stopping sequence initiated by "block" contact involves a sequence at each end that causes the voltage and current to drop to zero.

c) Pole Start/ Stop

This control shall enable start or stop of the complete pole, comprising converters at either of the rectifiers and the inverter and shall take care of all interlocks, start/stop preconditions and sequences automatically.

d) Direction of Power Transfer

Power flow shall be possible in both directions.

e) Pole Metallic Return/DMR (Dedicated Metallic Return)

This selector switch (or switches) shall enable an automatic sequence from Pole metallic return to DMR and vice versa. This mode change shall be possible even with power flowing in the DC system.

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f) DC Filter Connect/ Isolate

Motorized disconnects are specified for switching the filter arms to allow disconnection of a faulty filter bank or arm and for restoration to service as quickly as possible. An automatic switching sequence shall be provided which shall take care of all the interlocks.

g) DC Line Isolator

DC line isolators are specified for maintenance purposes and their electrical operation in local shall be possible. Operation shall be permitted only with pole blocked and station ground connected. Automatic operation shall also be possible if required by any sequences subject to satisfying all interlocks permitting the operation.

h) Grounding Switches in DC Yard

Grounding switches are specified for the DC switchyard area to allow each isolatable section of bus to be grounded. Only local electrical operation is required. However, if operation of any grounding switches is part of any automatic sequence(s), or is specified elsewhere, then those grounding switch(es) shall be operable locally as well as remotely.

i) Valve Hall Ground Switches

Remotely controlled motor operated grounding switches are specified for the valve halls to protect maintenance personnel. The operation of all the valve hall ground switches together as a group shall be possible by initiating a sequence from the control room. Provision shall however be made (key operated switch) for defeating the interlock to permit entry of personnel into the restricted area of the valve hall.

j) Maintenance/Bypass Isolators for Metallic Return Transfer Switch / Bus (MRTS or MRTB)

Electrically local operated isolators shall be provided to establish a ground reference when MRTS is being maintained. These shall be interlocked with the MRTS.

k) Emergency Stop

An emergency stop button on pole basis shall be provided in the control room. Operation of this button shall automatically ramp down at a fast rate the direct power, lead to blocking of the converters and reach safe shut down with Operation of High speed parallel/ De-parallel switches.

l) HVAC Controls

HVAC controls shall consist of close-open operations for circuit breakers and motor operated disconnectors.

ii. Station Control Facilities

The TSP shall provide the control facilities from the operator control desk through a TFT monitor and keyboard/ mouse system. These facilities shall include all control operations, digital setting,

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indicating devices, Station single line diagram and symbols, any other special control devices and meters required for control and monitoring of the complete HVDC system. The layout of the station single line diagram, together with control, indicating and metering devices on the control desk shall be logical, compact, and shall facilitate efficient supervision and operation of the station(s) by the operator.

iii. Station Level Status Supervision

The position of each switchgear e.g. Circuit breaker, isolator, earthing switch, transformer tap changer etc. shall be supervised continuously. Every detected change of position shall immediately be displayed in the single-line diagram on the station screen, recorded in the event list and an option to take hard copy printout of event list shall be available. Alarms shall be initiated in the case of spontaneous position changes.

The switchgear positions shall be indicated by two auxiliary switches, normally closed (NC) and normally open (NO), which shall give ambivalent signals. An alarm shall be initiated if these position indications are inconsistent or if the time required for operating mechanism to change position exceeds a predefined limit.

iv. System Indications and Power Measuring Facilities

The TSP shall provide DC and AC system / equipment indication facilities in the station control room at each converter station that shall include, but not be limited to, the functions shown on Table A and Table B. Alarms of slave stations shall be indicated and displayed both at Master Station and slave stations and vice-versa.

Graphic representation of valves and valve cooling piping network shall be provided on station monitoring system. The graphical representation shall also display faulty power modules in different colours indicating faulty power module position.

Pressure, temperature and relative humidity of each valve hall shall also be displayed in the control room. Alarm(s) shall be raised in case any of the parameters exceed limits.

'Table A' provides a list of minimum AC and DC metering facilities required, which shall be included on TFT monitors.

v. Energy Metering

Energy meters as per relevant CEA Guidelines and Specifications/Regulations for the 765 kV , 400 kV , 220 kV and 132 kV AC switchyards (as applicable) and 33 kV feeders at HVDC terminals shall be provided by the TSP.-

B. System Requirements

General

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The main control and monitoring systems shall be configured as dual redundant computer-based systems in a main and hot standby configuration generally as shown in 'Figure A'. The operator control, monitoring and support system could be integrated with station control system. Outage of any subsystem or complete loss of one system shall not affect the control and monitoring of the HVDC station. The system shall be based on open system concept in hardware and software and industry standard communication protocols and graphical user interface.

The redundant, computer-based system shall accept control inputs from the Operator by means of TFT monitor/ mouse etc and send these commands to the HVDC and the HVAC control systems.

The system shall gather alarm, status and measurand data from the plant and display it to the Operator on the mimic diagram on TFT monitors, loggers etc. as further defined below. The system shall be so designed that no alarm and status data or control data shall be lost.

Table -A Controls and Indications at Khavda and South Olpad :-

Sl. No.	Signal Name	Khavda	South Olpad
	CONTROLS SIGNALS		
1.	Bipole power order	√	√
2.	Bipole power order ramp	√	√
3.	Bipole power order limit	√	√
4.	Bipole power/current control	√	√
5.	Power direction P1, P2	√	√
6.	Power/Current control P1, P2	√	√
7.	Current order setting	√	√
8.	Current ramp start/stop	√	√
9.	Current order ramp setting	√	√
10.	Current limit setting	√	√
11.	Master station transfer	√	√
12.	Metallic/DMR switching	√	√
13.	Reduced voltage on/off P1, P2	√	√
14.	Start/Stop and Block/deblock P1, P2	√	√
15.	Power Swing modulation on/off	√	√
16.	DC power /current control	√	√
17.	Emergency stop P1, P2	√	√
18.	Frequency control/on/off	√	√
19.	Frequency target/limits	√	√
20.	Connect/isolate P1, P2	√	√
21.	Joint/separate, Sync/Async	√	√

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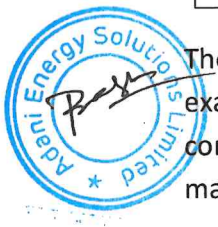
Sl. No.	Signal Name	Khavda	South Olpad
22.	DC Filter connect/isolate P1, P2	√	√
23.	RPC auto/man off switching	√	√
24.	RPC Volt/Reactive Selection	√	√
25.	RPC MVAr/Voltage set points	√	√
26.	Open line test auto/man P1, P2	√	√
27.	AC Filter (bank/ sub-bank) breaker open/close	√	√
28.	Conv. Trans Breaker open/close	√	√
29.	AC Filter (bank/sub-bank) Disconn open/close	√	√
30.	Conv. Trans Disconn open/close	√	√
31.	Tap changer auto/man P1, P2	√	√
32.	Valve hall Gr. Switch open/close P1, P2	√	√
33.	Khavda Sw. yard Breaker open	√	√
34.	South Olpad Sw. yard Breaker open	√	√
35.	Sub Synchronous Resonance Detected	√	√
36.	Sub Synchronous Damping Control Activated,	√	√
37.	Power Oscillation Damping Activated	√	√
38.	Sub Synchronous Control Interaction Detected	√	√
39.	Sub Synchronous Control Damping activated	√	√
	INDICATIONS		
40.	DC OP Mode Pwr./current	√	√
41.	Gr/metallic return indication. P1, P2	√	√
42.	Power direction P1, P2	√	√
43.	Pole Telecommunication healthy	√	√
44.	Pole blocked/deblock P1, P2	√	√
45.	Master station Khavda-South Olpad- LDC	√	√
46.	STATCOM Mode on	√	√
47.	Power ramp in progress	√	√
48.	Stabilization control on/off	√	√
49.	Full/reduced DC voltage indication P1, P2	√	√
50.	Tap changer Auto/Man indication.	√	√
51.	Pole connect/isolate indication.	√	√
52.	Power direction normal/reverse	√	√
53.	Runback activated indication.	√	√
54.	Frequency control on/off	√	√
55.	Frequency control activated	√	√
56.	AC bay Circuit breakers indication Phase wise.	√	√

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Sl. No.	Signal Name	Khavda	South Olpad
57.	AC bay disconnectors indication.	√	√
58.	Bypass Breaker Indication Phase wise	√	√
59.	Pole Discharge Switch Indication	√	√
60.	DC filter con/isolated indication.	√	√
56.	Grid Forming Mode Enabled	√	√
57.	Grid Following Mode Enabled	√	√
58.	Virtual Synchronous Machine Mode Active	√	√
59.	DC Voltage Control Station	√	√
60.	Active Power Control Station	√	√
61.	HVRT / LVRT Activated	√	√

Table -B Indication Signals to RLDC

S. No	Signal Name	RLDC
1.	Bipole power order	√
2.	Power Swing modulation on/off	√
3.	DMR/metallic return indication. P1, P2	√
4.	Pole blocked/deblock P1, P2	√
5.	Runback activated indication.	√
6.	Frequency control on/off	√
7.	Frequency control activated	√
8.	Full/reduced DC voltage indication.	√
9.	AC bay Circuit breakers indication.	√
10.	AC bay disconnectors indication.	√
11.	DC Power Bipole	√
12.	DC Line current/ voltage P1. P2	√
13.	AC side A/MW/MVAR/ P1, P2	√
14.	AC Filter/Cap A. MVAR all banks	√
15.	AC Lines A/MW/MVAR/	√
16.	Station/AC system MW exchange	√
17.	Station/AC System MVAR exch.	√
18.	AC Bus Voltage	√
19.	AC Bus Frequency	√



The system shall also be designed to allow input of signals from the Dispatch centre - for example, load frequency control (LFC) signals. The system shall be capable of meeting the control and monitoring requirements of each converter station and LDC while operating at maximum rating, with a reserve capacity of minimum twenty-five per cent. Equipment bins that

are not fully equipped with cards shall be fully wired and be ready to accept additional cards. Power supply units shall be rated to meet the full capacity requirements.

C. Functional Requirements

1. General

The redundant computer-based system shall be a highly reliable integrated system, which shall provide Operator's interface, alarm and monitoring system and operator guidance/ expert system.

The high-voltage apparatus within the station shall be operated from different places:

- Remote control centres
- Station operator control.
- Local Bay controller IED (in the bays)

Operation shall be possible by only one operator at a time. The operation shall depend on the conditions of other functions, such as interlocking, synchro-check etc.

2. Run Time Command Cancellation and Self-Supervision

Command execution timer (configurable) must be available for each control level connection. If the control action is not completed within a specified time, the command should get cancelled. Continuous self-supervision function with self-diagnostic feature shall be included.

3. User Configuration

The monitoring, controlling and configuration of all input and output logical signals and binary inputs and relay outputs for all built-in functions and signals shall be possible both locally and remotely.

It shall also be possible to interconnect and derive input and output signals, logic functions, using built-in functions, complex voltage and currents, additional logics (AND-gates, OR gates and timers). (Multi-activation of these additional functions should be possible).

The Functional requirement shall be divided into following levels:

a) Bay Level Functions.
b) System Level Functions.

D. Computer Information System Requirement:

A computer-based information system shall perform following functions:

- Initiation of commands to control HVDC system.
- Control and monitor the Valve cooling system.

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- Monitoring of process data to give brief overview as well as a comprehensive view of each subsystem.
- Sequence of event recording and alarm system including determination of Event Categories (major, warning, alarm).
- Process data archiving and trending.

Soft copy of complete station documentation shall be available on Operator Work Stations.

All the system trends shall be available at least for one-year period and retrievable on demand from the main storage system. The process data logging shall have hourly/ daily logging of station data. Archiving and back up storing facility of the log sheets shall be possible and facilities taking backup on External hard discs/ Drives minimum 2 tera bytes shall be provided.

E. Remote Control, Monitoring and Tele Control systems

The TSP shall provide facilities for coordinated control and monitoring of the HVDC system. All required remote control and remote monitoring facilities shall be provided at each converter station. Complete remote monitoring of each converter station shall be possible from opposite converter station. The HVDC tele-control system equipment shall be used in the processing of signals to be transmitted over the fibre optic communication system between the converter stations of Bipolar scheme.-

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Appendix C.3

Transient Fault Recorders

1. General

The transient fault recorders (TFR) shall continuously monitor the power system. These could be integrated with operator control and monitoring system or supplied as standalone units.

Below requirements are specified for standalone units. Similar functional requirements will be applicable for integrated TFR.

One recorder per pole shall be provided at each converter station. The TFR may be provided in the form of central unit together with Data Acquisition Units (DAUs). Initiation by any one of the fault detecting sensors or external initiating contacts shall cause the fault recorder to record on all channels. The record shall comprise-fault information, time of fault information and post fault information. The TSP shall determine the number of analog and event inputs required for each recorder and supply these number plus minimum 25% spare channels. The TFR shall also have facility for harmonic analysis upto 100th harmonics, inter-harmonics of waveforms. Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given below. It should also be compatible for checking DC harmonic performance values.

Recorders shall be of solid-state modular construction microprocessor based and without moving parts. First in, first out (FIFO) printing logic shall be used. The necessary software for directly analyzing the records on the memory of the TFR shall also be supplied.

Facilities shall also be provided for data retrieval from TFR and analyse by means of a master station based on compatible PC having minimum configuration of 2.8 GHz clock speed, 1 TB hard disc and 16 GB RAM capacity, complete with 24-inch LED monitor, keyboard/ mouse etc and include laser colour printer with capability to print on A3 and A4 size paper. All necessary software package(s) along with facility to communicate between TFR and PC shall be provided by the TSP.

2. Input Signals

The input signals and starting sensors required for the HVDC system for commissioning and operation shall be determined by the TSP. The input signals to each fault recorder system for a pole shall include, but not be limited to, the following:

- Converter module voltage;
- Converter arm current
- Converter module energy

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- Reactive Power Control Values Active Power Control Values Control references and limits e.g. Id, Iq,Vdc, Pdc. .
- Pole Voltage Order
- Active and Reactive power order
- AC Voltage (Converter)
- Real and Reactive Power Measurement Values
- Real and reactive current Measurement Values
- Pole current order;
- DC line voltage (own pole);
- DC line voltage (other pole);
- DC neutral Bus voltage (Both poles)
- DC line current (own pole);
- DC line current (other pole);
- DC power (each pole and both converters)
- DC power (other pole and both converters)
- DC line to Line Voltage
- Line-Line DC voltage Reference value for the DC voltage control
- DC line current limitations
- Current order
- AC bus voltage (3 phases);
- AC current to each valve group and transformer primary currents.
- Positive Sequence Filtered Current as RMS value (network side)
- Positive Sequence Filtered Current as RMS value (converter side)
- Converter transformer Primary and Secondary voltages.
- Positive Sequence Filtered Line-Line Voltage Line side
- Positive Sequence Filtered line to line Voltage converter side
- AC Positive Sequence filtered Frequency
- DC Current in DMR line
- DC Neutral Current (Own Pole)
- DC Neutral Current (Other Pole)
- Ground Current on DC Side grounding point

The Triggering of TFR shall include all protection initiations and following inputs:

- Pole Block/ Deblock
- Pole gate triggering loss
- Pole last Breaker opened
- Pole DC Protection Voltage level trigger
- Converter Protection operated along with different types
- Pole MR/ GR sequence initiated
- AC Over voltage/ under voltage Protection operated.
- Full voltage/ RVO Changeover

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- DC O/V, U/V
- Telecommunication Fail.
- Converter Status including Converter/ Pole Block/ Deblock/ESOF/Transmission status/Rectifier/Inverter etc
- Pole PMR/ DMR sequence initiated
- Binary Converter Status Signals

Each fault recorder shall be equipped with suitable input circuits and starting sensors for all of the input signals. The TSP shall ensure that the characteristics of the input circuits and starting sensors are well matched to the characteristics of the signal sources.

3. Electrical Characteristics

(i) Monitoring Systems

The recorder shall be a digital based type. Operation of the equipment shall be based on programs stored in non-volatile solid-state memory. Programs shall be stable and no inadvertent change of program(s) shall occur.

The recorder shall be equipped with a built-in post fault record- length timer, adjustable over a range of 0.5 to 10 seconds after the fault.

Normally open operation alarm contacts shall close while the fault recorder system is operating and be utilized as inputs to the alarm monitoring and reporting system. A three digit, manually resettable operations counter shall be provided that indicates the number of faults or disturbances recorded.

Facility for automatic storage of information to a PC or an independent storage device (e.g. a disc drive) shall be provided. The output shall be possible to be printed on plain paper in the A4/A3 format.

The recorded information shall include but not necessarily be limited to:

- Station Identification
- Identity of trigger source
- Record Identification for Analog, Event and Sensor traces
- Date/ Time: Year, Day, Hour, Minute, Second, Millisecond
- Analog traces
- Event traces
- Sensor traces
- Time marker trace which shall allow time interpolation of records to 2 ms.
- Start of record line.

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(ii) Operations

The fault recorder shall continuously monitor the power system. Initiation by fault detecting sensors or by other input contacts or pre-selected events shall cause that particular recorder to

record the fault information. The other pole recorder shall also record in a slave mode. Operation of any one of the initiating sensors shall start the recording mechanism or otherwise cause all channels to record until the fault clears or the record-length timer setting is exceeded.

The transient fault recorder shall have facility for suitable interface for transmission of recorded analog and digital information to a remote station. This shall be demonstrated by the TSP at site by using inter-station communication.

(iii) Input Circuitry

The input circuits for the recording channels shall be insulated for operation at potentials of 2000 Vrms between channels and between channel and ground. Each input recording channel shall be capable of operating from the output of 1A rms nominal secondaries of current transformers and capacitive voltage transformers with 63.5 V rated secondary. Each channel shall be supplied with a selection of current shunts and voltage multipliers to provide a range of high and low current or voltage ranges which can be selected by straps or similar method. The recorder shall also be capable of operating from the DCCT's and direct voltage devices supplied for the station. Any device required for processing of input signals in order to make them compatible to the equipment shall form an integral part of the supplied equipment. However, such processing of input signals shall in no way distort its waveform. The equipment shall be carefully screened, shielded, earthed and protected as may be required for its safe functioning. It shall be possible to position the reference point of any of the analog channels to any position on the record. The individual traces shall be identified on the record by numbering them in the order they are connected at the input.

The current values of scaling parameters related to the various channels shall be printed on each printout to enable quick interpretation of the records.

(iv) Starting Sensors

The initiating or detecting devices, which start the recording, shall be solid state and automatic self-resetting type.
Each sensor shall be equipped with an indicating lamp, viewable from the front of the cabinet, which operates when the sensor operates. The lamp shall remain 'on' until reset by the station operator. Failure to reset the lamp shall not affect subsequent operation of the sensor. Sensor settings shall be easily adjustable and easily accessible. One starting sensor for at least each of the following types of changes shall be provided.

- Level Changes Over Current Over Voltage Under voltage
- Swing Rate of change of nominal input
- Frequency
- Under frequency
- Over frequency



It shall be possible to adjust the response time of the sensors, in each case, to ensure the most rapid operation consistent with the characteristics of the analogue quantity being monitored.

It shall also be possible to initiate the fault recording, as required, by additional external relay contacts, either NO or NC.

(v) Pre-fault Periods

The recording system shall accurately record power system transient disturbances with a pre-fault period, which shall be settable between 50 to 250 ms.

(vi) Memories

Sufficient memory shall be provided to prevent any loss of records under all normal operating circumstances.

(vii) Time

A means shall be provided to record on the chart the time of occurrence of each fault or disturbance to a resolution of 2 milliseconds or better. The time clock shall be synchronized with the station master clock signal. Facility shall exist to display the time in hour, minutes and seconds on the front of the panel.

(viii) Calibrations

The recording system shall be so designed that each channel may be calibrated separately. Calibration shall be accomplished by applying the calibration level input in the test switches. Controls and switches shall be provided on the front panel to facilitate calibration.

(ix) Resolutions

a) Analog resolution

Analog to digital conversion shall be 12 bits (minimum). The amplitude of the recording shall be adjustable and magnification in fixed steps, of the recording, shall be provided.

b) Events Resolution

The event resolution at the lowest scan rate shall be two milliseconds or better.

c) Transient Response (analog channels)

The transient response delay of the analog input conditioning circuits to a step function input shall be less than 400 microseconds between 10% and 90% values of the step function with overshoot of the final value of the step function being not more than 2%.

(x) Recording Quality



Static trace width	1.5 mm maximum
Residual channel noise	0.1% of full-scale maximum at 50 Hz or any harmonic thereof

Recording resolution	0.1% of full scale
Phase error between channels	Less than 5 degrees at 50 Hz
Crosstalk	Lower than 50 dB (DC to 1500 Hz)

Scale alteration/ expansion facilities shall be provided.

(xi) Alarm Circuits and Indicators

Alarm circuits shall be provided to indicate inability for automatic operation due to power failure, out of paper condition, incorrect switch positioning or other failure(s), which shall be prominently visible on the recorder panel. Each alarm circuit shall include a normally open contact which shall be integrated into the station alarm monitoring and reporting system.

(xii) Power Requirements

The recording system shall be suitable for operation from the station battery supply. There shall be no loss of accuracy in the recording system for specified variations of DC input voltage.

Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given below. It should also be compatible for checking DC harmonic performance values. Most stringent of requirements defined above should be considered.

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Appendix C.4

DEFINITIONS

OUTAGE TERMS

1. Outage

   The state in which equipment or a unit of equipment is unavailable for normal operation due to an event directly related to the same equipment or some unit of equipment.

2. Scheduled Outage

   Scheduled outage is an outage which can be scheduled at least one week in advance. This includes planned maintenance, normally conducted on annual basis, and also unplanned maintenance or repair which can be deferred at least one week subsequent to discovery of the need for maintenance or repair. If the outage is extended due to additional work which would have otherwise caused a forced outage, the excess period is counted as a forced outage.

3. Forced Outage

   The state in which equipment is unavailable for normal operation, but is not in the scheduled outage state, i.e. an outage which is not a scheduled outage.

4. Pole Outages

   An outage which causes a reduction in the Bipole DC power system transfer capacity equal to or less than the power rating of one pole

5. Bipole Outages

   An outage which causes a reduction in the bipolar DC system power transfer capacity greater than the power rating of one pole

CAPACITY TERMS

1. Maximum Continuous Capacity (Pm)

   The maximum bipolar HVDC system capacity (MW) for which continuous operation under normal conditions is possible referred on to the rectifier DC bus, i.e. 2500 MW.

2. Outage Capacity (Po)

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The capacity reduction in MW which the outage would have caused if the HVDC system were operating at its maximum continuous capacity (Pm) at the time of the outage.

3. Outage Derating Factor (ODF)

   The ratio of outage capacity (Po) to maximum continuous capacity (Pm). ODF = Po/Pm

OUTAGE DURATION TERMS

1. Actual Outage Duration (AOD)

   The time elapsed in hours between the start and the end of an outage. The time shall be counted to the nearest 1/10th of an hour. Time less than 1/10 of an hour shall be counted as having duration of 1/10 of an hour.

2. Equivalent Outage Duration (EOD)

   The actual outage duration (AOD) in hours, multiplied by the outage derating factor (ODF), so as to take account of partial loss of capacity.

   EOD = AOD x ODF

   Each equivalent outage duration may be classified according to the type of outage involved, i.e. equivalent forced outage duration (EFOD) and equivalent scheduled outage duration (ESOD).

TIME CATEGORIES

1. Period Hours (PH)

   The number of hours in the reporting period.

   In a full year the Period Hours are 8760 h (8784 h for a leap year). If the equipment is commissioned part way through a year the period hours shall be proportionately less than 8760 h. (This shall not be applicable for verification of guarantees).

2. Actual Outage Hours (AOH)

   The sum of actual outage durations within the reporting period

   AOH = ∑ AOD



The actual outage hours (AOH) may be classified according to the type of outage involved, i.e. AFOH and ASOH.

3. Equivalent Outage Hours (EOH)

   The sum of all equivalent outage durations within the reporting period.

   EOH = ∑ EOD

   The equivalent outage hours may be classified according to the type of outage involved, i.e. equivalent forced outage hours (EFOH) and equivalent scheduled outage hours (ESOH).

   If outage duration overlaps the beginning or end of a reporting period, only the EOD which lie within the reporting period shall be included in EOH.

AVAILABILITY AND RELIABILITY TERMS

1. Energy Unavailability (EU)

   Energy unavailability is a measure of the energy which could not have been transmitted due to (scheduled and forced) outages.

   Energy Unavailability % (EU) = EOH/PH x 100

   Forced Energy Unavailability % (FEU) = EFOH/PH x 100

   Scheduled Energy Unavailability % (SEU) = ESOH/PH x 100

2. Energy Availability (EA)

   A measure of the energy which could have been transmitted except for limitations of capacity due to outages, arising from any cause, either forced or scheduled.

   Energy Availability % (EA) = (100 - EU)

3. Energy Utilisation (U)

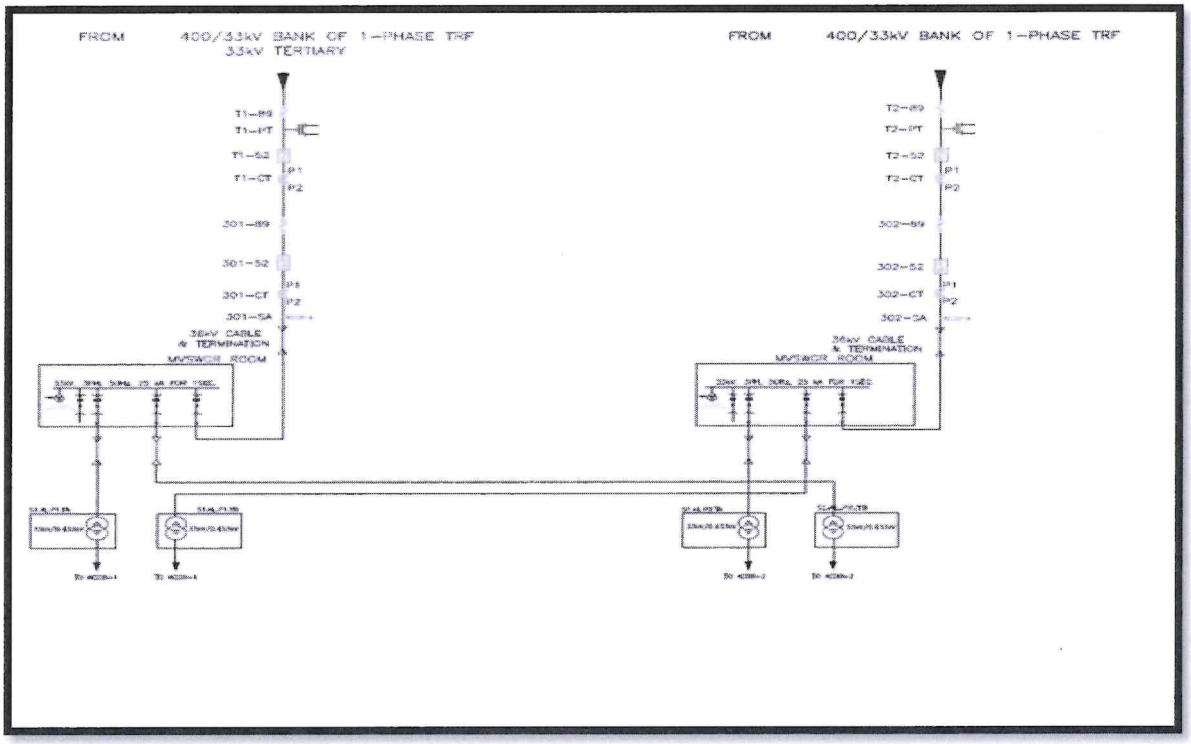
   A factor giving a measure of energy actually transmitted over the system.

   Energy Utilisation % (U) = [Total energy transmitted/ (Pm x PH)] x 100]

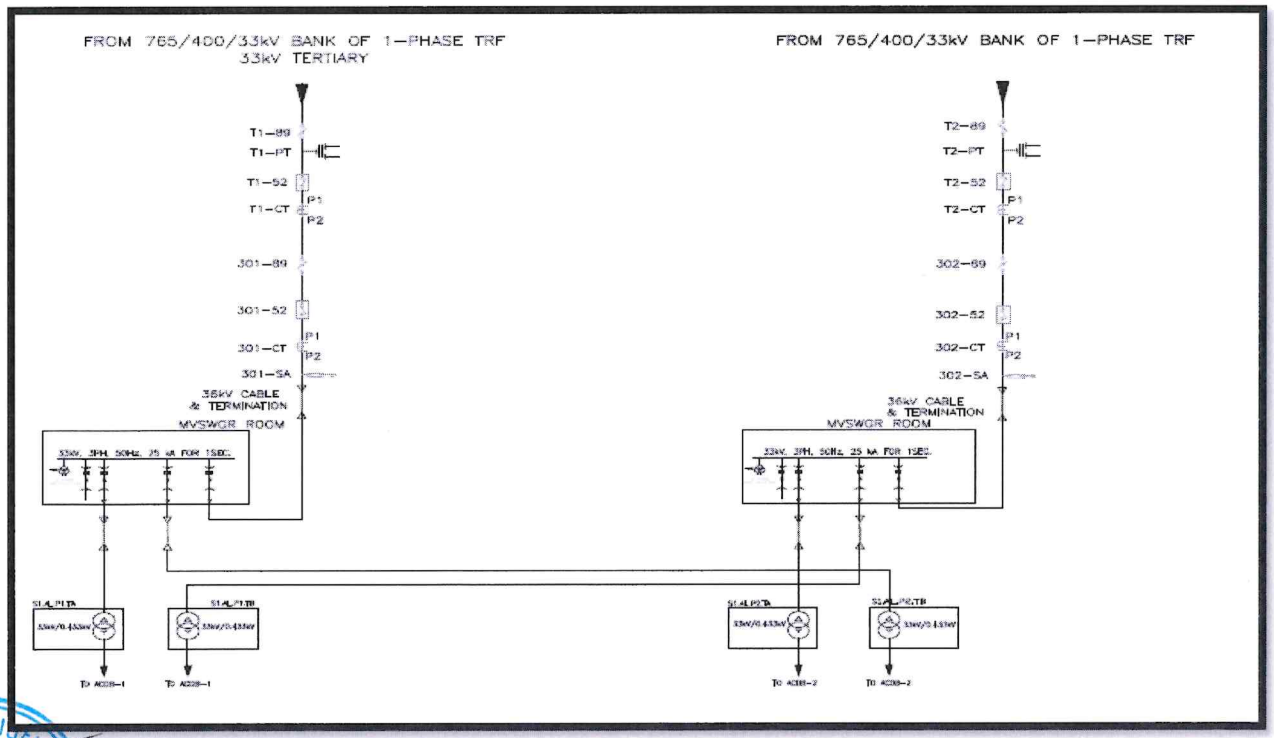


Appendix-C.5

For KPS3:



For South Olpad:



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Annexure – E1

SPECIFIC TECHNICAL REQUIREMENTS FOR ±500 kV HVDC TRANSMISSION LINE

A.1.0 The design, routing and construction of HVDC transmission lines shall be in accordance with CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time. Other CEA Regulations and MoP guidelines, as applicable, shall also be followed.

A.2.0 Selection of tower type shall be made as per CEA Regulations, however in case lattice type towers are used, the following shall also be applicable:

A.2.1 Steel section of grade E 250 and/or grade E 350 as per IS 2062, only are permitted for use in towers, extensions, gantry structures and stub setting templates. For towers in snowbound areas, steel sections shall conform to Grade-C of IS-2062.

A.2.2 Towers shall be designed as per IS-802:2015, however the drag coefficient of the tower shall be as follows: -

Solidity Ratio	Drag Coefficient
Up to 0.05	3.6
0.1	3.4
0.2	2.9
0.3	2.5
0.4	2.2
0.5 and above	2.0

A.3.0 Transmission Service Provider (TSP) shall adopt any additional loading/design criteria for ensuring reliability of the line, if so desired and /or deemed necessary.

A.4.0 Transmission line shall be designed considering wind zones as specified in wind map given in National Building Code 2016, Vol.1. The developer shall also make his own assessment of local wind conditions and frequent occurrences of high intensity winds (HIW) due to thunderstorms, dust-storms, downburst etc. along the line route and wherever required, higher wind zone than that given in wind map shall be considered for tower design for ensuring reliability of line. Further, for transmission line sections passing within a distance of 50 km from the boundary of two wind zones, higher of the two wind zones shall be considered for design of towers located in such sections.

A.5.0 Selection of reliability level for design of tower shall be as per CEA Regulation (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.

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A.6.0 A) For power line crossing of 400 kV or above voltage level (if crossed over the existing line), large angle and dead-end towers (i.e. D/DD/QD) shall be used on either side of power line crossing.

B) For power line crossing of 132 kV and 220 kV (or 230 kV) voltage level, angle towers (B/C/D/DB/DC/DD/QB/QC/QD) shall be used on either side of power line crossing depending upon the merit of the prevailing site condition and line deviation requirement.

C) For power line crossing of 66 kV and below voltage level, suspension/tension towers shall be provided on either side of power line crossing depending upon the merit of theprevailing site condition and line deviation requirement.

D) For crossing of railways, national highways and state highways, the rules/regulations of appropriate authorities shall be followed.

A.7.0 The relevant conductor configuration shall be as follows: -

i. Type of conductor: ACSR / AAAC / AL59

Basic parameters for Transmission Line associated with HVDC Bipole link:

Transmission line	ACSR Conductor specified	AAAC conductor based on 53 % conductivity of AL Alloy (Size as per IEC-1089)	Minimum size of AL59 conductor based on 59% conductivity of AL Alloy (Size as per Swedish -SS-420814)	Sub-conductor Spacing
±500 kV HVDC transmission lines *(Quad bundle configuration per pole)*	Lapwing: Strandin 45/4.78 mm-Al 7/3.18 mm-Stee 38.22 mm diameter 807.5 mm² Aluminium area; Maximum D Resistance at 20° (Ω/km): 0.0358; Minimum UTS 188.0 kN	Stranding details 61/4.38mm, 39.5 mm diameter; 921 mm² Aluminiun alloy area; Maximum D Resistance at 20° (Ω/km): 0.0361; Minimum UTS: 244.0 kN	Stranding details 61/4.36mm, 39.2 mm diameter; 910 mm² Aluminiun alloy area; Maximum DC Resistance at 20° (Ω/km): 0.0326; Minimum UTS: 199.0 kN	457 mm

Note: The transmission lines shall have to be designed for a maximum operating conductor temperature of 85 deg C.

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A.8.0 The required pole to pole spacing shall be governed by the tower design as well as minimum live metal clearances under different insulator swing angles. However, pole to pole clearance shall not be less than 12.5 m.

A.9.0 All electrical clearances including minimum live metal clearance, ground clearance and minimum mid span separation between earth wire and conductor as given below shall be considered:

1) Minimum live metal clearances for ±500 kV line:

a.(i) Swings and Clearances:

Wind Pressure Condition	Minimum Electrical Clearance
a) Swing angle (0º)	3.75 m

(ii) Swings and Clearances: For Jumper

Wind Pressure Condition	Minimum Electrical Clearance
a) Swing angle (0º)	3.75 m
b) Swing angle (15º)	3.15 m
c) Swing angle (57º)	1.1 m

(b) Minimum ground clearance: 12.5 m

c) Minimum mid span separation between earthwire and Pole conductor: 9.0 m

A.10.0 Shielding angle shall not exceed 10 deg for Pole.

A.11.0 Two numbers of Dedicated Metallic Return (DMR) line shall be provided for the ±500 kV HVDC transmission line. Design and selection of conductor of DMR shall be done by the TSP based on sound engineering practice, minimum power losses, meeting the statutory clearances and other technical requirement of RfP.

A.12.0 At least one out of two earth wires shall be OPGW and second earth wire, if not OPGW, shall be either of Galvanized Stranded Steel (GSS) or Aluminum Alloy Conductor Steel Reinforced (AACSR) or any other suitable conductor type depending upon span length and other technical consideration. However, minimum size of Galvanized Stranded Steel (GSS) shall be 7/4.5 mm and diameter 13.50 mm.

A.13.0 Each tower shall be earthed such that tower footing impedance does not exceed 10 ohms. Pipe type or Counterpoise type earthing shall be provided in accordance with relevant IS. Additional earthing shall be provided on every 7 to 8 km distance for direct earthing of both shield wires. If site condition demands, multiple earthing or use of earthing enhancement compound shall be used.



A.14.0 Pile type foundation shall be used for towers located in river or creek bed or on bank of river

having scourable strata or in areas where river flow or change in river course is anticipated, based on detailed soil investigation and previous years' maximum flooddischarge of the river, maximum velocity of water, highest flood level, scour depth and anticipated change in course of river based on river morphology data of at least past 20 years to ensure availability and reliability of the transmission line.

A.15.0 Transmission line route shall be finalized, in consultation with appropriate authorities so as to avoid the habitant zones of endangered species and other protected species. Bird diverters, wherever required, shall be provided on the line. In order to optimize the route use of GATISHAKTI platform shall also be made.

A.16.0 The transmission lines shall be designed with porcelain/glass/ Composite Insulators as per site pollution severity level in the concerned area. However, minimum creepage distance and insulator length shall be as per follows:

Sl. No.	Description	Type of Insulator	Insulator for ±500 kV HVDC Transmission Lines
1.	Minimum Creepage Distance for both Light and medium as well as for Heavy and very heavy pollution level	Composite Insulator	27500 mm
	Minimum Creepage Distance for Light and medium pollution level	Porcelain/Glass Insulator	22345 mm
2.	Minimum length of insulator	Composite/ Porcelain/Glass Insulator	6970 mm

A.17.0 Wherever, transmission lines are passing through cyclone prone areas i.e. areas upto 60 km from coast following shall also be applicable:

a) Terrain category-I, with terrain roughness factor (K2) of 1.08 shall be considered for tower design.

b) Importance factor for cyclonic region (K4) of 1.3 shall be considered for tower design.

c) The number of consecutive spans between the section points/ angle point shall not exceed 10 spans or 3km instead of conventional practice of 15 spans or 5km, in order to reduce the failure of such towers in coastal areas due to cascading effect. The section shall be terminated with tension tower/ angle tower and angle of deviation should be based on the site requirement.

A.18.0 Wherever, transmission lines are passing through cyclone prone areas (i.e. areas upto 60 km from coast)/ creek regions/ aggressive soil areas following shall also be applicable:

d) The fabricated tower parts and stubs shall have a minimum overall zinc coating of 900 g/m^2 of surface area except for plates and sections below 5 mm thickness which shall have a minimum overall zinc coating of 610 g/m^2 of surface area. The average

zinc coating for all sections and plates of 5 mm and above thickness shall be maintained as 127 microns and that for plates and sections below 5 mm shall be maintained as 87 microns.

e) Ready mix concrete of M30 Grade shall be used to avoid use of locally available saline water. However, design mix concrete of M30 Grade conforming to IS 456 with potable water can be used at locations where transportation of ready-mix concrete is not feasible. Minimum cement content in any case shall not be less than 330 kg/m^3.

f) The surface of the reinforced steel shall be treated with epoxy-based coating to enhance corrosion performance of foundation. Use of epoxy coated reinforcement in foundation shall be as per IS 13620. In addition, two (2) coats of bituminous painting of minimum 1.6 kg/m^2 per coat shall be applied on all exposed faces of foundation (i.e. pedestal and base slab).

g) Double coat of 20 mm thick cement plaster shall be provided on all exposed concrete surface up to 300 mm below ground level to give protection to concrete surface from environmental and saline effect.

h) Before coping of chimney top portion, three coats of anti-corrosive paint of minimum 30-35 microns dry film thickness each shall be applied on the stub in the 50 mm coping portion as well as up to 350 mm above CL portion.

A.19.0 The raised chimney foundation is to be provided in areas prone to flooding/water stagnation like paddy field /agricultural field and undulated areas to avoid direct contact of water with steel part of tower. The top of the chimney of foundation should be at least above HFL (High Flood Level) or the historical water stagnation/ logging level (based on locally available data) or above High Tide Level or 500 mm above Natural Ground level (whichever is higher).

A.20.0 The TSP shall abide by the Guidelines of CEA w.r.t. shifting of transmission lines for NHAI projects and other projects.

A.21.0 Safety precautions in regard to gas/oil pipelines in vicinity of Transmission lines shall be taken in coordination with gas/ petroleum authorities.



Annexure – E2

SPECIFIC TECHNICAL REQUIREMENTS FOR HVAC TRANSMISSION LINE

A.1.0 The design, routing and construction of transmission lines shall be in accordance with Chapter V, Part A of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time. Other CEA Regulations and MoP guidelines, as applicable, shall also be followed.

A.2.0 Selection of tower type shall be made as per CEA Regulations, however in case lattice type towers are used, the following shall also be applicable:

A.2.1 Steel section of grade E 250 and/or grade E 350 as per IS 2062, only are permitted for use in towers, extensions, gantry structures and stub setting templates. For towers in snowbound areas, steel sections shall conform to Grade-C of IS-2062.

A.2.2 Towers shall be designed as per IS-802:2015, however the drag coefficient of the tower shall be as follows: -

Solidity Ratio	Drag Coefficient
Up to 0.05	3.6
0.1	3.4
0.2	2.9
0.3	2.5
0.4	2.2
0.5 and above	2.0

A.3.0 Transmission Service Provider (TSP) shall adopt any additional loading/design criteria for ensuring reliability of the line, if so desired and /or deemed necessary.

A.4.0 Transmission line shall be designed considering wind zones as specified in wind map given in National Building Code 2016, Vol.1. The developer shall also make his own assessment of local wind conditions and frequent occurrences of high intensity winds (HIW) due to thunderstorms, dust-storms, downburst etc along the line route and wherever required, higher wind zone than that given in wind map shall be considered for tower design for ensuring reliability of line. Further, for transmission line sections passing within a distance of 50 km from the boundary of two wind zones, higher of the two wind zones shall be considered for design of towers located in such sections.

A.5.0 Selection of reliability level for design of tower shall be as per CEA Regulation (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.

A.6.0 A) For power line crossing of 400 kV or above voltage level, large angle and dead-end towers (i.e. D/DD/QD) shall be used on either side of power line crossing.

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B) For power line crossing of 132 kV and 220 kV (or 230 kV) voltage level, angle towers (B/C/D/DB/DC/DD/QB/QC/QD) shall be used on either side of power line crossing depending upon the merit of the prevailing site condition and line deviation requirement.

C) For power line crossing of 66 kV and below voltage level, suspension/tension towers shall be provided on either side of power line crossing depending upon the merit of the prevailing site condition and line deviation requirement.

D) For crossing of railways, national highways and state highways, Regulations of appropriate authorities shall be followed.

A.7.0 The relevant conductor configuration shall be as follows: -

Name : KPS3 – KPS3 (HVDC) 400 kV 2xD/C Line
Type of conductor: ACSR / AAAC / AL59

Basic parameters:

Transmission line	**ACSR Conductor specified**	**Equivalent AAAC conductor based on 53% conductivity of Al Alloy**	**Equivalent minimum size of AL59 conductor based on 59% conductivity of AL Alloy***	**Sub-conductor Spacing**
400 kV D/C (Quad Bundle) transmission lines	**Moose: Stranding** 54/3.53mm-Al + 7/3.53 mm-Steel; 31.77 mm diameter; 528.5 mm^2, Aluminium area; Maximum DC Resistance at 20°C (Ω/km): 0.05552; Minimum UTS: 161.20 kN	**Stranding details:** 61/3.55mm 31.95mm diameter; 604 mm^2 Aluminium alloy area; Maximum DC Resistance at 20°C (Ω/km): 0.05506; Minimum UTS: 159.80 kN	**Stranding details:** 61/3.31 mm 29.79 mm diameter; 525 mm^2 Aluminium alloy area; Maximum DC Resistance at 20°C (Ω/km): 0.0566; Minimum UTS: 124.70 kN	457 mm

Note:

1. **To select any size above the minimum, the sizes mentioned in the Indian standard i.e IS-398(part-6) should be followed.*

2. *The transmission lines shall have to be designed for a maximum operatingconductor temperature of 85 deg C.*

A.8.0 The required phase to phase spacing and horizontal spacing for 400 kV line shall be governed by the tower design as well as minimum live metal clearances for 400 kV voltage level under different insulator swing angles. However, the phase to phase spacing for 400 kV lines shall not be less than 8 m respectively.

A.9.0 All electrical clearances including minimum live metal clearance, ground clearance and minimum mid span separation between earth wire and conductor as given below shall be considered.

Minimum live metal clearances for 400 kV line:

i. a). Under stationary conditions:

From tower body: 3.05 m

b). Under Swing conditions

Wind Pressure Condition	Minimum Electrical Clearance
a) Swing angle (22º)	3.05 m
b) Swing angle (44º)	1.86 m

ii. Minimum ground clearance for 400 kV: 8.84 m

iii. Minimum mid span separation between earth-wire and conductor for 400 kV line: 9.0 m

A.10.0 Shielding angle shall not exceed 20 deg for 400 kV transmission line.

A.11.0 The Fault current for design of line shall be 63 kA for 1 sec for 400 kV.

A.12.0 In case of 400 kV voltage class lines, at least one out of two earth wires shall be OPGW and second earth wire, if not OPGW, shall be either of Galvanized Stranded Steel (GSS) or Aluminum Alloy Conductor Steel Reinforced (AACSR) or any other suitable conductor type depending upon span length and other technical consideration.

A.13.0 Each tower shall be earthed such that tower footing impedance does not exceed 10 ohms. Pipe type or Counterpoise type earthing shall be provided in accordance with relevant IS. Additional earthing shall be provided on every 7 to 8 km distance at tension tower for direct earthing of both shield wires. If site condition demands, multiple earthing or use of earthing enhancement compound shall be used.

A14.0 Pile type foundation shall be used for towers located in river or creek bed or on bank of river having scourable strata or in areas where river flow or change in river course is anticipated, based on detailed soil investigation and previous years' maximum flooddischarge of the river, maximum velocity of water, highest flood level, scour depth and anticipated change in course of river based on river morphology data of at least past 20 years to ensure availability and reliability of the transmission line.

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A.15.0 Transmission line route shall be finalized, in consultation with appropriate authorities so as to avoid the habitant zones of endangered species and other protected species. Bird diverters, wherever required, shall be provided on the line. In order to optimize the route use of GATISHAKTI platform shall also be made.

A.16.0 Wherever, transmission lines are passing through cyclone prone areas i.e. areas upto 60 km from coast following shall also be applicable:

a) Terrain category-I, with terrain roughness factor (K2) of 1.08 shall be considered for tower design for exposed open terrain with few or no obstruction which also includes open sea coasts, open stretch of water, desert and flat treeless plains.

b) Importance factor for cyclonic region (K4) of 1.3 shall be considered for tower design.

c) The number of consecutive spans between the section points/ angle point shall not exceed 10 spans or 3 km instead of conventional practice of 15 spans or 5 km, in order to reduce the failure of such towers in coastal areas due to cascading effect. The section shall be terminated with tension tower/ angle tower and angle of deviation should be based on the site requirement.

A.17.0 Wherever, transmission lines are passing through cyclone prone areas (i.e. areas up to 60 km from coast)/ creek regions/ aggressive soil areas following shall also be applicable:

a) The fabricated tower parts and stubs shall have a minimum overall zinc coating of 900 g/m^2 of surface area except for plates and sections below 5 mm thickness which shall have a minimum overall zinc coating of 610 g/m^2 of surface area. The average zinc coating for all sections and plates 5 mm and above thickness shall be maintained as 127 microns and that for plates and sections below 5 mm thickness shall be maintained as 87 microns.

b) Ready mix concrete of M30 Grade shall be used to avoid use of locally available saline water. However, design mix concrete of M30 Grade conforming to IS 456 with potable water can be used at locations where transportation of ready-mix concrete is not feasible. Minimum cement content in any case shall not be less than 330 kg/m^3.

c) The surface of the reinforced steel may be treated with epoxy-based coating to enhance corrosion performance of foundation. Use of epoxy coated reinforcement in foundation shall be as per IS 13620. In addition, two (2) coats of bituminous painting of minimum 1.6 kg/m^2 per coat shall be applied on all exposed faces of foundation (i.e. pedestal and base slab).

d) Double coat of 20 mm thick cement plaster shall be provided on all exposed concrete surface up to 300 mm below ground level to give protection to concrete surface from environmental and saline effect.

e) Before coping of chimney top portion, three coats of anti-corrosive paint of minimum 30-35 microns dry film thickness each shall be applied on the stub in the 50mm coping portion as well as up to 350 mm above CL portion.

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A.18.0 The raised chimney foundation is to be provided in areas prone to flooding/water stagnation like paddy field /agricultural field and undulated areas to avoid direct contact of water with steel part of tower. The top of the chimney of foundation should be at least above HFL (High Flood Level) or the historical water stagnation/ logging level (based on locally available data) or above High Tide Level or 500 mm above Natural Ground level (whichever is higher).

A.19.0 Routing of transmission line through protected areas of India shall be avoided to the extent possible. In case, it is not possible to avoid protected areas, the towers of the transmission line up to 400 kV level which are installed in protected areas shall be designed for Multi-circuit (4 circuits) configuration of same voltage level considering reliability level of at least two (2). The top two circuits of these multi-circuit towers shall be used for stringing of the transmission line under present scope and the bottom two circuits shall be made available for stringing of any future transmission line of any transmission service providers/ State transmission utilities/Central transmission utilities passing through the same protected area. Further, the configuration and coordinates of such transmission towers shall be submitted to CEA, CTU and BPC by the TSP.

A.20.0 The TSP shall abide by the Guidelines of CEA w.r.t. shifting of transmission lines for NHAI projects and other projects.

A.21.0 Safety precautions in regards to gas/oil pipe lines in vicinity of transmission lines shall be taken in coordination with gas/ petroleum authorities.

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ANNEXURE-E3

SPECIFIC TECHNICAL REQUIREMENTS FOR HVAC EQUIPMENT

The 400 kV switchyard at **KPS3 (HVDC) S/s, extension of KPS3 S/s and extension of South Olpad S/s** shall be GIS type generally conforming to the requirements of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 as amended from time to time.

All other CEA Regulations/guidelines as amended up to date and MoP guidelines shall also be followed.

B.1.0 Salient features of Substation Equipment and Facilities

The design and specification of substation equipment are to be governed by the following factors:

B.1.1 Insulation Coordination

The system design parameters for substations/switchyards shall be as given below:

Sl. No.	Description of parameters	400 kV KPS3 (HVDC) / KPS3 GIS Extn.	400 kV South Olpad GIS Extn
		400 kV System	400 kV System
1.	System operating voltage	400 kV	400 kV
2.	Maximum voltage of the system (rms)	420 kV	420 kV
3.	Rated frequency	50 Hz	50 Hz
4.	No. of phases	3	3
5.	Rated Insulation levels		
i)	Lightning Impulse withstand voltage for (1.2/50 micro sec.) - for Equipment other than Transformer and Reactor - for Insulator String	 1425 kV p 1550 kV p	 1425 kV p 1550 kV p
ii)	Switching impulse withstand voltage (250/2500 micro sec.) dry and wet	1050 kV p	1050 kV p
iii)	One-minute power frequency dry withstand voltage (rms)	650 kV	650 kV
6.	Corona extinction voltage	320 kV	320 kV
7.	Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz	1000 micro-volts at 266 kV rms	1000 micro-volts at 266 kV rms

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Sl. No.	Description of parameters	400 kV KPS3 (HVDC) / KPS3 GIS Extn.	400 kV South Olpad GIS Extn
		400 kV System	400 kV System
8.	Minimum creepage distance for insulator string/ longrod insulators/ outdoor bushings	13020 mm (31 mm/ kV)	13020 mm (31 mm/ kV)
9.	Minimum creepage distance for switchyard equipment	13020 mm (31 mm/ kV)	13020 mm (31 mm/ kV)
10.	Max. fault current	63 kA	63 kA
11.	Duration of fault	1 Sec	1 Sec

B.1.2 Switching Scheme

The switching schemes, as mentioned below, shall be adopted at various voltage levels of substation/switchyard:

Substation	400 kV side
400 kV KPS3 (HVDC)	One and Half breaker
400 kV KPS3 Extn	One and Half breaker
400 kV South Olpad Extn.	One and Half breaker

Notes: -

i) For one and half breaker switching scheme, any double circuit line consisting of two numbers of feeders and originating from the same transmission or generating switchyard shall not be terminated in one diameter.

ii) Two transformers of the same HV rating shall not be connected in the same diameter and similarly, two bus reactors of same HV rating shall also not be connected in the same diameter.

iii) A diameter in one and half breaker scheme is a set of 3 circuit breakers with associated isolators, earth switches, current transformers etc for controlling of 2 numbers of feeders.

iv) TSP shall plan distribution of line and transformer feeders to bus bar in such a way that all power can be evacuated successfully without crossing thermal limit at any point of bus-bar.

v) 400 kV Bus Sectionaliser shall be placed such that each section shall have proper distribution of Pole(s), ICT, Feeders and filter bank(s)/sub-bank(s) so as to have maximum operational flexibility.

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vi) *In case of GIS substation where the bus scheme is One and Half breaker scheme, the diameters shall be complete with feeder/line side isolator and GIS duct of the future bay shall be brought outside the GIS hall/building with extension/interface module suitably.*

B.2.0 Substation

Equipment and facilities (Voltage level as applicable):

The switchgear shall be designed and specified to withstand operating conditions and duty requirements. All equipment shall be designed considering the following minimum capacity.

Sl. No.	Description of bay	Ampacity		
		400 kV KPS3 (HVDC) GIS S/s	400 kV KPS3 GIS Extn	400 kV South Olpad GIS Extn
		400 kV	400 kV	400 kV
1.	Bus Bar	4000 A	4000A	4000A
2.	Line bay	3150 A	3150A	--NA--
3.	Converter bay	3150 A	--NA--	3150 A
3.	ICT bay	3150 A	--NA--	--NA--
4.	Bus Reactor bay	3150 A	--NA--	--NA--
5.	Bus Sectionaliser bays	4000 A	--NA--	--NA--

B.2.1 400/33 kV, 50 MVA Transformers [for exclusively supplying auxiliary power to HVDC terminal]

50 MVA, 400/33 kV, 3-Phase Transformers shall conform to CEA's "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above voltage class)" available on CEA website.

B.2.2 420 kV, 3-Phase, Shunt Reactor

125 MVAR, 420 kV, 3-Phase Reactor shall conform to CEA's "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above voltage class)" as amended up to date available on CEA website.

B.2.3 400 kV GIS Substation equipment

GIS (Gas Insulated Switchgear) shall be Indoor type in accordance to IEC: 62271-203. The switchgear shall be designed and specified to withstand operating conditions and duty requirements. All the switchgear such as Circuit Breaker, isolator, earth switch including CT, PT etc. shall be GIS type. The Surge Arrestor and Voltage Transformer shall be either GIS or outdoor AIS type.

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The GIS assembly shall consist of separate modular compartments e.g. Circuit Breaker compartment, Bus bar compartment filled with SF6 Gas and separated by gas tight partitions so as to minimize risk to human life, allow ease of maintenance and limit the effects of gas leaks failures and internal arcs etc. These compartments shall be designed to minimize the risk of damage to adjacent sections and protection of personnel in the event of a failure occurring within the compartments. Rupture diaphragms with suitable deflectors shall be provided to prevent uncontrolled bursting pressures developing within the enclosures under worst operating conditions, thus providing controlled pressure relief in the affected compartment. The arrangement of gas sections or compartments shall be such as to facilitate future extension of any make without any drilling, cutting or welding on the existing equipment. To add equipment, it shall not be necessary to move or dislocate the existing switchgear bays. The layout of Gas Insulated Bus Ducts shall be properly planned to optimize the length of bus ducts and for easy accessibility for maintenance. The length of busbars, bus ducts, isolator sections shall be optimized considering effects of fast transient voltage due to isolator operations.

The bus bar modules including auxiliary bus modules (wherever applicable) shall be provided with suitable End Piece (Interface) module on both sides with the test link facility for future extension as per provisions of future requirement. The end piece module shall be designed in such a way so that future GIS module may be tested without extending test voltage to existing bus and vice-versa by removing the test link.

TSP shall make available the complete details for the design of interface module such as cross section, enclosure material, enclosure dimensions (inner and outer), Flange diameter (inner and outer), conductor cross-section and connection arrangement, bolt spacing and dimension, rated gas pressure, Gasket detail etc. Further, adequate space for GIS busbar interface module shall be taken into account for future scope.

Each section shall have plug-in or easily removable connection pieces to allow for easy replacement of any component with the minimum disturbance to the remainder of the equipment. Inspection windows (View Ports) shall be provided for Disconnector Switches and both type of earth switches i.e. Maintenance and fast operating.

Local control cabinets (LCC) shall be provided as per requirement. The alarm and annunciation of GIS equipment shall be wired to the SCADA System.

The material and thickness of the enclosures shall be such as to withstand an internal flash over without burns through for a period of 300 ms at rated short time withstand current. The material shall be such that it has no effect of environment as well as from the by-products of SF6 breakdown under arcing conditions. This shall be validated with Type Test.

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Service continuity requirement for GIS: The GIS equipment with the given bus switching arrangement shall be divided into different gas compartments. During the work such as a fault

repair or major maintenance, requiring the dismantling of a gas compartment for which more than one compartments may need to be de-gassed.

TSP shall meet the following Service continuity conditions (to the extent possible) with ensuring equipment and operating personnel's safety:

- For One and half breaker bus switching scheme, during a fault in Circuit Breaker compartment, no bus bar and feeder is permitted out of service during maintenance and repair/replacement.
- During a fault in a GIS compartment other than the Circuit Breaker compartment, maximum of one bus bar and/or one feeder is permitted out of service during maintenance and repair/replacement.

UHF sensors in GIS for PD (Partial Discharge) detection:

The adequate number of Ultra High frequency (UHF) sensors shall be provided in the offered GIS along with suitable portable type Partial Discharge (PD) measuring instrument for detection of Partial discharge (of 5 pC and above as per IEC 60270). The number and location of these sensors shall be based on laboratory tests on the typical design of GIS as per recommendations of CIGRE Document No. 654 (Application Guide for sensitivity verification for UHF Partial discharge detection system for GIS).

B.2.3.1 Circuit Breakers (GIS)

GIS Circuit breakers shall in general be of C2-M2 class and comply with IEC-62271-100. The rated break time shall not exceed 40 ms (milli second) for 400 kV. Circuit breakers shall be suitable for single phase and three phase auto reclosing. Each breaker shall have two sets of trip circuits which would be connected to separate DC supplies for greater reliability. The Circuit breakers controlling 400 kV lines wherever required shall be provided with pre-insertion closing resistor of about 400 ohms with 8 ms insertion time or Controlled Switching Device (CSD) for lines longer than 200 km. The short line fault capacity shall be same as the rated capacity and this is proposed to be achieved without use of opening resistors. Controlled switching device shall be provided in Circuit Breaker of switchable line reactor bay and in 400 kV and above Main and Tie bay circuit breakers of line with non-switchable line reactors, Bus reactors and Transformers.

B.2.3.2 Isolators (GIS)

The isolators shall comply with IEC 62271-102 in general. Earth switches shall be provided at various locations to facilitate maintenance. Main blades and earth blades shall be interlocked and interlock shall be fail safe type. All isolators and earth switches shall be motor operated type.

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Isolator shall be of extended mechanical endurance class-M2 and suitable for Bus Transfer Current Switching duty as per IEC standard. High speed earthing switches shall be provided for grounding purpose at overhead line terminations and cable terminations and shall have fault making capability as specified. Earth switch for line isolator shall be of earthing switch class E1 and shall be suitable for induced current switching duty as defined for Class-B as per relevant standard.

B.2.3.3 Current Transformers (GIS)

Current Transformers shall comply with IEC 61869 in general. All ratios shall be obtained by secondary taps only. Generally, Current Transformers (CT) shall have five cores (four for protection and one for metering) whereas; CT in Tie bays shall have six cores (four for protections and two for metering) suitably distributed on both sides of CB (for 400 kV and above voltage class). The burden and knee point voltage shall be in accordance with the requirements of the system including possible feeds for telemetry. Accuracy class for protection core shall be PX and for metering core it shall be 0.2S. The rated burden of cores shall be closer to the maximum burden requirement of metering and protection system (not more than 20 VA for metering core) for better sensitivity and accuracy.

The instrument security factor shall be less than 5 for CTs up to 400 kV voltage class.

B.2.3.4 Voltage Transformer (GIS)

The voltage transformers shall conform to IEC-61869. Voltage transformers shall be of electromagnetic type with SF6 gas insulation. The earth end of the high voltage winding and the ends of the secondary winding shall be brought out in the terminal box. The voltage transformers shall be located as a separate bay module and will be connected phase to ground and shall be used for protection, metering and synchronization. The voltage transformers shall be of inductive type, nonresistant and shall be contained in their own-SF6 compartment, separated from other parts of installation. The voltage transformer shall be effectively shielded against high frequency electromagnetic transients. The voltage transformer shall have three secondary windings out of which two shall be used for protection and one for metering. The voltage transformer should be thermally and dielectrically safe when the secondary terminals are loaded with the guaranteed thermal burdens. The accuracy class for protection cores shall be 3P. The accuracy of 0.2 on metering core should be maintained throughout the entire burden range on all the three windings without any adjustments during operation. The rated burden of cores shall be closer to the maximum burden requirement of metering and protection system (not more than 50 VA for metering core) for better sensitivity and accuracy.



B.2.3.5 Surge Arresters (GIS) (if applicable)

336 kV Station High (SH) duty gapless type Surge arresters with thermal energy (Wth) of minimum 12 kJ/kV respectively shall be provided for 420 kV system conforming to IEC 60099-

4 in general. Other characteristics of Surge arrester shall be chosen in accordance with system requirements. Surge arresters shall be provided at line entrances, near transformers and reactors so as to achieve proper insulation coordination. A leakage current monitor with surge counter shall be provided with each surge arrester.

B.2.3.6 SF_6 to Air Bushing

Outdoor bushings, for the connection of conventional external conductors to the SF6 metal enclosed switchgear, shall be provided. Bushings shall generally be in accordance with the requirements of IEC-60137. The creepage distance over the external surface of outdoor bushings shall not be less than 31 mm/kV. SF6 to air Bushing shall be of Polymer / composite type and shall be robust and designed for adequate cantilever strength to meet the requirement of seismic condition. The electrical and mechanical characteristics of bushings shall be in accordance with IEC-60137. Polymer/composite insulator shall be seamless sheath of silicon rubber compound. The housing and weather sheds should have silicon content of minimum 30% by weight. It should protect the bushing against environmental influences, external pollution and humidity. The hollow silicon composite insulators shall comply with the requirements of IEC 61462 and the relevant parts of IEC-62217.

B.2.4 400 kV AIS Substation equipment (as applicable)

B.2.4.1 Capacitive Voltage Transformers (AIS)/ AC Voltage Transformer/ AC Voltage Divider

Capacitive Voltage transformers/AC Voltage Transformer/ AC Voltage Divider shall comply with IEC 61869 in general. These shall have three secondaries out of which two shall be used for protection and one for metering. The Accuracy class for protection cores shall be 3P and for metering core shall be 0.2. The Capacitive voltage transformers on lines shall be suitable for Carrier Coupling. The Capacitance of CVT for 400 kV shall be of 4400/8800 pF depending on PLCC requirements. The rated burden of cores shall be closer to the maximum burden requirement of metering and protection system (not more than 50 VA for metering core) for better sensitivity and accuracy.

For power quality measurement compatibility, the transducers including its interface with control and protection panels and display like Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given above.

B.2.4.2 Surge Arresters (AIS)

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336 kV Station High (SH) duty gapless type Surge arresters with thermal energy (Wth) of minimum 12 kJ/ kV conforming to IEC 60099-4 in general shall be provided for 400 kV systems. Other characteristics of the Surge arrester shall be chosen in accordance with system requirements. Surge arresters shall be provided at line entrances, near transformers and reactors so as to achieve proper insulation coordination. Surge Arresters shall be provided

with porcelain/ polymer housing fitted with pressure relief devices. A leakage current monitor with surge counter shall be provided with each surge arrester.

B.2.5 Protection Relaying and Control System

The protective relaying system proposed to be provided for transmission lines, auto-transformers, reactors and bus bars to minimize the damage to the equipment in the events of faults and abnormal conditions, is dealt in this section. All main protective relays shall be numerical type with IEC 61850 communication interface and should have interoperability during integration of numerical relays to communicate over IEC61850 protocol with RTU/SAS/IEDs of different OEMs. All numerical relays shall have built in disturbance recording feature.

The protection circuits and relays of transformer and reactor shall be electrically and physically segregated into two groups each being independent and capable of providing uninterrupted protection even in the event of one of the protection groups failing, to obtain redundancy, and to take protection systems out for maintenance while the equipment remains in service.

a) Transmission Lines Protection

400 kV transmission lines shall have Main-I numerical three zone distance protection scheme with carrier aided inter-tripping feature. 400 kV lines shall also have Main-II numerical distance protection scheme like Main-I but from different make that of Main-I. The Main-I and Main-II protection relays of same make may be provided only if they are of different hardware and manufacturing platform or different principle of operation.

However, Line Current Differential relay (with back up distance protection feature) as Main–I and Main-II shall be considered at both ends for short lines (line length below 30 km) having Fibre Optic communication link. Differential relay at remote end shall be provided by the TSP. Associated power and control cabling and integration with SAS at remote end shall be provided by respective bay owner.

Further, all 400 kV lines shall be provided with single and three phase auto-reclosing facility to allow reclosing of circuit breakers in case of transient faults. These lines shall also be provided with distance to fault locators to identify the location of fault on transmission lines.

All 400 kV lines shall also be provided with two stages over voltage protection. Over voltage protection and distance to fault locator may be provided as in-built feature of Main-I and Main-II protection relays. Auto reclose as built-in function of Bay Control Unit (BCU) is also acceptable.

The Main-I and Main-II protection relays shall be fed from separate DC sources and shall be mounted in separate panels.

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For 400 kV transmission lines, directional IDMT earth fault relay should be provided as standalone unit or in-built feature of Main-I and Main -II feature.

b) Auto Transformer Protection

These shall have the following protections:

i) Numerical Differential protection
ii) Numerical Restricted earth fault protection
iii) Numerical Back-up Directional Over-current and earth fault protection on High Voltage (HV) and Intermediate Voltage (IV) side
iv) Numerical Over fluxing protection on HV and IV side
v) Numerical Overload alarm

Further, Numerical Back-up Over-current and earth fault protection on HV and IV side of autotransformer shall not be combined with other protective functions in the main relays and shall be independent relays. Besides these, power transformers shall also be provided with Buchholz relay, Magnetic Oil Gauge (MOG) with low oil level alarm, protection against high oil and winding temperature and pressure relief device etc.

Suitable monitoring, control (operation of associated circuit breaker and isolator) and protection for LT auxiliary transformer connected to tertiary winding of auto-transformer for the purpose of auxiliary supply shall be provided. The over current and other necessary protection shall be provided for the auxiliary transformer. These protection and control may be provided as built in feature either in the bay controller to be provided for the auxiliary system or in the control and protection IEDs to be provided for autotransformer.

c) 400 kV Reactor Protection

Reactor shall be provided with the following protections:

i) Numerical Differential protection.
ii) Numerical Restricted earth fault protection
iii) Numerical Back-up impedance protection

Besides these, reactors shall also be provided with Buchholz relay, MOG with low oil level alarm, protection against oil and winding temperatures and pressure relief device, etc.

d) Bus bar Protection

The high speed low impedance type bus bar differential protection, which is essential to minimize the damage and maintain system stability at the time of bus bar faults, shall be provided for 400 kV. Duplicated bus bar protection is envisaged for 400 kV bus-bar protection. Bus bar protection scheme shall be such that it operates selectively for each bus and incorporate necessary features required for ensuring security. The scheme shall have

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complete bus bar protection for present as well as envisaged future bays i.e. input / output modules for future bays shall also be provided.

Bus Bar protection system for new substation shall be de-centralized (distributed) type.

In case, the bus section is provided, then each side of the bus section shall have separate set of bus bar protection schemes.

For existing substations, the existing bus bar protection shall be augmented as per requirement.

e) Local Breaker Back up Protection

This shall be provided for each 400 kV circuit breakers and will be connected to de-energize the affected stuck breaker from both sides.

Notes:

1. *LBB and REF relays shall be provided separately from transformer differential relay.*
2. *LBB relay may also be provided as built-in protection function of distributed bus bar protection scheme; however in such case separate LBB relay shall be provided for tie bays (in case of One and Half breaker scheme).*
3. *Over fluxing and overload protection can be provided as built-in feature of differential relay.*
4. *In 400 kV switchyard, if spare bay of half diameter is identified as future, Tie CB relay panel shall be with Auto-reclosure feature.*

B.2.6 Substation Automation System

a) For all the new substations, a state-of-art Substation Automation System (SAS) conforming to IEC-61850 shall be provided. The distributed architecture shall be used for Substation Automation system, where the controls shall be provided through Bay control units. The Bay control unit is to be provided bay-wise for voltage level 400 kV and above. All bay control units as well as protection units are normally connected through an Optical fibre high speed network. The control and monitoring of circuit breaker, dis-connector, re-setting of relays etc. can be done from Human Machine Interface (HMI) in the control room.

The functions of control, annunciation, disturbance recording, event logging and measurement of electrical parameters shall be integrated in the Substation Automation System.



At new substations, the Substation Automation System (SAS) shall be suitable for the operation and monitoring of the complete substation including proposed future bays/elements.

In existing substations with a Substation Automation System (SAS), augmentation of existing SAS shall be done for bays under the present scope.

In existing Substations where Substation automation is not provided, control functions shall be done through control panels.

Necessary gateway and modems (as required) shall be provided to send data to RLDC/SLDC as per their requirement and shall be provisioned with 2+2 redundancy i.e. 2 channels for Main Control Centre and 2 channels for Backup Control Centre. In order to meet this requirement, suitable redundancy at port and card level need to be ensured by the TSP to avoid any single point of failure which may lead to interruption in real-time grid operation. Accordingly, all the hardware for communication services of station as stated above shall support dual redundancy for data transmission of station to respective main and backup RLDCs. Any augmentation work at RLDC/SLDC is excluded from TSP's scope. However, all the configuration work at substation end required to send data to RLDC/SLDC shall be in the scope of TSP.

b) Time synchronization equipment

Time synchronization equipment complete in all respect including antenna, cable, processing equipment required to receive time signal through GPS or from National Physical Laboratory (NPL) through INSAT shall be provided at new substations. This equipment shall be used to synchronize SAS and IEDs etc.

B.3.0 Substation Support facilities

Certain facilities required for operation and maintenance of substations as described below shall be provided at new substation. In existing substation, these facilities have already been provided and would be extended/ augmented as per requirement.

B.3.1 Fire Fighting System

Fire-fighting system for substation including transformer and reactor shall conform to CEA (Measures Relating to Safety and Electric Supply) Regulations, 2023 as amended time to time.

Further, adequate water hydrants and portable fire extinguishers shall be provided in the substations. The main header of firefighting system shall be suitable for extension to bays covered under the future scope; necessary piping interface in this regard shall be provided.

Optical Beam type heat detection for GIS hall fire protection system shall be provided for all the GIS halls.

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At existing substations, the fire-fighting systems, as available, shall be augmented/ extended to meet the additional requirements.

B.3.2 Oil evacuating, filtering, testing and filling apparatus

To monitor the quality of oil for satisfactory performance of transformers, shunt reactors and for periodical maintenance necessary oil evacuating, filtering, testing and filling apparatus would be provided at new substations. Oil storage tanks of adequate capacities for storage of transformer oil would be provided.

Online Transformer Oil Drying Out System shall be provided in line with the provisions of Standard Specification and Technical Parameters for Transformers and Reactors (66 kV and above voltage class) as amended up to date available on CEA website.

B.3.3 Illumination

Normal and emergency AC and DC illumination shall be provided adequately in the control room and other buildings of the substation. The switchyard shall also be provided with adequate illumination.

Lighting of the entire control room building, fire-fighting pump house, other building (if any) and switchyard shall be done by LED based low power consumption luminaires.

B.3.4 Control Room

For new substation, substation control room shall be provided to house substation workstations for station level control (SAS) along with its peripheral and recording equipment, AC and DC distribution boards, DC batteries and associated battery chargers, Fire Protection panels, Telecommunication panels and other panels as per requirements. Air conditioning shall be provided in the building as functional requirements. Main cable trenches from the control room shall have adequate space provision for laying of cables from control room for all the future bays also.

Common control may be constructed for HVDC and HVAC systems.

At existing substations, the adequacy of size of control room shall be ascertained and the same shall be augmented as per requirement.

B.3.5 GIS hall

The Gas Insulated Switchgear (GIS) of each voltage level along with other associated equipment shall be housed inside separate GIS building. The panels i.e. Bay level units, bay mimic, relay and protection panels, RTCC panels, PLCC panels, panels for tele-communication system etc. are to be placed in a separate room in the GIS building. The size of the room shall be such that all the panels for the bays under present scope shall be accommodated. The panel room shall be air-conditioned. Further, the temperature of the room shall be monitored through substation automation system by providing necessary temperature transducers. Ventilation system of suitable capacity shall be provided for each GIS hall.

One EOT Crane of suitable capacity for erection and Maintenance of largest GIS component/assembly and all plant installed in the GIS switchgear room shall be provided in

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each GIS hall. The crane shall be capable of fulfilling all special requirements for erection and maintenance of GIS equipment. The capacity of the crane shall be sized to lift the heaviest GIS switchgear component.

For extension of existing GIS, existing facilities shall be suitably augmented/ extended for GIS equipment under present scope.

B.3.6 Control Concept

All the EHV circuit breakers in substation/switching stations shall be controlled and synchronized from the switchyard control room/remote control center. All the isolators shall have control from remote/local whereas the earth switches shall have local control only.

B.4 General Facilities

a. Line Gantry/Towers are envisaged for bays under present scope only. However, for adjacent future line bay, tower shall be designed for extension (considering Quad conductors for 765 kV and 400 kV future lines) wherever applicable.

b. Bay extension works at existing substation shall be executed by TSP in accordance with the requirement/provisions mentioned above. However, interface points shall be considered keeping in view the existing design/arrangement at the substation.

c. TSP has to arrange for construction power and water on its own.

d. All outdoor steel structures including anchor/foundation bolts shall be fully galvanized. The weight of the zinc coating shall be at least 610 g/m^2. However, for coastal/creek regions it shall be at least 900 g/m^2.

e. In 765 kV and 400 kV switchyard, if spare bay of half diameter is identified as future, all the equipment for Tie and Future Bay shall be designed considering the current rating of line bay i.e. 3150A.

f. Boundary wall shall be brick masonry wall with RCC frame or Stone masonry wall or Precast RCC wall under present scope along the property line of complete substation area including future switchyard area to prevent encroachment and unauthorized access. Minimum height of the boundary wall shall be of 1.8 m from finished ground level (FGL).



g. All electrical equipment shall be installed above the Highest Flood Level (HFL) and where such equipment is not possible to be installed above the Highest Flood Level, it shall be ensured that there is no seepage or leakage or logging of water.

B.5 EXTENSION OF EXISTING SUBSTATION

The following drawings/details of existing substation is attached with the RFP documents for further engineering by the bidder.

Sl. No.	Drawing Title	Drawing No./Details	Rev. No.
A.	**400 kV South Olpad GIS S/s**		
1.0	Single Line Diagram	The substation is under bidding in separate scheme. Thus, drawings are not available at this stage.	
2.0	General Arrangement		
3.0	Earthmat Layout		
4.0	Visual Monitoring System		
5.0	Bus Bar Protection		
6.0	Substation Automation System (SAS)		
B.	**400 kV KPS3 GIS S/s-Section I**		
1.0	Single Line Diagram	023012-E-IS-SY-1L-0001	H
2.0	General Arrangement	023012-E-IS-SY-EL-0002	C
3.0	Earthmat Layout	Drawings are yet to be finalized by developer.	
4.0	Visual Monitoring System		
5.0	Bus Bar Protection		
6.0	Substation Automation System (SAS)		
C.	**400 kV KPS3 GIS S/s-Section II**		
1.0	Single Line Diagram	The substation is under bidding in separate scheme. Thus, drawings are not available at this stage.	
2.0	General Arrangement		
3.0	Earthmat Layout		
4.0	Visual Monitoring System		
5.0	Bus Bar Protection		
6.0	Substation Automation System (SAS)		

Bidder is also advised to visit the substation sites and acquaint themselves with the topography, infrastructure such as requirement of roads, cable trench, drainage etc. and also the design philosophy.



Annexure – F

SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION

The communication requirement shall be in accordance to CEA (Technical Standards for Communication System in Power System Operations) Regulations, 2020, CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, CERC (Communication System for inter-State transmission of electricity) Regulations, 2017, and CEA (Cyber Security in Power Sector) Guidelines, 2021, all above documents as amended from time to time.

The complete ISTS communication system commissioned by TSP under the RFP shall be the asset of ISTS and shall be available for usage of ISTS requirements as suggested by CTU from time to time.

The communication services viz. SCADA, VoIP, PMU, AGC and AMR (wherever applicable) have been identified as critical services and therefore shall be provisioned with 2+2 redundancy i.e. 2 channels for Main Control Centre and 2 channels for Backup Control Centre. In order to meet this requirement, suitable redundancy at port and card level need to be ensured by the TSP to avoid any single point of failure which may lead to interruption in real-time grid operation.

PMU to PDC communication (wherever required) shall be through 2 channels to the PDC (main) as there is no backup PDC at present.

Accordingly, all the hardware for communication services of station as stated above shall support dual redundancy for data transmission of station to respective main and backup RLDCs.

In order to meet the requirement for grid management and operation of substations, Transmission Service Provider (TSP) shall provide the following:

For smooth operation of the HVDC system, communication network with high reliability and availability shall be provided for transmission of control and protection signals between the two or more (in case of multi-terminal DC) HVDC terminals. The communication system design shall be as follows:

- Main-I
- Main-II (as hot standby to Main-I)
- Back-up communication

The TSP shall supply, install and commission SDH equipment required for the converter stations at **KPS3 and South Olpad** and the necessary repeater stations. The repeater stations

for fibre optic communication are also included in the scope of the TSP. The number and locations of repeaters shall be finalized after survey by TSP.

COMMUNICATION SYSTEMS GENERAL

Duplicated (2X100%) main communication systems (Main-I and Main-II) at KPS3 and South Olpad terminal and its repeaters shall comprise first cubicle of Main Fibre Optic Terminal equipment (FOTE) and second cubicle of Standby FOTE and be provided to meet the requirements of the control, protection, data transfer and telephone systems. System shall be based on the fibre optic communication between the converter stations through ± 500 KV DC lines. Each Main and Standby FOTE system shall be independent of each other. TSP to design the optical fibre Communication system between the converter stations in such a way that communication is available even when there is complete failure of one FOTE system. All repeater stations required for the communication system shall be provided by TSP. The TSP shall provide all required equipment, accessories, routers, modems and facilities etc., as required, for successful commissioning and use of the communication channels at KPS3 and South Olpad HVDC Bipole terminal.

The backup communication link shall also be provided through OPGW on AC Lines. Necessary support shall be provided by the TSP to other TSP/s whose existing communication network is required to be configured for backup communication. Configuration work shall be done by the backup communication system owner/s for the KPS3 and South Olpad HVDC link in coordination with the TSP. TSP shall be responsible for all interface requirements with the Communication system of the other TSP(s) whose OPGW/Communication equipment are required for successful commissioning of the backup communication link including hardware/accessories etc .

C.1.0 Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard.

(i) TSP shall supply, install and commission one or more no. FODP (120 F or higher) alongwith panel and approach Cable (24F each) with all associated hardware fittings from gantry tower to Control Room for all the incoming lines envisaged under the present scope.

(ii) TSP shall supply, install and commission 2 Nos. STM-16 (FOTE) equipment locally patched (in redundant mode connected with separate fibre pairs of same OPGW) alongwith panel/s supporting minimum Five (5) directions with MSP (Multiplex Section Protection – 1+1, excluding local patching) at KPS3 (HVDC) S/s with necessary interfaces to meet the voice and data communication requirement

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among KPS3 HVDC, KPS3 GIS, South Olpad (HVDC)/ Repeater Stations. The suitable DC Power Supply and backup to be provided for each communication equipment operational in redundant mode.

(iii) FODP and FOTE equipment with panels shall be provided in Control Room of KPS3 (HVDC) S/s. FOTE and FODP Eq can be accommodated in same panel to optimize space.

(iv) The FOTE under present scope at HVDC shall be integrated by TSP with the existing FOTE at control room of **KPS3 GIS**. TSP to provide necessary FODP sub rack / Splice trays/ Patch cords etc. and optical interfaces/equipment in the existing FOTE/FODP panels in control room for providing required optical directions with the existing FOTE for onwards data transmission.

(v) The new communication equipment under the present scope shall be compatible for integration with existing regional level centralized NMS. The local configuration of the new communication equipment shall be the responsibility of TSP. The configuration work in the existing centralized NMS for integration of new Communication equipment shall be done by Regional ULDC Team, however all the necessary support in this regard shall be ensured by TSP.

(vi) TSP shall supply, install and commission Firewall in redundant mode (1+1) in line with the specification attached at **Annexure F.1**.

(vii) The maintenance of all the communication equipment and software thereof including FOTE, FODP, approach cable, Repeater Station, PMU, DCPS along with Battery Bank and Firewall shall be the responsibility of TSP.

C.2.0 Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s.

(i) TSP shall supply, install and commission one or more No. FODP (96 F) or higher) alongwith panel and approach Cable (24F each) with all associated hardware fittings from gantry tower to Control Room for all the incoming lines envisaged under the present scope.

(ii) TSP shall supply, install and commission 2 Nos. of STM-16 (FOTE) equipment locally patched (in redundant mode connected with separate fibre pairs of same OPGW) alongwith panel/s supporting minimum four(4) directions with MSP (Multiplex Section Protection – 1+1, excluding local patching) at South Olpad

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(HVDC) S/s with necessary interfaces to meet the voice and data communication requirement among South Olpad (HVDC), South Olpad GIS, KPS3 (HVDC) and Repeater Stations. The suitable DC Power Supply and backup to be provided for each communication equipment operational in redundant mode.

(iii) FODP and FOTE equipment with panels shall be provided in Control Room of South Olpad (HVDC) S/s. FOTE and FODP Eq can be accommodated in same panel to optimize space.

(iv) The FOTE under present scope at HVDC shall be integrated by TSP with the existing FOTE at control room of **South Olpad GIS**. TSP to provide necessary approach cables/FODP sub rack / Splice trays/ Patch cords etc. and optical interfaces/equipment in the existing FOTE/FODP panels in control room for providing required optical directions with the existing FOTE for onwards data transmission.

(v) The new communication equipment under the present scope shall be compatible for integration with existing regional level centralized NMS. The local configuration of the new communication equipment shall be the responsibility of TSP. The configuration work in the existing centralized NMS for integration of new Communication equipment shall be done by Regional ULDC Team, however all the necessary support in this regard shall be ensured by TSP.

(vi) TSP shall supply, install and commission Firewall in redundant mode (1+1) in line with the specification attached at **Annexure F.1**.

(vii) The maintenance of all the communication equipment and software thereof including FOTE, FODP, approach cable, Repeater Station, PMU, DCPS along with Battery Bank and Firewall shall be the responsibility of TSP.

C.3.0 KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line.

On KPS3 – KPS3 (HVDC) 400 kV 2xD/C line, TSP shall supply, install and commission One (1) No. OPGW cable containing 24 Fibres (24F) on one E/W peak and conventional earth wire on other E/W peak **on each of the D/C lines**.

The TSP shall install this OPGW from gantry of KPS3 GIS up to the gantry of KPS3 (HVDC) S/s with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called **OPGW Hardware** hereafter) and finally terminate in Joint Boxes at end

Substations. The transmission line length is 2 kms (approx.) where repeater is not required to meet link budget requirement of KPS3 GIS – KPS3 (HVDC).

C.4.0 4 No. of 400 kV line bays at KPS3 for KPS3 – KPS3 (HVDC) 400 kV 2xD/C line

(i) TSP shall supply, install and commission one or more No. FODP (144 F or higher) along with panel and required Approach Cable (24F) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room.

(ii) TSP shall supply, install and commission 2 Nos. of STM-16 (FOTE) equipment along with panel/s supporting minimum three (3) directions with MSP (Multiplex Section Protection – 1+1, excluding local patching) at KPS3 GIS with necessary interfaces to meet the voice and data communication requirement between, KPS3 (HVDC) and KPS3 GIS. The suitable DC Power Supply and backup to be provided for each communication equipment operational in redundant mode.

(iii) FOTE/FODP panel shall be installed in the new Bay Kiosk/ Switchyard Panel Room (SPR). The FOTEs under present scope shall be integrated by TSP with the existing/proposed FOTE at control room of **KPS3 GIS**. TSP to provide necessary FODP sub rack / Splice trays/ Patch cords etc. and optical interfaces/equipment in the existing FOTE/FODP panels in control room for providing required optical directions with the existing FOTE for onwards data transmission.

In case spare optical direction is not available in the existing FOTE at the control room, the TSP shall coordinate with station owner to reconfigure the directions in existing FOTE at control room. Alternatively, the TSP may integrate the FOTE under the present scope with existing FOTE in the nearby Kiosk connected to the control room FOTE (if available with spare direction). For this purpose, TSP shall provide necessary FODP sub rack / Splice trays/ Patch cords etc. and suitable optical interfaces/ equipment in the existing FOTE/FODP panels in another Kiosk (SPR).

(iv) FOTE and FODP can be accommodated in same panel to optimize space.

(v) The new communication equipment under the present scope shall be compatible for integration with existing regional level centralized NMS. The local configuration of the new communication equipment shall be the responsibility of TSP. The configuration work in the existing centralized NMS for integration of new Communication equipment shall be done by Regional ULDC Team, however all the necessary support in this regard shall be ensured by TSP.

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C.5.0 ±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW).

On ±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return), TSP shall supply, install and commission One (1) no. OPGW cable containing 24 Fibres (24F) on one E/W peak and conventional earth wire on other E/W peak. OPGW diameter shall be in line with earthwire parameters mentioned in Annexure-E1 (Specific technical requirements for HVDC transmission line).

The TSP shall install this OPGW from gantry of KPS3 (HVDC) up to the gantry of South Olpad (HVDC) S/s with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called **OPGW Hardware** hereafter) and finally terminate in Joint Boxes at end Substations. The transmission line length is 600 km (approx.) where repeaters are required to meet link budget requirement of KPS3 (HVDC) – South Olpad (HVDC).

TSP shall finalize the location and number of repeater stations depending upon the actual site conditions. Further TSP shall comply to the requirements mentioned as per **Appendix-F.1**.

Maintenance of OPGW Cable, OPGW Hardware and repeater equipment and items associated with repeater shelter shall be responsibility of TSP.



Specific Requirement for Phasor Measurement Units (PMUs)

TSP shall supply, install and commission required No. of Phasor Measurement Units (PMUs) PMUs at all the locations under the scope of TSP under this RFP as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 (along with all amendments if any), and all the applicable Regulations, Standards, Guidelines issued time to time. These PMUs shall be provided with GPS clock and LAN switch and shall connect with LAN switch of control room of respective substations/ generating stations with Fibre Optic cable. These PMUs shall be connected with the FOTE at Substation/ generating stations for onwards data transmission to the PDC (Phasor Data Concentrator) located at respective RLDC. Configuration work in existing PDC at RLDC for new PMU integration shall be done by respective RLDC, however all the necessary support in this regard shall be ensured by TSP. The maintenance of all the PMUs and associated equipment shall be the responsibility of TSP.

Note: Existing Station owner/s to provide necessary support to integrate different equipment and applications of new extended bays with the existing substation e.g. Communication (through FOTE), Voice etc. for smooth operation and monitoring of new added grid elements.



Appendix-F.1

Repeater Requirements

FOTE to be provided by TSP in repeater station/s shall be 2x STM-16 (FOTE) equipment (in redundant mode connected with separate fibre pairs of same OPGW/UGFO/Approach Cable)

- If the repeater location is finalized in the Control Room of a nearby substation, TSP shall provide 1 no. OPGW (48F) on a single Earthwire peak with OPGW Hardware and mid-way Joint Boxes etc. of the line crossing the main line and 1 no. Approach Cable (48F) with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the repeater equipment in substation control room.

  TSP shall co-ordinate for Space and DC power supply sharing for each operational communication equipment at repeater station in redundant mode.

  TSP shall provide FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link.

OR

- If the repeater location is finalized in the nearby substation premises, the TSP shall identify the Space for repeater shelter in consultation with station owner. Further TSP shall provide 1 no. OPGW (48F) on a single Earthwire peak with OPGW Hardware and mid-way Joint Boxes etc. of the line crossing the main line and 1 no. Approach Cable (48F) / UGFO (48F) with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the substation where the repeater shelter is to be housed.

  TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems for each operational communication equipment at repeater station in redundant mode.

OR

- If the repeater location is finalized on land near the transmission tower. TSP shall make the provisions for Land at nearby tower for repeater shelter. Further TSP shall provide 1 no. Approach Cable (48F) / UGFO (48F) with all associated hardware fittings to establish connectivity up to the location of repeater shelter.

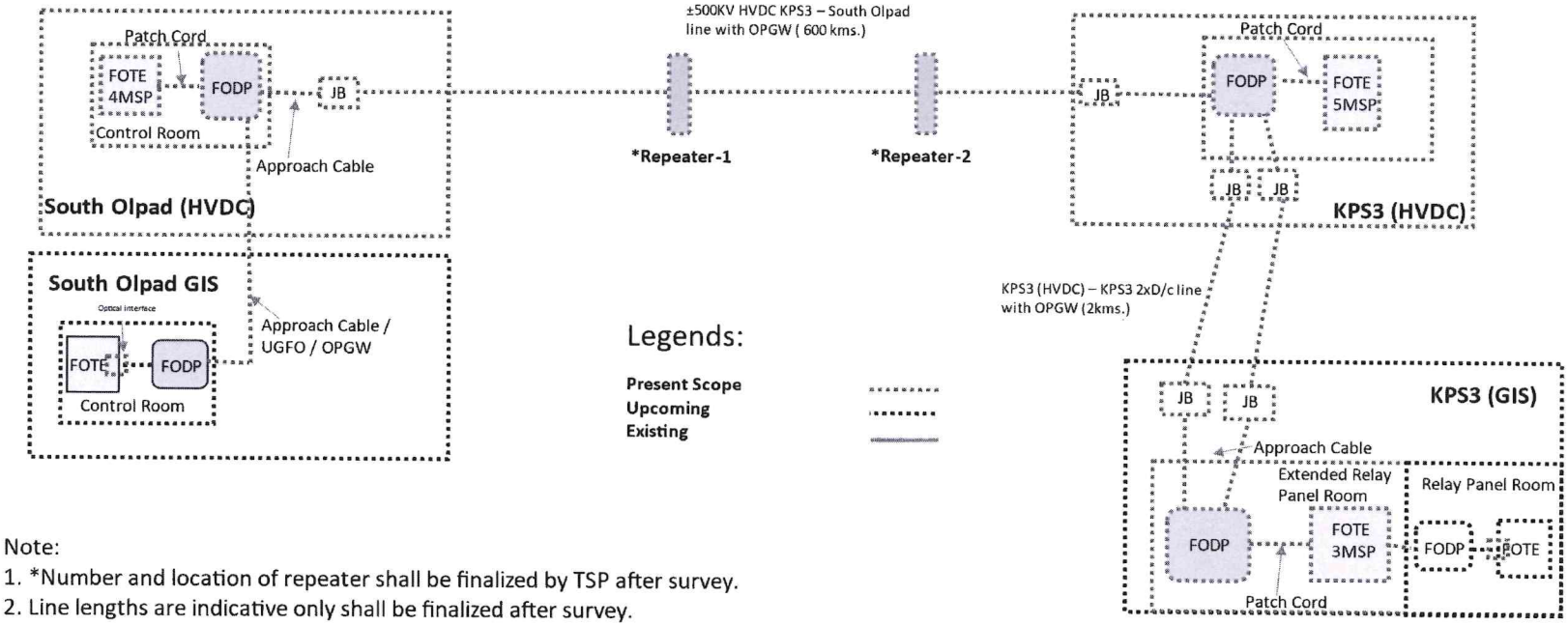
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TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems for each operational communication equipment at repeater station in redundant mode.

Maintenance of OPGW Cable and **OPGW Hardware**, repeater equipment and items associated with repeater shelter shall be responsibility of TSP.



Proposed Communication for Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C



Note:

1. *Number and location of repeater shall be finalized by TSP after survey.
2. Line lengths are indicative only shall be finalized after survey.
3. Two no. of FOTE are to be provided at KPS3 HVDC, KPS3 GIS SPR & South Olpad HVDC Stations.
4. The existing FOTE at KPS3 GIS SPR and South Olpad GIS shall be integrated with respective FOTE to be provided at HVDC stations.

Figure F.1

Annexure-F.1

Next Generation Firewall (NGFW)

TSP shall provide 2 NGFW one in Main and another in Standby mode having electrical ethernet interfaces/ports and placed between FOTE and SAS gateway/s at the substation. All ethernet based applications shall be terminated in the firewall ports directly (e.g. PMU, AMR, VOIP, SAS/SCADA etc.). Each port of firewall shall work as a separate zone. Firewall shall be hardware based with features of Block/Allow/drop and IPSec VPN (network encryption).

The number of ports/interfaces in each firewall (i.e. Main and Standby) shall be minimum 16 Nos. TSP shall provide either single firewall or multiple firewalls to meet this interfaces requirement, each for main as well as standby firewall. Minimum throughput of firewall shall be 300 Mbps.

The Firewall shall be managed/ configured as standalone at present and shall also have compatibility to manage/configure through Centralized Management Console (CMC) remotely in future.

Firewall shall be tested and certified for ISO15408 Common Criteria for least EAL4+. Further, the OEM must certify that it conforms to Secure Product Development Life Cycle requirements as per IEC62443-4-1. The firewall shall generate reports for NERC-CIP Compliance.

The specifications for the firewalls are given at **Annexure-F.2** and schematic diagram showing firewall placement given at **Figure F.2**.

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Annexure F.2

Specifications of Next Generation Firewall (NGFW)

1. NGFW shall have following features including but not limited to:
   Encryption through IPSec VPN (Virtual Private Network), Deep Packet Inspection (DPI), Denial of service (DoS) and Distributed Denial of Service (DDoS) prevention, Port Block/ Allow, rules/ policies for block/allow, IP (Internet Protocol) and Media Access Control (MAC) spoofing protection, threat detection, Intrusion Prevention System (IPS), Anti-Virus, Anti-Spyware, Man In The Middle (MITM) attack prevention.
2. The proposed firewall shall be able to handle (alert, block or allow) unknown /unidentified applications e.g. unknown TCP and UDP packets. It shall have the provision to define application control list based on application group and/or list.
3. Firewall shall have feature and also have capability to update the definition/ Signatures of Anti-Virus online as well as offline. Firewall shall also be compatible to update the definitions/signatures through CMC. There shall be a defined process for security patching and firmware up-gradation. There shall be a feature to field validate firmware checksum. The same shall also be validated before using the OEM provided file/binary in the process of firmware up-gradation and security patching
4. Firewall shall have Management Console port to configure remotely.
5. Firewall shall be EMI/EMC compliant in Substation environment as per IEC 61850-3.
6. Firewall shall be rack mounted in existing standard equipment cabinets.
7. Firewall shall have support of SCADA applications (IEC-60870-5-104), ICCP, PMU (IEEE C37.118), Sub-Station Automation System (IEC 61850), Ethernet and other substation environment protocols.
8. Client based Encryption/ VPN must support different Operating System platforms e.g. Windows, Linux and Mac.
9. The solution must have content and comprehensive file detection policies, blocking the files as function of their types, protocols and directions.
10. Firewall shall have logging facility as per standard logs/events format. Firewall shall have features to export the generated/stored logs/events in csv (Comma Separated Value) and also any other standard formats for offline usage, analysis and compliance. Firewall shall have suitable memory architecture and solution to store and be enable to export all logs/events for a period of last 90 days at any given time.
11. Firewall shall have features and be compatible with local as well as central authentication system (RADIUS, LDAP, or TACACS+) for user account and access right management. It shall also have Role Based User management feature.
12. Firewall shall have the capability to configure sufficient number of VLANs.
13. Firewall shall have the capability to support sufficient number of sessions.
14. Firewall shall have provision to configure multiple IP Sec VPNs, at least 100 Nos. (one-to-many or many-to-one). Shall support redundant operation with a similar router after creation of all the IP Sec VPN. IPSec VPN shall support encryption protocols as

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AES128, AES256 and hashing algorithms as MD5 and SHA1. IPSec VPN throughput shall support at least 300 Mbps

15. Firewall shall be capable of SNMP v3 for monitoring from Network Management system. It shall also have SNMPv3 encrypted authentication and access security
16. Firewall shall support in Active/Passive or Active-Active mode with High Availability features like load balancing, failover for firewall and IPsec VPN without losing the session connectivity.
17. Firewall should have integrated traffic shaping (bandwidth, allocation, prioritisation, etc.) functionality
18. Shall support simultaneous operation with both IPv4 and IPv6 traffic
19. Firewall shall be compatible with SNTP/NTP or any other standards for clock synchronization
20. Firewall shall have the features of port as well as MAC based security
21. Firewall shall support exporting of logs to a centralized log management system (e.g. syslog) for security event and information management.
22. Firewall time shall be kept synchronised to official Indian Timekeeping agency, time.nplindia.org.
23. Firewall product shall be provided with all applicable updates at least until 36 months since the applicable date of product shipping to the concerned utility.



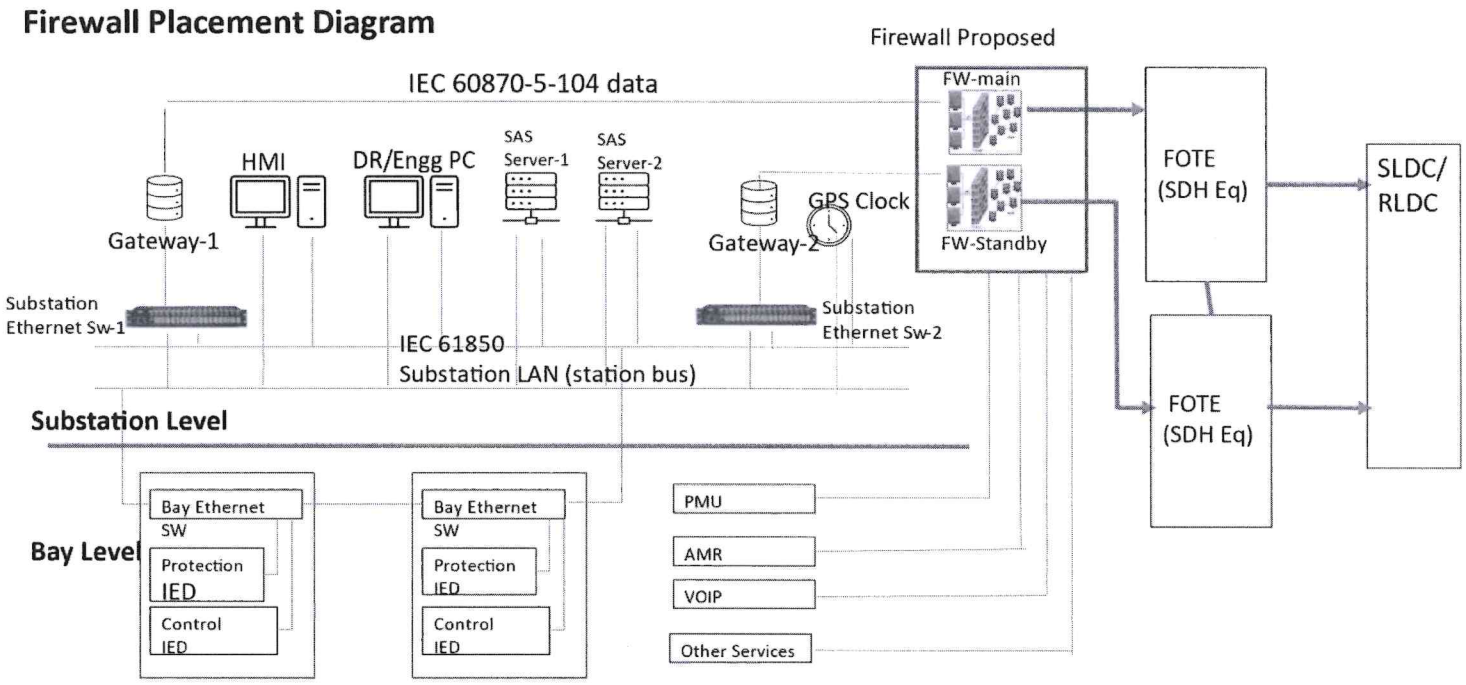

Firewall Placement Diagram
Firewall Proposed
IEC 60870-5-104 data
FW-main
FW-Standby
FOTE
(SDH Eq)
FOTE
(SDH Eq)
SLDC/
RLDC
HMI
DR/Engg PC
SAS
Server-1
SAS
Server-2
GPS Clock
Gateway-1
Gateway-2
Substation
Ethernet Sw-1
Substation
Ethernet Sw-2
IEC 61850
Substation LAN (station bus)
Substation Level
Bay Level
Bay Ethernet
SW
Protection
IED
Control
IED
Bay Ethernet
SW
Protection
IED
Control
IED
PMU
AMR
VOIP
Other Services

Figure F.2

C.6.0 PLCC and PABX:

Power line carrier communication (PLCC) equipment complete for speech, tele-protection commands and data channels shall be provided on each transmission line. The protections for transmission line and the line compensating equipment shall have hundred percent back up communication channels i.e. two channels for tele-protection in addition to one channel for speech plus data for each direction. The PLCC equipment shall in brief include the following:

(i) Coupling device, line traps, carrier terminals, protection couplers, HF cables, PABX (if applicable) and maintenance and testing instruments.

(ii) At new substation, a telephone exchange (PABX) of 24 lines shall be provided at as means of effective communication among various buildings of the substation, remote end substations and with control centers (RLDC/SLDC) etc.

(iii) Coupling devices shall be suitable for phase to phase coupling for 400 kV Transmission lines. The pass band of coupling devices shall have sufficient margin for adding communication channel in future if required. Necessary protection devices for safety of personnel and low voltage part against power frequency voltages and transient over voltage shall also be provided.

(iv) The line traps shall be broad band tuned suitable for blocking the complete range of carrier frequencies. Line Trap shall have necessary protective devices such as lightning arresters for the protection of tuning device. Decoupling network consisting of line traps and coupling capacitors may also be required at certain substation in case of extreme frequency congestion.

(v) The carrier terminals shall be of single side-band (SSB) amplitude modulation (AM) type and shall have 4 kHz band width. PLCC Carrier terminals and Protection couplers shall be considered for both ends of the line.

(vi) PLCC equipment for all the transmission lines covered under the scheme shall be provided by TSP as per following configuration. CVT and Wave trap for all the line bays under present scope shall be provided by TSP.

Sl. No	Line name	PLCC configuration
1.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C line	1 set Analog PLCC + 1 set Digital Protection Coupler for each circuit at both ends. OR 2 Sets of Digital Protection Coupler for each circuit at both ends with physically diverted path.

Further, CVT and Wave trap for all line bays under present scope shall be provided by TSP where analog PLCC is required.

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(vii) All other associated equipment like cabling, coupling device and HF cable shall also be provided by the TSP.

(viii) 2 sets of 48 V battery banks for PLCC and communication equipment shall be provided at each new Substation with at least 10 hours battery backup and extended backup, if required.



Annexure-G

Frequently Asked Queries:

1.0 Transmission Line:

1.1 Please clarify that whether shutdowns for crossing of existing transmission lines of POWERGRID/STUs/ Power Evacuation Lines from Generation Plants/ Any other Transmission Licensee will be given to TSP on chargeable basis or free of cost.

Reply: Shutdowns for crossing of existing transmission lines of POWERGRID/ STUs/ Power Evacuation Lines from Generation Plants/ Any other Transmission Licensee will be given to TSP by the concerned owner of the lines as per their own terms and conditions. As far as shutdown of ISTS lines are concerned the same can be availed by approaching respective Regional Power Committee.

1.2 We understand that the suggested swing angle criteria are applicable for Suspension Insulator in Suspension Tower. Further, you are requested to provide similar swing angle and clearance criteria for Pilot Insulator with Jumper and Jumper.

Reply: It is clarified that the swing angle criteria (as mentioned in RFP) for transmission lines is applicable for Suspension Insulator in Suspension Tower. Further, as per Clause 3.0 of Specific Technical Requirements for transmission lines, Transmission service Provider (TSP) shall adopt any additional loading/design criteria for ensuring reliability of the line, if so desired and /or deemed necessary.

1.3 We request you to kindly allow that use of diamond configuration at Power line crossings and the existing owner of the lines may be directed to allow the same for the successful bidders.

Reply: Power line crossing including Diamond configuration is responsibility of the TSP. TSP shall formally submit the profile of the crossing section to the owner of the existing line suggesting proposed crossing alternatives. The crossing will have to be carried out as per approval of owner of the existing line.

1.4 It is requested you to kindly provide present status of Forest Clearances if any transmission line corridor area falling in wildlife forest / reserve forest/ mangroves.

Reply: Based on the preliminary route survey, the process of initiation of forest clearance for the forest stretches, if any, enroute the proposed line alignment will be initiated by way of writing letters to the concerned authority(ies). However, it may be noted that it will be the responsibility of TSP for obtaining forest clearance for the forest stretches as provided in the survey report and also for any forest area encountered during detailed survey.

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2.0 Substation

2.1 We understand that space for storage of O&M spare shall be provided by existing owner within the station boundary without any cost. Kindly confirm.

Reply: Space for storage of O&M spares shall be arranged by TSP on its own.

2.2 We presume that the O&M for the end Termination bays will be in the scope of the TSP and TSP shall not be liable for any payment towards O&M to the existing owner of the substation. Kindly confirm.

Reply: Operation and maintenance of the bays is solely responsibility of the TSP. TSP shall follow CEA,s " Operation and Maintenance (O&M) guidelines and Standard Format for Memorandum of Understating between New TSP and Existing TSP" issued by CEA vide its letter No. I/28514/2023 dated 22.06.2023. Copy of the guideline is available on CEA website at following link:

https://cea.nic.in/wp-content/uploads/pse___td/2023/06/om_guidelines.pdf

2.3 With reference to subject scheme of existing sub-station, we assumed following scope of work:

(a) We assumed internal road is available and need not to consider in the present scope of work.

(b) Drainage is available and need not to consider in the present scope of work.

(c) Cable trench extension in adjacent to Main cable trench only under present scope of work.

(d) Levelled area being provided by developer for bay extension.

Reply: Regarding requirement of internal road, drainage, cable trench, leveling of the bay extension area, bidder is advised to visit site and acquaint themselves with the provisions/facilities available at substation.

2.4 Kindly provide the soil investigation report of soil parameters of existing substation.

Reply: Bidder is advised to visit the substation site and ascertain the requisite parameters.

2.5 Kindly confirm, energy accounting of aux. power consumption. Whether it will be on chargeable basis or part of transmission loss.

Reply: It will be on chargeable basis.

2.6 We understand that VMS requirement is for unmanned stations only. For Manned stations VMS is not compulsory.

Reply: VMS shall be provided in line with requirements of RfP document.

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2.7 It is understood that Construction water and power shall be provided free of cost to TSP by respective substation owner for construction of new bays.

Reply: Arrangement of construction power and water is in the scope of TSP.

2.8 It is understood that existing fire hydrant system shall be extended by the TSP for bay extension.

Reply: Existing fire hydrant system shall be extended from existing system (if required)

2.9 Please clarify that Status of land acquisition for Substations. Whether the lands have been acquired by BPC and will be transferred to TSP.

Reply: The acquisition of land for substation is in the scope of TSP.

2.10 We understood that no any dedicated metering CT and CVT required for Line/feeders. Further, we understood that requisite Energy meters for various 765 kV, 400 kV and 220 kV Feeders shall be provided and installed by CTU free of cost to TSP.

Reply: Dedicated metering CT and CVT are not required for line/feeders. Metering core of existing CT/CVT can be used provided accuracy class is matching with metering requirement. Requisite Special Energy Meters shall be provided and installed by CTU at the cost of TSP in C&P panel subject to space availability, else, in separate metering panel (to be provided by TSP at its cost).

3.0 Communication

3.1 What are the usage of OPGW, FOTE, PMU etc. under communication requirement of RFP?

Reply: User shall be responsible for providing compatible equipment along with appropriate interface for uninterrupted communication with the concerned control center and shall be responsible for successful integration with the communication system provided by CTU.

Communication systems e.g. OPGW, FOTE, PMU etc. are required for grid operation through RLDC/SLDC, speech communication, tele-protection and tele-metering.

3.2 Is space for installation of communication panels are provided to TSP in existing Substations incase new bays are in the scope of TSP?

Reply: The space related issues are deliberated in the RFP itself. TSP to carry out survey of the existing substation for physical space requirement. In case space is not available in the existing substation then TSP shall accommodate the same in the respective bay SPR (Switchyard Panel Room)/Bay Kiosk/ Relay panel room in case of GIS s/s. Further, TSP to connect and integrate the proposed FOTE with the existing FOTE in the control room.



In Case 132 kV Substation TSP shall accommodate the said panels either by extension of existing control room or other arrangements.

3.3 How is the OPGW laying done in case of LILO lines?

Reply: In case LILO lines are on same towers (e.g. both Line in and Line Out portion are on same towers, generally done LILO of S/C lines). Then 2x24F OPGW shall be required to install by TSP on both earthwire peak on 400 kV and 765 kV lines where two E/W peaks are available. On 220 kV and 132 kV lines where only one E/W peak is available TSP to install one no. 48F OPGW.

Incase LILO lines are on different towers (e.g. both Line In and Line Out portion are on different towers, generally done LILO of D/C lines). Then 1x24F OPGW shall be required to install by TSP on one earthwire peak, on both Line in and Line Out portions of 400 kV and 765 kV lines. On 220 kV and 132 kV lines where only one E/W peak is available TSP to install one no. 24F OPGW in place of conventional earthwire.

3.4 How is the OPGW laying done in case Multi circuit Towers?

Reply: In case two different lines are using common multi circuit portion for some distance (originating from different stations, may be terminating on same or on different stations). Two No. 24F OPGW to be installed on both E/W peaks for common M/C portion of 765 kV and 400 kV lines.

Incase 220/132 kV lines using multi circuit portion where single E/W peak is available one no. 48F may be installed for common multi circuit portion.



Amendment-1 dated 30.08.2024

to

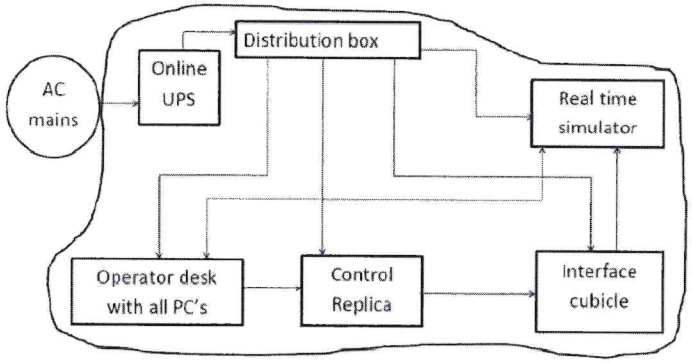
RFP Documents for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" through tariff based competitive bidding process.

Sl. No.	Existing Clause	New/Revised Clause
1	**Clause 7.1 of Annexure B of RfP Document** The BPC has appointed Independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation with the Central Vigilance Commission (Names and Addresses of the Monitors to be given). ---	**Clause 7.1 of Annexure B of RfP Document** The BPC has appointed Independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation with the Central Vigilance Commission (Names and Addresses of the Monitors to be given). **Shri Rajiv Ranjan** **R/o No. 170, 11th Cross, 3rd Main,** **RMV Stage 2, Dollars Colony** **Bengaluru North** **Bengaluru- 560094** **Mob No – 9448147003** **Email ID- rranjan68@gmail.com** **Shri Jeyakodi Virusankulam Kumarasamy, IAS (Retd.)** **R/o 3F, Orchid Villa, 6" Avenue,** **Harrington Road, Chetpet,** **Chennai-600031** **Mob No – 9176699444** **Email ID- jeyakodivk@gmail.com**

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Amendment-02 dated 10.09.2024 to

RFP Documents for *"Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C"* through tariff based competitive bidding process.

Sl. No.	Clause No.	Existing Provision	New/Revised Provision
1.	51 (Page-191)	TSP shall supply complete VSC HVDC control and protection replica system without redundancy along with a real time simulator for both the poles based on project specification mentioned in this document. The software and hardware design philosophy of control and protection replica shall be based on the design of ± 500 kV, 2500 MW Khavda - South Olpad VSC HVDC system for the purpose of dynamic performance testing, commissioning, troubleshooting and optimization during operation and training. Figure-4 shows a general diagram of the scope of Control Replica.  Fig 4 : Scope of contractor for Control Replica As show in Figure-4, the supply shall include simulator interface panel, station HMI, Transient	**A control and protection replica hardware (without redundancy) along with simulator shall be implemented for ± 500 kV, 2500 MW KPS3-South Olpad Bipole. The software and hardware design philosophy of control and protection replica shall be based on actual design of ± 500 kV, 2500 MW KPS3-South Olpad HVDC VSC Bipole system. However, it shall be possible to reconfigure and change parameters in the controllers. The supply shall also include simulator interface panel, station HMI, Transient Fault Recorder, Station GPS clock, network equipment, Uninterrupted Power Supply (UPS) system, communication cables, cable trays/racks and other associated accessories.** **The details are mentioned in Appendix-C.6.**

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		Fault Recorder, Station GPS clock, network equipment, Uninterrupted Power Supply (UPS) system, communication cables, cable trays/racks, tools and tackles, suitable furniture including operator desk, spares and other accessories required to implement the Control Replica. The dynamic performance test for 2500 MW Khavda – South Olpad HVDC VSC Bipole may be carried out with Control Replica, and the same shall be delivered to site after completion of site acceptance tests. The simulator shall contain AC network modelled as both voltage sources behind short circuit impedance and detailed AC equivalent network as provided to enable TSP to carry out test cases with both options.	



Appendix C.6

TECHNICAL REQUIREMENTS FOR THE REPLICA-SIMULATOR SETUP

1. Scope

The document mentions technical requirements that should be considered by the TSP for the implementation of one real-time laboratory for the Factory System Test (FST), commissioning, operation, training and optimization of VSC DC systems in a large AC Grid. Considering the strategic importance, complexity of controls and protection, operation and dynamic performance of the bipole system, the simulation facility shall include bipole replica – real time simulator setup.

The Dynamic Performance Test (DPS) /Factory System Test (FST) for 2500 MW KPS3-South Olpad HVDC Bipole shall be carried out with same simulator. The simulator shall contain AC network modeled as both i) voltage sources behind short circuit impedance and ii) detailed AC equivalent network as specified in Technical Specification to carry out test cases with both options.

The spare cards/modules including maintenance spares, communication cables etc. required for operation and maintenance of the replica system and simulator shall also be a part of supply. Minimum 10% spares shall be provided. The UPS provided for replica-simulator system shall have additional capacity of 10 kVA. The manufacturer of UPS shall have an operational authorized maintenance and support center in India at the time of award of the contract.

The TSP shall ensure support from OEM for KPS3-South Olpad HVDC Bipole control and protection replicas and simulator, for debugging the faults related to software and hardware and to provide software updates and hardware support for the useful life of the project..

The Replica and Simulator system shall be made available free of charge for conducting studies and tests proposed by CEA/CTUIL/Grid-India.

2. Main specifications of simulator for Real-Time Laboratory

The Simulators for Real-Time Laboratory must comply with the following specifications:.

2.1.1 Real-Time Simulation Laboratory Capability

The real-time simulation facility will enable to conduct system planning, operation and engineering studies with hardware/software in the loop as needed at different

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stages of the project.

2.1.2 Specification of Real-Time Simulator

2.1.2.1 Simulation Capability

For the Dynamic performance test/Factory System Test, the complete AC-system will be represented by an equivalent network.

The simulator must be able to simultaneously simulate following:

(i) The complete bipole DC system with all converters, DC and AC equipments, and AC/DC filter bank (as applicable) and other associated equipment that will be delivered at each station of the KPS3-South Olpad HVDC system.

(ii) The detailed model of each controller of the bipole systems shall include all HVDC controllers, filter bank controllers.

The AC grid that will be connected to the HVDC system terminals with the following capabilities:

(i) One equivalent AC system at each terminal of the HVDC system with the possibility to modify, short-circuit inductances, resonance conditions and damping, while the simulator is running.

(ii) Detailed dynamic equivalent AC system model with at least 200 3-phase busses including a minimum of 100 transmission lines, 50 generators modeled in details with controllers, 75 (3-ph) transformers with saturation, 25 (3-ph) fixed-impedance loads and 25 dynamic loads, 20 (3-ph) arrestors, models of 10 SVCs, 20 STATCOMs and 10 TCSCs, 50 Inverter Based Resources (IBR) alongwith associated Power plant controllers (PPCs).

2.1.2.2 Input-Output Interface

The real-time simulator must also have all necessary digital input-output systems to interface with detailed replicas (the actual control and protection system for bipole) of all HVDC controllers that will be supplied as part of the bipole project.

2.2 Operating flexibility, modularity and re-configurability

2.2.1 Real-Time and Non-Real-Time Simulation

The real-time simulator must be able to operate in real-time simulation mode with IO interface and non-real-time simulator in non-real-time simulation mode using the same HVDC and EHVAC grid models. In non-real-time simulation mode, the simulator shall have the capability to execute simple and detailed models of HVDC

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SVC and other FACTS controllers used for this project.

2.2.2 Minimum Simulation Time Step and Advanced Converter Models

The real-time simulator shall have the capability to simulate in real time with integration time step of not more than 50 microseconds for the entire - bipole system, ac reactive compensation equipment, converters, and HVDC simulation, in order to reduce the number of processors, the detailed ac system may have integration time step of 50 microseconds or less.

TSP shall seek Simulator supplierstо propose advanced switching algorithms and converter models to reach an effective switching/firing resolution better than 10 microsecond; for slow variation of converter power as required for verifying the damping of SSR controller. The required time steps shall also be programmable. Controller shall specify any additional requirement to the Simulator supplier as necessary to meet their test objectives for the delivery of the bipole system.

2.2.3 Voltage Source Converter (VSC) Power Electronic System Simulation

Following generic models shall be supplied.

Digital simulators should be optimized for the simulation of VSC power electronic systems integrated with large power grids. Furthermore, the proposed simulator must be designed to handle models with several thousands of individually controlled IGBTs as applicable used to implement modern multi-level VSC converters.

The proposed simulator should also be able to simulate DC-AC and AC-DC three-phase power converter models built with fast power electronic devices (MOSFET, IGBT), typical of those used in micro-grids or distributed energy generation (concentrated solar cell, micro-gas turbine, photovoltaic generator, biomass, combined heat and power, battery storage system) should also be simulated accurately in real-time.

These very fast IGBT-based power electronic systems, which can influence the performance of conventional and modern protection systems, require much smaller simulation time step values than what can be achieved through the use of conventional DSP-based real-time simulators optimized for power grid simulation.

The TSP shall seek the supplier to provide a fully flexible VSC sub-network whereby the user can freely configure the valve topology for Modular Multi level converter (minimum 512 full bridge sub-modules per valve), crowbar circuitry, filters, etc. and still achieve the required firing accuracy.



The TSP shall seek Supplier to demonstrate that MMC based voltage source converters have a continuously variable firing instant with a resolution of 3 microseconds or better. In addition, the TSP shall also seek Suppliers to demonstrate capability to simulate in real-time a chain-link VSC converter model used in AC-DC-AC converters and FACTS with thousands of individually controlled switches similar to chain-link VSC systems offered by major suppliers.

2.3 Simple and Complex Controller Numerical Models

The Bipole HVDC systems shall consist of the following models.

2.3.1 Preliminary Models for Phasor -Type Simulation tools

These preliminary models shall include all basic control functions used for similar projects and developed for transient stability software used by CEA/CTU/Grid India/TSP such as PSS/E.

2.3.2 Preliminary Models for Electro-Magnetic Transient type (EMT) Simulation Tools

These preliminary models shall include all typical control and protection functions used for similar projects and developed for EMT simulation tools such as PSCAD.

2.3.3 Detailed Models for Electro-Magnetic Transient (EMT) - type Simulation Tools

These models shall include all control and protection functions that will be used in controllers to be delivered for this project. TSP shall deliver several versions of these controllers developed at different phases of the project to enable CEA/CTU/Grid India/TSP to make simulation and analysis of the impact of the - bipole system on the remaining parts of the AC grid.

3 Preferred Technology Specifications

The following specifications in this clause are not mandatory but important optional items that will be used to select the real-time simulator technology fulfilling the mandatory specification items given in clause 2 above.

3.1 Off-the Shelf Software Technologies

The proposed simulator may take full advantage of off-the-shelf standard computer technology and commercially available software such as MATLAB, SIMULINK and SimPowerSystems.

The proposed simulator should also be interfaced with PSCAD, the industry standard software for simulation and analysis of electromagnetic transients in power systems. Such non-real-time interface is very important for the model verification and to compare the results obtained from the real-time simulator with the results obtained

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from well known non-real-time simulation tools accepted by the industry. The proposed simulator shall include interface software to facilitate the translation of the models used by PSCAD to the real-time simulator circuit data.

3.2 Scalability: Off-the-shelf multi-core Processor Board and Communication Fabric

The proposed digital real-time simulators may take full advantage of modern multi-core processors as soon as they become available from AMD or INTEL. Models should then be executed in - with minimum communication overhead by using on-chip and on-board shared-memory.

The real-time simulators may be implemented using very fast and low-latency commercial communication fabric to take advantage of communication technology evolution.

3.3 Advanced User-programmable FPGA-based I/O Systems and Co-Processors

3.3.1.1 User programmable FPGA chips and Development Software

The proposed simulator may include fast FPGA chips that can be programmed by users through graphical interface to implement specialized communication protocols, signal processing, control and protection systems.

3.3.1.2 Implementation of HVDC Controllers with time step below 1 micro-second

Users may have access to large FPGA chips so that TSP is able to implement their own models or models developed by universities of research centers.

Users may be able to implement fast PWM power converters and machine models with time step below 500 nanoseconds used in distributed energy systems and wind farms.

3.4 Operating under Windows for offline Simulation

It may be possible to execute the simulator software on standard Windows multi-core computer for non-real-time simulation to execute the same model used for real-time simulation. The simulator software may take full advantage of all processors cores available on the workstation or on the computer server to execute the simulation as fast as possible. This feature would be useful to execute several optimization and Monte Carlo studies in non-real-time mode before executing real-time simulations with actual controllers.

3.5 Interface with Physical Modeling Tools

The simulator may be interfaced with physical modeling tools such as tools from The Mathworks, Dassault (Dymola), LMS (AMEsim) and other tools specialized for



mechanical, fluid dynamic and other systems usually integrated with electrical systems. This feature may become important for the simulation of distributed energy systems including wind farms, fuel cells and other equipment requiring complex model available in Simulink but not readily available with conventional real-time simulators.

3.6 Prototyping controller/protection systems

The proposed simulators may include optional single-processor prototyping systems to implement controller or protection system algorithms in real-time on separate computers. These prototyping systems should have all necessary input-output interfaces to enable its connection with the main simulators.

3.7 I/O Driver Development Software and Source Code

The simulator supplier shall supply the source code and documented application examples to enable TSP and its suppliers to develop and implement software interface with custom or third-party input-output interface boards used to communicate with other equipment or other real-time simulators. The source code example shall enable to implement fast and low latency communication interface with a maximum latency of 10 microseconds to transfer a data packet of 500 bytes in both directions.

4. Training on Control Replica

As a part of project, training to TSP/CEA/CTU/Grid India officials regarding control/protection aspects of control replica / simulator shall be provided.

5. Access to Control replica

The TSP shall provide access to control replica/simulator to CEA/CTU/Grid India officials whenever required.



Sr. No.	Existing Clause	Revised Clause
1.	Definitions of RFP "Bid Bond" shall mean the unconditional and irrevocable bank guarantee for Rupees 190.99 crore (Rs. One Hundred Ninety crore and Ninety Nine Lakh only), to be submitted along with the Technical Bid by the Bidder under Clause 2.11 of this RFP, as per the format prescribed in Annexure 14;	Definitions of RFP "Bid Bond" shall mean the unconditional and irrevocable bank guarantee for Rupees 221.49 crore (Rs. One Two Hundred Twenty-One Crore and Fourty Nine Lakh only), to be submitted along with the Technical Bid by the Bidder under Clause 2.11 of this RFP, as per the format prescribed in Annexure 14;
2.	RFP Clause 2.1.2(i) Technical requirement to be met by the Bidding Company or Lead Member of the Bidding Consortium The Bidder must fulfill any one of the following technical requirements: (i) Experience of development of projects in the Infrastructure Sector in the last ten (10) years with aggregate capital expenditure of not less than Rs. 9549.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1). However, the capital expenditure of at least one (1) project shall not be less than Rs. 1909.92 Crore or equivalent USD and the capital expenditure of each project shall not be less than Rs. 100.00 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1).	Experience of development of projects in the Infrastructure Sector in the last ten (10) years with aggregate capital expenditure of not less than Rs. 11074.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1). However, the capital expenditure of at least one (1) project shall not be less than Rs. 2214.92 Crore or equivalent USD.
3.	RFP Clause 2.1.2 (ii) Experience in construction of project in infrastructure sector: The Technically Evaluated Entity should have received aggregate payments not less than Rs. 9549.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1) from its client(s) for construction works fully completed during the last 10 (ten) financial years. However, the payment received from at least one (1) project shall not be less than Rs. 1909.92 Crore or equivalent USD and the payment received of each project shall not be less than Rs. 100.00 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1).	Experience in construction of project in infrastructure sector: The Technically Evaluated Entity should have received aggregate payments not less than Rs. 11074.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1) from its client(s) for construction works fully completed during the last 10 (ten) financial years. However, the payment received from at least one (1) project shall not be less than Rs. 2214.92 Crore or equivalent USD.
4.	RFP Clause 2.1.3.1A The Bidder must fulfill following financial requirements: A. Networth: Networth should be not less than Rs. 3819.84 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1) computed as the Networth based on unconsolidated audited annual accounts (refer to Note below) of any of the last three (3) financial years as provided in Clause 2.2.3, immediately preceding the	The Bidder must fulfill following financial requirements: A. Networth: Networth should be not less than Rs. 4429.84 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1) computed as the Networth based on unconsolidated audited annual accounts (refer to Note below) of any of the last three (3) financial years as provided in Clause 2.2.3, immediately preceding the Bid Deadline. Also, the Networth of any of the last three (3) financial years should not be negative.

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	Bid Deadline. Also, the Networth of any of the last three (3) financial years should not be negative.	
5.	Clause 2.12.1 of RFP Within ten (10) days from the date of issue of the Letter of Intent, the Selected Bidder, on behalf of the TSP, will provide to the Nodal Agency the Contract Performance Guarantee for an amount of Rs. 477.48 Crore (Rupees Four Hundred Seventy Seven Crore and Fourty- Eight Lakh Only). The Contract Performance Guarantee shall be initially valid for a period up to three (3) months after the Scheduled COD of the Project and shall be extended from time to time to be valid for a period up to three (3) months after the COD of the Project and thereafter shall be dealt with in accordance with the provisions of the Transmission Service Agreement. The Contract Performance Guarantee shall be issued by any of the banks listed in Annexure-17.	Clause 2.12.1 of RFP, Within ten (10) days from the date of issue of the Letter of Intent, the Selected Bidder, on behalf of the TSP, will provide to the Nodal Agency the Contract Performance Guarantee for an amount of Rs. 553.73 Crore (Rupees Five Hundred Fifty-Three Crore and Seventy-Three Lakh Only). The Contract Performance Guarantee shall be initially valid for a period up to three (3) months after the Scheduled COD of the Project and shall be extended from time to time to be valid for a period up to three (3) months after the COD of the Project and thereafter shall be dealt with in accordance with the provisions of the Transmission Service Agreement. The Contract Performance Guarantee shall be issued by any of the banks listed in Annexure-17.
6.	Clause 3.1.1 of TSA The Selected Bidder, on behalf of the TSP, will provide to the Central Transmission Utility of India Limited (being the Nodal Agency) the Contract Performance Guarantee for an amount of Rs. 477.48 Crore (Rupees Four Hundred Seventy Seven crore and Fourty Eight Lakh Only)	Clause 3.1.1 of TSA The Selected Bidder, on behalf of the TSP, will provide to the Central Transmission Utility of India Limited (being the Nodal Agency) the Contract Performance Guarantee for an amount of Rs. 553.73 Crore (Rupees Five Hundred Fifty-Three Crore and Seventy-Three Lakh Only)
7.	Clause 3.3.3 of TSA If the Nodal Agency elects to terminate this Agreement as per the provisions of Article 3.3.1, the TSP shall be liable to pay to the Nodal Agency an amount of Rs. 477.48 (Rupees Four Hundred Seventy Seven Crore and Fourty Eight Lakh only) as liquidated damages. The Nodal Agency shall be entitled to recover this amount of damages by invoking the Contract Performance Guarantee to the extent of liquidated damages, which shall be required by the Nodal Agency, and the balance shall be returned to TSP, if any.	Clause 3.3.3 of TSA If the Nodal Agency elects to terminate this Agreement as per the provisions of Article 3.3.1, the TSP shall be liable to pay to the Nodal Agency an amount of Rs. 553.73 Crore (Rupees Five Hundred Fifty-Three Crore and Seventy-Three Lakh Only) as liquidated damages. The Nodal Agency shall be entitled to recover this amount of damages by invoking the Contract Performance Guarantee to the extent of liquidated damages, which shall be required by the Nodal Agency, and the balance shall be returned to TSP, if any.
8.	Clause 6.5.1 of TSA The Contract Performance Guarantee as submitted by TSP in accordance with Article 3.1.1 shall be released by the Nodal Agency within three (3) months from the COD of the Project. In the event of delay in achieving Scheduled COD of any of the Elements by the TSP (otherwise than due to reasons as mentioned in Article 3.1.3 or Article 11) and consequent part invocation of the Contract Performance Guarantee by the Nodal Agency, Nodal Agency shall release the Contract Performance Guarantee, if any remaining unadjusted, after the satisfactory completion by the TSP of all the requirements regarding achieving the Scheduled COD of the remaining Elements of the Project. It is clarified	Clause 6.5.1 of TSA The Contract Performance Guarantee as submitted by TSP in accordance with Article 3.1.1 shall be released by the Nodal Agency within three (3) months from the COD of the Project. In the event of delay in achieving Scheduled COD of any of the Elements by the TSP (otherwise than due to reasons as mentioned in Article 3.1.3 or Article 11) and consequent part invocation of the Contract Performance Guarantee by the Nodal Agency, Nodal Agency shall release the Contract Performance Guarantee, if any remaining unadjusted, after the satisfactory completion by the TSP of all the requirements regarding achieving the Scheduled COD of the remaining Elements of the Project. It is clarified

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	that the Nodal Agency shall also return / release the Contract Performance Guarantee in the event of (i) applicability of Article 3.3.1 to the extent the Contract Performance Guarantee is valid for an amount in excess of Rs 477.48 Crore (Rupees Four Hundred Seventy Seven crore and Fourty- Eight Lakh Only), or (ii) termination of this Agreement by the Nodal Agency as mentioned under Article 3.3.4 of this Agreement	that the Nodal Agency shall also return / release the Contract Performance Guarantee in the event of (i) applicability of Article 3.3.1 to the extent the Contract Performance Guarantee is valid for an amount in excess of Rs. 553.73 Crore (Rupees Five Hundred Fifty-Three Crore and Seventy-Three Lakh Only), or (ii) termination of this Agreement by the Nodal Agency as mentioned under Article 3.3.4 of this Agreement
9.	Clause 3.3.1 of TSA If any of the conditions specified in Article 3.1.3 is not duly fulfilled by the TSP even within three (3) Months after the time specified therein, then on and from the expiry of such period and until the TSP has satisfied all the conditions specified in Article 3.1.3, the TSP shall, on a monthly basis, be liable to furnish to Central Transmission Utility of India Limited (being the Nodal Agency) additional Contract Performance Guarantee of Rs. 47.75 Crore (Rupees Fourty Seven Crore and Seventy Five Lakh Only) within two (2) Business Days of expiry of every such Month. Such additional Contract Performance Guarantee shall be provided to Central Transmission Utility of India Limited (being the Nodal Agency) in the manner provided in Article 3.1.1 and Transmission Service Agreement shall become part of the Contract Performance Guarantee and all the provisions of this Agreement shall be construed accordingly. Central Transmission Utility of India Limited (being the Nodal Agency)shall be entitled to hold and / or invoke the Contract Performance Guarantee, including such additional Contract Performance Guarantee, in accordance with the provisions of this Agreement.	Clause 3.3.1 of TSA If any of the conditions specified in Article 3.1.3 is not duly fulfilled by the TSP even within three (3) Months after the time specified therein, then on and from the expiry of such period and until the TSP has satisfied all the conditions specified in Article 3.1.3, the TSP shall, on a monthly basis, be liable to furnish to Central Transmission Utility of India Limited (being the Nodal Agency) additional Contract Performance Guarantee of Rs. 55.37 Crore (Rupees Fifty Five Crore and Thirty Seven Lakh Only) within two (2) Business Days of expiry of every such Month. Such additional Contract Performance Guarantee shall be provided to Central Transmission Utility of India Limited (being the Nodal Agency) in the manner provided in Article 3.1.1 and Transmission Service Agreement shall become part of the Contract Performance Guarantee and all the provisions of this Agreement shall be construed accordingly. Central Transmission Utility of India Limited (being the Nodal Agency)shall be entitled to hold and / or invoke the Contract Performance Guarantee, including such additional Contract Performance Guarantee, in accordance with the provisions of this Agreement
10.	Clause 14.3.1 of TSA A Party ("Indemnifying Party") shall be liable to indemnify the other Party ("Indemnified Party") under this Article 14 for any indemnity claims made in a Contract Year only up to an amount of Rupees 31.83 Crore (Rs. Thirty One Crore and Eighty Three Lakh).	Clause 14.3.1 of TSA A Party ("Indemnifying Party") shall be liable to indemnify the other Party ("Indemnified Party") under this Article 14 for any indemnity claims made in a Contract Year only up to an amount of Rupees 36.92 Crore (Rs. Thirty Six Crore and Ninety Two Lakh).

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Amendment-4 (dated: 26.09.2024) to RFP Documents "Transmission System for Evacuation of power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C" through tariff based competitive bidding process			
Sl. No.	**Clause No.**	**Existing Clause**	**New/Revised Clause**
1.	Clause 20 of "Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC" in RfP.	**20. Converter Station DC Outdoor Yard** (a) The DC yard shall comprise of equipment such as HVDC bushings, smoothing reactors (if required), DC filters (as required), DC current and voltage measuring instruments and switchgear, surge arrester, insulators, clamps and connectors. (b) The specific creepage distance (corresponding to highest DC voltage) for DC yard and other areas shall be maintained as follows:	**20. Converter Station DC Yard** (a) The DC yard shall comprise of equipment such as HVDC bushings, smoothing reactors (if required), DC filters (as required), DC current and voltage measuring instruments and switchgear, surge arrester, insulators, clamps and connectors. **DC Yard at South Olpad S/s shall be outdoor yard. However, at KPS-3 S/s the DC yard shall be indoor with following specifications.** **(i) The indoor DC yard building shall be constructed adjacent to the valve hall. Suitable arrangements shall be made for O&M and replacement of the equipment. The floor of the indoor DC yard shall have a heavy-duty floor slab suitable for movement of heavy equipment.** **(ii) The indoor DC yard shall be a ventilated hall containing DC yard equipment connected to ±500 kV HV pole bus such as smoothing reactors (if required),**

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Table 6

Insulator type	Under light and medium pollution	Under heavy and very heavy pollution
Indoor porcelain or composite insulators for valve hall (other than valves) and indoor smoothing reactor area (if any)	20 mm/ kV	
IGBT Valves	14 mm/ kV	
Outdoor porcelain insulators or bushings with RTV# coating	50 mm/ kV	60 mm/KV
Outdoor composite insulators or bushings	50 mm/ kV	

 # RTV silicon coating shall be in accordance with IS 11310.

.....

high speed parallel/ de-parallel switch, line isolator, DC Current Transducer (DCCT), voltage divider, Line Fault Locator (LFL), DC filters (if required with at least including HV capacitors) etc.

(b) The specific creepage distance (corresponding to highest DC voltage) for DC yard and other areas shall **at least** be maintained as follows:

Table 6

Insulator type	Under light and medium pollution	Under heavy and very heavy pollution
Indoor porcelain or composite insulators for valve hall (other than valves) and indoor smoothing reactor area (if any)	20 mm/ kV	
Indoor DC Yard (other than smoothing reactor)	**30 mm/ kV**	
IGBT Valves	14 mm/ kV	
Outdoor porcelain insulators or bushings with RTV# coating	50 mm/ kV	60 mm/kV

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			Outdoor composite insulators or bushings: 50 mm/ kV # *RTV silicon coating shall be in accordance with IS 11310.* .....
2.	Clause B.1.2 (vi) of "Specific Technical Requirements for HVAC Equipment" of RfP.	*B.1.2(vi) In case of GIS substation where the bus scheme is One and Half breaker scheme, the diameters shall be complete with feeder/line side isolator and GIS duct of the future bay shall be brought outside the GIS hall/building with extension/interface module suitably.*	**Clause deleted.**
3.	Article 8, Availability of the project, Clause 8.2 of TSA Clause 8.2 Target Availability:	8.2 Target Availability: The Target Availability of each Element and the Project shall be 98%. Payment of monthly Transmission charges based on actual availability will be calculated as per para 1.2 of Schedule 4 of this Agreement.	8.2 Target Availability: ***The target availability shall be 98% for AC system and 95% for HVDC system.*** Payment of monthly Transmission charges based on actual availability will be calculated as per para 1.2 of Schedule 4 of this Agreement

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Amendment-5 dated 04.10.2024

to

RFP Documents for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" through tariff based competitive bidding process.

Sl. No	Clause No.	Existing Clause	New/Revised Clause
1	**Clause 5.1.4 a)**	5.1.4 a) acquisition of land for location specific substations, switching stations or HVDC terminal or inverter stations. Also, the actual location of substations, switching stations or HVDC terminal or inverter stations shall not be beyond 1 Km radius of the location proposed by the BPC in the survey report;	5.1.4 a) acquisition of land for location specific substations, switching stations or HVDC terminal or inverter stations. Also, the actual location of Greenfield substations (Switching Stations or HVDC Terminal or Inverter Stations) for a generation pooling substation and for load serving substations in the scope of TSP shall not be beyond 3 Km radius of the location proposed by the BPC in the survey report. However, actual location of any Greenfield intermediate Substations in the scope of TSP shall not be beyond 10 Km radius of the location proposed by the BPC in the Survey Report.

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Amendment-6 (dated: 15.10.2024) to RFP Documents "Transmission System for Evacuation of power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C" through tariff based competitive bidding process			
Sl. No.	**Clause No.**	**Existing Clause**	**New/Revised Clause**
1.	Clause 14 (d) of specific technical specification of RfP (page no. 153)	**14. Radio Interference (RI), Acoustic Noise (AN) and DC field** .... (d) For area with permanent access, the total calculated electric field at ground level shall not exceed 20 kV/m in the DC **outdoor** yard. For area with permanent access in DC **outdoor** yard, calculated Ion current density shall be less than 20 nA/m2 at ground level.	**14. Radio Interference (RI), Acoustic Noise (AN) and DC field** .... (d) For area with permanent access, the total calculated electric field at ground level shall not exceed 20 kV/m **excluding space charge** in the DC yard. For area with permanent access in DC yard, calculated Ion current density shall be less than 20 nA/m2 at ground level.
2.	Clause 20 of "Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC" in RfP.	**20. Converter Station DC Yard** (a) The DC yard shall comprise of equipment such as HVDC bushings, smoothing reactors (if required), DC filters (as required), DC current and voltage measuring instruments and switchgear, surge arrester, insulators, clamps and connectors. DC Yard at South Olpad S/s **shall be outdoor yard. However, at** KPS-3 S/**s the DC yard** shall be indoor with following specifications. ...	**20. Converter Station DC Yard** (a) The DC yard shall comprise of equipment such as HVDC bushings, smoothing reactors (if required), DC filters (as required), DC current and voltage measuring instruments and switchgear, surge arrester, insulators, clamps and connectors. DC Yard at South Olpad S/s and KPS-3 S/s shall be indoor with following specifications. ...

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Sr. No.	Existing Clause	Revised Clause
1.	RFP Clause 2.1.2(i) Technical requirement to be met by the Bidding Company or Lead Member of the Bidding Consortium The Bidder must fulfill any one of the following technical requirements: Experience of development of projects in the Infrastructure Sector in the last ten (10) years with aggregate capital expenditure of not less than Rs. 11074.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1). However, the capital expenditure of at least one (1) project shall not be less than Rs. 2214.92 Crore or equivalent USD	Technical requirement to be met by the Bidding Company or Lead Member of the Bidding Consortium The Bidder must fulfill any one of the following technical requirements: Experience of development of projects in the Infrastructure Sector in the last ten (10) years with aggregate capital expenditure of not less than Rs. 11074.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1). However, the capital expenditure of at least one (1) project shall not be less than Rs. 2214.92 Crore or equivalent USD and the capital expenditure of each project shall not be less than Rs. 100.00 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1).
2.	RFP Clause 2.1.2 (ii) Experience in construction of project in infrastructure sector: The Technically Evaluated Entity should have received aggregate payments not less than Rs. 11074.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1) from its client(s) for construction works fully completed during the last 10 (ten) financial years. However, the payment received from at least one (1) project shall not be less than Rs. 2214.92 Crore or equivalent USD	Experience in construction of project in infrastructure sector: The Technically Evaluated Entity should have received aggregate payments not less than Rs. 11074.60 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1) from its client(s) for construction works fully completed during the last 10 (ten) financial years. However, the payment received from at least one (1) project shall not be less than Rs. 2214.92 Crore or equivalent USD and the payment received of each project shall not be less than Rs. 100.00 Crore or equivalent USD (calculated as per provisions in Clause 3.4.1).

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Amendment-8 (dated: 25.10.2024) to RFP Documents "Transmission System for Evacuation of power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C" through tariff based competitive bidding process			
Sl. No.	**Clause No.**	**Existing Clause**	**New/Revised Clause**
1.	Clause 12: DC power circuit switching requirement:	… High speed switches for discharge of the DC line shall be provided with disconnector. …	… High speed switches for discharge of the DC line **(if required by HVDC design)** shall be provided with disconnector. …
2.	Clause: 13 **Insulation Coordination:**	… (d)The minimum insulation levels for 500 kV DC transmission line to ground shall be as per CEA Regulations: ▪ Lightning impulse withstand voltage (1.2/50 micro sec) (kVp): 1800 kV ▪ Switching surge withstand voltage under wet condition (kVp): 1000 kV … (k) Arrester Protective Levels … The TSP shall design the converter equipment to withstand a maximum **continuous** AC system voltage of 440 kV. The calculations for determination of arrester energy requirement shall be based on a maximum pre-fault voltage of 440 kV. …	… (d)The minimum insulation levels for 500 kV DC transmission line to ground shall be as per CEA Regulations: ▪ Lightning impulse withstand voltage (1.2/50 micro sec) (kVp): 1800 kV ▪ Switching surge withstand voltage under wet condition (kVp): **1300 kV** … (k) Arrester Protective Levels … The TSP shall design the converter equipment to withstand a maximum AC system voltage of 440 kV **for 15 minutes**. The calculations for determination of arrester energy requirement shall be based on a maximum pre-fault voltage of 440 kV. …

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3.	Clause 19 **Design Criteria for the Cooling System**	… Features to ensure high reliability, proper function and prolonged life time for the cooling system and converter valves shall be included. The following main components shall be supplied with redundancy in order to increase the availability: • main circulation water pump • air cooled liquid cooler (with redundant cooler as provided in (iv) above) • **bypass valves** • transducers • nitrogen bottles, if applicable ….	… Features to ensure high reliability, proper function and prolonged life time for the cooling system and converter valves shall be included. The following main components shall be supplied with redundancy in order to increase the availability: • main circulation water pump • air cooled liquid cooler (with redundant cooler as provided in (iv) above) • transducers • nitrogen bottles, if applicable ….
4.	**Clause 4**	… The criteria for the design and control of the network shall be as follows: - 400 kV AC bus voltages shall normally be within ±5.0% of nominal voltage (400 kV). Bus voltages outside this range may occur from time to time and may exist for long periods due to abnormal loads and/or contingencies. Unless otherwise stated, all equipment shall be rated to operate safely for AC voltages between 360 kV – 440 kV at the converter stations. …	… The criteria for the design and control of the network shall be as follows: - 400 kV AC bus voltages shall normally be within ±5.0% of nominal voltage (400 kV). Bus voltages outside this range may occur from time to time and may exist for long periods due to abnormal loads and/or contingencies. **Unless otherwise stated, all equipment shall be rated to operate safely for AC voltages between 360 kV – 420 kV continuously and for AC voltages between 420 kV – 440 kV for atleast 15 minutes at the converter stations.** …

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5.	Clause 17 HVDC Station Equipment	… (a) IGBT/BIGT valves and its accessories e.g. damping and grading circuits, converter cooling system etc.; …	… (a) IGBT/BIGT valves and its accessories e.g. damping and grading circuits **(if applicable),** converter cooling system etc.; …



Amendment-9 (dated: 11.11.2024) to RFP Documents "Transmission System for Evacuation of power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C" through tariff based competitive bidding process

<table>
<tr><th>Sl. No.</th><th>Clause No.</th><th>Existing Clause</th><th>New/Revised Clause</th></tr>
<tr><td>1.</td><td>Clause B.5 of specific technical specification of RfP</td><td>

B.5 EXTENSION OF EXISTING SUBSTATION

The following drawings/details of existing substation is attached with the RFP documents for further engineering by the bidder.

<table>
<tr><th>Sl. No.</th><th>Drawing Title</th><th>Drawing No./Details</th><th>Rev. No.</th></tr>
<tr><td>B.</td><td colspan="3">400kV KPS3 GIS S/s-Section I</td></tr>
<tr><td>1.0</td><td>Single Line Diagram</td><td>023012-E-IS-SY-1L-0001</td><td>H</td></tr>
<tr><td>2.0</td><td>General Arrangement</td><td>023012-E-IS-SY-EL-0002</td><td>C</td></tr>
<tr><td>3.0</td><td>Earthmat Layout</td><td rowspan="4">Drawings are yet to be finalized by developer.</td><td></td></tr>
<tr><td>4.0</td><td>Visual Monitoring System</td><td></td></tr>
<tr><td>5.0</td><td>Bus Bar Protection</td><td></td></tr>
<tr><td>6.0</td><td>Substation Automation System (SAS)</td><td></td></tr>
<tr><td>C.</td><td colspan="3">400kV KPS3 GIS S/s-Section II</td></tr>
<tr><td>1.0</td><td>Single Line Diagram</td><td rowspan="6">The substation is under bidding in separate scheme. Thus, drawings are not available at this stage.</td><td rowspan="6"></td></tr>
<tr><td>2.0</td><td>General Arrangement</td></tr>
<tr><td>3.0</td><td>Earthmat Layout</td></tr>
<tr><td>4.0</td><td>Visual Monitoring System</td></tr>
<tr><td>5.0</td><td>Bus Bar Protection</td></tr>
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<tr><td>B.</td><td colspan="3">400kV KPS3 GIS S/s</td></tr>
<tr><td>1.0</td><td>Single Line Diagram</td><td>C/Engg/Khavda-Extn/SLD/01</td><td>0</td></tr>
<tr><td>2.0</td><td>General Arrangement</td><td>C/Engg/Khavda-Extn/GA/01</td><td>0</td></tr>
<tr><td>3.0</td><td>Earthmat Layout</td><td rowspan="4">Drawings are yet to be finalized by developer.</td><td></td></tr>
<tr><td>4.0</td><td>Visual Monitoring System</td><td></td></tr>
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<tr><td>6.0</td><td>Substation Automation System (SAS)</td><td></td></tr>
</table>

</td></tr>
</table>

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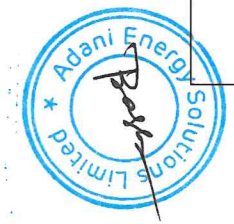
2.	6. System Performance of Annexure-A of ANNEXURE-C (Page No-138)	... ... | Mode	Power Range	Min Capacitive Reactive power per pole (MVAr)	Min Inductive reactive power per pole (MVAr) | |---|---|---|---| | Pole Power | 0-1250 MW | 410 | 410 | | Pole in STATCOM mode | 0 | 625 | 625 |	... ... **Minimum reactive power per pole for given mode shall be as below:** | Mode	Active Power Range	Min Capacitive Reactive power per pole (MVAr)	Min Inductive reactive power per pole (MVAr) | |---|---|---|---| | DC line connected | 0-1250 MW | 410* | 410* | | STATCOM mode (DC line disconnected) | 0 | 625 | 625 | • **For active Power flow less than 1250 MW, the increased reactive power capabilities as determined by HVDC design with atleast ±625 MVAr at zero active Power flow at the nominal DC voltage shall be provided by the TSP .** ...

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Amendment-10 (dated: 06.12.2024) to RFP Documents "Transmission System for Evacuation of power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C" through tariff based competitive bidding process			
Sl. No.	**Clause No.**	**Existing Clause**	**New/Revised Clause**
1.	Clause A.12.0 of Specific Technical Requirements for ±500 kV HVDC Transmission Line of RfP (page no. 220)	A.12.0 At least one out of two earth wires shall be OPGW and second earth wire, if not OPGW, shall be either of Galvanized Stranded Steel (GSS) or Aluminum Alloy Conductor Steel Reinforced (AACSR) or any other suitable conductor type depending upon span length and other technical consideration. However, minimum size of Galvanized Stranded Steel (GSS) shall be 7/4.5 mm and diameter 13.50 mm.	A.12.0 At least one out of two earth wires shall be OPGW and second earth wire, if not OPGW, shall be either of Galvanized Stranded Steel (GSS) or Aluminum Alloy Conductor Steel Reinforced (AACSR) or any other suitable conductor type depending upon span length and other technical consideration. However, minimum size of Galvanized Stranded Steel (GSS) shall be **minimum 7/3.66 mm and diameter 10.98 mm.**
2.	A.22.0	New Clause	The stringing of the transmission line in forest area shall be carried out through drone.
3.	A.23.0	New Clause	The tower shall be designed considering the porcelain Insulators with creepage factor of 31 mm/ kV irrespective of type of insulator used.

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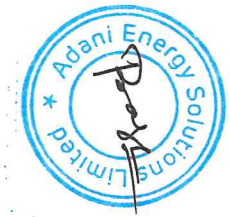
Sl. No.	Clause No.	Existing Clause	New/Revised Clause
1.	Clause 2.1.1 of RFP	The Bidder should be a company duly incorporated under the relevant laws (Bidding Company) or a Consortium of companies (Bidding Consortium) with one of the companies acting as the Lead Member of the Bidding Consortium. The Bidder shall be selected on meeting the Qualification Requirements specified in Section 2 of this RFP, as demonstrated by the Bidder's Technical Bid and the lowest Quoted Transmission Charges discovered from Final Offers quoted during the e-reverse bidding. A Bidding Consortium can participate in the bidding process for the Project if any Member of the Consortium has purchased the RFP document for such Project. Bidder who agrees and undertake to procure the products associated with the Transmission System as per provisions of Public Procurement (Preference to Make in India) orders issued by Ministry of Power vide **Orders No. 11/5/2018 - Coord. dated 28.07.2020** for transmission sector, as amended from time to time read with Department for Promotion of Industry and Internal Trade (DPIIT) orders in this regard, shall be eligible hereunder. Further, it is clarified that Procuring Entity as defined in orders shall deemed to have included Selected Bidder and/ or TSP.	The Bidder should be a company duly incorporated under the relevant laws (Bidding Company) or a Consortium of companies (Bidding Consortium) with one of the companies acting as the Lead Member of the Bidding Consortium. The Bidder shall be selected on meeting the Qualification Requirements specified in Section 2 of this RFP, as demonstrated by the Bidder's Technical Bid and the lowest Quoted Transmission Charges discovered from Final Offers quoted during the e-reverse bidding. A Bidding Consortium can participate in the bidding process for the Project if any Member of the Consortium has purchased the RFP document for such Project. Bidder who agrees and undertake to procure the products associated with the Transmission System as per provisions of Public Procurement (Preference to Make in India) orders issued by Ministry of Power vide **Orders No. P-45021/2/2017-PP (BE-II)-Part (4) Vol.II dated 19.07.2024** for transmission sector, as amended from time to time read with Department for Promotion of Industry and Internal Trade (DPIIT) orders in this regard, shall be eligible hereunder. Further, it is clarified that Procuring Entity as defined in orders shall deemed to have included Selected Bidder and/ or TSP.
2.	Clause 2.1.1 of RFP	Besides, Department of Expenditure, Ministry of Finance vide **Order (Public Procurement No 1) bearing File No. 6/18/2019-PPD dated 23.07.2020, Order (Public Procurement No 2) bearing File No. 6/18/2019-PPD dated 23.07.2020 and Order (Public Procurement No. 3) bearing File No. 6/18/2019-PPD, dated 24.07.2020,** as amended from time to time, have issued directions regarding public procurement from a bidder of a country, which shares land border with India are also applicable.	Besides, Department of Expenditure, Ministry of Finance vide, **OM No. F.7/10/2021-PPD (1) dated 23.02.2023** as amended from time to time, have issued directions regarding public procurement from a bidder of a country, which shares land border with India are also applicable.



Sl. No.	Clause No.	Existing Clause	New/Revised Clause
3.	Annexure 1 of RFP	…….. 4. We hereby agree and undertake to procure the products associated with the Transmission System as per provisions of Public Procurement (Preference to Make in India) orders issued by Ministry of Power vide **Orders No. 11/5/2018 - Coord. dated 28.07.2020** for transmission sector, as amended from time to time read with Department for Promotion of Industry and Internal Trade (DPIIT) orders in this regard. We hereby also agree and undertake to comply with Department of Expenditure, Ministry of Finance vide **Order (Public Procurement No 1) bearing File No. 6/18/2019-PPD dated 23.07.2020, Order (Public Procurement No 2) bearing File No. 6/18/2019-PPD dated 23.07.2020 and Order (Public Procurement No. 3) bearing File No. 6/18/2019-PPD, dated 24.07.2020,** as amended from time to time, regarding public procurement from a bidder of a country, which shares land border with India.	…….. 4. We hereby agree and undertake to procure the products associated with the Transmission System as per provisions of Public Procurement (Preference to Make in India) orders issued by Ministry of Power vide **Order No. P-45021/2/2017-PP (BE-II)-Part (4) Vol.II dated 19.07.2024** for transmission sector, as amended from time to time read with Department for Promotion of Industry and Internal Trade (DPIIT) orders in this regard. We hereby also agree and undertake to comply with Department of Expenditure, Ministry of Finance **vide Order OM No. F.7/10/2021-PPD (1) dated 23.02.2023**, as amended from time to time, regarding public procurement from a bidder of a country, which shares land border with India.

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Sl. No.	Clause No.	Existing Clause	New/Revised Clause
1.	Annexure C SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION C.1.0	TSP shall supply, install and commission one or more no. FODP (120 F or higher) along with panel and approach Cable (24F each) with all associated hardware fittings from gantry tower to Control Room for all the incoming lines envisaged under the present scope.	TSP shall supply, install and commission one or more no. FODP (240 F or higher) alongwith panel and approach Cable (48F each) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room for all the incoming lines envisaged under the present scope.
2.	Annexure C SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION C.2.0	TSP shall supply, install and commission one or more No. FODP (96 F) or higher) alongwith panel and approach Cable (24F each) with all associated hardware fittings from gantry tower to Control Room for all the incoming lines envisaged under the present scope	TSP shall supply, install and commission one or more No. FODP (192 F) or higher) alongwith panel and approach Cable (48F each) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room for all the incoming lines envisaged under the present scope
3.	Annexure C SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION C.3.0	On KPS3 – KPS3 (HVDC) 400 kV 2xD/C line, TSP shall supply, install and commission One (1) No. OPGW cable containing 24 Fibres (24F) on one E/W peak and conventional earth wire on other E/W peak on each of the D/C lines.	On KPS3 – KPS3 (HVDC) 400 kV 2xD/C line, TSP shall supply, install and commission One (1) No. OPGW cable containing 48 Fibres (48F) on one E/W peak and conventional earth wire on other E/W peak on each of the D/C lines. Proposed **OPGW Hardware, Joint Box and other accessories** shall be as per **48 Fiber**.
4.	Annexure C SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION C.4.0	TSP shall supply, install and commission one or more No. FODP (144 F or higher) along with panel and required Approach Cable (24F) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room.	TSP shall supply, install and commission one or more No. FODP (288 F or higher) along with panel and required Approach Cable (48F) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room.



5.	Annexure C SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION C.5.0	On ±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return), TSP shall supply, install and commission One (1) no. OPGW cable containing 24 Fibres (24F) on one E/W peak and conventional earth wire on other E/W peak. OPGW diameter shall be in line with earth wire parameters mentioned in Annexure-E1 (Specific technical requirements for HVDC transmission line).	On ±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return), TSP shall supply, install and commission One (1) no. OPGW cable containing 48 Fibres (48F) on one E/W peak and conventional earth wire on other E/W peak. OPGW diameter shall be in line with earthwire parameters mentioned in Annexure-E1 (Specific technical requirements for HVDC transmission line). Proposed **OPGW Hardware, Joint Box and other accessories** shall be as per **48 Fiber**
6.	Appendix F.1: SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION Repeater Requirements	• If the repeater location is finalized in the Control Room of a nearby substation, TSP shall provide 1 no. OPGW (48F) on a single Earthwire peak with OPGW Hardware & mid-way Joint Boxes etc. of the line crossing the main line and 1 no. Approach Cable (48F) with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the repeater equipment in substation control room. TSP shall co-ordinate for Space & DC power supply sharing for repeater equipment. TSP shall provide FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link.	If the repeater location is finalized in the Control Room of a nearby substation, TSP shall provide **OPGW to accommodate all the fibers in main transmission line** on a single Earthwire peak with OPGW Hardware & mid-way Joint Boxes etc. of the line crossing the main line and **and required approach Cable to accommodate all the OPGW fibers** with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the repeater equipment in substation control room. TSP shall co-ordinate for Space & DC power supply sharing for repeater equipment. TSP shall provide FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link.

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		OR • If the repeater location is finalized in the nearby substation premises, the TSP shall identify the Space for repeater shelter in consultation with station owner. Further TSP shall provide 1 no. OPGW (48F) on a single Earthwire peak with OPGW Hardware & mid-way Joint Boxes etc. of the line crossing the main line and 1 no. Approach Cable (48F) / UGFO (48F) with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the substation where the repeater shelter is to be housed. TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems. OR • If the repeater location is finalized on land near the transmission tower. TSP shall make	OR • If the repeater location is finalized in the nearby substation premises, the TSP shall identify the Space for repeater shelter in consultation with station owner. Further TSP shall provide **OPGW to accommodate all the fibers in main transmission line** on a single Earthwire peak with OPGW Hardware & mid-way Joint Boxes etc. of the line crossing the main line and **required approach Cable/UGFO to accommodate all the OPGW fibers** with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the substation where the repeater shelter is to be housed. TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems. OR

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		the provisions for Land at nearby tower for repeater shelter. Further TSP shall provide 1 no. Approach Cable (48F) / UGFO (48F) with all associated hardware fittings to establish connectivity up to the location of repeater shelter. TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems Maintenance of OPGW Cable and OPGW Hardware, repeater equipment & items associated with repeater shelter shall be responsibility of TSP.	• If the repeater location is finalized on land near the transmission tower. TSP shall make the provisions for Land at nearby tower for repeater shelter. Further TSP shall provide **required approach Cable to accommodate all the OPGW fibers** with all associated hardware fittings to establish connectivity up to the location of repeater shelter. TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems Maintenance of OPGW Cable and OPGW Hardware, repeater equipment & items associated with repeater shelter shall be responsibility of TSP.
7.	Frequently Asked Queries: 3.0 Communication	3.3 How is the OPGW laying done in case of LILO lines? **Reply**: In case LILO lines are on same towers (e.g. both Line in and Line Out portion are on same towers, generally done LILO of S/C lines). Then 2x24F OPGW shall be required to install by TSP on both earthwire peak on 400 kV & 765 kV lines where two E/W peaks are available. On 220 & 132 kV lines where only	3.3 How is the OPGW laying done in case of LILO lines? **Reply**: In case LILO lines are on same towers (e.g. both Line in and Line Out portion are on same towers, generally done LILO of S/C lines). Then ~~2x24F~~ **2x48F** OPGW shall be required to install by TSP on both earthwire peak on 400 kV & 765 kV lines where two E/W peaks are available. On 220 & 132 kV lines where only one

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		one E/W peak is available TSP to install one no. 48F OPGW. Incase LILO lines are on different towers (e.g. both Line In and Line Out portion are on different towers, generally done LILO of D/C lines). Then 1x24F OPGW shall be required to install by TSP on one earthwire peak and conventional earthwire on second earthwire peak, on both Line In and Line Out portion towers of 400 kV & 765 kV lines. On 220 &132 kV lines where only one E/W peak is available TSP to install one no. 24F OPGW in place of conventional earthwire. 3.4 How is the OPGW laying done in case Multi circuit Towers? **Reply**: In case two different lines are using common multi circuit portion for some distance (originating from different stations, may be terminating on same or on different stations). Two no. 24F OPGW to be installed on both E/W peaks for common M/C portion of 765 kV & 400 kV lines. Incase 220/132 kV lines using multi circuit portion where single E/W peak is available one no 48F may be installed for common multi circuit portion.	E/W peak is available TSP to install one no. ~~48F~~ **96F** OPGW. Incase LILO lines are on different towers (e.g. both Line In and Line Out portion are on different towers, generally done LILO of D/C lines). Then ~~1x 24F~~ **1x48F** OPGW shall be required to install by TSP on one earthwire peak and conventional earthwire on second earthwire peak, on both Line In and Line Out portion towers of 400 kV & 765 kV lines. On 220 &132 kV lines where only one E/W peak is available TSP to install one no. ~~24F~~ **48F** OPGW in place of conventional earthwire. 3.4 How is the OPGW laying done in case Multi circuit Towers? **Reply**: In case two different lines are using common multi circuit portion for some distance (originating from different stations, may be terminating on same or on different stations). Two no. ~~24F~~ **48F** OPGW to be installed on both E/W peaks for common M/C portion of 765 kV & 400 kV lines. Incase 220/132 kV lines using multi circuit portion where single E/W peak is available one no ~~48F~~ **96F** may be installed for common multi circuit portion.

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8.	A.23.0	The tower shall be designed considering the porcelain Insulators with creepage factor of 31 mm/ kV irrespective of type of insulator used.	Deleted



Amendment-13 dated 07.03.2025

to

RFP Documents for "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" through tariff based competitive bidding process.

Sl. No.	Existing Clause	New/Revised Clause
1	**Clause 7.1 of Annexure B of RfP Document** The BPC has appointed Independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation with the Central Vigilance Commission (Names and Addresses of the Monitors to be given). **Shri Rajiv Ranjan** **R/o No. 170, 11th Cross, 3rd Main,** **RMV Stage 2, Dollars Colony** **Bengaluru North** **Bengaluru- 560094** **Mob No – 9448147003** **Email ID- rranjan68@gmail.com** **Shri Jeyakodi Virusankulam Kumarasamy, IAS (Retd.)** **R/o 3F, Orchid Villa, 6" Avenue,** **Harrington Road, Chetpet,** **Chennai-600031** **Mob No – 9176699444** **Email ID- jeyakodivk@gmail.com**	**Clause 7.1 of Annexure B of RfP Document** The BPC has appointed Independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation with the Central Vigilance Commission (Names and Addresses of the Monitors to be given). **Shri Sanjiv Garg IRTS (Retd.)** **A-14/1, Vasant Vihar,** **New Delhi-110057.** **Mob No – 9818798390** **Email ID- sanjivgarg.india@gmail.com** **Shri Jeyakodi Virusankulam Kumarasamy, IAS (Retd.)** **R/o 3F, Orchid Villa, 6" Avenue,** **Harrington Road, Chetpet,** **Chennai-600031** **Mob No – 9176699444** **Email ID- jeyakodivk@gmail.com**

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Amendment-14 (dated: 21.04.2025) to RFP Documents "Transmission System for Evacuation of power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C" through tariff based competitive bidding process			
Sl. No.	**Clause No.**	**Existing Clause**	**New/Revised Clause**
1.	Amendment-02, Appendix C.6 Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	Amendment-02, Appendix C.6 3.7 **I/O Driver Development Software and Source Code** The simulator supplier shall supply the **source code and** documented application examples to enable TSP and its suppliers to develop and implement software interface with custom or third-party input-output interface boards used to communicate with other equipment or other real-time simulators. The **source code** example shall enable to implement fast and low latency communication interface with a maximum latency of 10 microseconds to transfer a data packet of 500 bytes in both directions.	Amendment-02, Appendix C.6 3.7 **I/O Driver Development Software and Source Code** The simulator supplier shall supply the documented application examples to enable TSP and its suppliers to develop and implement software interface with custom or third-party input-output interface boards used to communicate with other equipment or other real-time simulators. The example shall enable to implement fast and low latency communication interface with a maximum latency of 10 microseconds to transfer a data packet of 500 bytes in both directions

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2.	Appendix C.4 Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	Appendix C.4 of RfP **DEFINITIONS** **OUTAGE TERMS** .... 5. Bipole Outages An outage which causes a reduction in the bipolar DC system power transfer capacity greater than the power rating of one pole.	Appendix C.4 of RfP **DEFINITIONS** **OUTAGE TERMS** .... 5. Bipole Outages An outage which causes a reduction in the bipolar DC system power transfer capacity greater than the power rating of one pole **as a direct or immediate consequence of a single event.**
3.	Appendix C.2 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	Appendix C.2 of RfP **Operator's Control, Monitoring and Support Systems** .... **5. Miscellaneous Operator Controls** ..... b) Block/ Deblock This control shall enable the operator to stop (block) or start (deblock) a converter. Automatic sequences shall be provided to fulfil preconditions for deblock. A normal stopping sequence initiated by "block" contact involves a sequence at each end that causes the **voltage and** current to drop to zero.	Appendix C.2 of RfP **Operator's Control, Monitoring and Support Systems** .... **5. Miscellaneous Operator Controls** ..... b) Block/ Deblock This control shall enable the operator to stop (block) or start (deblock) a converter. Automatic sequences shall be provided to fulfil preconditions for deblock. A normal stopping sequence initiated by "block" contact involves a sequence at each end that causes the current to drop to zero.



4.	Annexure C Cl:12. Page No: 145 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	Cl:12. DC power circuit switching requirement: …… Page No: 145 of 261 of RfP …….. The equipment arrangement shall be designed to ensure that no single contingency, fault or loss of any piece of equipment except common equipment to both the poles can cause or result in a bipolar shutdown or **transient** reduction in power transfer to less than the rating of one Pole.	Cl:12. DC power circuit switching requirement: …… Page No: 145 of 261 of RfP …….. The equipment arrangement shall be designed to ensure that no single contingency, fault or loss of any piece of equipment except common equipment to both the poles can cause or result in a bipolar shutdown or reduction in power transfer to less than the rating of one Pole.
5.	Annexure C Cl:15. Dynamic Performance (b) and (d) Page No: 154 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	Cl:15. Dynamic Performance 15 ……. ……. (b) The HVDC system shall recover to 90% of the pre-fault DC power transfer level consistently within 100 ms from the instant of fault clearing, without subsequent sustained oscillation for all inverter AC system fault conditions. For all rectifiers AC system fault conditions, the recovery time, to 90% pre-fault power level, shall be within 100 ms from the instant of fault clearing. The TSP shall verify that such response time does not give rise for any risk of AC system instability in any system configuration. If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the recovery times other than those specified shall also be acceptable, subject to review.	Cl:15. Dynamic Performance 15 ……. ……. (b) The HVDC system shall recover to 90% of the pre-fault DC power transfer level consistently **in less than 500 ms** from the instant of fault clearing, without subsequent sustained oscillation for all inverter AC system fault conditions, **except for the case of Islanding at Khavda (rectifier) station].** For all rectifiers AC system fault conditions, the recovery time, to 90% pre-fault power level, shall be **in less than 500 ms** from the instant of fault clearing. The TSP shall verify that such response time does not give rise for any risk of AC system instability in any system configuration. If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the

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		…… …… (d) **Power Order Step Response** The HVDC controls, when in power control mode or any other mode where the DC power transfer is controlled, shall respond to maintain the power transfer of the Poles at the ordered or desired level at any power level between minimum and rated capacity of the HVDC system. When operating at any power order between the minimum and rated power transfer, the DC power controller shall respond to either a step increase or a step decrease in DC power order such that 90% of the ordered change is achieved within 150 milliseconds of the power order change at the rectifier. The TSP shall verify that such response time does not give rise for any risk of AC system instability in any system configuration. If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the recovery times other than those specified above shall also be acceptable.	recovery times other than those specified shall also be acceptable, subject to review. …… …… (d) **Power Order Step Response** The HVDC controls, when in power control mode or any other mode where the DC power transfer is controlled, shall respond to maintain the power transfer of the Poles at the ordered or desired level at any power level between minimum and rated capacity of the HVDC system. When operating at any power order between the minimum and rated power transfer, the DC power controller shall respond to either a step increase or a step decrease in DC power order such that 90% of the ordered change is achieved **in less than 500 ms** of the power order change at the rectifier. The TSP shall verify that such response time does not give rise for any risk of AC system instability in any system configuration. If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the recovery times other than those specified above shall also be acceptable.



6.	Annexure C Cl:15. Dynamic Performance (a) Page No: 154 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	Cl:15. Dynamic Performance (a)The purpose of dynamic performance design is to determine the control parameters for HVDC system and to ensure that the HVDC system shall have smooth, stable and fast operation for both steady state and transient conditions without adversely affecting the connected AC grid. The principal objectives of the design shall include: …….. …….. 3. Stabilization of the ac system following major disturbances. ……	Cl:15. Dynamic Performance (a)The purpose of dynamic performance design is to determine the control parameters for HVDC system and to ensure that the HVDC system shall have smooth, stable and fast operation for both steady state and transient conditions without adversely affecting the connected AC grid. The principal objectives of the design shall include: …….. …….. 3. Stabilization of the ac system following major disturbances **as per its capability limits.** ……
7.	Annexure C Cl:9:.Converters Operating modes Page No: 140 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	Cl:9. Converters Operating modes …….. The minimum operating modes are as follows: …….. h. **Black start:** Facility for Black start capability shall be possible for both the stations. TSP shall determine and provide any additional equipment such as diesel back up, batteries, etc. that is required to be able to carry out black start in both directions. This shall include any hardware and all the necessary control functions to perform the black start. ……	Cl:9. Converters Operating modes …….. The minimum operating modes are as follows: …….. h. **Black start:** Facility for Black start capability shall be possible for both the stations **at nominal DC Voltage**. TSP shall determine and provide any additional equipment such as diesel back up, batteries, etc. that is required to be able to carry out black start in both directions. This shall include any hardware and all the necessary control functions to perform the black start. ……

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8.	Annexure C Cl:10: System Studies Page No: 142 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	**10. System Studies** …… (bb) Studies of DC Current flowing through Windings of Converter Transformers. ……..	**10. System Studies** …… (bb) **deleted.** ……..
9.	Annexure C Cl:18: Page No: 159 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	**18. Converter Station AC Yard, Transformer yard and valve hall** (b) AC harmonic filters and shunt compensation, if required. State-of-the-art Voltage-Sourced Converters (VSC) in modular multi-level converter (MMC) topologies generate nearly no or only a small amount of harmonics. The need of ac harmonic filters shall be evaluated based on study results. **Suitable redundancy shall be provided in the filters to avoid reduction of transmission capacity of the station due to outage of any particular sub-bank for maintenance.** The AC harmonic filters shall be switched in and out by circuit breakers in FIFO logic to increase lifetime of switchgear. …… ……	**18. Converter Station AC Yard, Transformer yard and valve hall** (b) AC harmonic filters and shunt compensation, if required. State-of-the-art Voltage-Sourced Converters (VSC) in modular multi-level converter (MMC) topologies generate nearly no or only a small amount of harmonics. The need of ac harmonic filters shall be evaluated based on study results **and adequate filter shall be provided**. **Suitable redundancy shall be provided in the filters to avoid reduction of transmission capacity of the station.** The AC harmonic filters shall be switched in and out by circuit breakers in FIFO logic to increase lifetime of switchgear. …… ……

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10.	Annexure C Cl:9:.Converters Operating modes Page No: 140 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	**9. Converters Operating modes** The minimum operating modes are as follows: …….. f. Reactive Power and AC voltage control mode …….. Any oscillations of power and voltage at the HVDC converter shall be well damped and eliminated. g. STATCOM MODE……	**9. Converters Operating modes** The minimum operating modes are as follows: …….. f. Reactive Power and AC voltage control mode …….. Any oscillations of power and voltage at the HVDC converter shall be well damped and eliminated **as per its capability.** g. STATCOM MODE……
11	Appendix C.3, Clause 1 (Page No. 208) of Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	**1. General** …… …… TFR shall also have facility for harmonic analysis upto 100th harmonics, inter-harmonics of waveforms. …… ……	**2. General** …… …… TFR shall also have facility for harmonic analysis upto **50th** harmonics, inter-harmonics of waveforms. …… ……

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12	Annexure C Cl:15: Page No: 154 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	**15. Dynamic Performance** (a) The purpose of dynamic performance design is to determine the control parameters for HVDC system and to ensure that the HVDC system shall have smooth, stable and fast operation for both steady state and transient conditions without adversely affecting the connected AC grid. The principal objectives of the design shall include: .... 6. Control of power levels depending on the system configuration. Such a control may require **ac line load control (ACLLC) and** Run Back control features.	**15. Dynamic Performance** (a) The purpose of dynamic performance design is to determine the control parameters for HVDC system and to ensure that the HVDC system shall have smooth, stable and fast operation for both steady state and transient conditions without adversely affecting the connected AC grid. The principal objectives of the design shall include: .... 6. Control of power levels depending on the system configuration. Such a control may require Run Back control features.
13.	Annexure C Cl:18: Page No: 160 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	**18. Converter Station AC Yard, Transformer yard and valve hall** **(d)** .... The performance of the AC harmonic shall be determined by calculation and shall be based on either as-tested parameters of components or the extreme values of manufacturing tolerances if as-tested values are not available. Performance requirements are to be met for all operating modes. **In all Modes of operation, except the reduced DC line voltage modes, the performance requirement shall be met up to rated power with one larger size filter sub-bank and one characteristic harmonic**	**18. Converter Station AC Yard, Transformer yard and valve hall** **(d)** .... The performance of the AC harmonic shall be determined by calculation and shall be based on either as-tested parameters of components or the extreme values of manufacturing tolerances if as-tested values are not available. Performance requirements are to be met for all operating modes **except the reduced DC line voltage mode.**

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		sub-bank (largest) being out of service. All filter banks, sub-banks and branches shall be rated such that the remaining filter components are not overloaded due to detuning or resonance within the filters or between the filters, the generators, and the AC system for any combination of AC system voltage and/or frequency and configuration, or for any operating condition of the converters, or combination thereof, for which the converter valves are capable of continuous operation, or switching time between de-energized and energized states and there is no restriction on the operating power level for any operating conditions with one filter bank outage for power level up to 1.0 p.u. Short-time and transient conditions as well as operation with discontinuous DC current must be fully taken into account.	
14	Annexure C Cl:45: Page No: 188 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	**46. Performance Guarantee for Converter Station (excluding HVDC line)** .... c. The system shall meet various harmonic performance parameters on both AC side and DC side. Design targets for HVDC station Reliability and Availability^^ and station guaranteed losses^	**46. Performance Guarantee for Converter Station (excluding HVDC line)** .... d. The system shall meet various harmonic performance parameters on both AC side and DC side. Design targets for HVDC station Reliability and Availability^^ and station guaranteed losses^

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Table - 10

1	Overall Energy availability of HVDC scheme (a) Overall Performance (b) Excluding transformer	 Not less than 97% Not less than 98%
2	Forced Energy Unavailability (FEU)	Not more than 0.6%
3	Schedule Energy Unavailability (SEU)	Not more than 1%
4	Single Pole outage per year	Not more than 8 (with average outage duration of 7.5 hours)
5	Bipole outage per year	Not more than 0.2 (with average outage duration of 8 hours)
6	No-load losses (kW)	0.2 % of Bipole Rating per station
7	Equivalent load loss (kW)$	**Max 1.0 % of Bipole Rating per station**

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7	Equivalent load loss (kW)$	**Max 1.1 % of Bipole Rating per station**

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15	Annexure C Cl:8: Page No: 139 of 261 of RfP Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	**8. Reduced DC Line Voltage** …….. Reduced voltage operation shall be possible to be ordered by operator from either station. The change from normal to reduced voltage operation and vice versa shall not require a converter block or reduction in power below that achievable with the reduced voltage. **It shall be possible to start the transmission in reduced voltage mode.**	**8. Reduced DC Line Voltage** …….. Reduced voltage operation shall be possible to be ordered by operator from either station. The change from normal to reduced voltage operation and vice versa shall not require a converter block or reduction in power below that achievable with the reduced voltage.
16	Appendix C.4 of Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	Appendix C.4 Definitions 1. Actual Outage Duration (AOD) The time elapsed in hours between the start and the end of an outage. The time shall be counted to the nearest 1/10th of an hour. Time less than 1/10 of an hour shall be counted as having duration of 1/10 of an hour.	Appendix C.4 Definitions 1. Actual Outage Duration (AOD) The time elapsed in hours between the start and the end of an outage. The time shall be counted to the nearest 1/10th of an hour. Time less than 1/10 of an hour shall be counted as having duration of 1/10 of an hour. **The end of an outage is typically the last switching action related to return of the equipment to operational readiness.**

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17.	Annexure-C of RFP Cl:10. System studies (k) Page No: 141 of 261 Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	Annexure-C Page No: 141 of 261 **The equivalents to be prepared for peak load, light load and extremely weak (minimum SCR) network scenarios.** The dynamic network equivalent shall be prepared with full machine models having exciters, governor-turbine, generators, stabilizer models instead of voltage source models, up to a minimum of two buses away. These dynamic equivalent networks shall be used in PSCAD DPS, Real Time Digital Simulator (RTDS) DPS, with actual control and Protection panels.	Annexure-C Page No: 141 of 261 **TSP shall consider at least 02nos. cases i.e peak load and light load/extremely weak cases for network reduction.** The dynamic network equivalent shall be prepared with full machine models having exciters, governor-turbine, generators, stabilizer models instead of voltage source models, up to a minimum of two buses away. These dynamic equivalent networks shall be used in PSCAD DPS, Real Time Digital Simulator (RTDS) DPS, with actual control and Protection panels.
18.	Annexure-C of RFP Cl:41 Page No: 141 of 261 Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC of RfP.	**41. DC Line Faults** …….. …….. b) In case a fault occurs within 15 minutes of the last fault then both these faults shall be counted as attempts within single DC line fault recovery sequence. A fault that occurs after 15 minutes of the last fault shall be treated as start of new DC line fault recovery sequence. Maximum cooling period between two consecutive DC line fault recovery sequences shall be **60 minutes** during which tripping may be allowed. …….. ……..	**41. DC Line Faults** …….. …… b) Maximum cooling period between two consecutive DC line auto-restart sequence shall be 60 minutes in case successful auto-restart operation, and 120 minutes in case unsuccessful auto-restart operation, during which tripping may be allowed. …….. ……..

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19	Clause 13 (c) on Page 146 of RfP	The tripping action for lines shall be initiated if the fundamental frequency over voltage exceeds 1.1 pu for 5 seconds and if 1.5 pu fundamental frequency voltage persists for more than 100 milliseconds. The HVDC over voltage strategy shall be coordinated with such setting.	The tripping action on Over Voltage for lines shall be as per the Regional Over Voltage Protection Philosophy specified by the RPC. In genera or the default tripping action should initiate if the fundamental frequency over voltage exceeds 1.1 pu for 10 seconds and if 1.5 pu fundamental frequency voltage persists for more than 100 milliseconds. The HVDC over voltage strategy shall be coordinated with such setting.
20	Clause 13 (i) on Page 151 of RfP	Blocking of the converter valves to protect them and other DC side equipment from sustained over voltages as per table under HVRT Strategy appearing on the AC system shall not be permitted. ...	Blocking of the converter valves to protect them and other DC side equipment from sustained over voltages as per table under HVRT Strategy appearing on the AC system shall not be permitted upto 1.3 pu. ...
21	Clause 34 (a) on Page 181 of RfP	Highly reliable duplicated supply sources from two separate sources with automatic change-over facilities. These sources of auxiliary power shall be from 33 kV side of 2 Nos. of 400/33 kV transformers (50 MVA) at KPS3 HVDC and 33 kV tertiary of existing 2 Nos. 765/400/33 kV ICT at South Olpad. This source shall be stepped down to 433 V by means of station service transformer of minimum 2000 kVA capacity and rated 33/ 0.433 kV.	Highly reliable duplicated supply sources from two separate sources with automatic change-over facilities. These sources of auxiliary power shall be from 33 kV side of 2 Nos. of 400/33 kV transformers (50 MVA) at KPS3 HVDC and 33 kV tertiary of existing 2 Nos. 765/400/33 kV ICT at South Olpad. **Additionally, one more 33 kV supply from independent source shal be arranged and connected to 33 kV Bus at both KPS3 HVDC and South Olpad Stations.** This source shall be stepped down to 433 V by means of station service transformer of minimum 2000 kVA capacity and rated 33/ 0.433 kV.

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22	Clause 37 Para 4 on Page 184 of RfP	Fault infeed during faults shall be 1 p.u. of rated AC current for dead short circuit at Converter transformer AC bus. Dynamic reactive power support shall be over and above the steady state reactive power support.	**Reactive current** during faults shall be 1 p.u. of rated AC current for dead short circuit at Converter transformer AC bus. Dynamic reactive power support shall be over and above the steady state reactive power support.
23	Clause 41 Para 2 on Page 186 of RfP	For pole to ground faults, the TSP shall provide a sequence to de-ionize the fault and restart the monopole automatically after a predetermined programmable time. The first restart attempt shall be at pre-fault DC voltage and second restart attempt shall be at reduced DC voltage. The third attempt shall be in STATCOM mode. This constitutes one complete recovery sequence. All equipment shall be dimensioned considering these 3 restart attempts.	For pole to ground faults, the TSP shall provide a sequence to de-ionize the fault and restart the monopole automatically after a predetermined programmable time. The first restart attempt shall be at pre-fault DC voltage and second restart attempt shall be at reduced DC voltage. **Upon failure of both the attempts converter shall go into STATCOM mode. This constitutes one complete auto-restart sequence.** **All equipment shall be dimensioned considering the above auto-restart sequence.**
24	"Specific Requirement for Phasor Measurement Units (PMUs)" mentioned on Pae No 248 of RfP	TSP shall supply, install and commission required No. of Phasor Measurement Units (PMUs) PMUs at all the locations under the scope of TSP under this RFP as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 (along with all amendments if any), and all the applicable Regulations, Standards, Guidelines issued time to time. ...	TSP shall supply, install and commission required No. of Phasor Measurement Units (PMUs) PMUs at all the locations under the scope of TSP under this RFP as per "Guidelines on Unified Philosophy for placement of PMUs in Indian Grid" issued vide CEA letter No. CEA-PS-14-12/9/2024-PSETD Division dated 19.03.2025 for the scope of this RfP. ...

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<td>1.</td>
<td>RFP - Annexure C

Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC

Clause No:46:

And

TSA-Annexure D Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC</td>
<td>46. Performance Guarantee for Converter Station (excluding HVDC line)
.....
c. The system shall meet various harmonic performance parameters on both AC side and DC side.
Design targets for HVDC station Reliability and Availability^^ and station guaranteed losses^
<u>Table - 10</u>
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Sl. No. 14 of Amendment-14</td><td>
<table>
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<tr><td>7</td><td>Load losses at operation with 100% rated active power and 100% rated reactive power at nominal DC Voltage</td><td>Max 1.1 % of Bipole Rating per station</td></tr>
</table>
</td></tr>
<tr><td>2.</td><td>1.6.1.1 of RFP Document</td><td>Establishment, operation and maintenance of the Project on build, own, operate and transfer basis and completion of all the activities for the Project, including survey, detailed project report formulation, arranging finance, project management, necessary Consents, Clearances and Permits (way leave, environment & forest, civil aviation, railway/ road/river/canal/power crossing/PTCC, etc.), land compensation, design, engineering, equipment, material, construction, erection, testing & commissioning. Further, the actual location of substations, switching stations or HVDC terminal or inverter stations in the scope of TSP shall not be beyond 3 Km radius of the location proposed by the BPC in the survey report.

Further, the actual location of Greenfield substations (Switching Stations or HVDC Terminal or Inverter Stations) for a generation pooling substation and for load serving substations in the scope of TSP shall not be beyond 3 Km radius of the location proposed by the BPC in the survey report. However, actual location of any Greenfield</td><td>Establishment, operation and maintenance of the Project on build, own, operate and transfer basis and completion of all the activities for the Project, including survey, detailed project report formulation, arranging finance, project management, necessary Consents, Clearances and Permits (way leave, environment & forest, civil aviation, railway/ road/ river/ canal/ power crossing/ PTCC, etc.), land compensation, design, engineering, equipment, material, construction, erection, testing & commissioning.

Further, the actual location of Greenfield Substation (Switching Station or HVDC Terminal or Inverter Station) in the scope of TSP:

• For Generation Pooling Substation shall not be beyond 3 Km radius of the location proposed by BPC in their survey report.
• For Load Serving Substation within the scope of TSP shall not be beyond 5 Km radius of the location proposed by the BPC in their Survey Report</td></tr>
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S. No	Clause No.	Existing Clause	New/Revised Clause
		intermediate Substations in the scope of TSP shall not be beyond 10 Km radius of the location proposed by the BPC in the Survey Report.	• For an Intermediate Substation shall not be beyond **10 Km** radius of the location proposed by the BPC in their Survey Report.
3.	5.1.4 (a) of TSA Document And Amendment No 5	Acquisition of land for location specific substations, switching stations or HVDC terminal or inverter stations. Also, the actual location of Greenfield substations (Switching Stations or HVDC Terminal or Inverter Stations) for a generation pooling substation and for load serving substations in the scope of TSP shall not be beyond 3 Km radius of the location proposed by the BPC in the survey report. However, actual location of any Greenfield intermediate Substations in the scope of TSP shall not be beyond 10 Km radius of the location proposed by the BPC in the Survey Report	Acquisition of land for location specific substations, switching stations or HVDC terminal or inverter stations. Also, the actual location of Greenfield substations (Switching Stations or HVDC Terminal or Inverter Stations) in the scope of TSP: • For Generation Pooling Substation shall not be beyond **3 Km** radius of the location proposed by BPC in their survey report. • For Load Serving Substation within the scope of TSP shall not be beyond **5 Km** radius of the location proposed by the BPC in their Survey Report • For an Intermediate Substation shall not be beyond **10 Km** radius of the location proposed by the BPC in their Survey Report.

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Sr.No	Clause No.	Existing Clause	New/Revised Clause
1.	Term "Bid Bond" under "DEFINITIONS" of RfP Document	**"Bid Bond"** shall mean the unconditional and irrevocable bank guarantee for Rupees ..... (Rs.....) only [Bid Bond would be computed @ 2% of the required aggregate capital cost of projects/ aggregate payments received for the projects as calculated under Clause 2.1.2. of RFP document], to be submitted along with the Technical Bid by the Bidder under Clause 2. 11 of this RFP, as per the format prescribed in Annexure 14;	**"Bid Bond"** shall mean the unconditional and irrevocable" bank guarantee or unconditional and irrevocable Insurance Surety Bond issued by Insurance Company authorized by Insurance Regulatory and Development Authority of India) or Payment on Order Instrument for Rupees..... (Rs.....) Only [Bid Bond would be computed @ 2% of the required aggregate capital cost of projects/ aggregate payments received for the projects as calculated under Clause 2. 1. 2 of RFP Document], to be submitted along with the Technical Bid by the Bidder under Clause 2. 11 of this RFP, as per the format prescribed in Annexure 14 (for Bank Guarantee) or Annexure 14A (for Insurance Surety Bond) or Annexure 14B (for Payment on Order);
2.	New term "Payment on Order Instrument" Under "DEFINITIONS " , After term "Parent Company" of RfP Document	[New Term]	**"Payment on Order Instrument"** Shall mean Letter of Undertaking from Indian Renewable Energy Development Agency Limited (IREDA) or Power Finance Corporation Limited (PFC) or REC Limited (REC) [the three non-banking financial institutions under Ministry of New & Renewable Energy (MNRE)/ Ministry of Power (MoP)], to pay in case situation of default of Transmission Service Provider (TSP) in terms of tender conditions/ Power Purchase Agreement (PPA) arises. Such Letter(s) will have same effect as that of a Bank Guarantee issued by any public sector bank, Such "Payment on Order instrument" would have terms and conditions similar to that of any Bank Guarantee given by any public sector bank and would promise to pay the Nodal Agency on demand within stipulated time. TSPs can seek such Letter(s) by offering due security to the above-mentioned three non-banking financial institutions mentioned above (IREDA, PFC & REC). Nodal Agency shall not accept the instrument of 'Letter of Undertaking' as described above or in any other from,

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Sr.No	Clause No.	Existing Clause	New/Revised Clause
			from any other non-banking financial institutions or bank, except IREDA, PFC & REC.
3.	Para 14 of "ANNEXURE 1- COVERING LETTER" of RfP Document	**Bid Bond** We have enclosed a Bid Bond of Rupees.....Crores (Rs.....) only or US$ .....(.....US Dollars), in the form of bank guarantee no .....[Insert number of the Bank Guarantee] dated..... [Insert Date of the Bank Guarantee] as per your proforma (Annexure-14) from..... [Insert name of bank providing Bid Bond] and valid up to ....in terms of Clause 2. 11 of the RFP. Or We have enclosed a Bid Security Declaration as per your proforma (Annexure-14A) [To be inserted for projects wherein RFP has been issued before 31.12.2021 otherwise to be deleted]	**Bid Bond** We have enclosed a Bid Bond of Rupees.....Crores (Rs .....) only or US$ .....(.....US Dollars), in the form of- bank guarantee no .....[Insert number of the Bank Guarantee] dated..... [Insert Date of the Bank Guarantee] as per your proforma (Annexure-14) from..... [Insert name of bank providing Bid Bond] and valid up to .....in terms of Clause 2. 11 of the RFP. Or In the form of insurance surety bond no.....[Insert number of the Insurance Surety Bond] dated.....[Insert Date of the Insurance Surety Bond] as per your proforma (Annexure-14A from .....[Insert name of Insurance Company providing Insurance Surety bond] and valid up to.....in terms of Clause 2.11 of the RFP or in the form of Payment on Order Instrument no. ..... [Insert number of the Instrument] "dated.....[Insert Date of the Instrument] as per your proforma (Annexure-14B) ..... [Insert name of company issuing Payment on Order Instrument] and valid up to ..... in terms of Clause 2.11 of the RFP.
4.	Clause 2.12.1 of RfP Document	Within ten (10) days from the date of issue of the Letter of Intent, the Selected Bidder, on behalf of the TSP, will provide	Within ten (10) days from the date of issue of the Letter of Intent, the Selected Bidder, on behalf of the TSP, will provide to the Nodal

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Sr.No	Clause No.	Existing Clause	New/Revised Clause
		to the Nodal Agency the Contract Performance Guarantee for an amount of Rs..... Crore (Rupees..... Only) [Contract Performance Guarantee would be computed @ 5% of the required aggregate capital cost of projects/ aggregate payments received for the project as calculated under Clause 2.1.2 of RFP Document]. However, this value would be computed @ 3% of the required aggregate capital cost of projects/aggregate payments received for the projects as calculated under Clause 2.1.2 of RFP Document for the projects for which RFP has been issued till 31.12.2021]. The Contract Performance Guarantee shall be initially valid for a period up to three (3) months after the Scheduled COD of the Project and shall be extended from time to time to be valid for a period up to three (3) months after the COD of the Project and thereafter shall be dealt with in accordance with the provisions of the Transmission Service Agreement. The Contract Performance Guarantee shall be issued by any of the banks listed in Annexure-17.	Agency the Contract Performance Guarantee for an amount of Rs. .....Crore (Rupees.....Only [Contract Performance Guarantee would be computed @ 5% of the required aggregate capital cost of projects/ aggregate payments received for the project as calculated under Clause 2.1.2 of RFP Document]. The Contract Performance Guarantee shall be initially valid for a period up to three (3) months after the Scheduled COD of the Project and shall be extended from time to time to be valid for a period up to three (3) months after the COD of the Project and thereafter shall be dealt with in accordance with the provisions of the Transmission Service Agreement. The contract Performance Guarantee shall be issued by Any of the banks listed in Annexure-17 as per format given at Annexure-15 or Any of the insurance companies authorized by Insurance Regulatory and Development Authority of India as per format given at Anbnexure-15 A or PFC/REC/IREDA as per Payment on Order Instrument format given at Annexure-15 B.
5.	Annexure 14 A- FORMAT OF THE BID SECURITY DECLARATION [VALID TILL RFP ISSUED ON OR BEFORE 31.12.2021] of RfP Document	As per existing Annexure 14 A	As per new **Annexure 14 A-** FORMAT OF INSURANCE SURETY BOND FOR BID SECURITY (**Annex-1**).
6.	New Annexure 14-B in RfP Document	[New Annexure]	As per **Annexure 14 B-** FORMAT OF PAYMENT ON ORDER INSTRUMENT FOR BID SECURITY (**Annex-2**).

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Sr.No	Clause No.	Existing Clause	New/Revised Clause
7.	New Annexure 15-B in RfP Document	[New Annexure]	As per Annexure 15 A- FORMAT OF INSURANCE SURETY BOND FOR CONTRACT PERFORMANCE GUARANTEE (**Annex-3**).
8.	New Annexure 15-B in RfP Document	[New Annexure]	As per Annexure 15 B- FORMAT OF PAYMENT ON ORDER INSTRUMENT FOR CONTRAT PERFORMANCE GUARANTEE (**Annex-4**).
9.	Term "Contract Performance Guarantee" under "DEFINITIONS" of TSA Document	**"Contract Performance Guarantee"** shall mean the irrevocable unconditional bank guarantee, submitted and to be submitted by the TSP or by the Selected Bidder on the Nodal Agency from a bank mentioned in Annexure 17 of the RFP, in the form attached here to as Schedule 8, in accordance with Article 3 of this Agreement and which shall include the additional bank guarantee furnished by the TSP under this Agreement;	**"Contract Performance Guarantee"** shall mean the irrevocable unconditional bank guarantee, or insurance surety bond or Payment on Order Instrument submitted and to be submitted by the TSP or by the Selected Bidder on behalf of the TSP to the Nodal Agency from a bank mentioned in Annexure 17 of the RFP, in the form attached here to as Schedule 8 (for bank guarantee) or Schedule-8A (for insurance surety bond issued by any of the insurance companies authorized by Insurance Regulatory and Development Authority of India), or Schedule-8B (for Payment on Order Instrument issued by PFC/REC/IREDA) in accordance with Article 3 of this Agreement and which shall include the additional bank guarantee or insurance surety bond or Payment on Order Instrument furnished by the TSP under this Agreement;
10.	New term "Payment on Order Instrument" under "DEFINITIONS", after term "Parent Company" of TSA Document	[New Term]	**"Payment on Order Instrument"** shall mean Letter of Undertaking from Indian Renewable Energy Development Agency Limited (IREDA) or Power Finance Corporation Limited (PFC) or REC Limited (REC) [the three non-banking financial institutions under Ministry of New & Renewable Energy (MNRE)/ Ministry of Power (MoP), to pay in case situation of default of Transmission Service Provider (TSP) in terms of tender conditions/Power Purchase Agreement (PPA) arises. Such Letter (s) will have same effect as that of a Bank Guarantee issued by any public any public sector bank. Such "Payment on Order instrument" would have terms and

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Sr.No	Clause No.	Existing Clause	New/Revised Clause
			conditions similar to that of any Bank Guarantee given by any public sector bank and would promise to pay the Nodal Agency on demand within stipulated time. TSPs can seek such Letter(s) by offering due security to the above mentioned three non-banking financial institutions mentioned above (IREDA, PFC & REC). Nodal Agency shall not accept the instrument of 'Letter of Undertaking' as described above or in any other form, from any other non-banking financial institutions or bank, except IREDA, PFC & REC.
11.	New Schedule 8A in TSA Document	[New Schedule]	As per **Schedule 8A** – FORMAT OF INSURANCE SURETY BOND FOR CONTRACT PERFORMANCE GUARANTEE (**Annex-3**).
12.	New Schedule 8B in TSA Document	[New Schedule]	As per **Schedule 8B** – FORMAT OF PAYMENT ON ORDER INSTRUMENT FOR CONTRACT PERFORMANCE GUARANTEE (**Annex-4**).



Annex-1

ANNEXURE 14 A - FORMAT OF THE SURETY BOND FOR BID SECURITY

FORMAT OF THE SURETY BOND

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution.)

In consideration of the .....[Insert name of the Bidder] submitting the Bid inter alia for establishing the Inter-State transmission system for _____[Name of Project] on build, own, operate and transfer basis, in response to the RFP dated _____ issued by _____[Name of BPC], and the Bid Process Coordinator (hereinafter referred to as BPC) agreeing to consider such Bid of ..... [Insert the name of the Bidder] as per the terms of the RFP, the [Insert name of Surety Insurer issuing the surety bond and address of Head Office] (hereinafter referred to as "Surety Insurer") hereby agrees unequivocally, irrevocably and unconditionally to pay to _____[Name of BPC] or its authorized representative at _____[Address of BPC] forthwith on demand in writing from _____[Name of BPC] or any representative authorized by it in this behalf, any amount up to and not exceeding Rupees _____ Only (Rs _____ Crore) (the "Surety Bond"),on behalf of M/s.....[Insert name of the Bidder].

This surety bond shall be valid and binding on the Surety Insurer up to and including ..... [Date to be inserted on the basis of Clause 2.11 of this RFP] and shall not be terminable by notice or any change in the constitution of the Surety Insurer or by any other reasons whatsoever and our liability hereunder shall not be impaired or discharged by any extension of time or variations or alternations made, given, or agreed with or without our knowledge or consent, by or between concerned parties.

Our liability under this Surety Bond is restricted to Rupees _____ Only (Rs ____ Crore). The Surety Bond shall remain in force until .....[Date to be inserted on the basis of Clause 2.11 of this RFP]. _____ [Name of BPC] or its authorized representative shall be entitled to invoke this Surety bond until ..... [Insert Date, which is one hundred eighty (180) days after the date in the preceding sentence]. The Surety Insurer hereby expressly agrees that it shall not require any proof except for the written demand from _____ [Name of BPC] or its authorized representative, made in any format, raised at the above mentioned address of the Surety Insurer, in order to make the said payment to _____ [Name of BPC] or its authorized representative.

The Surety Insurer shall make payment hereunder on first demand without restriction or conditions and notwithstanding any objection, disputes, or disparities raised by the Bidder or any other person. The Surety Insurer shall not require _____ [Name of BPC] or its authorized representative to justify the invocation of this surety bond, nor shall the Surety Insurer have any recourse against _____ [Name of BPC] or its authorized representative in respect of any payment made hereunder.

This Surety Bond shall be interpreted in accordance with the laws of India.

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The Surety Insurer represents that this Surety Bond has been established in such form and with such content that it is fully enforceable in accordance with its terms as against the Surety Insurer in the manner provided herein.

This Surety Bond shall not be affected in any manner by reason of merger, amalgamation, restructuring, liquidation, winding up, dissolution or any other change in the constitution of the Surety Insurer.

This Surety Bond shall be a primary obligation of the Surety Insurer and accordingly _____[Name of BPC] or its authorized representative shall not be obliged before enforcing this Surety Bond to take any action in any court or arbitral proceedings against the Bidder, to make any claim against or any demand on the Bidder or to give any notice to the Bidder to enforce any security held by _____[Name of BPC] or its authorized representative or to exercise, levy or enforce any distress, diligence or other process against the Bidder.

The Surety Insurer declares that it has power to issue this Surety Bond and discharge the obligations contemplated herein, the undersigned is duly authorised and has full power to execute this Surety Bond for and on behalf of the Surety Insurer.

Notwithstanding anything contained hereinabove, our liability under this surety bond is restricted to Rupees _____ Only (Rs ____ Crore) and it shall remain in force until ..... [Date to be inserted on the basis of Clause 2.11 of RFP], with an additional claim period of one hundred eighty (180) days thereafter. We are liable to pay the guaranteed amount or any part thereof under this Surety Bond only if _____ [Name of BPC] or its authorized representative serves upon us a written claim or demand.

In witness where of:

Signature.....

Name: .....

Power of attorney No/ Employee No. as applicable.: .....

For:

..... [Insert Name of the Surety-Insurance Company]
Banker's Seal and Full Address, including mailing address of the Head Office

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Notes:

1. The Stamp Paper should be in the name of the Executing Insurance Company.

Annex-2

ANNEXURE 14B - Format of Payment on Order Instrument to be issued by IREDA/REC/PFC

(to be submitted separately for each Project)

No. Date

…..... [Insert name of BPC]

Reg: M/s_____(insert name of the bidding entity) **- Issuance of Payment on Order Instrument for an amount of Rs._____**

Dear Sir,

1. At the request of M/s..... (Insert name of the bidding entity), this Payment on Order Instrument (POI) for an amount of Rs..... (Rupees (In words)) is being issued by M/s. (Insert Name of the POI issuing Agency) ('IREDA/REC/PFC'). This Payment on Order Instrument comes into force immediately.

2. In consideration of the ..... [Insert name of the Bidding Entity] (hereinafter referred to as 'Bidder') submitting the response to RFP issued by [Insert name of BPC] for the project ..... [Insert name of the project] and [Insert name of BPC] considering such response to the RfP of M/s..... [Insert the name of Bidding Entity] as per the terms of the RFP, the ..... [Insert name & address of IREDA/PFC/REC] hereby agrees unequivocally, irrevocably and unconditionally to pay to [Insert name of BPC] at [Insert Name of the Place from the address of the BPC] forthwith without demur on demand in writing from ..... [Insert name of BPC] or any Officer authorized by it in this behalf, any amount up to and not exceeding Rupees [Insert amount not less than the bid bond value indicated in RFP] only, on behalf of M/s. [Insert name of the Bidding Entity].



3. In consideration of the above facts, IREDA/REC/PFC, having its registered office at ..... agrees to make payment for the sum of Rs (in words .....) to ..... [Insert name of BPC] on the following conditions:

(a) IREDA/REC/PFC agrees to make payment of the above said amount unconditionally, without demur and without protest within a period of _____ days of receipt of request from [Insert name of BPC] within the validity period of this letter as specified herein;

(b) The commitment of IREDA/REC/PFC, under this Payment on Order Instrument will have the same effect as that of the commitment under the Bank Guarantee issued by any Public Sector Bank and shall be enforceable in the same manner as in the case of a Bank Guarantee issued by a Bank and the same shall be irrevocable and shall be honoured irrespective of any agreement or its breach between IREDA/REC/PFC or its constituents notwithstanding any dispute that may be raised by them against [Insert name of BPC];

(c) The liability of IREDA/REC/PFC continues to be valid and binding on IREDA/REC/PFC and shall not be terminated, impaired, and discharged by virtue of change in its constitution and specific liability under this POI shall be binding on its successors or assignors;

(d) The liability of IREDA/REC/PFC shall continue to be valid and binding on IREDA/REC/PFC and shall not be terminated/impaired/discharged by any extension of time or variation and alteration made, given or agreed with or without knowledge or consent of the parties ([Insert name of BPC] and Bidder), subject however to the maximum extent of amount stated herein and IREDA/REC/PFC is not liable to any interest or costs etc.;

(e) This Payment on Order Instrument can be invoked either partially or fully, till the date of validity;

(f) IREDA/REC/PFC agrees that it shall not require any proof in addition to the written demand by [Insert name of BPC] made in any format within the validity period. IREDA/REC/PFC shall not require [Insert name of BPC] to justify the

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invocation of the POI against the Bidder, to make any claim against or any demand against the Bidder or to give any notice to the Bidder;

(g) The POI shall be the primary obligation of IREDA/REC/PFC and ..... [Insert name of BPC] shall not be obliged, before enforcing the POI, to take any action in any court or arbitral proceedings against the Bidder;

(h) The POI shall not be affected in any manner by reason of merger, amalgamation, restructuring or any other changes in constitution of IREDA/REC/PFC;

(i) Neither the ..... [Insert name of BPC] is required to justify the invocation of this POI nor shall IREDA/REC/PFC have any recourse against the ..... [Insert name of BPC] in respect of the payment made under this POI.

4. Notwithstanding anything contrary contained anywhere in this POI or in any other documents, this POI is and shall remain valid up to [Insert the date of validity of the POI as per Clause 2.11.1 of the RFP], with an additional claim period of three hundred and sixty-five (365) days thereafter and IREDA/REC/PFC shall make payment thereunder only if a written demand or request is raised within the said date and to the maximum extent of Rs..... and IREDA/REC/PFC shall in no case be liable for any interest, costs, charges, and expenses and IREDA's/REC's/PFC's liability in no case will exceed more than the above amount stipulated.

5. In pursuance of the above, IREDA/REC/PFC and [Insert name of BPC] have signed an Umbrella Agreement dated ..... setting out the terms and conditions for issue of letter of undertaking by IREDA/REC/PFC to ..... [Insert name of BPC] and the said terms and conditions shall be read as a part of this POI issued for the project of PP mentioned above.

Thanking you,

Yours faithfully
For and on behalf of
M/s.....

(Name of the POI issuing agency)

( )



General Manager

Copy to

M/s..... as per their request

( )

General Manager

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Annex-3

ANNEXURE 15A to the RfP

SCHEDULE 8A of TSA

(ISB for CPG)

FORMAT FOR SURETY INSURANCE CONTRACT

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution.

Foreign entities submitting Bids are required to follow the applicable law of India)

In consideration of the ..... [Insert name of the SPV or Selected Bidder on behalf of SPV or Lead Member in case of the Consortium, with address] (hereinafter referred to as the **'Principal Debtor'** for the purposes of this Surety Insurance Contract as provided in Section 126 of the Indian Contract Act, 1872) having been selected to undertake the Transmission Project on the terms and conditions contained in the Transmission Service Agreement dated ...../ to be executed as per the Model Transmission Service Agreement provided along with the Request for Proposal (**'RFP'**) and other RFP Project Documents, subject to the condition of providing a Performance Bank Guarantee or a Surety Insurance Contract guaranteeing/insuring the due performance of the obligations under the Transmission Service Agreement, to the Central Transmission Utility of India Limited (**'CTUIL'**) [herein after referred to as the Nodal Agency], the [Insert name and address of the Insurance Company issuing the Surety Insurance Contract and address of the head office] (hereinafter referred to as "**Surety**") hereby agrees unequivocally, irrevocably, absolutely and unconditionally, without demur, to pay to the Nodal Agency at..... [Insert Place and Address of the Nodal Agency indicated in Transmission Service Agreement, or to the designated Bank Account of the Nodal Agency, namely.....] forthwith on demand in writing from the Nodal Agency, or any Officer authorized by it in this behalf, intimated to the Surety at the address mentioned above, any amount as may be decided by the Nodal Agency not exceeding Rupees .....Crores (Rs.....) only [Insert the amount of the Surety Insurance Contract]

The Surety hereby acknowledges, accepts and confirms that the Surety has received from the Principal Debtor, by way of premium the entire consideration for the Surety to execute, in favour of the Nodal Agency, this Surety Insurance Contract, as extended by the Surety from time to time and assuming the obligation to pay to the Nodal Agency the amount in terms hereof, without any requirement for payment of any other consideration to the Surety by the Principal Debtor, or otherwise.

This Surety Insurance Contract shall be valid and binding on the Surety, as the principal obligation of the Surety to pay on demand by the Nodal Agency, and shall not be terminable by notice or any change in the constitution of the Surety or the term of the Transmission Service Agreement or by any other reasons whatsoever and the liability

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hereunder of the Surety shall not be impaired or discharged by any extension of time or variations or alternations made, given, or agreed (with or without the knowledge or consent of the Surety) by or between the Principal Debtor and the Nodal Agency.

The liability of the Surety under this Surety Insurance Contract is restricted to Rupees ..... Crores (Rs) only. The Surety Insurance Contract shall remain in force until [Insert the date of validity of the Surety Insurance Contract]. The Nodal Agency shall be entitled to invoke this Surety Insurance Contract up to three hundred sixty five (365) days after the last date of the validity of this Surety Insurance Contract.

The Surety hereby expressly agrees that it shall not require any proof except for the written demand from the Nodal Agency, containing the statement that the contractor has failed to meet its contractual obligations raised at the above mentioned address of the Surety (address of Surety office should be a place in NCR only) and the Surety shall pay the amount without reference to the Principal Debtor.

Any such demand made by the Nodal Agency on the Surety shall be conclusive and binding not withstanding any difference between the Nodal Agency and the Principal Debtor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Surety undertakes not to revoke this guarantee during its currency without previous consent of the Nodal Agency and further agrees that the Surety Insurance Contract herein contained shall continue to be enforceable till the Nodal Agency discharges this contract or till the expiry of tenor(including Claim period) whichever is earlier.

The Surety shall make payment hereunder within two (02) working days on first demand without restriction or conditions and notwithstanding any objection by the Principal Debtor, namely, ... [Insert name of SPV], or ..... [Insert name of the Selected Bidder], or ..... [Insert name of the TSP] and/or any other person. The Surety shall not require the Nodal Agency to justify the invocation of this Surety Insurance Contract, nor shall the Surety have any recourse against the Nodal Agency in respect of any payment made hereunder.

This SURETY INSURANCE CONTRACT shall be interpreted in accordance with the laws of India.

This SURETY INSURANCE CONTRACT is being executed by the Surety in terms of the IRDAI (Surety Insurance Contract) Guidelines, 2022 and the Surety hereby acknowledges, accepts and confirms that this Surety Insurance Contract shall be a Contract of Guarantee as provided under Section 126 of the Indian Contract Act, 1872 and further shall be covered by Section 14(3) (b) of the Insolvency and Bankruptcy Code, 2016 (as amended) shall be enforceable as such.

The Surety represents that this Surety Insurance Contract has been established in such form and with such content that it is fully enforceable in accordance with its terms as against the Surety in the manner provided herein.

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This SURETY INSURANCE CONTRACT shall not be affected in any manner by reason of merger, amalgamation, restructuring, liquidation, winding up, dissolution or any other change in the constitution of the Surety.
In order to give effect to this surety Bond, the Nodal Agency shall be entitled to act as if the surety insurer were the principal debtor and any change in the constitution of the contractor and/or the surety insurer, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the surety insurer under this surety Bond.

This SURETY INSURANCE CONTRACT shall be a primary obligation of the Surety as a Principal to pay on demand by the Nodal Agency and the Nodal Agency shall not be obliged before enforcing this Surety Insurance Contract to take any action in any court or arbitral proceedings against the Principal Debtor, namely, ... [Insert name of SPV], or ..... [Insert name of the Selected Bidder], or ..... [Insert name of the TSP] and/or any other person, as the case may be, to make any claim against or any demand on the Principal Debtor, namely,..... [Insert name of SPV], or ..... [Insert name of the Selected Bidder], or ..... [Insert name of the TSP] and/or any other person, as the case may be, or to give any notice to Principal Debtor, namely..... [Insert name of SPV], or ..... [Insert name of the Selected Bidder], or ..... [Insert name of the TSP] and/or any other person, as the case may be, or to enforce any security held by the Nodal Agency or to exercise, levy or enforce any distress, diligence or other process against the Principal Debtor, namely, ... [Insert name of SPV], or ..... [Insert name of the Selected Bidder], or ..... [Insert name of the TSP] and/or any other person, as the case may be.

The Surety acknowledges that this Surety Insurance Contract is not personal to the Nodal Agency and may be assigned, in whole or in part, (whether absolutely or by way of security) by Nodal Agency to any entity to whom the Nodal Agency is entitled to assign its rights and obligations under the Transmission Service Agreement Provided that any such assignment shall be in compliance with the relevant provisions of the Insurance Act 1938

The Surety hereby agrees and acknowledges that the Nodal Agency shall have a right to invoke this Surety Insurance Contract either in part or in full, as it may deem fit. In case of invocation of this Surety Insurance Contract in part, besides making payment for the part of Surety Insurance Contract invoked, surety at the request of nodal agency shall amend the value of Surety Insurance Contract to the extent of balance amount.

The Surety undertakes not to revoke this Surety Contract during its currency, except with the previous express consent of the Nodal Agency in writing and declares and warrants that it has the power to issue this Surety Contract and the undersigned has full powers to do so on behalf of the Surety

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In witness where of:

Signature.....

Name: .....

Power of attorney No/ Employee No. as applicable.: .....

For:

..... [Insert Name of the Surety-Insurance Company]
Banker's Seal and Full Address, including mailing address of the Head Office

Notes:

1. The Stamp Paper should be in the name of the Executing Insurance Company.



Annex-4

ANNEXURE 15B to the RfP

SCHEDULE 8B of TSA

(POI for CPG)

Format for Issuance of Payment on Order Instrument

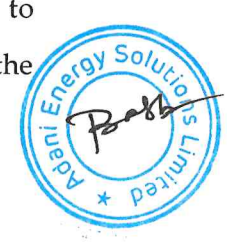
Dear Sir,

1. Indian Renewable Energy Development Agency Limited ('IREDA")/PFC/REC has sanctioned a non-fund based limit loan of Rs. (Rupees..... Only) to M/s. ..... [Insert name of SPV or selected Bidder] under the Loan Agreement executed on ..... to execute Transmission System Projects.
2. In consideration of the.....[Insert name of the SPV or Selected Bidder on behalf of SPV or Lead Member in case of the Consortium, with address] for the purposes of this Payment on Order Instrument ("POI") having been selected to undertake the Transmission Project on the terms and conditions contained in the Transmission Service Agreement dated ...../ to be executed as per the draft of the Model Transmission Service Agreement provided along with the Request for Proposal („RFP") and other RFP Project Documents, subject to the condition of providing a POI guaranteeing the due performance of the obligations under the Transmission Service Agreement to the Nodal Agency/Central Transmission Utility of India Limited („CTUIL"), the.....[Insert name and address of the non-banking financial institutions(IREDA/PFC/REC) issuing the POI and address of the head office] (hereinafter referred to as **"Guarantor")** hereby agrees unequivocally, irrevocably, absolutely and unconditionally, without demur, to pay to the Nodal Agency at .....[Insert Place and Address of the Nodal Agency indicated in Transmission Service Agreement, or to the designated Bank Account of the Nodal Agency, namely.....] forthwith on demand in writing from the Nodal Agency, or any Officer authorized by it in this behalf, intimated to the Guarantor at the address mentioned above, any amount as

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may be decided by the Nodal Agency not exceeding Rupees Crores (Rs.....) only [Insert the amount of Payment on Order Instrument]

3. At the request of .....and on behalf of M/s. ....., [Insert name of SPV or selected Bidder] this Payment on Order Instrument (POI) for an amount of Rs. ..... (Rupees .....) is being issued with IREDA/PFC/REC assuming the obligations to remit such amount to CTUIL from the sanctioned loan.
4. This Payment on Order Instrument comes into force immediately and IREDA/PFC/REC confirms that it has sufficient amount out of the sanctioned loan and shall maintain the required amount to pay under this Payment on Order Instrument, during the validity and claim period of this Payment on Order Instrument.
5. This POI has been issued by IREDA/PFC/REC utilizing the credit limit of M/s.....[Insert name of SPV or selected Bidder] IREDA/PFC/REC confirms that its liability to pay under this Payment on Order Instrument shall be primary and independent of whether at the time of invocation of Payment on Order Instrument, the sanctioned funds are available or not and notwithstanding, the status of M/s. ..... [Insert name of SPV or selected Bidder] at the relevant time and to whether IREDA/PFC/REC is able to recover the amount advanced by it to the said developer.
6. IREDA/PFC/REC and M/s. [Insert name of SPV or selected Bidder] hereby acknowledges, accepts and confirms that this Payment on Order Instrument shall be a Contract of Guarantee as provided under Section 126 of the Indian Contract Act, 1872 and further shall be covered by Section 14(3) (b) of the Insolvency and Bankruptcy Code, 2016 (as amended) shall be enforceable as such.
7. IREDA/PFC/REC liability under this POI is restricted to Rupees Crores (Rs.....) only. This POI shall remain in force until..... [Insert the date of validity of the POI]. The Nodal Agency shall be entitled to invoke this POI up to three hundred sixty-five (365) days after the last date of the



validity of this POI. This POI shall be extended from time to time for such period, as may be desired by the TSP.

8. The Guarantor hereby expressly agrees that it shall not require any proof except for the written demand from the Nodal Agency, raised at the above-mentioned address of the Guarantor (address of Guarantor office should be in NCR only) and the Guarantor shall pay the amount to the Nodal Agency without reference to the TSP.

9. Any such demand made by the Nodal Agency on the Guarantor shall be conclusive and binding not withstanding any difference between the Nodal Agency and the TSP or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Guarantor undertakes not to revoke this guarantee during its currency without previous consent of the Nodal Agency and further agrees that the POI herein contained shall continue to be enforceable till the Nodal Agency discharges this contract or till the expiry of tenure or (including Claim period) whichever is earlier.

10. The Guarantor shall make payment hereunder within two (02) working days on first demand without restriction or conditions and notwithstanding any objection or disputes raised by the TSP, namely, ... [Insert name of SPV], or [Insert name of the Selected Bidder], or ..... [Insert name of the TSP] and/or any other person. The Guarantor shall not require the Nodal Agency to justify the invocation of this POI, nor shall the Guarantor have any recourse against the Nodal Agency in respect of any payment made hereunder.

11. This POI shall be interpreted in accordance with the laws of India.

12. The Guarantor represents that this POI Contract has been established in such form and with such content that it is fully enforceable in accordance with its terms as against the Guarantor in the manner provided herein.

13. This POI shall not be affected in any manner by reason of merger, amalgamation, restructuring, liquidation, winding up, dissolution or any other change in the constitution of the Guarantor.

14. This POI Contract shall be a primary obligation of the Guarantor as a Principal to pay on demand by the Nodal Agency and the Nodal Agency shall not be obliged

Adani Energy Solutions Limited

before enforcing this POI Contract to take any action in any court or arbitral proceedings against the TSP, namely,..... [Insert name of SPV], or ..... [Insert name of the Selected Bidder], or.....[Insert name of the TSP] and/or any other person, as the case may be to make any claim against or any demand on the TSP, namely, ... [Insert name of SPV], or ..... [Insert name of the Selected Bidder], or ... .[Insert name of the TSP] and/or any other person, as the case may be, or to give any notice to TSP, namely..... [Insert name of SPV], or .....[Insert name of the Selected Bidder], or ..... [Insert name of the TSP] and/or any other person, as the case may be, or to enforce any security held by the Nodal Agency or to exercise, levy or enforce any distress, diligence or other process against the TSP, namely, ... [Insert name of SPV], or .....[Insert name of the Selected Bidder], or ..... [Insert name of the TSP] and/or any other person, as the case may be.

15. The Guarantor acknowledges that this POI Contract is not personal to the Nodal Agency and may be assigned, in whole or in part, (whether absolutely or by way of security) by Nodal Agency to any entity to whom the Nodal Agency is entitled to assign its rights and obligations under the Transmission Service Agreement.

16. The Guarantor hereby agrees and acknowledges that the Nodal Agency shall have a right to invoke this POI Contract either in part or in full, as it may deem fit. In case of invocation of this POI Contract in part, besides making payment for the part of POI Contract invoked, Guarantor at the request of Nodal Agency shall amend the value of POI Contract to the extent of balance amount.

IN WITNESS WHERE OF the non- banking financial institutions through its authorized officer, has set its hand and stamp on this..... day of.....at.....

Signature.....

Name: .....

Power of attorney No.: .....

For:

Adani Energy Solutions Limited

…..... [Insert Name of the non- banking financial institutions Company]

Seal and Full Address, including mailing address of the Head Office



Annexure A3

सत्यमेव जयते

प्रारुप 1
पंजीकरण प्रमाण-पत्र

कॉर्पोरेट पहचान संख्या : U40300GJ2013PLC077803 2013 - 2014

मैं एतदद्वारा सत्यापित करता हूँ कि मैसर्स

ADANI TRANSMISSION LIMITED

का पंजीकरण, कम्पनी अधिनियम 1956 (1956 का 1) के अंतर्गत आज किया जाता है और यह कम्पनी लिमिटेड है।

यह निगमन-पत्र आज दिनांक नौ दिसम्बर दो हजार तेरह को अहमदाबाद में जारी किया जाता है।

Form 1
Certificate of Incorporation

Corporate Identity Number : U40300GJ2013PLC077803 2013 - 2014
I hereby certify that ADANI TRANSMISSION LIMITED is this day incorporated under the Companies Act, 1956 (No. 1 of 1956) and that the company is limited.

Given at Ahmedabad this Nineth day of December Two Thousand Thirteen.

Signature valid
Digitally signed by Shyam Nath
Date: 2013.12.09 14:50:09 GMT+05:30

Registrar of Companies, Gujarat, Dadra and Nagar Havelli
कम्पनी रजिस्ट्रार, गुजरात, दादरा एवं नगर हवेली

*Note: The corresponding form has been approved by Deepak Persoya, Assistant Registrar of Companies and this certificate has been digitally signed by the Registrar through a system generated digital signature under rule 5(2) of the Companies (Electronic Filing and Authentication of Documents) Rules, 2006.
The digitally signed certificate can be verified at the Ministry website (www.mca.gov.in).

कम्पनी रजिस्ट्रार के कार्यालय अभिलेख में उपलब्ध पत्राचार का पता :
Mailing Address as per record available in Registrar of Companies office:
ADANI TRANSMISSION LIMITED
Adani House, Nr. Mithakhali Six Roads,, Navrangpura,
Ahmedabad - 380009,
Gujarat, INDIA

Certified True Copy
For, Adani Transmission Limited
Company Secretary

Adani Energy Solutions Limited

सत्यमेव जयते

व्यापार प्रारंभ करने का प्रमाण–पत्र

कम्पनी अधिनियम 1956 की धारा 149(3) के अनुसरण में

कॉर्पोरेट पहचान संख्या : U40300GJ2013PLC077803

मैं एतदद्वारा सत्यापित करता हूँ कि मैसर्स
ADANI TRANSMISSION LIMITED

जिसका निगमन, कम्पनी अधिनियम, 1956(1956 का 1) के अंतर्गत दिनांक नौ दिसम्बर दो हजार तेरह को किया गया था और जिसने निर्धारित प्रपत्र में घोषणा प्रस्तुत की है या विधिवत सत्यापित किया है कि उक्त कम्पनी ने, अधिनियम की धारा 149(2) (क) से (ग) तक की शर्तो का अनुपालन कर लिया है और व्यापार करने के लिए हकदार है।

यह प्रमाण–पत्र आज दिनांक सत्राह दिसम्बर दो हजार तेरह को अहमदाबाद में जारी किया जाता है।

Certificate for Commencement of Business

Pursuant of Section 149(3) of the Companies Act, 1956

Corporate Identity Number : U40300GJ2013PLC077803

I hereby certify that the ADANI TRANSMISSION LIMITED which was incorporated under the Companies Act, 1956(No. 1 of 1956) on the Nineth day of December Two Thousand Thirteen , and which has this day filed or duly verified declaration in the prescribed form that the conditions of the Section 149(2)(a) to (c) of the said act, have been complied with and is entitled to commence business.

Given at Ahmedabad this Seventeenth day of December Two Thousand Thirteen.

Signature valid
Digitally signed by Shyam Nath
Date: 2013.12.17 17:32:48 GMT+05:30

Registrar of Companies, Gujarat, Dadra and Nagar Havelli

कम्पनी रजिस्ट्रार, गुजरात, दादरा एवं नगर हवेली

*Note: The corresponding form has been approved by Deepak Persoya, Assistant Registrar of Companies and this certificate has been digitally signed by the Registrar through a system generated digital signature under rule 5(2) of the Companies (Electronic Filing and Authentication of Documents) Rules, 2006.
The digitally signed certificate can be verified at the Ministry website (www.mca.gov.in).

कम्पनी रजिस्ट्रार के कार्यालय अभिलेख में उपलब्ध पत्राचार का पता :
Mailing Address as per record available in Registrar of Companies office:

ADANI TRANSMISSION LIMITED
Adani House, Nr. Mithakhali Six Roads,, Navrangpura,
Ahmedabad - 380009,
Gujarat, INDIA

Adani Energy Solutions Limited

सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF CORPORATE AFFAIRS

Office of the Registrar of Companies

ROC Bhavan,Ahmedabad,RoC Bhavan Opp Rupal Park Society, Behind Ankur Bus Stop,Gujarat,380013,India

Certificate of Incorporation pursuant to change of name

[Pursuant to rule 29 of the Companies (Incorporation) Rules, 2014]

Corporate Identification Number (CIN): **L40300GJ2013PLC077803**

I hereby certify that the name of the company has been changed from ADANI TRANSMISSION LIMITED to ADANI ENERGY SOLUTIONS LIMITED with effect from the date of this certificate and that the company is Company limited by shares.

Company was originally incorporated with the name ADANI TRANSMISSION LIMITED

Given under my hand at Ahmedabad this TWENTY SEVENTH day of JULY TWO THOUSAND TWENTY THREE

Document certified by DS MINISTRY OF CORPORATE AFFAIRES 1 <olrameshmishra@gmail.com>.

Digitally signed by DS MINISTRY OF CORPORATE AFFAIRES 1
Date: 2023.07.27 11:48:12 IST

Indrajit Vania

Assistant Registrar of Companies/ Deputy Registrar of Companies/ Registrar of Companies

ROC Ahmedabad

Note: The corresponding form has been approved by Indrajit Vania, Registrar of Companies, ROC Ahmedabad and this order has been digitally signed by the Registrar of Companies through a system generated digital signature under rule 9(2) of the Companies (Registration Offices and Fees) Rules, 2014.

Mailing Address as per record available in Registrar of Companies office:

ADANI ENERGY SOLUTIONS LIMITED

Adani Corporate House, Shantigram Near Vaishno Devi Circle, S. G. Highway, Khodiyar,NA,Ahmedabad,Ahmedabad-382421,Gujarat,India

Note: This certificate of incorporation is in pursuance to change of name by the Company and does not affects the rights and liabilities of stakeholders pursuant to such change of name. It is obligatory on the part of the Company to display the old name for a period of two years along with its new name at all places wherever a Company is required to display its name in terms of Section 12 of the Act. All stakeholders are advised to verify the latest status of the Company and its Directors etc and view public documents of the Company on the website of the Ministry www.mca.gov.in/MCA21

Adani Energy Solutions Limited

PFC CONSULTING LTD.

पीएफसी कंसल्टिंग लिमिटेड

(पावर फाइनेंस कॉर्पोरेशन लिमिटेड की पूर्णतःस्वामित्वाधीन सहायक कंपनी)

PFC CONSULTING LIMITED

(A wholly owned subsidiary of Power Finance Corporation Limited)

CIN : U74140DL2008GOI175858

Ref. No. 04/25-26/ITP-76/RFP

November 14, 2025

To

Mr. Shashank Sharma,
Adani Energy Solutions Limited,
3rd Floor, South Wing,
Adani Corporate House, Shantigram,
Ahmedabad – 382 421, Gujarat, India.

E-mail: shashankb.sharma@adani.com

Sub.: **Independent Transmission Project (ITP) "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"- Letter of Intent**

Dear Sir,

We refer to:

1. The Request for Proposal document dated July 26, 2024 issued to **'Adani Energy Solutions Limited'** as regards participation in the international competitive bidding process for Transmission Scheme for **"Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"**, and as amended till the bid deadline including all correspondence/ clarifications / amendments exchanged between **'Adani Energy Solutions Limited'** and PFC Consulting Limited in regard thereto (hereinafter collectively referred to as the **"Final RFP"**);
2. The offer of **'Adani Energy Solutions Limited'** by way of a Technical Bid pursuant to (1) above submitted on July 21, 2025 in response to the Final RFP.
3. The offer of **'Adani Energy Solutions Limited'** by way of Financial Bid-Initial Offer submitted on July 21, 2025 in response to the Final RFP.
4. The offer of **'Adani Energy Solutions Limited'** by way of a Financial Bid-Final Offer Submitted during e-Reverse Auction process concluded on September 10, 2025 in response to the Final RFP.
5. The Technical Bid as at S.No. (2) above and the Financial Bid as at S.No. (3) & (4) above, hereinafter collectively referred to as the "Bid".

This is to inform you that the process of evaluating bids received pursuant to the Final RFP, including the Bid, has been concluded. We are pleased to inform you that your proposal and offer received by way of the "Bid" has been accepted and **'Adani Energy Solutions Limited'** is hereby declared as the Successful Bidder as per Clause 3.6.1 of the Final RFP for the above project and consequently, this Letter of Intent (hereinafter referred to as the "LoI") is being issued.

This LoI is based on the Final RFP and you are requested to please comply with the following:

a) Acknowledging its issuance and unconditionally accepting its contents and recording "Accepted unconditionally" under the signature of your authorized signatory on each page of the duplicate

copy of this letter attached herewith and returning the same to PFC Consulting Limited within seven (07) days of the date of issuance of LoI. This LoI is issued to you in duplicate.

b) Completion of various activities as stipulated in the Final RFP including in particular Clause 2.15.2, Clause 2.15.3 and Clause 2.15.4 of the Final RFP, within the timelines as prescribed therein.

It may be noted that PFC Consulting Limited has the rights available to them under the Final RFP, including rights under Clause 2.15.5 and Clause 3.6.3 thereof, upon your failure to comply with the aforementioned conditions.

As you are aware, the issuance and contents of this LoI are based on the Bid submitted by you as per the Final RFP including the Transmission charges and other details regarding the Scheduled COD as contained therein. The Quoted Transmission Charges as submitted by you and the Scheduled COD of each transmission element and the Project as agreed by you in your Bid, as per Annexure 21 and Format-1 of Annexure 8 respectively of the Final RFP is annexed herewith as **Schedule-A** and incorporated herein by way of reference.

Yours sincerely,
For PFC Consulting Limited

(Naveen Kumar)
General Manager

Enclosures:

- **Schedule A** – Quoted Transmission Charges and the Scheduled COD of each Transmission Element and the Project submitted in your Bid, as per Annexure 21 and Format-1 of Annexure 8 respectively of the Final RFP

Copy to:

1. **Chairman and Managing Director, Power Finance Corporation Limited**, "Urjanidhi", 1, Barakhamba Lane, Connaught Lane, New Delhi – 110001

2. **Director (Transmission), Ministry of Power**, Shram Shakti Bhawan, Rafi Marg, New Delhi-110001

3. **Chief Engineer (PSPA-I) and Member Secretary (NCT), Central Electricity Authority**, 3rd Floor, Sewa Bhawan, R.K. Puram, New Delhi – 110066

4. **Chief Operating Officer (COO), Central Transmission Utility of India Limited (CTUIL)**, 5th-10th Floor, Ircon International Tower-1, Sector-32, Gurugram-122001

5. **Secretary, Central Electricity Regulatory Commission**, 6th, 7th & 8th Floors, World Trade Center, Tower-B, Nauroji Nagar, New Delhi – 110029

Adani Energy Solutions Limited

SCHEDULE - A

(Page 1 of 2)

1. Quoted Transmission Charges as per Annexure-21-Format For Financial Bid

Quoted Transmission Charges: Rs.23,917.69 Million Per Annum

Adani Energy Solutions Limited

1. Scheduled COD of each transmission Element and the Project as per Format 1 of Annexure-8 of RFP

SCHEDULE-A

S. No.	Name of the Transmission Element	Scheduled COD as per Gazette Notification	% of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
a)	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	48 months from SPV transfer	100%	All Elements are required to be commissioned simultaneously as their utilization is dependent on commissioning of each other.
b)	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*			
c)	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal			
d)	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations			
e)	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)			

**The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC and HVAC switchyards shall be implemented by the TSP*

Adani Energy Solutions Limited

adani
Energy Solutions

Annexure A5

Ref: AESL/BD/PFCCL/20251118
Date: 18th November 2025

The General Manager,
PFC Consulting Limited,
9th Floor, A-Wing, Statesman House,
Connaught Place,
New Delhi - 110001, India

Subject : "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" – **Acceptance of Letter of Intent (LoI)**

Reference : "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C" dated 14.11.2025 **(Ref. No. 04/25-26/ITP-76/RFP)**

Dear Sir,

The Letter of Intent (LoI) dated 14.11.2025 issued to Adani Energy Solutions Limited for the subject cited transmission scheme is hereby "Accepted unconditionally".

Please find enclosed the copy of the duly accepted LoI.

Thanking you,

For Adani Energy Solutions Limited

Authorized Signatory

Adani Energy Solutions Limited

Adani Energy Solutions Limited

Adani Energy Solutions Ltd
(Formerly known as Adani Transmission Limited)
Adani Corporate House
Shantigram, Near Vaishno Devi Circle,
S. G. Highway, Khodiyar,
Ahmedabad 382 421
Gujarat, India
CIN: L40300GJ2013PLC077803

Tel +91 79 2555 7555
Fax +91 79 2555 7177
www.adanienergysolutions.com

PFC CONSULTING LTD.

पीएफसी कंसल्टिंग लिमिटेड
(पावर फाइनेंस कॉर्पोरेशन लिमिटेड की पूर्णतःस्वामित्वाधीन सहायक कंपनी)
PFC CONSULTING LIMITED
(A wholly owned subsidiary of Power Finance Corporation Limited)
CIN : U74140DL2008GOI175858

Ref. No. 04/25-26/ITP-76/RFP

November 14, 2025

To
Mr. Shashank Sharma,
Adani Energy Solutions Limited,
3rd Floor, South Wing,
Adani Corporate House, Shantigram,
Ahmedabad – 382 421, Gujarat, India.

E-mail: shashankb.sharma@adani.com

Sub.: Independent Transmission Project (ITP) "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C"- Letter of Intent

Dear Sir,

We refer to:

1. The Request for Proposal document dated July 26, 2024 issued to '**Adani Energy Solutions Limited**' as regards participation in the international competitive bidding process for Transmission Scheme for "**Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C**", and as amended till the bid deadline including all correspondence/ clarifications / amendments exchanged between '**Adani Energy Solutions Limited**' and PFC Consulting Limited in regard thereto (hereinafter collectively referred to as the "**Final RFP**");
2. The offer of '**Adani Energy Solutions Limited**' by way of a Technical Bid pursuant to (1) above submitted on July 21, 2025 in response to the Final RFP.
3. The offer of '**Adani Energy Solutions Limited**' by way of Financial Bid-Initial Offer submitted on July 21, 2025 in response to the Final RFP.
4. The offer of '**Adani Energy Solutions Limited**' by way of a Financial Bid-Final Offer Submitted during e-Reverse Auction process concluded on September 10, 2025 in response to the Final RFP.
5. The Technical Bid as at S.No. (2) above and the Financial Bid as at S.No. (3) & (4) above, hereinafter collectively referred to as the "Bid".

"Accepted Unconditionally"

This is to inform you that the process of evaluating bids received pursuant to the Final RFP, including the Bid, has been concluded. We are pleased to inform you that your proposal and offer received by way of the "Bid" has been accepted and '**Adani Energy Solutions Limited**' is hereby declared as the Successful Bidder as per Clause 3.6.1 of the Final RFP for the above project and consequently, this Letter of Intent (hereinafter referred to as the "LoI") is being issued.

This LoI is based on the Final RFP and you are requested to please comply with the following:

a) Acknowledging its issuance and unconditionally accepting its contents and recording "Accepted unconditionally" under the signature of your authorized signatory on each page of the duplicate

copy of this letter attached herewith and returning the same to PFC Consulting Limited within seven (07) days of the date of issuance of LoI. This LoI is issued to you in duplicate.

b) Completion of various activities as stipulated in the Final RFP including in particular Clause 2.15.2, Clause 2.15.3 and Clause 2.15.4 of the Final RFP, within the timelines as prescribed therein.

It may be noted that PFC Consulting Limited has the rights available to them under the Final RFP, including rights under Clause 2.15.5 and Clause 3.6.3 thereof, upon your failure to comply with the aforementioned conditions.

As you are aware, the issuance and contents of this LoI are based on the Bid submitted by you as per the Final RFP including the Transmission charges and other details regarding the Scheduled COD as contained therein. The Quoted Transmission Charges as submitted by you and the Scheduled COD of each transmission element and the Project as agreed by you in your Bid, as per Annexure 21 and Format-1 of Annexure 8 respectively of the Final RFP is annexed herewith as **Schedule-A** and incorporated herein by way of reference.

Yours sincerely,
For PFC Consulting Limited

(Naveen Kumar)
General Manager

Enclosures:

- **Schedule A** – Quoted Transmission Charges and the Scheduled COD of each Transmission Element and the Project submitted in your Bid, as per Annexure 21 and Format-1 of Annexure 8 respectively of the Final RFP

Copy to:

1. **Chairman and Managing Director, Power Finance Corporation Limited**, "Urjanidhi", 1, Barakhamba Lane, Connaught Lane, New Delhi – 110001
2. **Director (Transmission), Ministry of Power**, Shram Shakti Bhawan, Rafi Marg, New Delhi-110001
3. **Chief Engineer (PSPA-I) and Member Secretary (NCT), Central Electricity Authority**, 3rd Floor, Sewa Bhawan, R.K. Puram, New Delhi – 110066
4. **Chief Operating Officer (COO), Central Transmission Utility of India Limited (CTUIL)**, 5th-10th Floor, Ircon International Tower-1, Sector-32, Gurugram-122001
5. **Secretary, Central Electricity Regulatory Commission**, 6th, 7th & 8th Floors, World Trade Center, Tower-B, Nauroji Nagar, New Delhi – 110029

"Accepted Unconditionally"

Adani Energy Solutions Limited

Adani Energy Solutions Limited

SCHEDULE - A

(Page 1 of 2)

1. Quoted Transmission Charges as per Annexure-21-Format For Financial Bid

Quoted Transmission Charges: Rs.23,917.69 Million Per Annum

"Accepted Unconditionally"

Adani Energy Solutions Limited

Adani Energy Solutions Limited

1. Scheduled COD of each transmission Element and the Project as per Format 1 of Annexure-8 of RFP

SCHEDULE-A

S. No.	Name of the Transmission Element	Scheduled COD as per Gazette Notification	% of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
a)	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	48 months from SPV transfer	100%	All Elements are required to be commissioned simultaneously as their utilization is dependent on commissioning of each other.
b)	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*			
c)	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal			
d)	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations			
e)	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)			

The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC and HVAC switchyards shall be implemented by the TSP

Adani Energy Solutions Limited

"Accepted Unconditionally"

Adani Energy Solutions Limited

Annexure A6

TRANSMISSION SERVICE AGREEMENT

FOR

DEVELOPMENT AND OPERATION OF INTER-STATE TRANSMISSION SYSTEM

FOR TRANSMISSION OF ELECTRICITY THROUGH TARIFF BASED COMPETITIVE BIDDING FOR

Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C

BETWEEN THE

CENTRAL TRANSMISSION UTILITY OF INDIA LIMITED

(NODAL AGENCY)

AND

KPS III HVDC TRANSMISSION LIMITED

....., 2024



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THIS TRANSMISISON SERVICE AGREEMENT (hereinafter referred to as "TSA" or "Agreement" or "the Agreement" or "this Agreement") is made on the ..... [Insert day] of..... [Insert month] of Two Thousand and..... [Insert Year]

BETWEEN:

The .....[Insert name and registered address of Nodal Agency for the project], acting as a Nodal Agency (referred to as the "Nodal Agency"), which expression shall unless repugnant to the context or meaning thereof include its successors, and permitted assigns) as Party of the one part;

AND

..... [Insert Name of the Transmission Service Provider], incorporated under the Companies Act, 1956/ Companies Act, 2013 (as the case may be), having its registered office at ..... (herein after referred to as "Transmission Service Provider" or "TSP" or "ISTS Licensee", which expression shall unless repugnant to the context or meaning thereof include its successors, and permitted assigns) as Party of the other part;

("Nodal Agency" and "TSP" are individually referred to as "Party" and collectively as the "Parties")

AND WHEREAS:

A) In accordance with the Bidding Guidelines, the Bid Process Coordinator (hereinafter referred to as BPC) had initiated a competitive e-reverse bidding process through issue of RFP for selecting a Successful Bidder to build, own, operate and transfer the Project comprising of the Elements mentioned in Schedule 1 (hereinafter referred to as the Project)

B) Pursuant to the said e-reverse bidding process, the BPC has identified the Successful Bidder, who will be responsible to set up the Project on build, own, operate and transfer basis to provide Transmission Service in accordance with the terms of this Agreement and the Transmission License.

C) The Selected Bidder have submitted the Contract Performance Guarantee and acquired one hundred percent (100%) of the equity shareholding of ..... [Insert Name of the SPV], along with all its related assets and liabilities in terms of the provisions of the Share Purchase Agreement.

D) The TSP has agreed to make an application for a Transmission License to the Commission for setting up the Project on build, own, operate and transfer basis.

E) The TSP has further agreed to make an application to the Commission for the adoption of the Transmission Charges under Section 63 of the Electricity Act, 2003, along with a certification from the Bid Evaluation Committee in accordance with the Bidding Guidelines issued by Ministry of Power, Government of India.

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F) The TSP has agreed to execute the agreement(s) required, if any, under Sharing Regulations within fifteen (15) days from the date of grant of Transmission License from the Commission.

G) The TSP agrees to the terms and conditions laid down under Sharing Regulations, for making available the ISTS and charge the Transmission Charges in accordance with the terms and conditions of Sharing Regulations.

H) The billing, collection and disbursement of the Transmission Charges by the CTU to the ISTS Licensee shall be governed as per Sharing Regulations.

I) The terms and conditions stipulated in the Transmission License issued by the Commission to the TSP shall be applicable to this Agreement and the TSP agrees to comply with these terms and conditions. In case of inconsistency between the Transmission License terms & conditions and the conditions of this Agreement, the conditions stipulated in the Transmission License granted by the Commission shall prevail.

NOW, THEREFORE, IN CONSIDERATION OF THE PREMISES AND MUTUAL AGREEMENTS, COVENANTS AND CONDITIONS SET FORTH HEREIN, IT IS HEREBY AGREED BY AND BETWEEN THE PARTIES HERETO AS FOLLOWS:



ARTICLE: 1

1 DEFINITIONS AND INTERPRETATIONS

1.1 Definitions:

1.1.1 The words / expressions used in this Agreement, unless as defined below or repugnant to the context, shall have the same meaning as assigned to them by the Electricity Act, 2003 and the rules or regulations framed there under including those issued / framed by the Commission (as defined hereunder), as amended or re-enacted from time to time or the General Clauses Act, failing which it shall bear its ordinary English meaning.

The words/expressions when used in this Agreement shall have the respective meanings as specified below:

"Acquisition Price" shall have the same meaning as defined in the Share Purchase Agreement;

"Act" or **"Electricity Act"** or **"Electricity Act 2003"** shall mean the Electricity Act, 2003 and any amendments made to the same or any succeeding enactment thereof;

"Affiliate" shall mean a company that either directly or indirectly

(i) controls or

(ii) is controlled by or

(iii) is under common control with

a Bidding Company (in the case of a single company) or a Member (in the case of a Consortium) and "**control**" means ownership by one entity of at least twenty six percent (26%) of the voting rights of the other entity;

"Availability" in relation to the Project or in relation to any Element of the Project, for a given period shall mean the time in hours during that period the Project is capable to transmit electricity at its Rated Voltage and shall be expressed in percentage of total hours in the given period and shall be calculated as per the procedure contained in Appendix –IV to Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024, attached herewith in Schedule 6;

"Bid" shall mean technical bid and financial bid submitted by the Bidder, in response to the RFP, in accordance with the terms and conditions of the RFP;

"Bid Deadline" shall mean the last date and time for submission of the Bid in response to RFP, as specified in the RFP;

"Bidding Company" shall refer to such single company that has made a Response to RFP for the Project;

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"Bidding Consortium / Consortium" shall refer to a group of companies that has collectively made a Response to RFP for the Project;

"Bid Documents" or **"Bidding Documents"** shall mean the RFP, along with all attachments thereto or clarifications thereof;

"Bidding Guidelines" shall mean the "Tariff Based Competitive Bidding Guidelines for Transmission Service" and "Guidelines for Encouraging Competition in Development of Transmission Projects" issued by Government of India, Ministry of Power under Section – 63 of the Electricity Act as amended from time to time;

"Bid Process Coordinator" or **"BPC"** shall mean a person or its authorized representative as notified by the Government of India, responsible for carrying out the process for selection of Bidder who will acquire Transmission Service Provider;

"Bill" shall mean any bill raised by the CTU on the DICs to recover the Transmission Charges pursuant to the Sharing Regulations;

"Business Day" shall mean a day other than Sunday or a statutory holiday, on which the banks remain open for business in the State in which the Nodal Agency's registered office is located and the concerned TSP are located;

"CEA" shall mean the Central Electricity Authority constituted under Section -70 of the Electricity Act;

"Change in law" shall have the meaning ascribed thereto in Article 12;

"Commercial Operation Date" or **"COD"** shall mean the date as per Article 6.2;

"Commission" or **"CERC"** shall mean the Central Electricity Regulatory Commission referred to in sub-section (1) of Section 76 of the Electricity Act, 2003 or its successors and assigns;

"Competent Court of Law" shall mean the Supreme Court or any High Court, or any tribunal or any similar judicial or quasi-judicial body in India that has jurisdiction to adjudicate upon issues relating to the Project;

"Connection Agreement" shall mean the agreement between the CTU or STU or any other concerned parties and the TSP, setting out the terms relating to the connection of the Project to the Inter-connection Facilities and use of the Inter State Transmission System as per the provisions of the IEGC, as the case may be;

"Consultation Period" shall mean the period of sixty (60) days or such longer period as the Parties may agree, commencing from the date of issue of a TSP's Preliminary Notice or a Nodal Agency's Preliminary Termination Notice, as provided in Article 13

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of this Agreement, for consultation between the Parties to mitigate the consequence of the relevant event having regard to all the circumstances;

"Consents, Clearances and Permits" shall mean all authorizations, licenses, approvals, registrations, permits, waivers, privileges, acknowledgements, agreements, or concessions required to be obtained from or provided by any concerned authority for the development, execution and operation of Project including without any limitation for the construction, ownership, operation and maintenance of the Transmission Lines and/or sub-stations;

"Construction Period" shall mean the period from (and including) the Effective Date of the Transmission Service Agreement up to (but not including) the COD of the Element of the Project in relation to an Element and up to (but not including) the COD of the Project in relation to the Project;

"Contractors" shall mean the engineering, procurement, construction, operation & maintenance contractors, surveyors, advisors, consultants, designers, suppliers to the TSP and each of their respective sub-contractors (and each of their respective successors and permitted assigns) in their respective capacities as such;

"Contract Performance Guarantee" shall mean the irrevocable unconditional bank guarantee, submitted and to be submitted by the TSP or by the Selected Bidder on behalf of the TSP to the Nodal Agency from a bank mentioned in Annexure 17 of the RFP, in the form attached here to as Schedule 8, in accordance with Article 3 of this Agreement and which shall include the additional bank guarantee furnished by the TSP under this Agreement;

"Contract Year", for the purpose of payment of Transmission Charges, shall mean the period beginning on the COD, and ending on the immediately succeeding March 31 and thereafter each period of 12 months beginning on April 1 and ending on March 31 provided that the last Contract Year shall end on the last day of the term of the TSA;

"CTU" or **"Central Transmission Utility"** shall have same meaning as defined in the Electricity Act, 2003;

"Day" shall mean a day starting at 0000 hours and ending at 2400 hours;

"D/C" shall mean Double Circuit;

"Designated ISTS Customers" or **"DICs"** shall have the meaning as ascribed in the Sharing Regulations;

"Dispute" shall mean any dispute or difference of any kind between the Parties, in connection with or arising out of this Agreement including any issue on the interpretation and scope of the terms of this Agreement as provided in Article 16;

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"Effective Date" for the purposes of this Agreement, shall have the same meaning as per Article 2.1 of this Agreement;

"Electrical Inspector" shall mean a person appointed as such by the Government under sub-section (1) of Section 162 of the Electricity Act 2003 and also includes Chief Electrical Inspector;

"Electricity Rules 2005" shall mean the rules framed pursuant to the Electricity Act 2003 and as amended from time to time;

"Element" shall mean each Transmission Line or each circuit of the Transmission Lines (where there are more than one circuit) or each bay of Sub-station or switching station or HVDC terminal or inverter station of the Project, including ICTs, Reactors, SVC, FSC, etc. forming part of the ISTS, which will be owned, operated and maintained by the concerned ISTS Licensee, and which has a separate Scheduled COD as per Schedule 2 of this Agreement and has a separate percentage for recovery of Transmission Charges on achieving COD as per Schedule 5 of this Agreement;

"Event of Default" shall mean the events as defined in Article 13 of this Agreement;

"Expiry Date" shall be the date which is thirty five (35) years from the COD of the Project;

"Financial Closure" shall mean the first Business Day on which funds are made available to the TSP pursuant to the Financing Agreements;

"Financially Evaluated Entity" shall mean the company which has been evaluated for the satisfaction of the financial requirement set forth in the RFP;

"Financing Agreements" shall mean the agreements pursuant to which the TSP is to finance the Project including the loan agreements, security documents, notes, indentures, security agreements, letters of credit and other documents, as may be amended, modified, or replaced from time to time, but without in anyway increasing the liabilities of the Designated ISTS Customers / Nodal Agency;

"Financial Year" shall mean a period of twelve months at midnight Indian Standard Time (IST) between 1st April & 31st March;

"Force Majeure" and **"Force Majeure Event"** shall have the meaning assigned thereto in Article 11;

"GOI" shall mean Government of India;

"Grid Code" / "IEGC" shall mean the Grid Code specified by the Central Commission under Clause (h) of sub-section (1) of Section 79 of the Electricity Act;



"Independent Engineer" shall mean an agency/ company, appointed by Nodal Agency in accordance with the Guidelines for Encouraging Competition in Development of Transmission Projects.

"Indian Governmental Instrumentality" shall mean Government of India, Government of any State in India or any ministry, department, board, authority, agency, corporation, commission under the direct or indirect control of Government of India or any State Government or both, any political sub-division of any of them including any court or Commission or tribunal or judicial or quasi-judicial body in India but excluding the CTU, TSP and the Designated ISTS Customers;

"Insurances" shall mean the insurance cover to be obtained and maintained by the TSP in accordance with Article 9 of this Agreement;

"Interconnection Facilities" shall mean the facilities as may be set up for transmission of electricity through the use of the Project, on either one or both side of generating station's / CTU's / STU's / ISTS Licensee's / Designated ISTS Customer's substations (as the case may be) which shall include, without limitation, all other transmission lines, gantries, sub-stations and associated equipments not forming part of the Project;

"ISTS Licensee" shall be the TSP under this Agreement, consequent to having been awarded a Transmission License by the CERC and shall be referred to as the TSP or the ISTS Licensee, as the context may require in this Agreement;

"Law" or "Laws" in relation to this Agreement, shall mean all laws including electricity laws in force in India and any statute, ordinance, rule, regulation, notification, order or code, or any interpretation of any of them by an Indian Governmental Instrumentality having force of law and shall include all rules, regulations, decisions and orders of the Commission;

"Lead Member of the Bidding Consortium" or "Lead Member" shall mean a company who commits at least 26% equity stake in the Project, meets the technical requirement as specified in the RFP and so designated by other Member(s) in Bidding Consortium;

"Lenders" means the banks, financial institutions, multilateral funding agencies, non banking financial companies registered with the Reserve Bank of India (RBI), insurance companies registered with the Insurance Regulatory & Development Authority (IRDA), pension funds regulated by the Pension Fund Regulatory & Development Authority (PFRDA),mutual funds registered with Securities & Exchange Board of India (SEBI), etc., including their successors and assigns, who have agreed on or before COD of the Project to provide the TSP with the debt financing described in the capital structure schedule, and any successor banks or financial institutions to whom their interests under the Financing Agreements may be transferred or assigned;



Provided that, such assignment or transfer shall not relieve the TSP of its obligations to the Nodal Agency under this Agreement in any manner and shall also does not lead to an increase in the liability of the Nodal Agency;

"Lenders Representative" shall mean the person notified by the Lender(s) in writing as being the representative of the Lender(s) or the Security Trustee and such person may from time to time be replaced by the Lender(s) pursuant to the Financing Agreements by written notice to the TSP;

"Letter of Intent" or **"LOI"** shall have the same meaning as in the RFP;

"Member in a Bidding Consortium / Member" shall mean each company in the Bidding Consortium;

"Month" shall mean a period of thirty (30) days from (and excluding) the date of the event;

"Monthly Transmission Charges" for any Element of the Project, after COD of the Element till COD of the Project, and for the Project after COD of the Project, shall mean the amount of Transmission Charges as specified in Schedule 5 of this Agreement multiplied by no. of days in the relevant month and divided by no. of days in the year;

"National Load Despatch Centre" shall mean the centre established as per sub-section (1) of Section 26 of the Electricity Act 2003;

"**Nodal Agency**" shall mean CTU, which shall execute and implement the Transmission Service Agreement (TSA);

Provided that while taking major decisions, CTU shall consult CEA on technical matters and any other matter it feels necessary.

"Notification" shall mean any notification, issued in the Gazette of India;

"Operating Period" for any Element of the Project shall mean the period from (and including) the COD of such Element of the Project, up to (and including) the Expiry Date and for the Project, shall mean the period from (and including) the COD of the Project, up to (and including) the Expiry Date;

"Parent Company" shall mean an entity that holds at least twenty six percent (26%) of the paid - up equity capital directly or indirectly in the Bidding Company or in the Member in a Bidding Consortium, as the case may be;

"Preliminary Termination Notice" shall mean a Nodal Agency's Preliminary Termination Notice as defined in Article 13 of this Agreement;

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"Project" shall mean "Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C", as detailed in Schedule 1 of this Agreement;

"**Project Assets**" shall mean all physical and other assets relating to and forming part of the Project including:

(a) rights over the Site for substations, ROW for transmission lines;

(b) tangible & intangible assets such as civil works and equipment including foundations, embankments, pavements, electrical systems, communication systems, relief centres, administrative offices, Sub-stations, software, tower and sub-stations designs etc;

(c) project facilities situated on the Site;

(d) all rights of the TSP under the project agreements;

(e) financial assets, such as receivables, security deposits etc;

(f) insurance proceeds; and

(g) Applicable Permits and authorisations relating to or in respect of the Transmission System;"

"Project Execution Plan" shall mean the plan referred to in Article 3.1.3(c) hereof;

"Prudent Utility Practices" shall mean the practices, methods and standards that are generally accepted internationally from time to time by electric transmission utilities for the purpose of ensuring the safe, efficient and economic design, construction, commissioning, operation, repair and maintenance of the Project and which practices, methods and standards shall be adjusted as necessary, to take account of:

(i) operation, repair and maintenance guidelines given by the manufacturers to be incorporated in the Project,

(ii) the requirements of Law, and

(iii) the physical conditions at the Site;

(iv) the safety of operating personnel and human beings;

"Rated Voltage" shall mean voltage at which the Transmission System is designed to operate or such lower voltage at which the line is charged, for the time being, in consultation with the Central Transmission Utility;

"Rebate" shall have the meaning as ascribed to in Article 10.3 of this Agreement;



"RFP" shall mean Request For Proposal dated 26.07.2024 along with all schedules, annexures and RFP Project Documents attached thereto, issued by the BPC for tariff based competitive bidding process for selection of Bidder as TSP to execute the Project, including any modifications, amendments or alterations thereto;

"RFP Project Documents" shall mean the following documents to be entered into in respect of the Project, by the Parties to the respective agreements:

a. Transmission Service Agreement,

b. Share Purchase Agreement,

c. Agreement(s) required under Sharing Regulations and

d. Any other agreement as may be required;

"RLDC" shall mean the relevant Regional Load Dispatch Centre as defined in the Electricity Act, 2003, in the region(s) in which the Project is located;

"RPC" shall mean the relevant Regional Power Committee established by the Government of India for the specific Region(s) in accordance with the Electricity Act, 2003 for facilitating integrated operation of the Power System in that Region;

"Scheduled COD" in relation to an Element(s) shall mean the date(s) as mentioned in Schedule 2 as against such Element(s) and in relation to the Project, shall mean the date as mentioned in Schedule 2 as against such Project, subject to the provisions of Article 4.4 of this Agreement, or such date as may be mutually agreed among the Parties;

"Scheduled Outage" shall mean the final outage plan as approved by the RPC as per the provisions of the Grid Code;

"Selected Bid" shall mean the technical Bid and the Final Offer of the Selected Bidder submitted during e-reverse bidding, which shall be downloaded and attached in Schedule 7 on or prior to the Effective Date;

"Share Purchase Agreement" shall mean the agreement amongst **PFC Consulting Limited (PFCCL)**, KPS III HVDC TRANSMISSION LIMITED and the Successful Bidder for the purchase of one hundred (100%) per cent of the shareholding of the KPS III HVDC TRANSMISSION LIMITED for the Acquisition Price, by the Successful Bidder on the terms and conditions as contained therein;

"Sharing Regulations" shall mean the Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020 and as amended from time to time;



"Site" in relation to a substation, switching station or HVDC terminal or inverter station, shall mean the land and other places upon which such station / terminal is to be established;

"SLDC" shall mean the State Load Despatch Centre established as per sub-section (1) of Section 31 of the Electricity Act 2003;

"STU" or **"State Transmission Utility"** shall be the Board or the Government company, specified as such by the State Government under sub-section (1) of Section 39 of the Electricity Act 2003;

"Successful Bidder" or **"Selected Bidder"** shall mean the Bidder selected pursuant to the RFP and who has to acquire one hundred percent (100%) equity shares of KPS III HVDC TRANSMISSION LIMITED, along with all its related assets and liabilities, which will be responsible as the TSP to establish the Project on build, own, operate and transfer basis as per the terms of the TSA and other RFP Project Documents;

"TSP's Preliminary Notice" shall mean a notice issued by the TSP in pursuant to the provisions of Article 13.3 of this Agreement;

"Target Availability" shall have the meaning as ascribed hereto in Article 0 of this Agreement;

"Technically Evaluated Entity" shall mean the company which has been evaluated for the satisfaction of the technical requirement set forth in RFP;

"Termination Notice" shall mean a Nodal Agency's Termination Notice given by the Nodal Agency to the TSP pursuant to the provisions of Articles 3.3.1, 3.3.4, 4.4.2, 5.8, 13.2 and 13.3 of this Agreement for the termination of this Agreement;

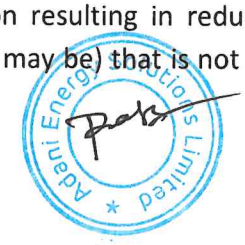
"Term of Agreement" for the purposes of this Agreement shall have the meaning ascribed thereto in Article 2.2 of this Agreement;

"Transmission Charges" shall mean the Final Offer of the Selected Bidder during the e-reverse bidding and adopted by the Commission, payable to the TSP as per Sharing Regulations;

"Transmission License" shall mean the license granted by the Commission in terms of the relevant regulations for grant of such license issued under the Electricity Act;

"Transmission Service" shall mean making the Project available as per the terms and conditions of this Agreement and Sharing Regulations;

"Unscheduled Outage" shall mean an interruption resulting in reduction of the Availability of the Element(s) / Project (as the case may be) that is not a result of a Scheduled Outage or a Force Majeure Event.



"Ultimate Parent Company" shall mean an entity which owns at least twenty six **percent** (26%) equity in the Bidding Company or Member of a Consortium, (as the case may be) and in the Technically Evaluated Entity and / or Financially Evaluated Entity (as the case may be) and such Bidding Company or Member of a Consortium, (as the case may be) and the Technically Evaluated Entity and / or Financially Evaluated Entity (as the case may be) shall be under the direct control or indirectly under the common control of such entity;

1.2 Interpretation:

Save where the contrary is indicated, any reference in this Agreement to:

"Agreement" shall be construed as including a reference to its Schedules, Appendices and Annexures;

"Rupee", **"Rupees"** and **"Rs."** shall denote lawful currency of India;

"crore" shall mean a reference to ten million (10,000,000) and a **"lakh"** shall mean a reference to one tenth of a million (1,00,000);

"encumbrance" shall be construed as a reference to a mortgage, charge, pledge, lien or other encumbrance securing any obligation of any person or any other type of preferential arrangement (including, without limitation, title transfer and retention arrangements) having a similar effect;

"holding company" of a company or corporation shall be construed as a reference to any company or corporation of which the other company or corporation is a subsidiary;

"indebtedness" shall be construed so as to include any obligation (whether incurred as principal or surety) for the payment or repayment of money, whether present or future, actual or contingent;

"person" shall have the meaning as defined in Section 2 (49) of the Act;

"subsidiary" of a company or corporation (the holding company) shall be construed as a reference to any company or corporation:

(i) which is controlled, directly or indirectly, by the holding company, or

(ii) more than half of the issued share capital of which is beneficially owned, directly or indirectly, by the holding company, or

(iii) which is a subsidiary of another subsidiary of the holding company,



for these purposes, a company or corporation shall be treated as being controlled by another if that other company or corporation is able to direct its affairs and/or to control the composition of its board of directors or equivalent body;

"winding-up", **"dissolution"**, **"insolvency"**, or **"reorganization"** in the context of a company or corporation shall have the same meaning as defined in the Companies Act, 1956/ Companies Act, 2013 (as the case may be).

1.2.1 Words importing the singular shall include the plural and vice versa.

1.2.2 This Agreement itself or any other agreement or document shall be construed as a reference to this or to such other agreement or document as it may have been, or may from time to time be, amended, varied, novated, replaced or supplemented.

1.2.3 A Law shall be construed as a reference to such Law including its amendments or re-enactments from time to time.

1.2.4 A time of day shall, save as otherwise provided in any agreement or document be construed as a reference to Indian Standard Time.

1.2.5 Different parts of this Agreement are to be taken as mutually explanatory and supplementary to each other and if there is any inconsistency between or among the parts of this Agreement, they shall be interpreted in a harmonious manner so as to give effect to each part.

1.2.6 The tables of contents and any headings or sub-headings in this Agreement have been inserted for ease of reference only and shall not affect the interpretation of this Agreement.

1.2.7 All interest payable under this Agreement shall accrue from day to day and be calculated on the basis of a year of three hundred and sixty five (365) days.

1.2.8 The words "hereof" or "herein", if and when used in this Agreement shall mean a reference to this Agreement.

1.2.9 The contents of Schedule 7 shall be referred to for ascertaining accuracy and correctness of the representations made by the Selected Bidder in Article 17.2.1 hereof.



ARTICLE: 2

2 EFFECTIVENESS AND TERM OF AGREEMENT

2.1 Effective Date:

This Agreement shall be effective from later of the dates of the following events:

The Selected Bidder, on behalf of the TSP, has provided the Contract Performance Guarantee, as per terms of Article 3.1 of this Agreement; and

The Selected Bidder has acquired for the Acquisition Price, one hundred percent (100%) of the equity shareholding of PFC Consulting Limited (PFCCL) in KPS III HVDC TRANSMISSION LIMITED along with all its related assets and liabilities as per the provisions of the Share Purchase Agreement. and

The Agreement is executed and delivered by the Parties;

2.2 Term and Termination:

2.2.1 Subject to Article 2.2.3 and Article 2.4, this Agreement shall continue to be effective in relation to the Project until the Expiry Date, when it shall automatically terminate.

2.2.2 Post the Expiry Date of this Agreement, the TSP shall ensure transfer of Project Assets to CTU or its successors or an agency as decided by the Central Government at zero cost and free from any encumbrance and liability. The transfer shall be completed within 90 days of expiry of this Agreement failing which CTU shall be entitled to take over the Project Assets Suo moto.

2.2.3 This Agreement shall terminate before the Expiry Date in accordance with Article 13 or Article 3.3.2 or Article 3.3.4.

2.3 Conditions prior to the expiry of the Transmission License

2.3.1 In order to continue the Project beyond the expiry of the Transmission License, the TSP shall be obligated to make an application to the Commission at least two (2) years before the date of expiry of the Transmission License, seeking the Commission's approval for the extension of the term of the Transmission License up to the Expiry Date.

2.3.2 The TSP shall timely comply with all the requirements that may be laid down by the Commission for extension of the term of the Transmission License beyond the initial term of twenty-five (25) years & upto the Expiry Date and the TSP shall keep the Nodal Agency fully informed about the progress on its application for extension of the term of the Transmission License.



2.4 Survival:

The expiry or termination of this Agreement shall not affect any accrued rights, obligations/ roles and liabilities of the Parties under this Agreement, including the right to receive liquidated damages as per the terms of this Agreement, nor shall it effect the survival of any continuing obligations/ roles for which this Agreement provides, either expressly or by necessary implication, which are to survive after the Expiry Date or termination including those under Articles 3.3.3, 3.3.5, Article 9.3 (Application of Insurance Proceeds), Article 11 (Force Majeure), Article 13 (Events of Default and Termination), Article 14 (Liability & Indemnification), Article 16 (Governing Law & Dispute Resolution), Article 19 (Miscellaneous).

2.5 Applicability of the provisions of this Agreement

2.5.1 For the purpose of Availability, Target Availability and the computation of Availability, Incentive, Penalty, the provisions provided in this Agreement shall apply and any future modifications in the relevant Rules and Regulations shall not be applicable for this Project.

2.5.2 For the purposes of this Agreement for ISTS systems developed under the tariff based competitive bidding framework, the provisions relating to the definitions (Availability and COD), Article 3 (Contract Performance Guarantee and Conditions Subsequent), Article 5 (Construction of the Project), Article 6 (Connection and Commissioning of the Project), Article 8 (Target Availability and calculation of Availability), Article 11 (Force Majeure), Article 12 (Change in Law), Article 13 (Event of Default), Article 14 (Indemnification), Article 15 (Assignment and Charges), Articles 16.1, 16.2 and 16.4 (Governing Laws and Dispute Resolution) and Article 17 (representation and warranties of the ISTS Licensee) of this agreement shall supersede the corresponding provisions under Sharing Regulations.

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ARTICLE: 3

3 CONDITIONS SUBSEQUENT

3.1 Satisfaction of conditions subsequent by the TSP

3.1.1 Within ten (10) days from the date of issue of Letter of Intent, the Selected Bidder, shall:

a. Provide the Contract Performance Guarantee, and
b. Acquire, for the Acquisition Price, one hundred percent (100%) equity shareholding of KPS III HVDC TRANSMISSION LIMITED from **PFC Consulting Limited (PFCCL)**, who shall sell to the Selected Bidder, the equity shareholding of KPS III HVDC TRANSMISSION LIMITED, along with all its related assets and liabilities.
c. Execute this Agreement;

The TSP shall, within five (5) working days from the date of acquisition of SPV by the Selected Bidder, undertake to apply to the Commission for the grant of Transmission License and for the adoption of tariff as required under section-63 of the Electricity Act.

The Selected Bidder, on behalf of the TSP, will provide to the **Central Transmission Utility of India Limited** (being the Nodal Agency) the Contract Performance Guarantee for an amount of **Rs. 477.48 Crore** (Rupees Four Hundred Seventy Seven crore and Fourty Eight Lakh Only)

3.1.2 The Contract Performance Guarantee shall be initially valid for a period up to three (3) months after the Scheduled COD of the Project and shall be extended from time to time to be valid for a period up to three (3) months after the COD of the Project. In case the validity of the Contract Performance Guarantee is expiring before the validity specified in this Article, the TSP shall, at least thirty (30) days before the expiry of the Contract Performance Guarantee, replace the Contract Performance Guarantee with another Contract Performance Guarantee or extend the validity of the existing Contract Performance Guarantee until the validity period specified in this Article.

3.1.3 The TSP agrees and undertakes to duly perform and complete the following activities within six (6) months from the Effective Date (except for c) below), unless such completion is affected due to any Force Majeure Event, or if any of the activities is specifically waived in writing by the Nodal Agency:

a. To obtain the Transmission License for the Project from the Commission;

b. To obtain the order for adoption of Transmission Charges by the Commission, as required under Section 63 of the Electricity Act 2003;

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c. To submit to the Nodal Agency, CEA & Independent Engineer, the Project Execution Plan, immediately after award of contract(s) and maximum within one hundred and twenty (120) days from the Effective Date. Also, an approved copy each of Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) would be submitted to Independent Engineer & Nodal Agency in the same time period. The TSP's Project Execution Plan should be in conformity with the Scheduled COD as specified in Schedule 2 of this Agreement, and shall bring out clearly the organization structure, time plan and methodology for executing the Project, award of major contracts, designing, engineering, procurement, shipping, construction, testing and commissioning to commercial operation;

d. To submit to the Nodal Agency, CEA & Independent Engineer a detailed bar (GANTT) chart of the Project outlining each activity (taking longer than one Month), linkages as well as durations;

e. To submit to the Nodal Agency, CEA & Independent Engineer detailed specifications of conductor meeting the functional specifications specified in RFP;

f. To achieve Financial Closure;

g. To provide an irrevocable letter to the Lenders duly accepting and acknowledging the rights provided to the Lenders under the provisions of Article 15.3 of this Agreement and all other RFP Project Documents;

h. To award the Engineering, Procurement and Construction contract ("EPC contract") for the design and construction of the Project and shall have given to such Contractor an irrevocable notice to proceed; and

i. To sign the Agreement(s) required, if any, under Sharing Regulations.

3.2 Recognition of Lenders' Rights by the Nodal Agency

3.2.1 The Nodal Agency hereby accepts and acknowledges the rights provided to the Lenders as per Article 15.3 of this Agreement and all other RFP Project Documents.

3.3 Consequences of non-fulfilment of conditions subsequent

3.3.1 If any of the conditions specified in Article 3.1.3 is not duly fulfilled by the TSP even within three (3) Months after the time specified therein, then on and from the expiry of such period and until the TSP has satisfied all the conditions specified in Article 3.1.3, the TSP shall, on a monthly basis, be liable to furnish to **Central Transmission Utility of India Limited (being the Nodal Agency)** additional Contract Performance Guarantee of **Rs. 47.75 Crore (Rupees Fourty Seven Crore and Seventy Five Lakh Only)** within two (2) Business Days of expiry of every such Month. Such additional Contract Performance Guarantee shall be provided to **Central Transmission Utility of India Limited (being the Nodal Agency)** in the manner provided in Article 3.1.1 and

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shall become part of the Contract Performance Guarantee and all the provisions of this Agreement shall be construed accordingly. **Central Transmission Utility of India Limited (being the Nodal Agency)** shall be entitled to hold and / or invoke the Contract Performance Guarantee, including such additional Contract Performance Guarantee, in accordance with the provisions of this Agreement.

3.3.2 Subject to Article 3.3.4, if:

(i) the fulfilment of any of the conditions specified in Article 3.1.3 is delayed beyond nine (9) Months from the Effective Date and the TSP fails to furnish additional Contract Performance Guarantee to the Nodal Agency in accordance with Article 3.3.1 hereof; or

(ii) the TSP furnishes additional Performance Guarantee to the Nodal Agency in accordance with Article 3.3.1 hereof but fails to fulfil the conditions specified in Article 3.1.3 within a period of twelve (12) months from the Effective Date,

the Nodal Agency shall have the right to terminate this Agreement, by giving a Termination Notice to the TSP, in writing, of at least seven (7) days, with a copy to CEA and the Lenders' Representative in order to enable the Lenders to exercise right of substitution in accordance with Article 15.3 of this Agreement.

3.3.3 If the Nodal Agency elects to terminate this Agreement as per the provisions of Article 3.3.1, the TSP shall be liable to pay to the Nodal Agency an amount of **Rs. 477.48** (Rupees Four Hundred Seventy Seven Crore and Fourty Eight Lakh only) as liquidated damages. The Nodal Agency shall be entitled to recover this amount of damages by invoking the Contract Performance Guarantee to the extent of liquidated damages, which shall be required by the Nodal Agency, and the balance shall be returned to TSP, if any.

It is clarified for removal of doubt that this Article shall survive the termination of this Agreement.

3.3.4 In case of inability of the TSP to fulfil the conditions specified in Article 3.1.3 due to any Force Majeure Event, the time period for fulfilment of the condition subsequent as mentioned in Article 3.1.3, may be extended for a period of such Force Majeure Event. Alternatively, if deemed necessary, this Agreement may be terminated by the Nodal Agency by giving a Termination Notice to the TSP, in writing, of at least seven (7) days, with a copy to CEA and the Lenders' Representative in order to enable the Lenders to exercise right of substitution in accordance with Article 15.3 of this Agreement and the Contract Performance Guarantee shall be returned as per the provisions of Article 6.5.1.



Provided, that due to the provisions of this Article 3.3.4, any increase in the time period for completion of conditions subsequent mentioned under Article 3.1.3, shall lead to an equal increase in the time period for the Scheduled COD. If the Scheduled COD is extended beyond a period of one hundred eighty (180) days due to the provisions of this Article 3.3.4, the TSP will be allowed to recover the interest cost during construction corresponding to the period exceeding one hundred eighty (180) days by adjustment in the Transmission Charges in accordance with Schedule 9.

3.3.5 Upon termination of this Agreement as per Articles 3.3.1 and 3.3.4, the Nodal Agency may take steps to bid out the Project again.

3.3.6 The Nodal agency, on the failure of the TSP to fulfil its obligations, if it considers that there are sufficient grounds for so doing, apart from invoking the Contract Performance Guarantee under para 3.3.3 may also initiate proceedings for blacklisting the TSP as per provisions of Article 13.2 of TSA.

3.4 Progress Reports

The TSP shall notify the Nodal Agency and CEA in writing at least once a Month on the progress made in satisfying the conditions subsequent in Articles 3.1.3.



ARTICLE: 4

4 DEVELOPMENT OF THE PROJECT

4.1 TSP's obligations in development of the Project:

Subject to the terms and conditions of this Agreement, the TSP at its own cost and expense shall observe, comply with, perform, undertake and be responsible:

a. for procuring and maintaining in full force and effect all Consents, Clearances and Permits, required in accordance with Law for development of the Project;

b. for financing, constructing, owning and commissioning each of the Element of the Project for the scope of work set out in Schedule 1 of this Agreement in accordance with:

i. the Electricity Act and the Rules made thereof;

ii. the Grid Code;

iii. the CEA Regulations applicable, and as amended from time to time, for Transmission Lines and sub-stations:

- the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007;
- Central Electricity Authority (Technical Standards for construction of Electrical Plants and Electric Lines) Regulation, 2010;
- Central Electricity Authority (Grid Standard) Regulations, 2010;
- Central Electricity Authority (Safety requirements for construction, operation and maintenance of Electrical Plants and Electrical Lines) Regulation, 2011;
- Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulation, 2010;
- Central Electricity Authority (Technical Standards for Communication System in Power System Operation) Regulations, 2020.

iv. Safety/ security Guidelines laid down by the Government;

v. Prudent Utility Practices, relevant Indian Standards and the Law;

not later than the Scheduled COD as per Schedule 2 of this Agreement;

c. for entering into a Connection Agreement with the concerned parties in accordance with the Grid Code.

d. for owning the Project throughout the term of this Agreement free and clear of any encumbrances except those expressly permitted under Article 15 of this Agreement;

e. to co-ordinate and liaise with concerned agencies and provide on a timely basis

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relevant information with regard to the specifications of the Project that may be required for interconnecting the Project with the Interconnection Facilities;

f. for providing all assistance to the Arbitrators as they may require for the performance of their duties and responsibilities;

g. to provide to the Nodal Agency and CEA, on a monthly basis, progress reports with regard to the Project and its execution (in accordance with prescribed form) to enable the CEA to monitor and co-ordinate the development of the Project matching with the Interconnection Facilities;

h. to comply with Ministry of Power order no. 25-11/6/2018 – PG dated 02.07.2020 as well as other Guidelines issued by Govt. of India pertaining to this;

i. to procure the products associated with the Transmission System as per provisions of Public Procurement (Preference to Make in India) orders issued by Ministry of Power vide orders No. 11/5/2018 - Coord. dated 28.07.2020 for transmission sector, as amended from time to time read with Department for Promotion of Industry and Internal Trade (DPIIT) orders in this regard (Procuring Entity as defined in above orders shall deemed to have included Selected Bidder and/ or TSP).

Also, to comply with Department of Expenditure, Ministry of Finance vide Order (Public Procurement No 1) bearing File No. 6/18/2019-PPD dated 23.07.2020, Order (Public Procurement No 2) bearing File No. 6/18/2019-PPD dated 23.07.2020 and Order (Public Procurement No. 3) bearing File No. 6/18/2019-PPD, dated 24.07.2020, as amended from time to time, regarding public procurement from a bidder of a country, which shares land border with India;

j. to submit to Nodal Agency information in the prescribed format [To be devised by Nodal Agency] for ensuring compliance to Article 4.1 i) above.

k. to comply with all its obligations undertaken in this Agreement.

4.2 Roles of the Nodal Agency in implementation of the Project:

4.2.1 Subject to the terms and conditions of this Agreement, the Nodal Agency shall be the holder and administrator of this Agreement and shall inter alia:

a. appoint an Independent Engineer within 90 days of the Effective Date

b. provide letters of recommendation to the concerned Indian Governmental Instrumentality, as may be requested by the TSP from time to time, for obtaining the Consents, Clearances and Permits required for the Project;

c. coordinate among TSP and upstream/downstream entities in respect of Interconnection Facilities; and

d. monitor the implementation of the Agreement and take appropriate action for breach thereof including revocation of guarantees, cancellation of Agreement, blacklisting etc



e. provide all assistance to the Arbitrators as required for the performance of their duties and responsibilities; and
f. perform any other responsibility (ies) as specified in this Agreement.

4.3 Time for Commencement and Completion:

a. The TSP shall take all necessary steps to commence work on the Project from the Effective Date of the Agreement and shall achieve Scheduled COD of the Project in accordance with the time schedule specified in Schedule 2 of this Agreement;
b. The COD of each Element of the Project shall occur no later than the Scheduled COD or within such extended time to which the TSP shall be entitled under Article 4.4 hereto.

4.4 Extension of time:

4.4.1 In the event that the TSP is unable to perform its obligations for the reasons solely attributable to the Nodal Agency, the Scheduled COD shall be extended, by a 'day to day' basis, subject to the provisions of Article 13.

4.4.2 In the event that an Element or the Project cannot be commissioned by its Scheduled COD on account of any Force Majeure Event as per Article 11, the Scheduled COD shall be extended, by a 'day to day' basis for a period of such Force Majeure Event. Alternatively, if deemed necessary, the Nodal Agency may terminate the Agreement as per the provisions of Article 13.4 by giving a Termination Notice to the TSP, in writing, of at least seven (7) days, with a copy to CEA and the Lenders' Representative in order to enable the Lenders to exercise right of substitution in accordance with Article 15.3 of this Agreement.

4.4.3 If the Parties have not agreed, within thirty (30) days after the affected Party's performance has ceased to be affected by the relevant circumstance, on how long the Scheduled COD should be deferred by, any Party may raise the Dispute to be resolved in accordance with Article 16.

4.5 Metering Arrangements:

4.5.1 The TSP shall comply with all the provisions of the IEGC and the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 as amended from time to time, with regard to the metering arrangements for the Project. The TSP shall fully cooperate with the CTU / STU / RLDC and extend all necessary assistance in taking meter readings.

4.6 Interconnection Facilities:

4.6.1 Subject to the terms and conditions of this Agreement, the TSP shall be responsible for connecting the Project with the interconnection point(s) specified in Schedule 1 of

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this Agreement. The Interconnection Facilities shall be developed as per the scope of work and responsibilities assigned in Schedule 1 of this Agreement. The Nodal Agency shall be responsible for coordinating to make available the Interconnection Facilities.

4.6.2 In order to remove any doubts, it is made clear that the obligation of the TSP within the scope of the project is to construct the Project as per Schedule-1 of this Agreement and in particular to connect it to the Interconnection Facilities as specified in this Agreement.



ARTICLE: 5

5 CONSTRUCTION OF THE PROJECT

5.1 TSP's Construction Responsibilities:

5.1.1 The TSP, at its own cost and expense, shall be responsible for designing, constructing, erecting, testing and commissioning each Element of the Project by the Scheduled COD in accordance with the Regulations and other applicable Laws specified in Article 4.1 of this Agreement.

5.1.2 The TSP acknowledges and agrees that it shall not be relieved from any of its obligations under this Agreement or be entitled to any extension of time or any compensation whatsoever by reason of the unsuitability of the Site or Transmission Line route(s).

5.1.3 The TSP shall be responsible for obtaining all Consents, Clearances and Permits related but not limited to road / rail / river / canal / power line / crossings, Power and Telecom Coordination Committee (PTCC), defence, civil aviation, right of way / way-leaves and environmental & forest clearances from relevant authorities required for developing, financing, constructing, maintaining/ renewing all such Consents, Clearances and Permits in order to carry out its obligations under this Agreement in general and shall furnish to the Nodal Agency such copy/ies of each Consents, Clearances and Permits, on demand. Nodal Agency shall provide letters of recommendation to the concerned Indian Governmental Instrumentality, as may be requested by the TSP from time to time, for obtaining the Consents, Clearances and Permits required for the Project.

5.1.4 The TSP shall be responsible for:

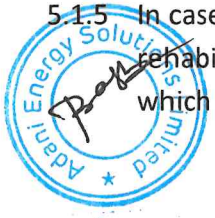
a) acquisition of land for location specific substations, switching stations or HVDC terminal or inverter stations. Also, the actual location of substations, switching stations or HVDC terminal or inverter stations shall not be beyond 1 Km radius of the location proposed by the BPC in the survey report;

b) final selection of Site including its geo-technical investigation;

c) survey and geo-technical investigation of line route in order to determine the final route of the Transmission Lines;

d) seeking access to the Site and other places where the Project is being executed, at its own risk and costs, including payment of any crop, tree compensation or any other compensation as may be required.

5.1.5 In case the Project involves any resettlement and rehabilitation, the resettlement and rehabilitation package will be implemented by the State Government authorities, for which the costs is to be borne by the TSP and no changes would be allowed in the



Transmission Charges on account of any variation in the resettlement and rehabilitation cost. The TSP shall provide assistance on best endeavour basis, in implementation of the resettlement and rehabilitation package, if execution of such package is in the interest of expeditious implementation of the Project and is beneficial to the Project affected persons.

5.2 Appointing Contractors:

5.2.1 The TSP shall conform to the requirements as provided in this Agreement while appointing Contractor(s) for procurement of goods & services.

5.2.2 The appointment of such Contractor(s) shall neither relieve the TSP of any of its obligations under this Agreement nor make the Nodal Agency liable for the performance of such Contractor(s).

5.3 Monthly Progress Reporting:

The TSP shall provide to the CEA, Nodal Agency & Independent Engineer, on a monthly basis, progress reports along with likely completion date of each Element with regard to the Project and its execution (in accordance with prescribed form). The Nodal Agency/ CEA shall monitor the development of the Project for its timely completion for improving and augmenting the electricity system as a part of its statutory responsibility.

5.4 Quality of Workmanship:

The TSP shall ensure that the Project is designed, built and completed in a good workmanship using sound engineering and construction practices, and using only materials and equipment that are new and manufactured as per the MQP and following approved FQP for erection, testing & commissioning and complying with Indian /International Standards such that, the useful life of the Project will be at least thirty five (35) years from the COD of the Project.

The TSP shall ensure that all major substation equipment / component (e.g. transformers, reactors, Circuit Breakers, Instrument Transformers (IT), Surge Arresters (SA), Protection relays, clamps & connectors etc.), equipment in terminal stations of HVDC installations including Thyristor/ IGBT valves, Converter Transformers, smoothing reactors, Transformer bushings and wall bushings, GIS bus ducts, towers and gantry structures and transmission towers or poles and line materials (conductors, earthwire, OPGW, insulator, accessories for conductors, OPGW & earthwires, hardware fittings for insulators, aviation lights etc), facilities and system shall be designed, constructed and tested (Type test, Routine tests, Factory Acceptance Test (FAT)) in accordance with relevant CEA Regulations and Indian Standards. In case Indian Standards for any particular equipment/ system/ process is not available, IEC/ IEEE or equivalent International Standards and Codes shall be followed.

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5.5 Progress Monitoring & Quality Assurance:

5.5.1 The Project Execution Plan submitted by the TSP in accordance with Article 3.1.3 c) shall comprise of detailed schedule of all the equipments/items /materials required for the Project, right from procurement of raw material till the dispatch from works and receipt at the site. Further, it should also include various stages of the construction schedule up to the commissioning of the Project.

5.5.2 Nodal Agency, CEA & Independent Engineer shall have access at all reasonable times to the Site and to the Manufacturer's works and to all such places where the Project is being executed.

5.5.3 Independent Engineer shall ensure conformity of the conductor specifications with the functional specifications specified in RFP.

5.5.4 The Independent Engineer shall monitor the following during construction of the Project:

a) Quality of equipments, material, foundation, structures and workmanship etc. as laid down in Article 5.4 and 6.1.4 of the TSA. Specifically, quality of Sub-station equipments, transmission line material and workmanship etc. would be checked in accordance with the Article 5.4.
b) Progress in the activities specified in Condition Subsequent
c) Verification of readiness of the elements including the statutory clearances & completion of civil works, fixing of all components and finalisation of punch points (if any) prior to charging of the elements
d) Progress of construction of substation and Transmission Lines

5.5.5 The progress shall be reviewed by the Independent Engineer against the Project Execution Plan. The Independent Engineer shall prepare its report on monthly basis and submit the same to Nodal Agency highlighting the progress achieved till the end of respective month vis-à-vis milestone activities, areas of concern, if any, which may result in delay in the timely completion of the Project. Based on the progress, Nodal Agency and/ or CEA shall issue written instructions to the TSP to take corrective measures, as may be prudent for the timely completion of the Project. In case of any deficiency, the Nodal Agency would be at liberty to take action in accordance with the procedure of this Agreement.

5.5.6 For any delay in commissioning any critical Element(s), as identified in Schedule 1 & Schedule 2 of this Agreement, beyond a period of 45 days shall lead to a sequestration of 10% of the Contract Performance Guarantee.



5.6 Site regulations and Construction Documents

The TSP shall abide by the Safety Rules and Procedures as mentioned in Schedule 3 of this Agreement

The TSP shall retain at the Site and make available for inspection at all reasonable times, copies of the Consents, Clearances and Permits, construction drawings and other documents related to construction.

5.7 Supervision of work:

The TSP shall provide all necessary superintendence for execution of the Project and its supervisory personnel shall be available to provide full-time superintendence for execution of the Project. The TSP shall provide skilled personnel who are experienced in their respective fields.

5.8 Remedial Measures:

The TSP shall take all necessary actions for remedying the shortfall in achievement of timely progress in execution of the Project, if any, as intimated by the Independent Engineer and/ or CEA and/ or the Nodal Agency. However, such intimation by the Independent Engineer and/ or CEA and/ or the Nodal Agency and the subsequent effect of such remedial measures carried out by the TSP shall not relieve the TSP of its obligations in the Agreement. Independent Engineer and/ or CEA and/ or the Nodal Agency may carry out random inspections during the Project execution, as and when deemed necessary by it. If the shortfalls as intimated to the TSP are not remedied to the satisfaction of the CEA and/ or the Nodal Agency, this Agreement may be terminated by the Nodal Agency by giving a Termination Notice to the TSP, in writing, of at least seven (7) days, with a copy to CEA and the Lenders' Representative in order to enable the Lenders to exercise right of substitution in accordance with Article 15.3 of this Agreement .



ARTICLE: 6

6 CONNECTION AND COMMISSIONING OF THE PROJECT

6.1 Connection with the Inter-Connection Facilities:

6.1.1 The TSP shall give the RLDC(s), CTU, / STU, as the case may be, and any other agencies as required, at least sixty (60) days advance written notice of the date on which it intends to connect an Element of the Project, which date shall not be earlier than its Scheduled COD or Schedule COD extended as per Article 4.4.1 & 4.4.2 of this Agreement, unless mutually agreed to by Parties. Further, any preponing of COD of any element prior to Scheduled COD must be approved by the Nodal Agency.

6.1.2 The RLDC / SLDC (as the case may be) or the CTU / STU (as the case may be), for reasonable cause, including non-availability of Interconnection Facilities as per Article 4.2, can defer the connection for up to fifteen (15) days from the date notified by the TSP pursuant to Article 6.1.1, if it notifies to the TSP in writing, before the date of connection, of the reason for the deferral and when the connection is to be rescheduled. However, no such deferment on one or more occasions would be for more than an aggregate period of thirty (30) days. Further, the Scheduled COD would be extended as required, for all such deferments on "day to day" basis.

6.1.3 Subject to Articles 6.1.1 and 6.1.2, any Element of Project may be connected with the Interconnection Facilities when:

a) it has been completed in accordance with this Agreement and the Connection Agreement;
b) it meets the Grid Code, Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 as amended from time to time and all other Indian legal requirements, and
c) The TSP has obtained the approval in writing of the Electrical Inspector certifying that the Element is ready from the point of view of safety of supply and can be connected with the Interconnection Facilities.

6.1.4 It has satisfactorily met all the testing requirements as per Articles 6.1.4

6.1.5 Site Acceptance Test (SAT)/ pre-commissioning tests of all major substation equipment, component, system, facilities shall be successfully carried out before commissioning. The Type tests, FAT and SAT reports should be available at the substation / terminal station of HVDC installations for ready reference of operation and maintenance staff and has to be made available to the Independent Engineer appointed for quality monitoring or their authorised representatives, as and when they wish to examine the same.



6.2 Commercial Operation:

6.2.1 An Element of the Project shall be declared to have achieved COD twenty four (24) hours following the connection of the Element with the Interconnection Facilities pursuant to Article 6.1 or seven (7) days after the date on which it is declared by the TSP to be ready for charging but is not able to be charged for reasons not attributable to the TSP subject to Article 6.1.2.

Provided that an Element shall be declared to have achieved COD only after all the Element(s), if any, which are pre-required to have achieved COD as defined in Schedule 2 of this Agreement, have been declared to have achieved their respective COD.

6.2.2 Once any Element of the Project has been declared to have achieved deemed COD as per Article 6.2.1 above, such Element of the Project shall be deemed to have Availability equal to the Target Availability till the actual charging of the Element and to this extent, TSP shall be eligible for the Monthly Transmission Charges applicable for such Element

6.3 Compensation for Direct Non Natural Force Majeure Event or Indirect Non Natural Force Majeure Event or Natural Force Majeure Event (affecting the Nodal Agency)

6.3.1 If the TSP is otherwise ready to connect the Element(s) of the Project and has given due notice, as per provisions of Article 6.1.1, to the concerned agencies of the date of intention to connect the Element(s) of the Project, where such date is not before the Scheduled COD, but is not able to connect the Element(s) of the Project by the said date specified in the notice, due to Direct Non Natural Force Majeure Event or Indirect Non Natural Force Majeure Event or Natural Force Majeure Event affecting the Nodal Agency, provided such Direct Non Natural Force Majeure Event or Indirect Non Natural Force Majeure Event or Natural Force Majeure Event affecting the Nodal Agency has continued for a period of more than three (3) continuous or non-continuous Months, the TSP shall, until the effects of the Direct Non Natural Force Majeure Event or of Indirect Non Natural Force Majeure Event or Natural Force Majeure Event affecting the Nodal Agency no longer prevent the TSP from connecting the Element(s) of the Project, be deemed to have achieved COD relevant to that date and to this extent, be deemed to have been providing Transmission Service with effect from the date notified, and shall be treated as follows:

a) In case of delay due to Direct Non Natural Force Majeure Event, TSP is entitled for Transmission Charges calculated on Target Availability for the period of such events in excess of three (3) continuous or non continuous Months in the manner provided in (c) below.

b) In case of delay due to Indirect Non Natural Force Majeure Event or Natural Force Majeure Event affecting the Nodal Agency, TSP is entitled for payment for debt service which is due under the Financing Agreements, subject to a

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maximum of Transmission Charges calculated on Target Availability, for the period of such events in excess of three (3) continuous or non continuous Months in the manner provided in (c) below.

c) In case of delay due to Direct Non Natural Force Majeure Event or Indirect Non Natural Force Majeure Event or Natural Force Majeure Event affecting the Nodal Agency, the TSP is entitled for payments mentioned in (a) and (b) above, after commencement of Transmission Service, in the form of an increase in Transmission Charges. These amounts shall be paid from the date, being the later of a) the date of cessation of such Indirect Non Natural Force Majeure Event or Natural Force Majeure Event affecting the Nodal Agency and b) the completion of sixty (60) days from the receipt of the Financing Agreements by the Nodal Agency from the TSP.

Provided such increase in Transmission Charges shall be so as to put the TSP in the same economic position as the TSP would have been in case the TSP had been paid amounts mentioned in (a) and (b) above in a situation where the Force Majeure Event had not occurred.

For the avoidance of doubt, it is clarified that the charges payable under this Article 6.3.1 shall be recovered as per Sharing Regulations.

6.4 Liquidated Damages for Delay in achieving COD of Project:

6.4.1 If the TSP fails to achieve COD of any Element of the Project or the Project, by the Element's / Project's Scheduled COD or such Scheduled COD as extended under Articles 4.4.1 and 4.4.3, then the TSP shall pay to the Nodal Agency, a sum equivalent to 3.33% of Monthly Transmission Charges applicable for the Element of the Project [in case where no Elements have been defined, to be on the Project as a whole] / Project, for each day of delay up to sixty (60) days of delay and beyond that time limit, at the rate of five percent (5%) of the Monthly Transmission Charges applicable to such Element / Project, as liquidated damages for such delay and not as penalty, without prejudice to any rights of the Nodal Agency under the Agreement.

6.4.2 The TSP's maximum liability under this Article 6.4 shall be limited to the amount of liquidated damages calculated in accordance with Article 6.4.1 for and up to six (6) months of delay for the Element or the Project.

Provided that, in case of failure of the TSP to achieve COD of the Element of the Project even after the expiry of six (6) months from its Scheduled COD, the provisions of Article 13 shall apply.

6.4.3 The TSP shall make payment to the Nodal Agency of the liquidated damages calculated pursuant to Article 6.4.1 within ten (10) days of the earlier of:

a) the date on which the applicable Element achieves COD; or

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b) the date of termination of this Agreement.

The payment of such damages shall not relieve the TSP from its obligations to complete the Project or from any other obligation and liabilities under the Agreement.

6.4.4 If the TSP fails to pay the amount of liquidated damages to the Nodal Agency within the said period of ten (10) days, the Nodal Agency shall be entitled to recover the said amount of the liquidated damages by invoking the Contract Performance Guarantee. If the then existing Contract Performance Guarantee is for an amount which is less than the amount of the liquidated damages payable by the TSP to the Nodal Agency under this Article 6.3 and the TSP fails to make payment of the balance amount of the liquidated damages not covered by the Contract Performance Guarantee, then such balance amount shall be deducted from the Transmission Charges payable to the TSP. The right of the Nodal Agency to encash the Contract Performance Guarantee is without prejudice to the other rights of the Nodal Agency under this Agreement.

6.4.5 For avoidance of doubt, it is clarified that amount payable by TSP under this Article is over and above the penalty payable by TSP under Article 5.5.6 of this Agreement.

6.5 Return of Contract Performance Guarantee

6.5.1 The Contract Performance Guarantee as submitted by TSP in accordance with Article 3.1.1 shall be released by the Nodal Agency within three (3) months from the COD of the Project. In the event of delay in achieving Scheduled COD of any of the Elements by the TSP (otherwise than due to reasons as mentioned in Article 3.1.3 or Article 11) and consequent part invocation of the Contract Performance Guarantee by the Nodal Agency, Nodal Agency shall release the Contract Performance Guarantee, if any remaining unadjusted, after the satisfactory completion by the TSP of all the requirements regarding achieving the Scheduled COD of the remaining Elements of the Project. It is clarified that the Nodal Agency shall also return / release the Contract Performance Guarantee in the event of (i) applicability of Article 3.3.1 to the extent the Contract Performance Guarantee is valid for an amount in excess of **Rs 477.48** Crore (Rupees Four Hundred Seventy Seven crore and Fourty- Eight Lakh Only), or (ii) termination of this Agreement by the Nodal Agency as mentioned under Article 3.3.4 of this Agreement.

6.5.2 The release of the Contract Performance Guarantee shall be without prejudice to other rights of the Nodal Agency under this Agreement.



ARTICLE: 7

7 OPERATION AND MAINTENANCE OF THE PROJECT

7.1 Operation and Maintenance of the Project:

The TSP shall be responsible for ensuring that the Project is operated and maintained in accordance with the regulations made by the Commission and CEA from time to time and provisions of the Act.



ARTICLE: 8

8 AVAILABILITY OF THE PROJECT

8.1 Calculation of Availability of the Project:

Calculation of Availability for the Elements and for the Project, as the case may be, shall be as per **Appendix –IV to Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024,** as applicable on the Bid Deadline and as appended in Schedule 6 of this Agreement.

8.2 Target Availability:

The Target Availability of each Element and the Project shall be **98%.**

Payment of monthly Transmission charges based on actual availability will be calculated as per para 1.2 of Schedule 4 of this Agreement.

If the availability of any Element or the Project is below the Target Availability, for six consecutive months in a Contract Year, the DIC(s) or the Nodal Agency may issue a show cause notice to the TSP, asking them to show cause as to why the Transmission Service Agreement be not terminated, and if no satisfactory cause is shown it may terminate the Agreement. If the Nodal Agency is of the opinion that the transmission system is of critical importance, it may carry out or cause to carry the operation and maintenance of transmission system at the risk and cost of TSP.



ARTICLE: 9

9 INSURANCES

9.1 Insurance:

9.1.1 The TSP shall effect and maintain or cause to be effected and maintained during the Construction Period and the Operating Period, adequate Insurances against such risks, with such deductibles including but not limited to any third party liability and endorsements and co-beneficiary/insured, as may be necessary under

a. any of the Financing Agreements,

b. the Laws, and

c. in accordance with Prudent Utility Practices.

The Insurances shall be taken effective from a date prior to the date of the Financial Closure till the Expiry Date.

9.2 Evidence of Insurance cover:

9.2.1 The TSP shall furnish to the Nodal Agency copies of certificates and policies of the Insurances, as and when the Nodal Agency may seek from the TSP as per the terms of Article 9.1

9.3 Application of Insurance Proceeds:

9.3.1 Save as expressly provided in this Agreement, the policies of Insurances and the Financing Agreements, the proceeds of any insurance claim made due to loss or damage to the Project or any part of the Project shall be first applied to reinstatement, replacement or renewal of such loss or damage.

9.3.2 If a Natural Force Majeure Event renders the Project no longer economically and technically viable and the insurers under the Insurances make payment on a "total loss" or equivalent basis, the portion of the proceeds of such Insurance available to the TSP (after making admissible payments to the Lenders as per the Financing Agreements) shall be allocated only to the TSP. Nodal Agency and / or concerned Designated ISTS Customers shall have no claim on such proceeds of the Insurance.

9.3.3 Subject to the requirements of the Lenders under the Financing Agreements, any dispute or difference between the Parties as to whether the Project is no longer economically and technically viable due to a Force Majeure Event or whether that event was adequately covered in accordance with this Agreement by the Insurances shall be determined in accordance with Article 16.



9.4 Effect on liability of the Nodal Agency / Designated ISTS Customers

9.4.1 The Nodal Agency and / or the Designated ISTS Customers shall have no financial obligations or liability whatsoever towards the TSP in respect of this Article 9.



ARTICLE: 10

10 BILLING AND PAYMENT OF TRANSMISSION CHARGES

10.1 Subject to provisions of this Article 10, the Monthly Transmission Charges shall be paid to the TSP, in Indian Rupees, on monthly basis as per the provisions of the Sharing Regulations, from the date on which an Element(s) has achieved COD until the Expiry Date of this Agreement, unless terminated earlier and in line with the provisions of Schedule 4 of this Agreement.

10.2 Calculation of Monthly Transmission Charges:

The Monthly Transmission Charges for each Contract Year including Incentive & Penalty payment shall be calculated in accordance with the provisions of Schedule 4 of this Agreement.

10.3 Rebate & Late Payment Surcharge:

The rebate and late payment surcharge shall be governed as per Sharing Regulations.

10.4 Disputed Bills, Default in payment by the Designated ISTS Customers & Annual Reconciliation:

Any Disputed Bill, Default in payment by the Designated ISTS Customers & Annual Reconciliation shall be governed as per Sharing Regulations.



ARTICLE: 11

11 FORCE MAJEURE

11.1 Definitions

11.1.1 The following terms shall have the meanings given hereunder.

11.2 Affected Party

11.2.1 An Affected Party means any Party whose performance has been affected by an event of Force Majeure.

11.2.2 Any event of Force Majeure shall be deemed to be an event of Force Majeure affecting the TSP only if the Force Majeure event affects and results in, late delivery of machinery and equipment for the Project or construction, completion, commissioning of the Project by Scheduled COD and/or operation thereafter;

11.3 Force Majeure

A 'Force Majeure' means any event or circumstance or combination of events and circumstances including those stated below that wholly or partly prevents or unavoidably delays an Affected Party in the performance of its obligations/ roles under this Agreement, but only if and to the extent that such events or circumstances are not within the reasonable control, directly or indirectly, of the Affected Party and could not have been avoided if the Affected Party had taken reasonable care or complied with Prudent Utility Practices:

a) Natural Force Majeure Events:

i. act of God, including, but not limited to drought, fire and explosion (to the extent originating from a source external to the Site), earthquake, volcanic eruption, landslide, flood, cyclone, typhoon, tornado, or exceptionally adverse weather conditions, which are in excess of the statistical measures for the last hundred (100) years; and

ii. epidemic/ pandemic notified by Indian Governmental Instrumentality.

b) Non-Natural Force Majeure Events :

i. Direct Non–Natural Force Majeure Events

- Nationalization or compulsory acquisition by any Indian Governmental Instrumentality of any material assets or rights of the Affected Party; or

- the unlawful, unreasonable or discriminatory revocation of, or refusal to renew, any Consents, Clearances and Permits required by the Affected Party to perform their obligations/ roles under the RFP Project Documents or any

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unlawful, unreasonable or discriminatory refusal to grant any other Consents, Clearances and Permits required for the development/ operation of the Project, provided that a Competent Court of Law declares the revocation or refusal to be unlawful, unreasonable and discriminatory and strikes the same down; or

- any other unlawful, unreasonable or discriminatory action on the part of an Indian Governmental Instrumentality which is directed against the Project, provided that a Competent Court of Law declares the action to be unlawful, unreasonable and discriminatory and strikes the same down.

ii. Indirect Non - Natural Force Majeure Events

- act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, revolution, riot, insurrection, terrorist or military action; or

- radio active contamination or ionising radiation originating from a source in India or resulting from any other Indirect Non Natural Force Majeure Event mentioned above, excluding circumstances where the source or cause of contamination or radiation is brought or has been brought into or near the Site by the Affected Party or those employed or engaged by the Affected Party; or

- industry-wide strikes and labour disturbances, having a nationwide impact in India.

11.4 Force Majeure Exclusions

11.4.1 Force Majeure shall not include (i) any event or circumstance which is within the reasonable control of the Parties and (ii) the following conditions, except to the extent that they are consequences of an event of Force Majeure:

a) Unavailability, late delivery, or changes in cost of the machinery, equipment, materials, spare parts etc. for the Project;

b) Delay in the performance of any Contractors or their agents;

c) Non-performance resulting from normal wear and tear typically experienced in transmission materials and equipment;

d) Strikes or labour disturbance at the facilities of the Affected Party;

e) Insufficiency of finances or funds or the Agreement becoming onerous to perform; and

f) Non-performance caused by, or connected with, the Affected Party's:

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i. negligent or intentional acts, errors or omissions;

ii. failure to comply with an Indian Law; or

iii. breach of, or default under this Agreement or any Project Documents.

g) Any error or omission in the survey report provided by BPC during the bidding process.

11.5 Notification of Force Majeure Event

11.5.1 The Affected Party shall give notice to the other Party of any event of Force Majeure as soon as reasonably practicable, but not later than seven (7) days after the date on which such Party knew or should reasonably have known of the commencement of the event of Force Majeure. If an event of Force Majeure results in a breakdown of communications rendering it unreasonable to give notice within the applicable time limit specified herein, then the Party claiming Force Majeure shall give such notice as soon as reasonably practicable after reinstatement of communications, but not later than one (1) day after such reinstatement.

Provided that, such notice shall be a pre-condition to the Affected Party's entitlement to claim relief under this Agreement. Such notice shall include full particulars of the event of Force Majeure, its effects on the Party claiming relief and the remedial measures proposed. The Affected Party shall give the other Party regular reports on the progress of those remedial measures and such other information as the other Party may reasonably request about the Force Majeure.

11.5.2 The Affected Party shall give notice to the other Party of (i) the cessation of the relevant event of Force Majeure; and (ii) the cessation of the effects of such event of Force Majeure on the performance of its rights or obligations/ roles under this Agreement, as soon as practicable after becoming aware of each of these cessations.

11.6 Duty to perform and duty to mitigate

To the extent not prevented by a Force Majeure Event, the Affected Party shall continue to perform its obligations/ roles as provided in this Agreement. The Affected Party shall use its reasonable efforts to mitigate the effect of any event of Force Majeure as soon as practicable.

11.7 Available Relief for a Force Majeure Event

Subject to this Article 11,

a) no Party shall be in breach of its obligations/ roles pursuant to this Agreement to the extent that the performance of its obligations/ roles was prevented, hindered or delayed due to a Force Majeure Event;



b) each Party shall be entitled to claim relief for a Force Majeure Event affecting its performance in relation to its obligations/ roles under Articles 3.3.4, 4.4.2 and 6.3.1 of this Agreement.

c) For the avoidance of doubt, it is clarified that the computation of Availability of the Element(s) under outage due to Force Majeure Event, as per Article 11.3 affecting the TSP shall be as per **Appendix –IV to Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024** as on Bid Deadline. For the event(s) for which the Element(s) is/are deemed to be available as per **Appendix –IV to Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024**, then the Transmission Charges, as applicable to such Element(s), shall be payable as per Schedule 4, for the duration of such event(s).

d) For so long as the TSP is claiming relief due to any Force Majeure Event under this Agreement, the Nodal Agency may, if it so desires, from time to time on one (1) day notice, inspect the Project and the TSP shall provide the Nodal Agency's personnel with access to the Project to carry out such inspections.

e) For avoidance of doubt, the TSP acknowledges that for extension of Scheduled COD a period up to one hundred eighty (180) days due to Force Majeure event, no compensation on the grounds such as interest cost, incident expenditure, opportunity cost will be made to the TSP. However, if Scheduled COD is extended beyond a period of one hundred eighty (180) days due to Force Majeure event, the TSP will be allowed to recover the interest cost during construction corresponding to the period exceeding one hundred eighty (180) days by adjustment in the Transmission Charges in accordance with Schedule 9.



ARTICLE: 12

12 CHANGE IN LAW

12.1 Change in Law

12.1.1 Change in Law means the occurrence of any of the following after the Bid Deadline resulting into any additional recurring / non-recurring expenditure by the TSP or any savings of the TSP:

- the enactment, coming into effect, adoption, promulgation, amendment, modification or repeal (without re-enactment or consolidation) in India, of any Law, including rules and regulations framed pursuant to such Law, subject to the provisions under Article 12.1.2;
- a change in the interpretation or application of any Law by any Indian Governmental Instrumentality having the legal power to interpret or apply such Law, or any Competent Court of Law;
- the imposition of a requirement for obtaining any Consents, Clearances and Permits which was not required earlier;
- a change in the terms and conditions prescribed for obtaining any Consents, Clearances and Permits or the inclusion of any new terms or conditions for obtaining such Consents, Clearances and Permits;
- any change in the licensing regulations of the Commission, under which the Transmission License for the Project was granted if made applicable by such Commission to the TSP;
- change in wind zone; or
- any change in tax or introduction of any tax made applicable for providing Transmission Service by the TSP as per the terms of this Agreement.

12.1.2 Notwithstanding anything contained in this Agreement, Change in Law shall not cover any change:

a) Taxes on corporate income; and
b) Withholding tax on income or dividends distributed to the shareholders of the TSP.

12.2 Relief for Change in Law

12.2.1 During Construction Period, the impact of increase/decrease in the cost of the Project on the Transmission Charges shall be governed by the formula given in Schedule 9 of this Agreement.

12.2.2 During the Operation Period:

During the operation period, if as a result of Change in Law, the TSP suffers or is benefited from a change in costs or revenue, the aggregate financial effect of which

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exceeds 0.30% (zero point three percent) of the Annual Transmission Charges in aggregate for a Contract Year, the TSP may notify so to the Nodal Agency and propose amendments to this Agreement so as to place the TSP in the same financial position as it would have enjoyed had there been no such Change in Law resulting in change in costs or revenue as aforesaid.

12.2.3 For any claims made under Articles 12.2.1 and 12.2.2 above, the TSP shall provide to the Nodal Agency documentary proof of such increase / decrease in cost of the Project / revenue for establishing the impact of such Change in Law.

In cases where Change in Law results in decrease of cost and it comes to the notice of Nodal Agency that TSP has not informed Nodal Agency about such decrease in cost, Nodal Agency may initiate appropriate claim.

12.3 Notification of Change in Law:

12.3.1 If the TSP is affected by a Change in Law in accordance with Article 12.1 and wishes to claim relief for such Change in Law under this Article 12, it shall give notice to Nodal Agency of such Change in Law as soon as reasonably practicable after becoming aware of the same.

12.3.2 The TSP shall also be obliged to serve a notice to the Nodal Agency even when it is beneficially affected by a Change in Law.

12.3.3 Any notice served pursuant to Articles 12.3.1 and 12.3.2 shall provide, amongst other things, precise details of the Change in Law and its estimated impact on the TSP.

12.4 Payment on account of Change in Law

12.4.1 The payment for Change in Law shall be through a separate Bill. However, in case of any change in Monthly Transmission Charges by reason of Change in Law, as determined in accordance with this Agreement, the Bills to be raised by the Nodal Agency after such change in Transmission Charges shall appropriately reflect the changed Monthly Transmission Charges.



ARTICLE: 13

13 EVENTS OF DEFAULT AND TERMINATION

13.1 TSP's Event of Default

The occurrence and continuation of any of the following events shall constitute a TSP Event of Default, unless any such TSP Event of Default occurs as a result of any non-fulfilment of its obligations as prescribed under this Agreement by the Nodal Agency or a Force Majeure Event:

a. After having taken up the construction of the Project, the abandonment by the TSP or the TSP's Contractors of the construction of the Project for a continuous period of two (2) months and such default is not rectified within thirty (30) days from the receipt of notice from the Nodal Agency in this regard;
b. The failure to commission any Element of the Project by the date falling six (6) months after its Scheduled COD unless extended by Nodal Agency as per provisions of this Agreement;
c. If the TSP:
    i. assigns, mortgages or charges or purports to assign, mortgage or charge any of its assets or rights related to the Project in contravention of the provisions of this Agreement; or
    ii. transfers or novates any of its obligations pursuant to this Agreement, in a manner contrary to the provisions of this Agreement;

Except where such transfer is in pursuance of a Law and

    i. it does not affect the ability of the transferee to perform, and such transferee has the financial and technical capability to perform, its obligations under this Agreement;
    ii. is to a transferee who assumes such obligations under the Project and this Agreement remains effective with respect to the transferee;

d. If:
    i. The TSP becomes voluntarily or involuntarily the subject of any bankruptcy or insolvency or winding up proceedings and such proceedings remain uncontested for a period of thirty (30) days; or
    ii. any winding up or bankruptcy or insolvency order is passed against the TSP; or
    iii. the TSP goes into liquidation or dissolution or a receiver or any similar officer is appointed over all or substantially all of its assets or official liquidator is appointed to manage its affairs, pursuant to Law,

    Provided that a dissolution or liquidation of the TSP will not be a TSP's Event of Default, where such dissolution or liquidation of the TSP is for the purpose of a merger, consolidation or reorganization with the prior approval of the Commission as per the provisions of Central

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Electricity Regulatory Commission (Procedure, terms and Conditions for grant of Transmission License and other related matters) Regulations, 2006 or as amended from time to time; or

e. Failure on the part of the TSP to comply with the provisions of Article 19.1 of this Agreement; or

f. the TSP repudiates this Agreement and does not rectify such breach even within a period of thirty (30) days from a notice from the Nodal Agency in this regard; or

g. after Commercial Operation Date of the Project, the TSP fails to achieve monthly Target Availability of ..... [to be inserted by the BPC as applicable] [98% for AC system and 95% for HVDC system], for a period of six (6) consecutive months or within a non-consecutive period of six (6) months within any continuous aggregate period of eighteen(18) months except where the Availability is affected by Force Majeure Events as per Article 11; or

h. any of the representations and warranties made by the TSP in Article 17 of this Agreement being found to be untrue or inaccurate. Further, in addition to the above, any of the undertakings submitted by the Selected Bidder at the time of submission of the Bid being found to be breached or inaccurate, including but not limited to undertakings from its Parent Company / Affiliates related to the minimum equity obligation; or

i. the TSP fails to complete / fulfil all the activities / conditions within the specified period as per Article 3; or

j. except for the reasons solely attributable to Nodal Agency, the TSP is in material breach of any of its obligations under this Agreement and such material breach is not rectified by the TSP within thirty (30) days of receipt of notice in this regard from the Nodal Agency; or

k. the TSP fails to take the possession of the land required for location specific substations, switching stations or HVDC terminal or inverter stations and / or fails to pay the requisite price to the parties and / or any State Government authority from whom the land is acquired, within twelve (12) months from the Effective Date.

13.2 Termination Procedure for TSP Event of Default

a. Upon the occurrence and continuance of any TSP's Event of Default under Article 13.1 the Nodal Agency may serve notice on the TSP, with a copy to the CEA and the Lenders' Representative, of their intention to terminate this Agreement (a "Nodal Agency's Preliminary Termination Notice"), which shall specify in reasonable detail, the circumstances giving rise to such Nodal Agency's Preliminary Termination Notice.

b. Following the issue of a Nodal Agency's Preliminary Termination Notice, the Consultation Period shall apply and would be for the Parties to discuss as to

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what steps shall be taken with a view to mitigate the consequences of the relevant Event of Default having regard to all the circumstances.

c. During the Consultation Period, the Parties shall, save as otherwise provided in this Agreement, continue to perform their respective obligations/ roles under this Agreement, and the TSP shall not remove any material, equipment or any part of the Project, without prior consent of the Nodal Agency.

Following the expiry of the Consultation Period, unless the Parties shall have otherwise agreed to the contrary or the circumstances giving rise to Nodal Agency's Preliminary Termination Notice shall have ceased to exist or shall have been remedied, this Agreement may be terminated by the Nodal Agency by giving a Termination Notice to the TSP, in writing, of at least seven (7) days, with a copy to CEA and the Lenders' Representative in order to enable the Lenders to exercise right of substitution in accordance with Article 15.3 of this Agreement.

Further, the Nodal Agency may also initiate proceedings to blacklist the TSP & its Affiliates from participation in any RFP issued by BPCs for a period of 5 years.

13.3 Procedure for Nodal Agency's non-fulfilment of Role

a. Upon the Nodal Agency not being able to fulfil its role under Article 4.2, the TSP may serve notice on the Nodal Agency, with a copy to CEA and the Lenders' Representative (a "TSP's Preliminary Notice"), which notice shall specify in reasonable detail the circumstances giving rise to such non-fulfilment of role by the Nodal Agency.

b. Following the issue of a TSP's Preliminary Notice, the Consultation Period shall apply.

c. The Consultation Period would be for the Parties to discuss as to what steps shall be taken with a view to mitigate the consequences of the relevant non-fulfilment of role by the Nodal Agency including giving time extension to TSP, having regard to all the circumstances.

d. During the Consultation Period, both Parties shall, save as otherwise provided in this Agreement, continue to perform their respective obligations/ roles under this Agreement.

13.4 Termination due to Force Majeure

13.4.1 In case the Parties could not reach an agreement pursuant to Articles 3.3.4 and 4.4.2 of this Agreement and the Force Majeure Event or its effects continue to be present, the Nodal Agency shall have the right to cause termination of the Agreement. In case of such termination, the Contract Performance Guarantee shall be returned to the TSP as per the provisions of Article 6.5.1.



13.4.2 In case of termination of this Agreement, the TSP shall provide to the Nodal Agency the full names and addresses of its Contractors as well as complete designs, design drawings, manufacturing drawings, material specifications and technical information, as required by the Nodal Agency within thirty (30) days of Termination Notice.

13.5 Termination or amendment due to non-requirement of any Element or Project during construction

13.5.1 In case any Element or Project, which is under construction, is no longer required due to any reason whatsoever, the Nodal Agency may issue a notice to this effect to the TSP.

13.5.2 Nodal agency may also issue notice to the TSP seeking their response to the proposed termination/ amendment (as the case may be) of the Agreement. The Nodal Agency shall issue copy of such notice to Lenders. In the notice, Nodal Agency shall also include an assessment of the physical progress made by TSP in the Element/ Project (as the case may be) that is no longer required.

13.5.3 The TSP shall neither carry out further investment nor carry out any work on the Element/ Project (as the case may be) that is no longer required after delivery of the notice.

13.5.4 After taking into account the comments of the TSP, the Nodal Agency may terminate the Agreement or amend it if both Parties agree to the amendment.

13.6 Revocation of the Transmission License

13.6.1 The Commission may, as per the provisions of the Electricity Act, 2003, revoke the Transmission License of the ISTS Licensee. Further, in such a case, the Agreement shall be deemed to have been terminated.

13.7 Termination Payment

13.7.1 If Agreement is terminated on account of Force Majeure Events, non-requirement of any Element or Project during Construction, Nodal Agency's non-fulfilment of Role & TSP's Event of Default, the TSP shall be entitled for Termination Payment equivalent to valuation of Project Assets. Upon payment, the Nodal Agency shall take over the Project Assets.



ARTICLE: 14

14 LIABILITY AND INDEMNIFICATION

14.1 Indemnity

14.1.1 The TSP shall indemnify, defend and hold the Nodal Agency harmless against:

(a) any and all third party claims, actions, suits or proceedings against the Nodal Agency for any loss of or damage to property of such third party, or death or injury to such third party, arising out of a breach by the TSP of any of its obligations under this Agreement, except to the extent that any such claim, action, suit or proceeding has arisen due to a negligent act or omission, breach of this Agreement or non-fulfilment of statutory duty on the part of Nodal Agency; and

(b) any and all losses, damages, costs and expenses including legal costs, fines, penalties and interest actually suffered or incurred by the Nodal Agency from third party claims arising by reason of:

i. a breach by the TSP of any of its obligations under this Agreement, (provided that this Article 14 shall not apply to such breaches by the TSP, for which specific remedies have been provided for under this Agreement) except to the extent that any such losses, damages, costs and expenses including legal costs, fines, penalties and interest (together to constitute "Indemnifiable Losses") has arisen due to a negligent act or omission, breach of this Agreement or non-fulfilment of statutory duty on the part of the Nodal Agency, or

ii. any of the representations and warranties of the TSP under this Agreement being found to be inaccurate or untrue.

14.1.2 The Nodal Agency shall, in accordance with the Regulations framed by CERC in this regard, indemnify, defend and hold the TSP harmless against:

(a) any and all third party claims, actions, suits or proceedings against the TSP, for any loss of or damage to property of such third party, or death or injury to such third party, arising out of any material breach by the Nodal Agency of any of their roles under this Agreement, except to the extent that any such claim, action, suit or proceeding has arisen due to a negligent act or omission, breach of this Agreement or breach of statutory duty on the part of the TSP, its Contractors, servants or agents; and

(b) any and all losses, damages, costs and expenses including legal costs, fines, penalties and interest ('Indemnifiable Losses') actually suffered or incurred by the TSP from third party claims arising by reason of:



i. any material breach by the Nodal Agency of any of its roles under this Agreement (provided that, this Article 14 shall not apply to such breaches by the Nodal Agency, for which specific remedies have been provided for under this Agreement), except to the extent that any such Indemnifiable Losses have arisen due to a negligent act or omission, breach of this Agreement or breach of statutory duty on the part of the TSP, its Contractors, servants or agents or

ii. any of the representations and warranties of the Nodal Agency under this Agreement being found to be inaccurate or untrue.

14.2 Patent Indemnity:

14.2.1

(a) The TSP shall, subject to the Nodal Agency's compliance with Article 14.2.1 (b), indemnify and hold harmless the Nodal Agency and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Nodal Agency may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Agreement by reason of the setting up of the Project by the TSP.

Such indemnity shall not cover any use of the Project or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Agreement, any infringement resulting from the misuse of the Project or any part thereof, or any products produced in association or combination with any other equipment, plant or materials not supplied by the TSP, pursuant to the Agreement.

(b) If any proceedings are brought or any claim is made against the Nodal Agency arising out of the matters referred to in Article 14.2.1(a), the Nodal Agency shall promptly give the TSP a notice thereof, and the TSP shall at its own expense take necessary steps and attend such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. The TSP shall promptly notify the Nodal Agency of all actions taken in such proceedings or claims.

(c) If the TSP fails to notify the Nodal Agency within twenty-eight (28) days after receipt of such notice from the Nodal Agency under Article 14.2.1(b) above, that it intends to attend any such proceedings or claim, then the Nodal Agency shall be free to attend the same on their own behalf at the cost of the TSP. Unless the TSP has so failed to notify the Nodal Agency within the twenty eight (28) days period, the Nodal Agency shall make no admission that may be prejudicial to the defence

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of any such proceedings or claims.

(d) The Nodal Agency shall, at the TSP's request, afford all available assistance to the TSP in attending to such proceedings or claim, and shall be reimbursed by the TSP for all reasonable expenses incurred in so doing.

14.2.2

(a) The Nodal Agency, in accordance with the Regulations framed by CERC in this regard, subject to the TSP's compliance with Article 14.2.2(b) shall indemnify and hold harmless the TSP and its employees, officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs and expenses of whatsoever nature, including attorney's fees and expenses, which the TSP may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Agreement by reason of the setting up of the Project by the TSP.

(b) If any proceedings are brought or any claim is made against the TSP arising out of the matters referred to in Article 14.2.2 (a) the TSP shall promptly give the Nodal Agency a notice thereof, and the Nodal Agency shall at its own expense take necessary steps and attend such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. The Nodal Agency shall promptly notify the TSP of all actions taken in such proceedings or claims.

(c) If the Nodal Agency fails to notify the TSP within twenty-eight (28) days after receipt of such notice from the TSP under Article 14.2.2(b) above, that it intends to attend any such proceedings or claim, then the TSP shall be free to attend the same on its own behalf at the cost of the Nodal Agency. Unless the Nodal Agency has so failed to notify the TSP within the twenty (28) days period, the TSP shall make no admission that may be prejudicial to the defence of any such proceedings or claim.

(d) The TSP shall, at the Nodal Agency request, afford all available assistance to the Nodal Agency in attending to such proceedings or claim, and shall be reimbursed by the Nodal Agency for all reasonable expenses incurred in so doing.

14.3 Monetary Limitation of liability

14.3.1 A Party ("Indemnifying Party") shall be liable to indemnify the other Party ("Indemnified Party") under this Article 14 for any indemnity claims made in a Contract Year only up to an amount of Rupees **31.83 Crore** (Rs. Thirty One Crore and Eighty Three Lakh).



14.4 Procedure for claiming indemnity

14.4.1 Where the Indemnified Party is entitled to indemnification from the Indemnifying Party pursuant to Articles 14.1 or 14.2 the Indemnified Party shall promptly notify the Indemnifying Party of such claim, proceeding, action or suit referred to in Articles 14.1 or 14.2 in respect of which it is entitled to be indemnified. Such notice shall be given as soon as reasonably practicable after the Indemnified Party becomes aware of such claim, proceeding, action or suit. The Indemnifying Party shall be liable to settle the indemnification claim within thirty (30) days of receipt of the above notice.

Provided however that, if:

i. the Parties choose to contest, defend or litigate such claim, action, suit or proceedings in accordance with Article 14.4.3 below; and

ii. the claim amount is not required to be paid/deposited to such third party pending the resolution of the Dispute,

the Indemnifying Party shall become liable to pay the claim amount to the Indemnified Party or to the third party, as the case may be, promptly following the resolution of the Dispute, if such Dispute is not settled in favour of the Indemnified Party.

14.4.2 The Indemnified Party may contest, defend and litigate a claim, action, suit or proceeding for which it is entitled to be indemnified under Articles 14.1 or 14.2 and the Indemnifying Party shall reimburse to the Indemnified Party all reasonable costs and expenses incurred by the Indemnified Party. However, such Indemnified Party shall not settle or compromise such claim, action, suit or proceedings without first getting the consent of the Indemnifying Party, which consent shall not be unreasonably withheld or delayed.

14.4.3 An Indemnifying Party may, at its own expense, assume control of the defence of any proceedings brought against the Indemnified Party if it acknowledges its obligation to indemnify such Indemnified Party, gives such Indemnified Party prompt notice of its intention to assume control of the defence, and employs an independent legal counsel at its own cost that is reasonably satisfactory to the Indemnified Party.

14.5 Limitation on Liability

14.5.1 Except as expressly provided in this Agreement, neither the TSP nor the Nodal Agency nor their respective officers, directors, agents, employees or Affiliates (including, officers, directors, agents or employees of such Affiliates), shall be liable or responsible to the other Party or its Affiliates including its officers, directors, agents, employees, successors, insurers or permitted assigns for incidental, indirect or consequential, punitive or exemplary damages, connected with or resulting from performance or non-performance of this Agreement, or anything done in connection herewith,



including claims in the nature of lost revenues, income or profits (other than payments expressly required and properly due under this Agreement), any increased expense of, reduction in or loss of transmission capacity or equipment used therefore, irrespective of whether such claims are based upon breach of warranty, tort (including negligence, whether of the Nodal Agency, the TSP or others), strict liability, contract, breach of statutory duty, operation of law or otherwise.

14.5.2 The Nodal Agency shall have no recourse against any officer, director or shareholder of the TSP or any Affiliate of the TSP or any of its officers, directors or shareholders for such claims excluded under this Article. The TSP shall also have no recourse against any officer, director or shareholder of the Nodal Agency, or any Affiliate of the Nodal Agency or any of its officers, directors or shareholders for such claims excluded under this Article.

14.6 Duty to Mitigate

The party entitled to the benefit of an indemnity under this Article 14 shall take all reasonable measures to mitigate any loss or damage which has occurred. If the Party fails to take such measures, the other Party's liabilities shall be correspondingly reduced.

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ARTICLE: 15

15 ASSIGNMENTS AND CHARGES

15.1 Assignments:

15.1.1 This Agreement shall be binding upon, and inure to the benefit of the Parties and their respective successors and permitted assigns. This Agreement shall not be assigned by any Party, except as provided in Article 15.3.

15.2 Permitted Charges:

15.2.1 Neither Party shall create or permit to subsist any encumbrance over all or any of its rights and benefits under this Agreement.

15.2.2 However, the TSP may create any encumbrance over all or part of the receivables, or the Project Assets of the Project in favour of the Lenders or the Lenders' Representative on their behalf, as security for amounts payable under the Financing Agreements and any other amounts agreed by the Parties.

Provided that:

i. the Lenders or the Lenders' Representative on their behalf shall have entered into the Financing Agreements and agreed in writing to the provisions of this Agreement; and

ii. any encumbrance granted by the TSP in accordance with this Article 15.2.2 shall contain provisions pursuant to which the Lenders or the Lender's Representative on their behalf agrees unconditionally with the TSP to release from such encumbrances upon payment by the TSP to the Lenders of all amounts due under the Financing Agreements.

15.2.3 Article 15.2.1 does not apply to:

a. liens arising by operation of law (or by an agreement evidencing the same) in the ordinary course of the TSP developing and operating the Project;

b. pledges of goods, the related documents of title and / or other related documents, arising or created in the ordinary course of the TSP developing and operating the Project; or

c. security arising out of retention of title provisions in relation to goods acquired in the ordinary course of the TSP developing and operating the Project.

15.3 Substitution Rights of the Lenders

15.3.1 The TSP would need to operate and maintain the Project under the provisions of this

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Agreement and cannot assign the Transmission License or transfer the Project or part thereof to any person by sale, lease, exchange or otherwise, without the prior approval of the Nodal Agency.

15.3.2 However, in the case of default by the TSP in debt repayments or in the case of default by the TSP as per Article 13 of this Agreement during the debt repayments, the Commission may, on an application from the Lenders, assign the Transmission License to the nominee of the Lenders subject to the fulfilment of the qualification requirements and provisions of the Central Electricity Regulatory Commission (Procedure, terms and Conditions for grant of Transmission License and other related matters) Regulations, 2006 and as amended from time to time.



ARTICLE: 16

16 GOVERNING LAW AND DISPUTE RESOLUTION

16.1 Governing Law:

This Agreement shall be governed by and construed in accordance with the Laws of India. Any legal proceedings in respect of any matters, claims or disputes under this Agreement shall be under the jurisdiction of appropriate courts in Delhi.

16.2 Amicable Settlement:

16.2.1 Either Party is entitled to raise any claim, dispute or difference of whatever nature arising under, out of or in connection with this Agreement, including its existence or validity or termination or whether during the execution of the Project or after its completion and whether prior to or after the abandonment of the Project or termination or breach of the Agreement by giving a written notice to the other Party, which shall contain:

(i) a description of the Dispute;
(ii) the grounds for such Dispute; and
(iii) all written material in support of its claim.

16.2.2 The other Party shall, within thirty (30) days of issue of notice issued under Article 16.2.1, furnish:

(i) counter-claim and defences, if any, regarding the Dispute; and
(ii) all written material in support of its defences and counter-claim.

16.2.3 Within thirty (30) days of issue of notice by the Party pursuant to Article 16.2.1, if the other Party does not furnish any counter claim or defense under Article 16.2.2, or thirty (30) days from the date of furnishing counter claims or defence by the other Party, both the Parties to the Dispute shall meet to settle such Dispute amicably. If the Parties fail to resolve the Dispute amicably within thirty (30) days from the later of the dates mentioned in this Article 16.2.3, the Dispute shall be referred for dispute resolution in accordance with Article 16.3.

16.3 Dispute Resolution:

All Disputes shall be adjudicated by the Commission.

16.4 Parties to Perform Obligations:

Notwithstanding the existence of any Dispute and difference referred to the Commission as provided in Article 16.3 and save as the Commission may otherwise direct by a final or interim order, the Parties hereto shall continue to perform their respective obligations/ roles (which are not in dispute) under this Agreement.



ARTICLE: 17

17 REPRESENTATION AND WARRANTIES

17.1 Representation and warranties of the Nodal Agency

17.1.1 The Nodal Agency hereby represents and warrants to and agrees with the TSP as follows and acknowledges and confirms that the TSP is relying on such representations and warranties in connection with the transactions described in this Agreement:

a. It has all requisite powers and authority to execute and consummate this Agreement;

b. This Agreement is enforceable against the Nodal Agency in accordance with its terms;

c. The consummation of the transactions contemplated by this Agreement on the part of Nodal Agency will not violate any provision of nor constitute a default under, nor give rise to a power to cancel any charter, mortgage, deed of trust or lien, lease, agreement, license, permit, evidence of indebtedness, restriction, or other contract to which the Nodal Agency is a Party or to which the Nodal Agency is bound, which violation, default or power has not been waived;

17.2 Representation and Warranties of the TSP:

17.2.1 The TSP hereby represents and warrants to and agrees with the Nodal Agency as follows and acknowledges and confirms that the Nodal Agency is relying on such representations and warranties in connection with the transactions described in this Agreement:

a. It has all requisite powers and has been duly authorized to execute and consummate this Agreement;

b. This Agreement is enforceable against it, in accordance with its terms;

c. The consummation of the transactions contemplated by this Agreement on the part of the TSP will not violate any provision of nor constitute a default under, nor give rise to a power to cancel any charter, mortgage, deed of trust or lien, lease, agreement, license, permit, evidence of indebtedness, restriction, or other contract to which the TSP is a Party or to which the TSP is bound which violation, default or power has not been waived;

d. The TSP is not insolvent and no insolvency proceedings have been instituted, nor threatened or pending by or against the TSP;

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e. There are no actions, suits, claims, proceedings or investigations pending or, to the best of the TSP's knowledge, threatened in writing against the TSP at law, in equity, or otherwise, and whether civil or criminal in nature, before or by, any court, commission, arbitrator or governmental agency or authority, and there are no outstanding judgments, decrees or orders of any such courts, commission, arbitrator or governmental agencies or authorities, which materially adversely affect its ability to execute the Project or to comply with its obligations under this Agreement.

17.2.2 The TSP makes all the representations and warranties above to be valid as on the Effective Date of this Agreement.



ARTICLE: 18

18 INDEPENDENT ENGINEER

18.1 Appointment of Independent Engineer

The Nodal Agency shall appoint an agency/ company as Independent Engineer as per framework provided in the Guidelines for Encouraging Competition in Development of Transmission Projects for selection of Independent Engineer.

18.2 Roles and functions of Independent Engineer

The role and functions of the Independent Engineer shall include the following:

a. Progress Monitoring as required under this Agreement;
b. Ensuring Quality as required under this Agreement;
c. determining, as required under the Agreement, the costs of any works or services and/or their reasonableness during construction phase;
d. determining, as required under the Agreement, the period or any extension thereof, for performing any duty or obligation during construction phase;
e. determining, as required under the Agreement, the valuation of the Project Assets.
f. Assisting the Parties in resolution of Disputes and
g. Undertaking all other duties and functions in accordance with the Agreement.

18.3 Remuneration of Independent Engineer

The fee and charges of the Independent Engineer shall be paid by the Nodal Agency as per terms & conditions of appointment.

18.4 Termination of appointment

18.4.1 The Nodal Agency may, in its discretion, terminate the appointment of the Independent Engineer at any time, but only after appointment of another Independent Engineer.

18.4.2 If the TSP has reason to believe that the Independent Engineer is not discharging its duties and functions in a fair, efficient and diligent manner, it may make a written representation to the Nodal Agency and seek termination of the appointment of the Independent Engineer. Upon receipt of such representation, the Nodal Agency shall hold a tripartite meeting with the TSP and Independent Engineer for an amicable

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resolution, and the decision of Nodal agency is final. In the event that the appointment of the Independent Engineer is terminated hereunder, the Nodal Agency shall appoint forthwith another Independent Engineer.

18.5 Authorised signatories

The Nodal Agency shall require the Independent Engineer to designate and notify to the Nodal Agency up to 2 (two) persons employed in its firm to sign for and on behalf of the Independent Engineer, and any communication or document required to be signed by the Independent Engineer shall be valid and effective only if signed by any of the designated persons; provided that the Independent Engineer may, by notice in writing, substitute any of the designated persons by any of its employees.



ARTICLE: 19

19 MISCELLANEOUS PROVISIONS

19.1 Equity Lock-in Commitment:

19.1.1 The aggregate equity share holding of the Selected Bidder in the issued and paid up equity share capital of KPS III HVDC TRANSMISSION LIMITED shall not be less than Fifty one percent (51%) up to a period of one (1) year after COD of the Project.

Provided that, in case the Lead Member or Bidding Company is holding equity through Affiliate/s, Ultimate Parent Company or Parent Company, such restriction as specified above shall apply to such entities.

Provided further, that in case the Selected Bidder is a Bidding Consortium, the Lead Member shall continue to hold equity of at least twenty six percent (26%) upto a period of one (1) year after COD of the Project and any Member of such Bidding Consortium shall be allowed to divest its equity as long as the other remaining Members (which shall always include the Lead Member) hold the minimum equity specified above.

19.1.2 If equity is held by the Affiliates, Parent Company or Ultimate Parent Company of the Selected Bidder, then, subject to the second proviso to Article 19.1.1, such Affiliate, Parent Company or Ultimate Parent Company shall be eligible to transfer its shareholding in KPS III HVDC TRANSMISSION LIMITED to another Affiliate or to the Parent Company / Ultimate Parent Company of the Selected Bidder. If any such shareholding entity, qualifying as an Affiliate / Parent Company / Ultimate Parent Company, is likely to cease to meet the criteria to qualify as an Affiliate / Parent Company / Ultimate Parent Company, the shares held by such entity shall be transferred to another Affiliate / Parent Company / Ultimate Parent Company of the Selected Bidder.

19.1.3 Subject to Article 19.1.1, all transfer(s) of shareholding of KPS III HVDC TRANSMISSION LIMITED by any of the entities referred to in Article 19.1.1 and 19.1.2 above, shall be after prior written intimation to the Nodal Agency.

19.1.4 For computation of effective Equity holding, the Equity holding of the Selected Bidder or its Ultimate Parent Company in such Affiliate(s) or Parent Company and the equity holding of such Affiliate(s) or Ultimate Parent Company in KPS III HVDC TRANSMISSION LIMITED shall be computed in accordance with the example given below:

If the Parent Company or the Ultimate Parent Company of the Selected Bidder A directly holds thirty percent (30%) of the equity in KPS III HVDC TRANSMISSION LIMITED, then holding of Selected Bidder A in KPS III HVDC TRANSMISSION LIMITED

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shall be thirty percent (30%);

If Selected Bidder A holds thirty percent (30%) equity of the Affiliate and the Affiliate holds fifty percent (50%) equity in KPS III HVDC TRANSMISSION LIMITED, then, for the purposes of ascertaining the minimum equity/equity lock-in requirements specified above, the effective holding of Bidder A in KPS III HVDC TRANSMISSION LIMITED shall be fifteen percent (15%), (i.e., 30% x 50%)

19.1.5 The provisions as contained in this Article 19.1 shall override the terms of the consortium agreement submitted as part of the Bid.

19.1.6 The TSP shall be responsible to report to Nodal Agency, within thirty (30) days from the occurrence of any event that would result in any change in its equity holding structure from that which existed as on the date of signing of the Share Purchase Agreement. In such cases, the Nodal Agency would reserve the right to ascertain the equity holding structure and to call for all such required documents / information / clarifications as may be required.

19.2 Commitment of maintaining Qualification Requirement

19.2.1 The Selected Bidder will be required to continue to maintain compliance with the Qualification Requirements, as stipulated in RFP Document, till the COD of the Project. Where the Technically Evaluated Entity and/or the Financially Evaluated Entity is not the Bidding Company or a Member in a Bidding Consortium, as the case may be, the Bidding Company or Member shall continue to be an Affiliate of the Technically Evaluated Entity and/or Financially Evaluated Entity till the COD of the Project.

19.2.2 Failure to comply with the aforesaid provisions shall be dealt in the same manner as TSP's Event of Default as under Article 13 of this Agreement.

19.3 Language:

19.3.1 All agreements, correspondence and communications between the Parties relating to this Agreement and all other documentation to be prepared and supplied under the Agreement shall be written in English, and the Agreement shall be construed and interpreted in accordance with English language.

19.3.2 If any of the agreements, correspondence, communications or documents are prepared in any language other than English, the English translation of such agreements, correspondence, communications or documents shall prevail in matters of interpretation.

19.4 Affirmation

The TSP and the Nodal Agency, each affirm that:



a) neither it nor its respective directors, employees, or agents has paid or undertaken to pay or shall in the future pay any unlawful commission, bribe, pay-off or kick-back; and
b) it has not in any other manner paid any sums, whether in Indian currency or foreign currency and whether in India or abroad to the other Party to procure this Agreement, and the TSP and the Nodal Agency hereby undertake not to engage in any similar acts during the Term of Agreement.

19.5 Severability

The invalidity or enforceability, for any reason, of any part of this Agreement shall not prejudice or affect the validity or enforceability of the remainder of this Agreement, unless the part held invalid or unenforceable is fundamental to this Agreement.

19.6 Counterparts

This Agreement may be executed in one or more counterparts, each of which shall be deemed an original and all of which collectively shall be deemed one and the same Agreement.

19.7 Breach of Obligations/ Roles

The Parties acknowledge that a breach of any of the obligations/ roles contained herein would result in injuries. The Parties further acknowledge that the amount of the liquidated damages or the method of calculating the liquidated damages specified in this Agreement is a genuine and reasonable pre-estimate of the damages that may be suffered by the non-defaulting Party in each case specified under this Agreement.

19.8 Restriction of Shareholders / Owners Liability

19.8.1 Parties expressly agree and acknowledge that none of the shareholders of the Parties hereto shall be liable to the other Parties for any of the contractual obligations of the concerned Party under this Agreement.

19.8.2 Further, the financial liabilities of the shareholder(s) of each Party to this Agreement shall be restricted to the extent provided in the Indian Companies Act, 1956 / Companies Act, 2013 (as the case may be).

19.9 Taxes and Duties:

19.9.1 The TSP shall bear and promptly pay all statutory taxes, duties, levies and cess, assessed/levied on the TSP, its Contractors or their employees that are required to be paid by the TSP as per the Law in relation to the execution of the Project and for

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providing Transmission Service as per the terms of this Agreement.

19.9.2 The Nodal Agency shall be indemnified and held harmless by the TSP against any claims that may be made against the Nodal Agency in relation to the matters set out in Article 19.9.1.

19.9.3 The Nodal Agency shall not be liable for any payment of, taxes, duties, levies, cess whatsoever for discharging any obligation of the TSP by the Nodal Agency on behalf of TSP or its personnel, provided the TSP has consented in writing to the Nodal Agency for such work, for which consent shall not be unreasonably withheld.

19.10 No Consequential or Indirect Losses

The liability of the TSP shall be limited to that explicitly provided in this Agreement.

Provided that, notwithstanding anything contained in this Agreement, under no event shall the Nodal Agency or the TSP claim from one another any indirect or consequential losses or damages.

19.11 Discretion:

Except where this Agreement expressly requires a Party to act fairly or reasonably, a Party may exercise any discretion given to it under this Agreement in any way it deems fit.

19.12 Confidentiality

19.12.1 The Parties undertake to hold in confidence this Agreement and RFP Project Documents and not to disclose the terms and conditions of the transaction contemplated hereby to third parties, except:

a) to their professional advisors;

b) to their officers, contractors, employees, agents or representatives, financiers, who need to have access to such information for the proper performance of their activities; or

c) disclosures required under Law,

without the prior written consent of the other Parties.

Provided that, the TSP agrees and acknowledges that the Nodal Agency, may, at any time, disclose the terms and conditions of the Agreement and the RFP Project Documents to any person, to the extent stipulated under the Law and the Competitive Bidding Guidelines.



19.13 Order of priority in application:

Save as provided in Article 2.5, in case of inconsistencies between the terms and conditions stipulated in Transmission License issued by the Commission to the TSP, agreement(s) executed between the Parties, applicable Law including rules and regulations framed thereunder, the order of priority as between them shall be the order in which they are placed below:

- terms and conditions of Transmission License;
- applicable Law, rules and regulations framed thereunder;
- this Agreement;
- Agreement(s), if any, under Sharing Regulations.

19.14 Independent Entity:

19.14.1 The TSP shall be an independent entity performing its obligations pursuant to the Agreement.

19.14.2 Subject to the provisions of the Agreement, the TSP shall be solely responsible for the manner in which its obligations under this Agreement are to be performed. All employees and representatives of the TSP or Contractors engaged by the TSP in connection with the performance of the Agreement shall be under the complete control of the TSP and shall not be deemed to be employees, representatives, Contractors of the Nodal Agency and nothing contained in the Agreement or in any agreement or contract awarded by the TSP shall be construed to create any contractual relationship between any such employees, representatives or Contractors and the Nodal Agency.

19.15 Amendments:

19.15.1 This Agreement may only be amended or supplemented by a written agreement between the Parties.

19.16 Waiver:

19.16.1 No waiver by either Party of any default or breach by the other Party in the performance of any of the provisions of this Agreement shall be effective unless in writing duly executed by an authorised representative of such Party.

19.16.2 Neither the failure by either Party to insist on any occasion upon the performance of the terms, conditions and provisions of this Agreement nor time or other indulgence granted by one Party to the other Parties shall act as a waiver of such breach or acceptance of any variation or the relinquishment of any such right or any

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other right under this Agreement, which shall remain in full force and effect.

19.17 Relationship of the Parties:

This Agreement shall not be interpreted or construed to create an association, joint venture, or partnership or agency or any such other relationship between the Parties or to impose any partnership obligation or liability upon either Party and neither Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

19.18 Entirety:

19.18.1 This Agreement along with its sections, schedules and appendices is intended by the Parties as the final expression of their agreement and is intended also as a complete and exclusive statement of the terms of their agreement.

19.18.2 Except as provided in this Agreement, all prior written or oral understandings, offers or other communications of every kind pertaining to this Agreement or the provision of Transmission Service under this Agreement to the Nodal Agency by the TSP shall stand superseded and abrogated.

19.19 Notices:

19.19.1 All notices or other communications which are required to be given under this Agreement shall be in writing and in the English language

19.19.2 If to the TSP, all notices or communications must be delivered personally or by registered post or facsimile or any other mode duly acknowledged to the addressee below:

Address	:
Attention	:
Email	:
Fax. No.	:
Telephone No.	:

19.19.3 If to the Nodal Agency, all notices or communications must be delivered personally or by registered post or facsimile or any other mode duly acknowledged to the addresses below:

(i) **Central Transmission Utility of India Limited (Nodal Agency)**

Address	:
Attention	:
Email	:
Fax. No.	:

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Telephone No. :

19.19.4 All notices or communications given by facsimile shall be confirmed by sending a copy of the same via post office in an envelope properly addressed to the appropriate Party for delivery by registered mail. All notices shall be deemed validly delivered upon receipt evidenced by an acknowledgement of the recipient, unless the Party delivering the notice can prove in case of delivery through the registered post that the recipient refused to acknowledge the receipt of the notice despite efforts of the postal authorities.

19.19.5 Any Party may by notice of at least fifteen (15) days to the other Party change the address and/or addresses to which such notices and communications to it are to be delivered or mailed.

19.20 Fraudulent and Corrupt Practices

19.20.1 The TSP and its respective officers, employees, agents and advisers shall observe the highest standard of ethics during the subsistence of this Agreement. Notwithstanding anything to the contrary contained in the Agreement, the Nodal Agency may terminate the Agreement without being liable in any manner whatsoever to the TSP, if it determines that the TSP has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice in the Bid process. In such an event, the Nodal Agency shall forfeit the Contract Performance Guarantee of the TSP, without prejudice to any other right or remedy that may be available to the Nodal Agency hereunder or subsistence otherwise.

19.20.2 Without prejudice to the rights of the Nodal Agency under Clause 19.20.1 hereinabove and the rights and remedies which the Nodal Agency may have under this Agreement, if a TSP is found by the Nodal Agency to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice during the Bid process, or after the issue of Letter of Intent (hereinafter referred to as LoI) or after the execution of the agreement(s) required under Sharing Regulations, the Nodal Agency may terminate the Agreement without being liable in any manner whatsoever to the TSP. Further, the TSP & its Affiliates shall not be eligible to participate in any tender or RFP issued by any BPC for an indefinite period from the date such TSP is found by the Nodal Agency to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practices, as the case may be.

19.20.3 For the purposes of this Clause 19.20, the following terms shall have the meaning hereinafter respectively assigned to them:

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(a) **"corrupt practice"** means (i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the actions of any person connected with the Bid process (for avoidance of doubt, offering of employment to or employing or engaging in any manner whatsoever, directly or indirectly, any official of the BPC who is or has been associated or dealt in any manner, directly or indirectly with the Bid process or the LoI or has dealt with matters concerning the RFP Project Documents or arising there from, before or after the execution thereof, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of the BPC, shall be deemed to constitute influencing the actions of a person connected with the Bid Process); or (ii) engaging in any manner whatsoever, whether during the Bid Process or after the issue of the LoI or after the execution of the RFP Project Documents, as the case may be, any person in respect of any matter relating to the Project or the LoI or the RFP Project Documents, who at any time has been or is a legal, financial or technical adviser of the BPC in relation to any matter concerning the Project;

(b)"**fraudulent practice**" means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bid process;

(c) "**coercive practice**" means impairing or harming, or threatening to impair or harm, directly or indirectly, any person or property to influence any person's participation or action in the Bid process;

(d) "**undesirable practice**" means (i) establishing contact with any person connected with or employed or engaged by the BPC with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Bid process; or (ii) having a Conflict of Interest; and

(e) "**restrictive practice**" means forming a cartel or arriving at any understanding or arrangement among Bidders with the objective of restricting or manipulating a full and fair competition in the Bid process;

19.21 Compliance with Law:

Despite anything contained in this Agreement but without prejudice to Article 12, if any provision of this Agreement shall be in deviation or inconsistent with or repugnant to the provisions contained in the Electricity Act, 2003, or any rules and regulations made there under, such provision shall be deemed to be amended to the extent required to bring it into compliance with the aforesaid relevant provisions as amended from time to time.

IN WITNESS WHEREOF, THE PARTIES HAVE CAUSED THIS AGREEMENT TO BE EXECUTED BY THEIR DULY AUTHORISED REPRESENTATIVES AS OF THE DATE AND PLACE SET FORTH ABOVE.

Adani Energy Solutions Limited

1. For and on behalf of TSP

.....

[Signature, Name, Designation and Address]

2. For and on behalf of **Central Transmission Utility of India Limited (Nodal Agency)**

.....

[Signature, Name, Designation and Address]

WITNESSES:

1. For and on behalf of

: **BPC**

.....

[Signature]

.....

[Insert, Name, Designation and Address of the Witness]

2. For and on behalf of

: **Nodal Agency**

.....

[Signature]

.....

[Insert Name, Designation and Address of the Witness]

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SCHEDULES

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Schedule: 1

Project Description and Scope of Project

Annexure – A

i) Description of the Transmission Scheme:

Government of India has set a target for establishing 500 GW capacity from non-fossil energy sources by 2030. In this direction, in December 2020, Hon'ble Prime Minister laid the foundation stone of the world's largest renewable energy park in Gujarat's Kutch. This 30 GW capacity hybrid renewable energy park is being built along the Indo-Pak border at Khavda using both wind and solar energy and is expected to play a major role in fulfilling India's vision of generating 500 GW of non-fossil generation capacity by 2030.

Out of 30 GW, 15 GW RE capacity is expected to come up by 2024-25 and balance by 2026-27 timeframe and beyond. Transmission system for evacuation of up to 22 GW power from Khavda RE Park is already under implementation/bidding in 4 phases as per details below:

Phase	RE Capacity (GW)	Status of Transmission System
I	3	Under Implementation: • KPS1 S/s and KPS1 – Bhuj 765 kV D/C line: Awarded to Adani Transmission Ltd. (Commissioned). • KPS2 S/s: Awarded to POWERGRID with SCOD of Dec'24. • KPS1 – KPS2 765 kV D/C line: Awarded to Megha Engg with SCOD of Jan'25.
II	5	Under Implementation: • KPS3 S/s and KPS3 – KPS2 765 kV D/C line: Awarded to POWERGRID with SCOD of Dec'24. • Khavda Ph-II Part A - Awarded to Adani Transmission Ltd. with Expected SCOD of March'25. • Khavda Ph-II Parts B and C – Awarded to POWERGRID with Expected SCOD of March'25. • Khavda Ph-II Part D – Awarded to TPGL(RTM) with Expected SCOD of March'25.
III	7	Under Implementation: Khavda-Ph-III-Part A-Awarded to Adani Khavda-Ph-III-Part-B -Awarded to POWERGRID • Expected SCOD: Dec'25
IV	7	Under Bidding: • Agreed in 14th NCT –and expected SCOD is Jun'26

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The Phase-V scheme has been planned to enable evacuation of an additional 8 GW RE power from Khavda RE park.

The subject scheme (under Part C) includes establishment of KPS3 (HVDC) S/s through KPS3 – KPS3 (HVDC) 400 kV 2xD/C line and establishment of 2500 MW, ± 500 kV HVDC [VSC] terminal station (2x1250 MW) at KPS3(HVDC) and South Olpad along with ±500 kV HVDC Bipole line with DMR between KPS3 (HVDC) and South Olpad (HVDC).

The subject Transmission system was deliberated and approved in the 14th NCT meeting held on 09.06.2023. The Ministry of Power vide Gazette notification dated 29.08.2023 (Copy of Gazette attached) has appointed PFCCL as BPC for implementation of the subject transmission scheme through TBCB route.

ii) Detailed Scope of Work

Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8GW): Part C

Sl. No.	Scope	Capacity/ Route length
1.	Establishment of 2500 MW, ±500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	2500 MW, ±500 kV KPS3 (HVDC) [VSC] Terminal station
2.	Establishment of 2500 MW, ±500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*	2500 MW, ±500 kV South Olpad (HVDC) [VSC] terminal station
3.	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal. **Future Provisions at KPS3 (HVDC) S/s** **Space for:** ○ 400 kV line bays – 6 Nos. (3 on each section)	○ 400/33 kV, 1x50 MVA ICT along with bays : **2 Nos.** ○ 125 MVAR 420 kV bus reactor- **2 Nos**. (one on each section) ○ 400 kV reactor bay- **2 Nos.** (one on each section) ○ 400 kV Bus sectionaliser- 1 Set

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	○ 400 kV reactor bay- 2 Nos. (one on each section)	
4.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations	Route length- 2 km 400 kV GIS line bays - 4 Nos. at KPS3 (2 Nos. on each bus section) 400 kV GIS line bays - 4 Nos at KPS3 (HVDC) (2 Nos. on each bus section)
5.	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)	Route length: 600 km

** The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC and HVAC switchyards shall be implemented by the TSP*

Note:

i. *The 1250 MW pole-1 shall emanate from 400 kV bus section 1 of KPS3 (HVDC) and terminate at South Olpad S/s. Similarly, the 1250 MW pole-2 shall emanate from 400 kV bus section 2 of KPS3 (HVDC) and terminate at South Olpad S/s.*

ii. *HVDC System will be designed with 100% power reversal capability as well as black start, automatic grid restoration and dynamic reactive power support capability.*

iii. *The rated power transmission capacity as well as the rated transmission voltage shall be defined and guaranteed at the rectifier DC Bus.*

iv. *TSPs of KPS3 shall provide space for scope at Sl. No. 4 as per the above scope*

v. *TSP of South Olpad S/s shall provide space for scope at Sl. No. 2 as per above scope ensuring*

   (a) indicative total space requirement for HVDC terminal station of size 400 m x 300 m. The AC switchyard connection and DC overhead line shall be from 300 m side of rectangular plot.

   (b) the width of the approach road and access road shall be at least 10 m for facilitating smooth transportation of HVDC equipment including converter transformer and with access road all around the space for HVDC.

   (c) the spatial arrangement for proposed space for HVDC terminal and the layout proposed for the current AC GIS transmission scheme is such that Bus duct length required for interconnection between AC GIS station and HVDC terminal is minimum to the extent possible in linear manner and the layout of the AC line termination gantries should be such that there is no crossing of present/ future AC lines and HVDC line near the termination ends of both AC and HVDC yards.

vi. *The transmission line lengths mentioned above are approximate as the exact length shall be obtained after the detailed survey.*

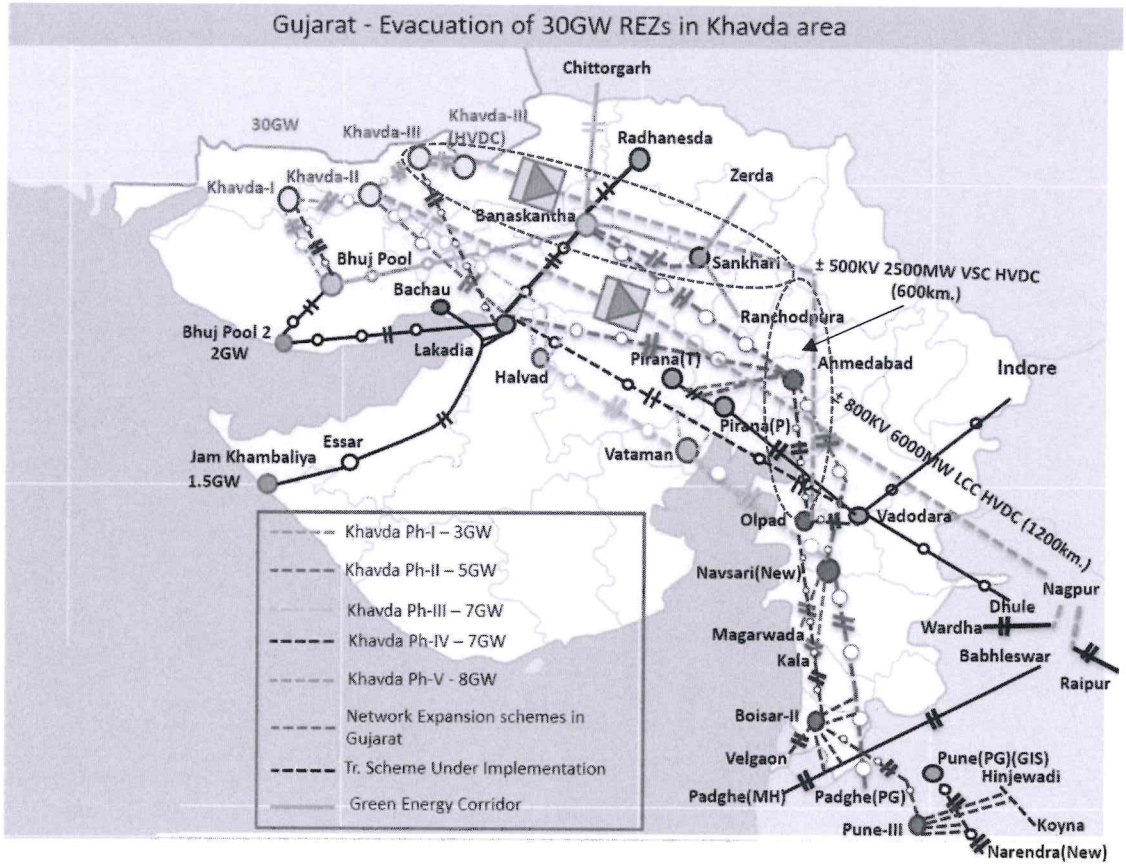
vii. *Implementation timeline: 48 months from SPV transfer*

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iii) Transmission Grid Map:

Transmission Grid Map indicating the details of the Project is given below:

Transmission Grid Map



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Annexure – B

Sl. No.	Name of the Transmission Element	Scheduled COD	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
1.	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	48 months from SPV transfer	100%	All Elements are required to be commissioned simultaneously as their utilization is dependent on commissioning of each other.
2.	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*			
3.	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.			
4.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations			
5.	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)			

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** The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC and HVAC switchyards shall be implemented by the TSP*



Annexure - C

Location details of existing / proposed substations:

a. **South Olpad substation:**

Substation is under bidding under separate scheme.

b. **KPS3 Substation:**

24°12'26.58'N, 69°29'41.53"E

Note: *The above coordinates/location of substation indicated is approximate in the substation area. Exact coordinates for the corresponding bays/gantry for termination of the respective line may be verified and finalized in coordination with actual site.*

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Annexure-D

Specific Technical Requirement of 2500 MW (2x1250 MW), ±500 kV HVDC [Type: Voltage Source Converter (VSC)]

1. General

The proposed HVDC link shall be ±500 kV, 2500 MW HVDC line between KPS 3 (Gujarat) and South Olpad (Gujarat) using Dedicated metallic return and consist of Bipole (2x1250 MW). The bipole shall consist of Pole-1 (1250 MW) and Pole-2 (1250 MW). The HVDC terminals shall be implemented with 100% power reversal capability.

The system shall generally conform to the requirements of the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, Central Electricity Authority (Safety requirements for construction, operation and maintenance of electrical plants and electric lines) Regulations, 2011 as amended from time to time and any other relevant Rules/ Regulations/ Standards/ Guidelines.

2. Abbreviations

The following terminology shall apply at various places of this specification:

DMR: Dedicated Metallic Return
DMRTB: Dedicated Metallic Return Transfer Breaker
DPS: Dynamic Performance Studies
ESCR: Effective Short Circuit Ratio
FAT: Factory Acceptance Tests
HMI: Human Machine Interface
HVAC: High Voltage Alternating Current
HVDC: High Voltage Direct Current
HVRT: High Voltage Ride Through
IBR: Inverter Based Resources
Id: Direct current (any defined value)
LCC: Line Commutated Converter
VSC: Voltage Source Converter
LI/SI: Lightning Impulse/Switching Impulse
LVRT: Low Voltage Ride Through

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NBS:	Neutral Bus Switch
NGBS:	Neutral Ground Bus Switch
PCC:	Point of Common Coupling
POI:	Point of Interconnection
PMR:	Pole Metallic Return
PMRTB:	Pole Metallic Return Transfer Breaker
RPC:	Reactive Power Control
SAS:	Substation Automation System
SCADA:	Supervisory Control and Data Acquisition
SCR:	Short Circuit Ratio
SSTI:	Sub-synchronous Torsional Interaction
TSP:	Transmission Service Provider
Ud:	Direct voltage (any defined value)

3. Definitions

Bipole: A pair of two (2) poles which are connected to opposite polarities (positive and negative). For power transmission in one Bipole, two such pairs are required.

Forward Power flow direction: Active power transmission from Khavda PS3 to South Olpad HVDC.

Inverter: HVDC terminal which is receiving the power.

MMC: (**Modular Multi-level Converter**): Multi-level converter in which each valve arm consists of multiple power modules connected in series.

MMC building block: self-contained, two-terminal controllable voltage source together with D.C. capacitor(s) and immediate auxiliaries, forming part of a MMC.

PCC (Point of Common Coupling)/ POI (Point of Interconnection): The connection point between the HVDC and the power system at which performance requirements are defined.

Reverse Power flow direction: Active power transmission from South Olpad to Khavda PS3

VSC phase unit: Equipment used to connect the two DC terminals to one AC terminal.

VSC unit: Three VSC phase units, together with VSC unit control equipment, essential protective and switching devices, DC storage capacitors, phase reactors and auxiliaries, if any, used for conversion

VSC converter unit: Individual operative unit comprising all equipment between the point



of connection on the AC side and the point of connection on the DC side, essentially one or more VSC converters, together with one or more interface/converter transformers, converter unit control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion.

VSC converter station (HVDC Substation): Part of VSC HVDC system which consists of one or more VSC converter units including DC switchgear, DC fault current controlling devices, if any, installed in a single location together with buildings, reactors, filters, reactive power supply, control, monitoring, protective, measuring and auxiliary equipment.

VSC HVDC system: High-voltage direct current transmission system connecting two VSC converter stations transferring energy in the form of HVDC including related transmission lines and/or cables, switching stations, if any, as well as other equipment and sub-systems needed for operation

STATCOM operation: Mode of operation of a converter when only reactive power (capacitive or inductive) is exchanged with the AC system [Ref: IEC 62747:2019]

SCR: Ratio of the AC network short-circuit level (in MVA) at 1 p.u. voltage at the point of connection to the AC bus of the HVDC substation, to the rated DC power of the HVDC substation (in MW) [Ref: IEC 62747:2019]

Operating state: Condition in which the HVDC substation is energized and the converters are de-blocked [Ref: IEC 62747:2019].

Valve blocking: State condition of a valve when all IGBTs are turned off [Ref: IEC 62747:2019]
In reading of this RfP, term "BIGT" can be used interchangeably for "IGBT".

Converter blocking: Operation to initiate a mode change from operating state to blocked state of a VSC unit [Ref: IEC 62747:2019].

Converter deblocking: Operation to initiate a mode change from blocked state to operating state of a VSC unit [Ref: IEC 62747:2019].

Inductive operation: Operation in which the converter consumes reactive power from the AC system with or without exchanging active power [Ref: IEC 62747:2019].

Capacitive operation: Operation in which the converter feeds reactive power into the AC system with or without exchanging active power [Ref: IEC 62747:2019].

4. For Definition, relevant standards as mentioned in the clause 51 of this Annexure may be referred.

VSC Transmission configuration:



± 500 kV HVDC Bipole system between KPS3 (HVDC) and South Olpad (HVDC) shall be VSC transmission in bipolar configuration with dedicated metallic return as indicated in Fig.1 below.

The PCC points shall be connection of Pole 1 and Pole 2 to 400 kV AC Bus sections at KPS-3 (HVDC) substation and connection of Pole 1 and Pole 2 to 400 kV AC Bus at South Olpad.

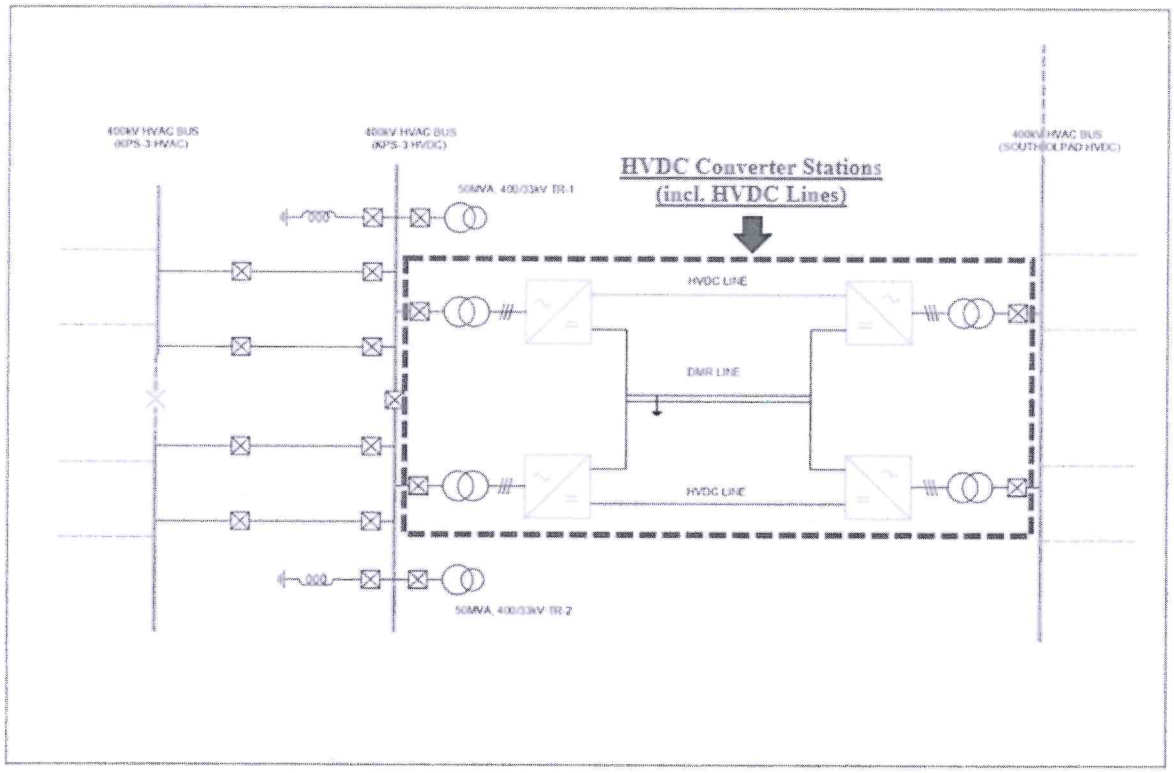


Fig.1: VSC transmission in bipolar configuration with dedicated metallic return

Design Consideration:

The salient technical features for HVDC terminals shall be as follows (Table 1):

Table 1

Sl. No.	Item Description	Parameters
1.	Rectifier station location (Forward direction power)	Near KPS3 (Gujarat) [If the power direction is reversed, Khavda becomes inverter]
2.	Inverter station location (Forward direction power)	South Olpad (Gujarat) [If the power direction is reversed, South Olpad will become rectifier]
3.	Rated DC voltage (1.0 pu)	± 500 kV DC at Rectifier HVDC Pole Bus
4.	Rated power (1.0 pu)	2500 MW at Rectifier DC Bus

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Sl. No.	Item Description	Parameters
5.	Minimum DC Power	0 MW
6.	AC system frequency	Nominal 50 Hz
7.	Fault Current level AC system	63 kA for 1 sec for Khavda (HVDC) Near KPS3 63 kA for 1 sec for South Olpad
8.	Minimum Short circuit level (MVA) at 400 kV Khavda KPS3 (both rectifier and inverter operation)	14400 MVA# for both Sec-I and Sec-II (with IBR) 12600 MVA# for both Sec-I and Sec-II (without IBR) *(Considering outage of 2x1500 MVA ICTs on each section, with 400 kV bus sectionaliser kept open)*
9.	Minimum Short circuit level (MVA) at 400 kV South Olpad (both rectifier and inverter operation)	15400 MVA# *(Considering outage of 1x1500 MVA ICT)*
10.	Reverse power rating	100% of rated forward direction power transfer rating$
11.	Reduced voltage	80% of rated DC voltage [Applicable for both power flow directions]
12.	Converter transformer	Single phase two winding design
13.	IGBT/BIGT Valve	Water cooled
14.	Valve cooling system	Dry type design
15.	HVDC control system*	Main + hot standby
16.	HVDC protection system*	Duplicated Protection
17.	Auxiliary supply source	Two supplies shall be fetched from the 33 kV side of 2 Nos. of 400/33 kV transformer (50 MVA) at KPS3 HVDC and 33 kV tertiary of 2 Nos. 765/400/33 kV ICT at South Olpad.
18.	DC Harmonic filter	DC filter for each pole at each HVDC terminal station, if required as per TSP/OEM design
19.	AC Network Impedance	5th Harmonic 1.5% 7th Harmonic 1.0% Other Harmonics 0.5% (each) Further, Relevant CIGRE/ IEC document shall be used for the Network harmonic impedance together with information in PSSE network files provided by CTU.
20.	Negative sequence voltage (fundamental frequency)	1% for Performance 1.5% for rating of equipment
21.	Online fault locator for HVDC pole lines	One No. per pole at each terminal station [when not integrated with Control and



Sl. No.	Item Description	Parameters
		Protection System]
22.	Blocking filter	As per requirement
23.	Reliability and Availability Design Targets	As per Table 10
24.	Station Loss evaluation criteria	Methodology as per IEC 61803 and IEC 62751 and Target figures stated in Table 10
25.	System Grounding	Solidly grounded or Resistive Grounding as per OEM Practice

 # The values of short circuit level are based on available network topology and generalized parameters for various network elements.

** TSP can provide integrated Control and Protection system as well meeting functional requirements.*

$ The power reversal in HVDC links shall be possible from the maximum active power transmission capacity from KPS3 (HVDC) to South Olpad (HVDC) to the maximum active power transmission capacity from South Olpad (HVDC) to KPS3 (HVDC) within 60 minutes.

The criteria for the design and control of the network shall be as follows:

- 400 kV AC bus voltages shall normally be within ±5.0% of nominal voltage (400 kV). Bus voltages outside this range may occur from time to time and may exist for long periods due to abnormal loads and/or contingencies. Unless otherwise stated, all equipment shall be rated to operate safely for AC voltages between 360 kV – 440 kV at the converter stations.

- AC system frequency shall normally be within 48.5 Hz to 51 Hz and the HVDC system shall operate in this range without any restrictions on power transfer. However, equipment shall be rated for 47.5 Hz to 52.5 Hz band except AC/ DC filters, if any.

- For calculating reactive power exchange and filter performance (if any), the 400 kV AC voltage variations to be taken, shall be from 380 kV to 420 kV and the frequency shall be from 49.0 Hz to 50.5 Hz. Frequency range for AC/DC filter (if any) rating shall be 48.5 Hz to 51 Hz.

5. Environmental Data

The environmental data shall be considered as per following Table-2:

Table 2

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Sr. No.	System data	Khavda (HVDC) Near KPS3	South Olpad
1	Max/ min Ambient temperature (dry bulb one-hour average) Max dry bulb 24 hr average	50 deg C max 0 deg C min 40 deg C	50 deg C max 0 deg C min 40 deg C
2	Relative Humidity (%, max)	100	100
3	Average annual rainfall	As per rainfall map of IMD	As per rainfall map of IMD
4	Iso-keraunic level	As applicable	As applicable
5	Wind Zone	As per National Building Code 2016	As per National Building Code 2016
6	Seismic Level	As per Seismic zone of the site	As per Seismic zone of the site
7	Altitude above sea level	< 1000 m	< 1000 m
8	Pollution level (IEC 60815)	Heavy	Heavy

6. System Performance

The HVDC system shall be designed to meet all performance requirements and shall be compatible with the existing power system. The HVDC system shall not cause instability to the existing AC network. Also, it shall not cause adverse effects to other HVDC system(s) in vicinity, solar based generation plants (near Khavda KPS-3) as well as other Generating Units. This shall be verified by stability, multi-infeed and Sub Synchronous Resonance (SSR) studies and any other Study required, if applicable. The steady state, dynamic, HVRT, LVRT, Harmonic and flicker performance requirements as per applicable Rule/ Regulations/ Standards/ Guidelines shall be applicable.

The rated power transmission capacity shall be defined and guaranteed at Rectifier DC Bus and rated transmission voltage shall be defined at the rectifier DC bus. In the calculation of the power transmission capability, the most unfavourable combination of control and measurement tolerances shall be considered and without redundant cooling and submodules. All components of the transmission system shall be rated to meet the requirements given in this section and other requirements specified elsewhere in this Specification.

HVDC system performance and rating requirements for high voltage equipment and other critical equipment shall be determined taking into account the extreme values of environmental and AC and DC system parameters as applicable for performance/rating requirements given in this specification and manufacturing and measuring tolerances.

TSP shall determine the PQ diagram of the individual converters as well as the total DC transmission system. The PQ diagram shall be valid for all 400 kV AC bus voltages in the range of 380 kV to 420 kV and for all frequencies in the range of 48.5 Hz to 51.0 Hz. The PQ

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diagram shall also show, where applicable, different limits for 47.5 Hz to 52.5 Hz and for bus bar voltages in the range of 360 kV to 440 kV.

Mode	Power Range	Min Capacitive Reactive power per pole (MVAr)	Min Inductive reactive power per pole (MVAr)
Pole Power	0-1250 MW	410	410
Pole in STATCOM mode	0	625	625

There shall be no restriction on connecting, starting and operating the HVDC link if frequency and AC voltage at rectifier station are within 48.5-51.0 Hz and 380 - 420 kV respectively. Khavda end of link shall be operated as a grid forming facility that provides 50 Hz power frequency and controls the AC voltage level at 400 kV bus.

For calculations, the maximum line resistance shall be taken at a maximum conductor temperature of 85°C with minimum wind velocity and maximum solar radiation while for minimum line resistance the conductor temperature shall be taken as 0°C.

7. DC Voltage:

The nominal direct voltage at the Rectifier converter station shall be ± 500 kV relative to neutral. This voltage shall be maintained within ± 10 kV by tap changer and modulation index control for all power flows with balanced current between the poles/converters for all AC bus bar voltages between 380 kV and 420 kV and for all AC system frequencies between 49.0 Hz and 50.5 Hz.

In any monopolar operation, the rectifier Pole Voltage to Ground may be decreased by equivalent Voltage drop in DMR line.

In the event that the AC system voltage is below 380 kV, down to 360 kV, the DC line voltage may be correspondingly reduced.

If the AC system voltage at Rectifier or Inverter end is above 420 kV but not exceeding 440 kV, the DC line voltage to ground may be increased but shall not exceed 525 kV at Rectifier.

The above references to DC pole voltages shall be interpreted as extremes and shall not be exceeded due to measurement error, tap changer control dead band, tolerances in the manufacture or in the control system, harmonics or for any other reason.

8. Reduced DC Line Voltage

The HVDC system shall be capable of operating continuously at a nominal pole voltage of 400 kV relative to neutral at rectifier DC bus in bipolar as well as in monopole modes. Rectifier station shall be capable of transmitting power flows upto 2000 MW in bipolar link and 1000 MW in Monopole. Redundant cooling may be in service. The pole voltage shall be within 10 kV of the above, provided that the AC bus voltage is below 400 kV.



It shall also be possible to set DC voltage reference between 400 kV to 500 kV in either pole in the steps of 1 kV by the operator action.

Power levels in this voltage range shall be as permitted by the main circuit rating of the equipment. However, reduced voltage attempt by DC line protection shall directly first achieve 400 kV. The reduced voltage may be achieved by a combination of tap changer and modulation index control.

Reduced voltage operation shall be possible to be ordered by operator from either station. The change from normal to reduced voltage operation and vice versa shall not require a converter block or reduction in power below that achievable with the reduced voltage. It shall be possible to start the transmission in reduced voltage mode.

9. Converters Operating modes

The HVDC equipment at both Converter Stations shall be designed and rated to operate with different DC power orders. Necessary facilities shall be provided to permit these modes of operation and to allow the individual Pole power and/or voltage to be set as per below.

Each Pole and Bipole shall be capable of transmitting power for the system short circuit levels specified in this specification. These operating modes shall also be available for reverse power and reduced voltage operation. The poles should have the facility to operate independently with capability to transfer any excess power requirement from one pole to the other in the event of a trip of one pole. The healthy pole shall be limited to its rated capacity.

The minimum operating modes are as follows:

(a) **Balanced Bipolar**: This mode is the normal mode of operation for the link. In this mode DC currents in the two poles should be balanced and any small unbalance current between the poles should flow through DMR.

(b) **Unbalanced bipolar operation**: Two poles running at different power levels and difference in pole currents flowing through DMR.

(c) Monopolar operation with Dedicated Metallic Return (DMR i.e., D1 or D2 or D1||D2) mode

(d) Monopolar operation with Pole Metallic Return (PMR) mode.

(e) **Constant frequency and AC voltage control mode**: HVDC station at Khavda is



connected to HVAC network integrated with renewable solar and wind generators. During disturbances HVAC network at Khavda may get isolated therefore the HVDC station at rectifier shall always operate as a grid forming facility that provides 50 Hz power frequency and control the AC voltage at 400 kV level. The operator shall be able to set an appropriate droop in the AC voltage control to achieve a reasonable contingency reserve and sharing of reactive power with other reactive power in the system

(f) **Reactive Power and AC voltage control mode:** each Converter Station shall be designed and able to independently control the reactive power or the AC voltage. The operator shall be able to select between the reactive power and AC voltage control modes and shall also be able to select the reference values for Q/ U_{ac}. The voltage control strategy should not result in excessively high tap changer operations of converter transformers. AC voltage and reactive power control of each converter station shall operate stably with nearby reactive power compensation devices. Any oscillations of power and voltage at the HVDC converter shall be well damped and eliminated.

(g) **STATCOM mode:** In case HVDC pole is not transmitting power, healthy converter shall be capable of operating independently under Statcom Mode. The operator shall be able to activate Statcom mode separately for each converter station.

(h) **Black start:** Facility for Black start capability shall be possible for both the stations. TSP shall determine and provide any additional equipment such as diesel back up, batteries, etc. that is required to be able to carry out black start in both directions. This shall include any hardware and all the necessary control functions to perform the black start.

10. System Studies

The TSP shall be responsible for overall system engineering and detailed design of all elements, systems, facilities and equipment. The TSP shall have to carry out following studies and shall submit the study reports for this purpose for both directions of power flow. The TSP may note that the following list is only indicative and if any other studies, calculations etc. are required the same shall have to be done by TSP.

(a) Main circuit parameters

(b) Transient Current Requirement and Short circuit studies

(c) Thermal Rating Study for Key Equipment

(d) Studies for Overvoltage Protection and Insulation co-ordination for AC and DC

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systems

(e) AC, DC Harmonics (if applicable, required as per OEM's design) filter design, rating and performance

(f) Temporary overvoltage (TOV) and Fundamental Frequency Temporary Over Voltage-(FFTOV) and Ferro Resonance Overvoltage Studies

(g) AC and DC Transient overvoltage Study, surge arrester stress

(h) Runback and run up studies (the Last Line/ Last Breaker logic (if required) shall be limited to the AC lines and AC breakers within the HVDC stations)

(i) AC breaker Transient Recovery Voltage (TRV) and rate of rise of recovery voltage (RRRV) studies

(j) DC High Speed Switch Requirement Study (as applicable)

(k) AC equivalent study

The equivalents to be prepared for peak load, light load and extremely weak (minimum SCR) network scenarios. The dynamic network equivalent shall be prepared with full machine models having exciters, governor-turbine, generators, stabilizer models instead of voltage source models, up to a minimum of two buses away. These dynamic equivalent networks shall be used in PSCAD DPS, Real Time Digital Simulator (RTDS) DPS, with actual control and Protection panels.

(l) DC Commutation switch requirements (as applicable)

(m) Load flow, stability, modulation and frequency controller design study

(n) LVRT, HVRT, harmonic resonance and other dynamic studies

(o) Black start islanded operation studies at both ends

(p) Electrical interference (RI and PLC) study , filter design, rating and performance

(q) Reliability and availability study

(r) Audible noise study

(s) Loss calculations/study

(t) Studies for deciding the operational logic and sequences considering Dedicated Metallic Return Conductor (DMR) operation and Metallic return with pole conductor, in case of monopolar Operation

(u) Impact of parallel AC lines

(v) Real Time Simulator-based studies for testing of actual HVDC Controls (Factory Acceptance Test or Factory System Test)

(w) AC/ DC system interaction studies

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(x) Interaction studies between this VSC HVDC and other nearby HVDC stations and nearby Inverter Based Resources (IBR)

(y) Studies to determine the requirements for communication between the converter stations and remote Load Despatch Centres (LDCs).

(z) Studies for designing the equipment for Dedicated Metallic Return Conductor (DMR) operation and metallic return with pole conductor, in case of monopolar operation up to rated power.

(aa) Sub synchronous Resonance and Self Excitation Studies

These studies shall be carried out to demonstrate that the HVDC system does not excite the torsional modes of oscillations and self-excitation of the generators and Sub-synchronous Resonance in thermal/gas turbine generators near Converter Stations under all defined system operating conditions. The study shall demonstrate that the HVDC system has positive damping for all sub synchronous torsional modes of the generators.

(bb) Studies of DC Current flowing through Windings of Converter Transformers

(cc) Studies of DC Current flowing through breakers on AC side of converter transformer for earth faults on converter side of transformer at locations as applicable and sizing of auxiliary resistor to ensure zero crossings in the total current in the AC breaker.

(dd) AC line and other bays protection co-ordination studies in grid forming mode.

(ee) Studies for the Control, Protection and Communication Systems

(ff) DC over voltage studies

(gg) Low frequency characteristics

(hh) High frequency characteristics

(ii) Station earthing

The study reports shall include the following study results:

(i) Dynamic Performance Study including the RE Resources near Converter Stations

(ii) Hierarchical Structure of the Control and Protection

(iii) Redundancy of the Control and Protection Systems

(iv) DC Power and Voltage Control Modes and Features

(v) Switching Sequences and interlocking

(vi) AC and DC System Protections

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For each protection, the report shall include the following:

a) Purpose of the protection

b) Principle of protection operation

c) Required accuracy of measuring signals

d) Fault detection and coordination between the DC controls and the protection and AC protection.

e) Consequences of protection operation, such as DC control and sequence control initiated at both converter stations

f) Redundancy of protection and operation of backup protection

g) Detailed calculations of the protection settings together with limiting fault cases and/or criteria that determine these settings.

h) Description of the applicable protection in case of loss of telecommunication.

(vii) Reactive Power Control

The study shall include at least the following:

a) Reactive power control principles for converter operation during steady state and transient conditions including STATCOM mode of operation

b) Switchover and control feature between AC voltage/reactive power controls

c) Reference variable control criteria

d) Criteria for switching of reactive power sub banks, as applicable.

e) Operator operation, including control and monitoring features

f) Equipment description, emphasizing reliability/availability and maintenance features

g) Validity checking of signals

(viii) Telecommunication Interface Requirements

(ix) Station Control and SCADA System

(x) Control for Converter Transformer Tap changer

(xi) Additional Control Study



The report, as applicable shall include the studies of the following control modes with the AC network condition of Khavda and South Olpad and actual performance of converter equipment and possible fault condition being taken into account.

a) Power ramp down

b) Power ramp up

c) Damping of sub-synchronous oscillations

d) Abnormal AC voltage and frequency control

e) Supplementary modulation signals

f) Fault current infeed studies

g) Negative sequence current infeed studies

(xii) Multi Infeed Interaction Study with nearby HVDC Systems

(xiii) Black Start Mode network studies.

(jj) Any other studies as deemed necessary by TSP

TSP shall carry out necessary studies for performance under this RfP considering the 400 kV Bus-sectionalizer at KPS-3 (S/s) in both Open and closed condition.

The load flow and dynamic file shall be provided to the TSP in PSS/E 34 or newer version format. This will include maximum and minimum fault contribution from conventional generation and IBRs considering full power, reduced dc voltage power, black Start modes and other network scenarios which can lead to highest possible dynamic overvoltage variations. Necessary Generic Models for IBRs or modelling assumptions shall also be provided for studies requiring the same. Conventional generator, lumped mass model and controller models in vicinity shall also be provided. For sharing User defined Models (UDMs) TSP and Solution Providers will be required to abide with the statutory requirements of the UDM provider if required.

In case of absence of detailed models of nearby inverters and 6000 MW LCC HVDC, the harmonic distortions shall be considered as per the relevant CEA Regulations. The impedance of RE Park at the Pooling station PCC will be provided to the TSP. The rest of the network may be modelled by the harmonic impedance and the rating and performance studies shall be done accordingly. Harmonic impedance shall take into account all



contingencies in base file, N-1, N-2 and other PSS/E scenarios for network for full power and reduced DC power.

PSS/E files shall be provided based on the data available at the time of issuance of the RfP. The TSP is required to validate the data before carrying out simulation. However, clarification, if any, may be sought before the bid submission. CEA/ CTU shall endeavour to give clarification to the extent possible. In case of any discrepancy observed/ non-availability of data for any of the machines and other control devices, typical values may be used in the studies with the intimation to CEA/ CTU.

11. Digital Models

TSP shall provide to CTU following models of all supplied circuit components and control and protection of the HVDC Systems. The models shall be up to date with all the design features implemented in the Project.

(a) PSCAD

(b) PSS/E

TSP shall provide both UDM and Generic model for RMS based stability model (in PSS/E V36 or above) and EMT (PSCAD). All appropriate control features shall be modelled in the above models and necessary documentation on the theory and use of model should be provided. Further, a generic model, benchmarked to the extent possible to the UDM PSS/E and PSCAD model, shall also be furnished. Generic models can be shared by the CEA, CTU and Grid-India with the concerned stakeholders/**external party(ies)** e. g. STUs etc. **on need basis**. For User Defined model, confidentiality shall be maintained by the CEA, CTU and Grid-India. For PSCAD, User Defined model shall be provided by the TSP for which confidentiality shall be maintained by the CEA, CTU and Grid-India. Both UDM (PSCAD and PSS/E) and Generic model (PSSE) shall be provided by OEMs to CEA/CTU/GRID-INDIA without any NDA (Non-Disclosure Agreement)

Data sharing requirements as per Procedure for First Time Charging/ Energization (FTC) and Integration of New or Modified Power System Element to Grid Controller of India Ltd. (GRID-INDIA) shall also be done by the TSP. All the requisite data/ reports/ models including User defined models/ documents as required as per the CEA/CTU/Grid India Standards/ Guidelines shall be provided by the TSP. Data sharing format will be subject to the agreement or other statutory requirements mandated by HVDC Solution Providers if required.

12. DC power circuit switching requirement:

The TSP shall provide all DC switching devices as per the requirements of this Specification to enable the smooth and efficient operation of the HVDC system. TSP may decide at which end DMR shall be connected to earth based on the practices being followed by the Original Equipment Manufacturer (OEM).

All disconnectors or isolators which are used to provide isolation for maintenance on any



equipment shall have visible breaks. If a visible break is not inherent then an additional separate isolator having a visible break shall be provided.

The equipment arrangement shall be designed to ensure that no single contingency, fault or loss of any piece of equipment except common equipment to both the poles can cause or result in a bipolar shutdown or transient reduction in power transfer to less than the rating of one Pole.

High speed switches for discharge of the DC line shall be provided with disconnector.

The station layout shall provide safe access to all equipment for service and maintenance.

The DC power circuit arrangement shall provide at least the following functions:

(a) Isolating and grounding Converter Station Pole for maintenance.

(b) Isolating and grounding either or both DC transmission line Poles for maintenance.

(c) Isolating and grounding the DMR conductor at the Converter Station for maintenance when operating in bipolar mode with balanced DC currents. All primary equipment, control, protection and measuring equipment necessary to achieve this function shall be provided. All the studies and design engineering necessary for the HVDC System to operate in such modes shall be performed.

(d) Clearing of a Pole for maintenance without affecting the power flow on the other Pole.

(e) Switching between active power transmission and STATCOM mode

(f) Grounding of the neutral bus through a high-speed switch (NBGS) during bipolar operation balanced current mode.

(g) Clearing neutral bus fault on one Pole.

13. Insulation co-ordination

(a) HVDC System shall be suitably protected against Impulses and disturbances external and internal to the system such as switching impulses, lighting impulses, steep front impulses, dynamic over voltages and load rejection (1 pu power). The insulation of all equipment shall be properly protected and coordinated with surge arresters and/or surge capacitors. Insulation coordination shall be done keeping in mind the minimum electrical clearances, safety clearances and maintenance clearances as per Switching Impulse Withstand Level (SIWL). Insulation coordination shall be done as per relevant IS/ IEC Standards.

(b) The insulation of the equipment and protection levels of Surge Arresters connected to the converter AC bus bars of the converter stations at both rectifiers and inverter shall be coordinated with the insulation and surge arrester characteristics of the connected AC systems to which the converter stations are to be connected without exceeding the



discharge duty of these arresters so as not to overload these existing arresters of the network. Only 336 kV surge arrester (rated voltage) shall be used on 400 kV AC incoming line side.

(c) The tripping action for lines shall be initiated if the fundamental frequency over voltage exceeds 1.1 pu for 5 seconds and if 1.5 pu fundamental frequency voltage persists for more than 100 milliseconds. The HVDC over voltage strategy shall be coordinated with such setting.

(d) The minimum **insulation levels** for 500 kV DC transmission line to ground shall be as per CEA Regulations:

- Lightning impulse withstand voltage (1.2/50 micro sec) (kVp): 1800 kV
- Switching surge withstand voltage under wet condition (kVp): 1000 kV

(e) The ratio of **impulse withstand voltage** to impulse protective level shall be in line with Table 3 of IEC-60071-11.

(f) The TSP shall carry out insulation coordination studies for the Project. The TSP shall perform all necessary HVDC digital simulator studies and shall keep detailed report(s) on insulation coordination in its record. The TSP shall carry out insulation coordination studies for rating of all arresters supplied for the project, establishing the required insulation level for supplied equipment and the clearances between energized parts and between energized parts and the ground. The arrester arrangement and protective levels shall be selected such that, generally, the overvoltage on the AC side is protected by arresters on the AC side, and overvoltage on the DC side are adequately limited by an arrangement of arresters on the DC side. Critical components of the supplied converter equipment shall be directly protected by arresters connected closest to them. The arresters installed shall be rated such that these arresters are not overstressed for all operating modes and configurations. The studies must show that any existing 420 kV equipment including any existing surge arrestors will not be overstressed for all modes of operation and configurations of either Converter Station when HVDC station is extension of an existing AC station.

The report(s) shall detail the characteristics of the surge arresters, energy ratings and shall demonstrate that the selected insulation protective and withstand levels, discharge and coordinating currents, and arrester ratings and discharge capabilities are adequately coordinated and comply with the requirements of this Specification. It shall also detail all insulation and air clearances and leakage distances and shall justify the selected values based on the present Specifications. The report(s) shall include all assumptions made for the study parameters and describe the types of events modeled (i.e. AC and DC faults, transformer bushing faults, converter valve or control mis-



operations, etc.) and identify the decisive cases that establish the insulation design.

(g) **Temporary Overvoltage**

High voltages at the converter buses can occur due to load rejections or other cause. The HVDC system shall remain connected and provide dynamic voltage control to mitigate the voltage rise within the capability of the equipment. The requirement for ac system voltage control during an overvoltage has highest priority and therefore it is permissible to run back the active power transfer to limit the overvoltage.

The converter valves shall be capable of continuing to operate under the temporary overvoltage conditions specified below, which could occur with the valves deblocked and also that the valves are capable of deblocking under the highest temporary over voltage conditions within five (5) cycles of the initiation of a fault or disturbance. The equipment shall be designed for the applicable short circuit ratio and overvoltage arising thereby.

Temporary Overvoltage caused by Bipole link HVDC transmission shall be controlled to 1.4 pu or below. Temporary overvoltage caused by other equipment in the AC network shall be controlled within the limits of the capability of the deblocked converter. In case of DC line permanent fault, the converters should restart in STATCOM mode for AC grid support. In case the converter is tripped, and not possible to restart within seconds, filter tripping shall be allowed to limit overvoltage as applicable.
The actual temporary overvoltage shall be determined by the TSP, but the equipment shall be designed for temporary over voltage not less than the values given above. In addition, so as to prevent operation and overstressing of the arresters, the TSP shall limit the temporary over voltages including harmonic, resonant, and ferro-resonant effects on the 400 kV AC bus bars so that:

- **705 kV** crest phase to ground is not exceeded by more than 3 peaks;
- **565 kV** crest phase to ground is not exceeded by more than 10 cycles;
- **510 kV** crest phase to ground is not exceeded by more than 20 cycles.

In the calculation of temporary over voltages on the AC side the TSP shall allow for blocking of the complete Bipole from up to the highest steady state transmission capability of the installation. On the DC side the TSP shall allow for the maximum load rejection which could occur and which leaves converter deblocked.

The converter Equipment shall be designed to withstand temporary over voltages corresponding to AC Side which are not less than 1.5 times 400 kV upto 100ms at converter stations with the converter blocked



The TSP shall provide and commission all equipment necessary to limit the temporary over voltages on the AC bus bars to the levels specified above. The actual temporary overvoltage shall be determined by the TSP but AC equipment shall be designed for temporary overvoltage not less than the values given above.

The connected AC harmonic filter shall be assumed to be that with the highest MVAr applicable to the mode of operation which does not exceed the maximum reactive power exchange with the AC system as specified in this specification.

The converter equipment shall be rated for continued operation under the maximum over voltage conditions to be defined by the TSP taking into consideration the dynamic over voltage profiles as determined by the design studies to be performed by the TSP. Irrespective of the over voltage profile derived by the TSP, the equipment shall be rated to withstand an over voltage according to above figures following deblocking.

DC withstand voltage design of equipment shall take due consideration of the temporary voltage stresses that the respective equipment may be exposed to based on studies of different disturbances as applicable.

Any switching equipment within the scope of supply of the TSP which may be called upon to operate at this voltage in either a main or backup role shall have the appropriate capability.

HVRT Strategy:

The HVDC Station shall enter into HVRT mode (exit from continuous operating region) when the Voltage at AC bus i.e. 400 kV side (RMS) is above 1.1p.u. due to faults/control actions/or any other cause.

The HVDC Station shall remain connected to the grid when voltage at the interconnection point (AC bus), on any or all phases (symmetrical or asymmetrical overvoltage conditions) rises above the specified values given below for specified time:

Over voltage (pu#)	**Minimum time to remain connected and Deliver the rated reactive support (Second) at POI**
V > 1.50	Instantaneous trip



1.50 ≥ V > 1.30	100 ms
1.30 ≥ V > 1.10	10 sec
1.10 ≥ V > 1.05	15 minutes
V ≤ 1.05	Continuous

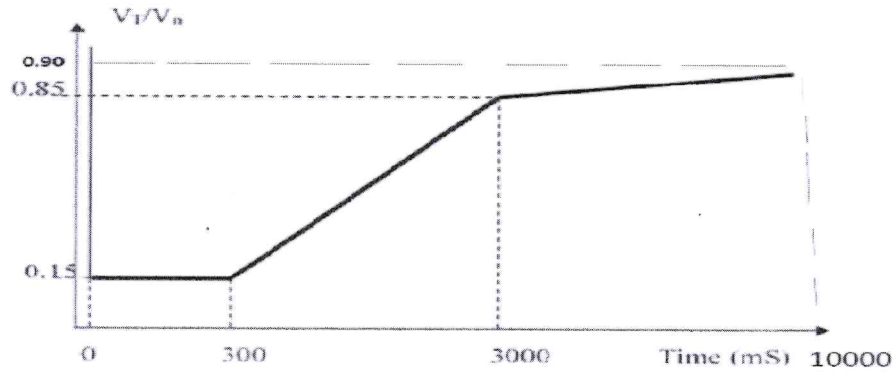
 # 1 pu = 400 kV (3 phase RMS voltage at POI)

During HVRT mode, HVDC Station shall provide reactive power support (absorption) at POI proportional to Voltage at POI (inductive operation). There shall be maximum VSC current (up to 0.8 p.u..) during inductive operation considering voltage of 1.3 p.u. at AC side (POI). 1 p.u. of VSC current is the current corresponding to 1 p.u. of apparent power (1250 MW per pole active power and 410 MVAr per pole reactive power) under nominal system condition.

LVRT Strategy:

The HVDC Station shall enter into LVRT mode (exit from continuous operating region) when the Voltage at AC bus i.e. 400 kV side (RMS) is below 0.9 p.u. due to faults/control actions/or any other cause.

The HVDC Station must remain connected to the grid when voltage at the interconnection point (AC bus), on any one, two or all phases (symmetrical or asymmetrical overvoltage conditions) dips up to the level depicted by the thick lines in the following curve:



1 p.u. = 400 kV (3 phase RMS voltage at POI)

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During the voltage dip, the supply of reactive power has first priority, while the supply of active power has second priority. Restoration of voltage shall be said to be achieved when the voltage at PoI settles within ±5% of pre fault voltage. Active power shall be restored to at least 90% of the pre-fault level within 1 sec of restoration of voltage.

During LVRT mode, HVDC Station shall withstand all above low voltage conditions and needs to be coordinated to provide reactive power support (injection) at POI with a maximum VSC current of 0.8 p.u. (capacitive operation). 1 p.u. of VSC current is the current corresponding to 1 p.u. of apparent power (1250 MW per pole active power and 410 MVAr per pole reactive power) under normal system condition.

(h) **Transient and Temporary over voltages**

In the calculation of transient over voltages the TSP shall consider at least:

(i) Lightning surges propagating down the AC and DC overhead lines, including direct strike to line conductors and back flashover.

(ii) Lightning surges due to direct strike within the converter station in the event of shielding failure

(iii) Steep fronted waves resulting from flashovers or faults, including those to ground from the valve windings of the converter transformers with tripping of bipole or monopole based on feasibility of survival of healthy pole.

(iv) Over voltages due to switching of converter transformers, AC filters and shunt capacitors, shunt reactors, 765 kV and 400 kV transmission lines, 765 kV and 400 kV class transformers or other equipment.

(v) For re-closure of AC filters, residual voltage on the capacitors shall be considered.

(vi) The saturation effects of converter transformer due to presence of remnant flux shall also be considered.

(vii) Application and clearing of single phase and three-phase to ground faults which may be cleared by AC circuit breakers; Possibilities of breaker re-strikes shall also be considered although the breaker should be designed as restrike free.

(viii) Faults within converter equipment, including control and telecommunication malfunctions.

(ix) Over-voltages due to blocking of converter of monopole or bipole.

(x) Over-voltages due to DC and DMR line resonance.

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(xi) Uneven distribution of over-voltages, particularly within the converter valves.

(xii) Arrester location relative to protected equipment and arrester characteristics.

(xiii) For determination of maximum transient and temporary overvoltages at converter bus with a sequence of clearance of three phase /single phase AC bus fault along with the following scenarios shall be checked and highest value shall be considered for suitable protection actions:

a. Blocking of one pole or both poles running at full load with appropriate AC filters remaining connected OR

b. Highest temporary overvoltage as mentioned in clause 13 g above

(xiv) Single pole to ground and Pole to Pole fault at DC line or at either station followed by tripping of pole/bipole as applicable.

(i) **Limitation of Overvoltage**

Blocking of the converter valves to protect them and other DC side equipment from sustained over voltages as per table under HVRT Strategy appearing on the AC system shall not be permitted. The use of converter valve group controls to limit temporary (dynamic) over voltages shall be permitted provided that the valves and other converter equipment are adequately rated.

(j) **Determination of Overvoltage**

The TSP shall determine the highest transient and temporary over voltages, which can occur with the equipment parameters selected and with the AC system and DC line as defined in this Specification.

(k) **Arrester Protective Levels**

The transient overvoltage imposed across insulation shall be limited by surge arresters. Dynamic over voltages may also be limited by surge arresters but only if the arresters are adequately rated for such duty.

The discharge current (coordinating current) shall be determined by the TSP appropriate to the arrester location and line and equipment parameters. For arresters connected to the 400 kV AC bus bars, the 8/20 microsecond wave coordinating discharge current shall be 10 kA, 15 kA or 20 kA as appropriate. Where multicolumn arresters are used or where arresters in separate housings are connected in parallel, unequal sharing of the discharge current shall be considered.



The TSP shall design the converter equipment to withstand a maximum continuous AC system voltage of 440 kV. The calculations for determination of arrester energy requirement shall be based on a maximum pre-fault voltage of 440 kV.

(l) **Lightning shield**

The TSP is responsible for the design of the lightning shield. The system shall also be designed to provide "effective shielding" to ensure that almost no insulation flashover can result from atmospheric discharges striking the overhead shielding.

Effective and adequate lightning protection shall be provided to protect all converter equipment including wall bushings and the Converter Station buildings from damage due to atmospheric discharges and shall ensure that any lightning strikes shall not cause flashover or mal-operation of any equipment which can affect the power transmission capability of the Converter Station.

14. Radio Interference (RI), Acoustic Noise (AN) and DC field

(a) All the necessary precautions shall be made during HVDC design to ensure that there shall be no mal-operation, damage or danger to any equipment, system or personnel due to electromagnetic or electrostatic interference effects. The converter terminal(s) shall neither damage nor cause mal-operation of the DC control and protection system or the DC tele-control system.

(b) All the necessary precautions shall be taken in the form of noise suppression techniques, shielding and filtering devices to prevent harmful interference, which may be generated by the converter terminals, with the Power Line Carrier (PLC) systems, Radio communication systems, Television systems, VHF, UHF and microwave radio systems.

(c) The audible noise shall be limited to the following values for various areas of the converter station and buildings. It is to be demonstrated by calculation and site measurement that the specified sound pressure levels are not be exceeded.

Table 5

Valve hall (in places where long term access is required during normal operation) Mechanical equipment indoor areas requiring long term access (measured at 2 meter distance)	90 dBA

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Equipment in outdoor areas (measured at 15 meter distance) except converter transformers	75 dBA
Office area*	45 dBA
Control rooms*	45 dBA
Diesel generator (Operating area)	75 dBA
Compressor areas (measured at 2 meter distance)	90 dBA
At the station boundary (Outside wall or fence)	70 dBA

* *"Background" noise from the ventilation system.*

(d) For area with permanent access, the total calculated electric field at ground level shall not exceed 20 kV/m in the DC outdoor yard. For areas with permanent access in DC outdoor yard, calculated Ion current density shall be less than 20 nA/m^2 at ground level.

(e) Radio Interference (RI)

The TSP shall take the necessary precautions in the form of valve hall and building shielding to meet his own requirements plus the following:

(i) With the Bipole operating at any of the specified operating modes and power levels and within the design range of IGBT switching, the Radio Interference Level (RIL) from electromagnetic radiation generated by the converter shall not exceed 100 micro volt/m under fair weather conditions at any point outside station fence which are:

500 meters or more from the nearest bus connecting the valve to the converter transformers within the station

and

at a lateral distance of 30 m for the conductors of any outgoing AC line, HVDC line and DMR line.

This RIL criterion shall be achieved at all frequencies within the range of 150 kHz to 300 MHz.

(ii) The valve hall design shall incorporate the screening requirements. The use of a mesh screen external to the building, covering all or part of the switchyard shall not be permitted.

(iii) The shielding shall be designed so that the specified radio interference levels shall not be exceeded assuming any earth resistivity between 10 and 1000

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ohm-meter.

(iv) Maximum radio interference voltage for frequency between 0.5 MHz to 2 MHz at 1.1 times of maximum DC voltage for 500 kV DC system, 266 kV RMS for 400 kV system and 156 kV RMS for 220 kV system and 92 kV RMS for 132 kV system shall be 2500, 1000, 1000 and 500 micro-Volt respectively.

(f) Television Interference (TVI)

The Television Interference Level (TVIL) shall not exceed 10 micro volts/m at the locations/contour line specified above.

(g) Interference with Power-Line Carrier Systems

The TSP shall take the necessary precautions in the form of noise suppression techniques and filtering devices to prevent harmful interference from the converter stations to Power Line Carrier (PLC) systems operating on the HVAC transmission line networks connected to each station and also to other power line carrier systems located adjacent to the HVDC bipolar line such that PLC systems shall operate reliably in fair weather conditions. The frequency spectra to be protected for PLC system is 40 kHz to 500 kHz.

15. Dynamic Performance

(a) The purpose of dynamic performance design is to determine the control parameters for HVDC system and to ensure that the HVDC system shall have smooth, stable and fast operation for both steady state and transient conditions without adversely affecting the connected AC grid.

The principal objectives of the design shall include:

1. Optimal response of HVDC controls following step change in ordered parameters like current, power, DC voltage etc.
2. Stable operation of the DC system following major disturbances.
3. Stabilization of the ac system following major disturbances.
4. Control of temporary over voltages and avoidance of self-excitation of the generators.
5. Control of frequency following quasi-static (slow) and fast changes in ac system load / generation at the rectifiers and/or inverter ends.
6. Control of power levels depending on the system configuration. Such a control may require ac line load control (ACLLC) and Run Back control features.



(b) The HVDC system shall recover to 90% of the pre-fault DC power transfer level consistently within 100 ms from the instant of fault clearing, without subsequent sustained oscillation for all inverter AC system fault conditions. For all rectifiers AC system fault conditions, the recovery time, to 90% pre-fault power level, shall be within 100 ms from the instant of fault clearing. The TSP shall verify that such response time does not give rise for any risk of AC system instability in any system configuration. If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the recovery times other than those specified shall also be acceptable, subject to review.

(c) HVDC should continue operation at reduced power if conditions get outside the voltage, frequency and short circuit capacity ranges specified in system data as much as possible with its inherent capability.

HVDC terminal Characteristic and Step responses: The response time (tr1) is defined as the time from the initiation of the order change to the time when 90% of the ordered change has been accomplished, subject to the condition that the measured value remains at the new order within a tolerance of +10% of the ordered change at rectifiers DC terminal after the first overshoot. If the measured value exceeds the tolerance of +10% of the ordered change after the first overshoot, then the response time (tr2) shall be defined to be the interval from the initiation of the order change to the time when the measured value returns to and thereafter remains at the new order within a tolerance of +10% of the ordered change. The first overshoot shall not exceed 30% of the ordered change and the measured value shall settle at the new order within a tolerance of +2% by the second overshoot. For an over damped system, the response times (tr3) is defined as the time from initiation of the order change to the time when 90% of the ordered change has been accomplished. The measured value shall settle at the new order within a tolerance of +2% by four times tr3. Step response to changes in power (current) order shall be executed in the following manner:

When the ordered change is *positive*:

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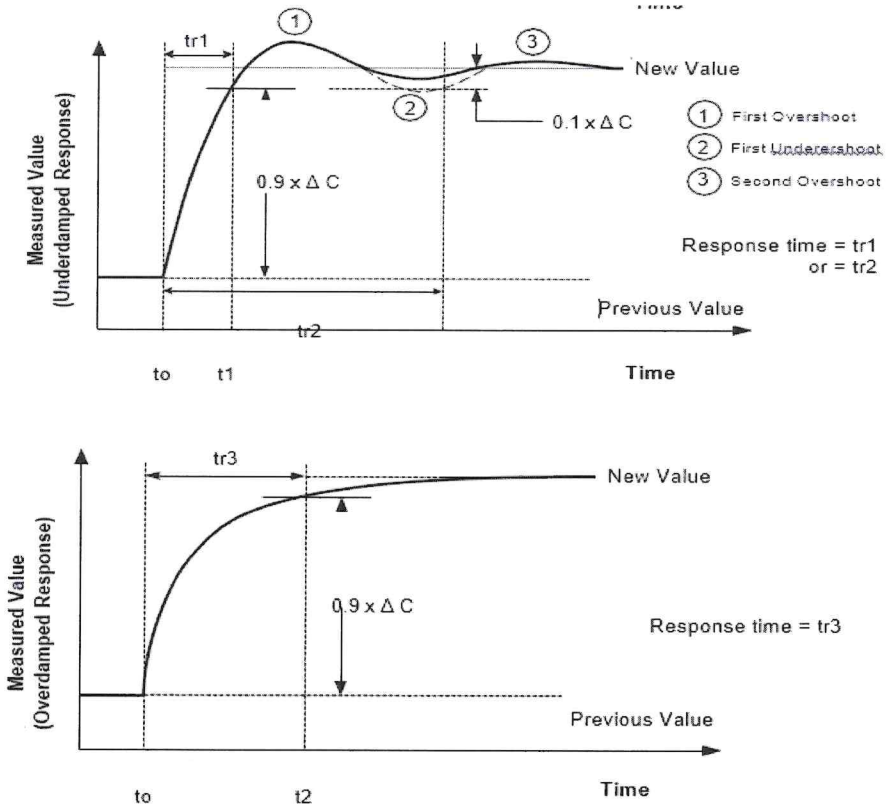
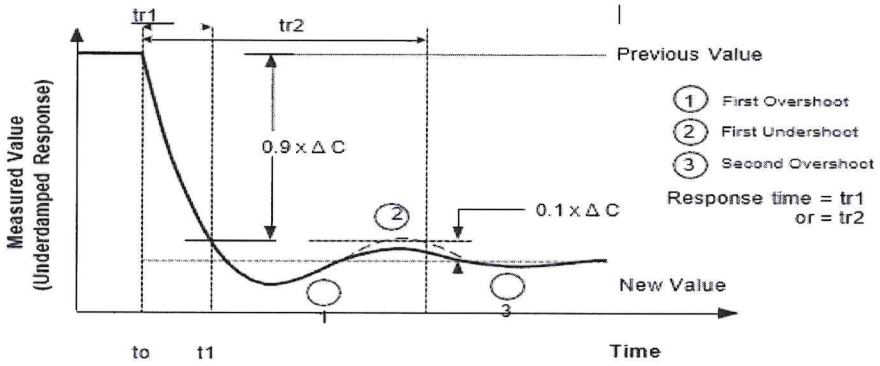


Fig 2- Definition of response to positive step change

When the ordered change is *negative*:



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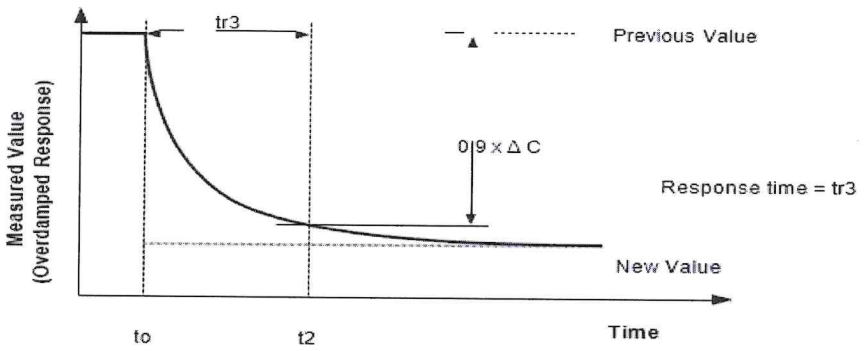


Fig 3- *Definition of response to negative step change*

(d) Power Order Step Response

The HVDC controls, when in power control mode or any other mode where the DC power transfer is controlled, shall respond to maintain the power transfer of the Poles at the ordered or desired level at any power level between minimum and rated capacity of the HVDC system.

When operating at any power order between the minimum and rated power transfer, the DC power controller shall respond to either a step increase or a step decrease in DC power order such that 90% of the ordered change is achieved within 150 milliseconds of the power order change at the rectifier. The TSP shall verify that such response time does not give rise for any risk of AC system instability in any system configuration. If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the recovery times other than those specified above shall also be acceptable.

(e) Response to AC Bus Voltage Change

The TSP shall demonstrate the response of the power controls to sudden changes in AC bus voltages of -5.0% to + 2.0% from its nominal value and ensure that it is stable.

(f) Power Voltage Instability

HVDC links operating in constant DC power control and weak AC system conditions can lead to power voltage instability under certain disturbances. To prevent such power voltage instability, the TSP shall provide control measures to prevent AC system collapse during AC system disturbance due to the action of the HVDC control. The TSP may adopt change over to grid forming mode and a power reduction or a dynamic gain supervision function in the control system to avoid such

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instability if the short circuit MVA changes during a particular power transmission level.

16. Main Circuit Design

The purpose of Main Circuit design is mainly to determine the operating characteristics and rating of converter valves and converter transformers (MVA, tap changer range etc.) It also forms the input for AC Filter and Reactive compensation design. The main circuit arrangement and circuit shall depend on type of HVDC system, Power Transmission requirements, DC Voltage Levels, connected AC voltage levels, Reactive Power requirements and AC and DC Harmonic requirements. The system shall meet various harmonic performance parameters, as specified elsewhere in this specification, on both AC Side and DC side. This requirement along with those given in Table-2, shall be met simultaneously by the AC/DC filters.

17. HVDC Station Equipment

The function blocks of converter station are Converter area (converter valves, converter transformer, smoothing reactor(if required)), DC yard (DC filters (if required), DCCT, DC Voltage Divider, PLC filters of DC side (if required), DC pole arresters, Disconnectors and ground switches), AC filter yard (as per design requirement), AC yard and auxiliaries. A typical VSC based HVDC station shall consist of the following main equipment:

(a) IGBT/BIGT valves and its accessories e.g. damping and grading circuits, converter cooling system etc.;
(b) Converter transformers;
(c) Arm Reactors/Phase reactors
(d) Smoothing reactors (if required);
(e) DC filters; (if required);
(f) AC filters (Harmonic filters and PLC filters) and shunt compensation; (if required);
(g) Control and protection of AC and DC side;
(h) Electrical and mechanical auxiliaries;
(i) Dedicated Metallic Return (DMR);
(j) AC switchyard equipment;
(k) DC switchyard equipment;
(l) AC and DC Surge arresters;
(m) AC and DC Measuring instruments;
(n) Communication system between converter stations (OPGW)
(o) DC wall bushings
(p) AC wall bushings (if applicable)

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(q) Auxiliary Power System

(r) Key interlocking system for valve hall, DC filters (if applicable), AC filter (if applicable)

(s) Fundamental frequency blocking filter, if required

(t) Pre -insertion resistors with bypass breaker for charging of converter module capacitors.

(u) High speed DC discharge switch and resistor to allow fast DC line fault discharge if required for fast dc line fault recovery.

18. Converter Station AC Yard, Transformer yard and valve hall

(a) AC commutating bus equipment

The AC circuit breakers, disconnectors, instrument transformers and other switchyard equipment shall be similar to that of the equipment specified under Regulation 46 of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022. The bus rating shall be adopted according to the calculation considering single bus outage. The switching duties of the AC circuit breakers will be decided based on transient over voltage study, insulation co-ordination, AC filters and protection studies.

Insertion resistors:

Insertion resistors shall be used to limit inrush currents during energization of the converter. They shall be located on the primary or converter side of the converter transformer. After the energization process is completed, the resistor shall be bypassed by a disconnector or bypass switch.

(b) AC harmonic filters and shunt compensation, if required

State-of-the-art Voltage-Sourced Converters (VSC) in modular multi-level converter (MMC) topologies generate nearly no or only a small amount of harmonics. The need of ac harmonic filters shall be evaluated based on study results. Suitable redundancy shall be provided in the filters to avoid reduction of transmission capacity of the station due to outage of any particular sub-bank for maintenance.
The AC harmonic filters shall be switched in and out by circuit breakers in FIFO logic to increase lifetime of switchgear. Based on the studies, reactive power requirement for the terminal and bank or sub-bank size shall be determined such that reactive power exchange with the AC bus shall remain within specified limits.

System Contribution:

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Bidder may suitably model nearby different RE generators as all these generators are required to meet harmonics requirement under "CEA Technical standards for Connectivity to the grid" regulations.

At Converter station ac bus, combined converter and static compensator (if used) harmonic currents as calculated for rating purposes shall be increased to allow for harmonic currents from the ac system *(if applicable)* in following manner:

a) At 3rd and 5th Harmonics the increase in current to be allowed shall be calculated based on the assumption that the existing distortion shall be considered as 2% with respect to nominal voltage at converter bus. This is to be considered for 3rd and 5th harmonic Filter component rating

b) At all even order harmonics and at all other non-characteristic or theoretically cancelled harmonics the increase in current to be allowed shall be not less than 50 (fifty) percent provided that the contribution of the harmonic in question to any rating parameter, in the absence of the above increase, is not greater than 10 (ten) percent of the total harmonic rating.

c) At all characteristic harmonics or at any other harmonic which is effectively filtered (i.e. the harmonic contributes more than 10% of the total harmonic rating of a component in the absence of the increase) the increase in current to be allowed shall not be below 20 (twenty) percent.

(c) If filters are required, the main filter equipment namely capacitors, reactors and resistors shall comply with the requirements of following IEC or Equivalent IS as follows:

A. Capacitors-IEC 60871;
B. Reactors - IEC 60076-6;
C. Resistors - IEC 62001/As per owner's specification.
D. Only air-core reactors shall be used in AC and DC filters for harmonic filtration.

(d) If study results confirm the need for power line carrier (PLC) filtering, PLC filters shall be installed close to converter transformers to mitigate high frequency harmonic currents generated during IGBT/BIGT switching.

Performance Requirement

The AC harmonic performance shall be better or equal to as defined by following performance parameters:

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A. The individual harmonic distortion, D_n, shall not exceed 1.5%
Individual Harmonic Distortion, $D_n = V_n/V_1$

B. The Telephone Influence Factor (TIF) shall not exceed 50.
Telephone Influence Factor, $TIF = \sqrt{(\Sigma (V_n * F_n/V_1)^2)}$

Where Fn: Weighting factor for nth harmonic according to EEI publication - 60-68(1960) corrected to 50 Hz operation by graphical interpolation

C. The Total Effective Distortion, Deff, as defined below shall not exceed 3%:

$$\text{Deff} = \sqrt{\sum_{n=2}^{n=50} \frac{V_n^2}{V_1^2} X100}$$

'1' refers to fundamental frequency (50 Hz)

'n' refers to the harmonic of n^{th} order (corresponding frequency is 50 x n Hz)

The active impedance presented by VSC HVDC at AC bus shall have no undamped or negative impedance region for all harmonics included inter harmonic based on IEC 62001-5, clause 9.2 and 9.3. In case, certain network harmonic impedance cannot be addressed by VSC HVDC, required solution should be included.

The performance of the AC harmonic shall be determined by calculation and shall be based on either as-tested parameters of components or the extreme values of manufacturing tolerances if as-tested values are not available. Performance requirements are to be met for all operating modes. In all Modes of operation, except the reduced DC line voltage modes, the performance requirement shall be met up to rated power with one larger size filter sub-bank and one characteristic harmonic sub-bank (largest) being out of service. All filter banks, sub-banks and branches shall be rated such that the remaining filter components are not overloaded due to detuning or resonance within the filters or between the filters, the generators, and the AC system for any combination of AC system voltage and/or frequency and configuration, or for any operating condition of the converters, or combination thereof, for which the converter valves are capable of continuous operation, or switching time between de-energized and energized states and there is no restriction on the operating power level for any operating conditions with one filter bank outage for power level up to 1.0 p.u. Short-time and transient conditions as well as operation with discontinuous DC current must be fully taken into account.

(e) Shunt Reactor Banks

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Shunt reactors, if required, of suitable size shall be provided to meet reactive power exchange requirements derived from the studies. The shunt reactor must be switched in or out by a circuit breaker. The shunt reactor shall conform to CEA's Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above voltage class). The shunt reactor shall be covered under automatic switching under the reactive power control strategy.

(f) Converter transformers

(i) The converter transformer shall be designed in accordance with IEC- 60076-57-129. The converter transformers shall be single phase two winding units. The maximum flux density in any part of the core and yoke at the rated MVA, voltage and frequency shall be such that under 10% continuous over voltage condition it does not exceed 1.9 Tesla. The Converter transformer shall be capable of withstanding minimum DC current of 10 A per single phase transformer entering through the neutral.

(ii) Transformers shall withstand combined voltage and frequency fluctuations which produce the following over fluxing conditions:

a. 110 % for continuous

b. 125 % for 1 minute

c. 140 % for 5 seconds

(iii) It shall be demonstrated in design that the converter transformer shall not move to saturation beyond the design limit for overvoltage magnitude and duration applicable for the project.

(iv) The insulation level for the transformer AC (line side) windings and bushings shall be as given at Regulation 45 of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 and insulation levels of the valve side windings shall be determined in accordance with studies. The impedance of the transformer shall be determined as in accordance with studies and variations in impedance shall be as per the requirement of relevant standards.

(v) Converter transformers shall be equipped with On Load Tap Changer (OLTC) and Metal Oxide Varistor (MOV) devices shall be provided between tap leads of the OLTC. The OLTC tap steps shall be determined in accordance with the operating strategy of both the converters. The OLTC shall be designed for a minimum 2,50,000 operations without repair or change of any part including oil. The OLTC shall be designed for a contact life of minimum 6,00,000 operations.

(vi) The requirements of soak pits and firewalls shall be in line with Regulation 46 of Central Electricity Authority (Technical Standards for Construction of Electrical Plants

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and Electric Lines) Regulations, 2022.

(vii) The converter transformer bushing shall be designed in accordance with IEC-60137/ IEC-65700, as applicable.

19. Converter valves and valve cooling system

(a) The converter valve assembly shall be designed and tested as per relevant IEC 62501. The valve shall be designed and protected during operating conditions for various over voltage and over current stresses to which it may be subjected to due to faults occurring in various parts of the station.

(b) The converter valve modules, used for converting AC to DC or vice versa, shall be complete with associated electronic IGBT switching system; protection, monitoring and damping system, auxiliaries and cooling system. Adequate redundant devices shall be provided to enable continued operation in case of failure of an individual component. Advanced converter topologies shall be used to reduce losses of VSC based HVDC converters.

(c) The IGBT power modules shall be water cooled, air insulated and indoor type. The valves shall be either suspended type or floor mounted type depending upon the operating DC voltage and seismic requirements.

(d) Necessary control and monitoring including tripping of the HVDC system in case of cooling system failure shall be provided.

(e) The valves shall be placed in the valve hall which shall have a positive pressure over atmospheric pressure and humidity control feature through HVAC system.

(f) No oil immersed part is permitted to be used inside the valve as well as valve hall. The electronic components located within the valve shall be designed to eliminate overheat and arcing. Only components of low flammability, high reliability and adequate ratings in margins can be used.

(g) Description of Valve Cooling System:

(i) Fine Water Circuit

The fine water circuit shall consist of a main circuit and a water treatment circuit. The cooling medium in the fine water circuit shall be deionised water with low conductivity.

(ii) Main Water Circuit

The main cooling circuit shall consist of water within the converter valves, a de-aeration vessel /venting, pumps and filters.

The main circuit shall be provided with an expansion vessel with level

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transducers and or pressurised with nitrogen, as per requirement of OEM design. The level transducers shall be used for control of the make-up water for the system, if applicable, and for detection of leakages.

There shall be two water pumps. One of the two water pumps shall circulate the 100% water through the main cooling circuit and the water treatment circuit. The other pump shall be included for redundancy purpose. The operation shall be automated and arranged into alternative weeks between these two pumps. Upon failure of the unit in service, the redundant shall be automatically activated.

(iii) Water Treatment Circuit

A part of the main flow shall be circulated in the water treatment circuit. The water treatment circuit shall consist of oxygen removers (if required), ion exchangers and mechanical filter. Sensors shall be provided for measuring conductivity of the water, both in the main cooling circuit and in the treatment circuit at the exit side of the ion-exchanger. The water treatment circuit shall have provision to connect makeup pump and associated valves and strainers. The water pipe for fine water make up shall be connected to main fine water circuit through the water treatment circuit.

(iv) Air Cooled Liquid Coolers

The air-cooled dry type liquid coolers shall cool the water from the converter valves. At least one cooler unit or minimum 10% of total cooler units required to achieve the operating water temperatures for rated power (whichever is more), shall be provided by the TSP as redundant over and above the quantity required.

All the stations shall have dry type coolers. Each cooler shall consist of cooling fans with separated air channels.

Suitable protection against corrosion, oxidation etc. shall be provided for all cooling equipment.

(v) Mechanical Design

The cooling system shall be pre-fabricated. There shall be three main parts:

- fine water pump unit;
- air cooled liquid coolers;
- piping.

The fine water pump unit shall be mounted on a frame and shall be placed in the valve cooling room. The air-cooled liquid coolers shall be placed outdoors, near to the valve cooling rooms. The piping shall be especially designed stainless steel and adapted to the station building.

(vi) Control Equipment

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The valve cooling control equipment shall be specially designed for application to the cooling system for converter valves. There shall be two computer-based control systems such that either both are in ACTIVE mode, or when one system is in ACTIVE mode the other system shall be in ACTIVE STANDBY mode. Each computer-based system shall be self-checking and an automatic changeover to the other system shall take place in the case of failure of the active system.

(vii) Design Criteria for the Cooling System

Features to ensure high reliability, proper function and prolonged life time for the cooling system and converter valves shall be included. The following main components shall be supplied with redundancy in order to increase the availability:

- main circulation water pump
- air cooled liquid cooler (with redundant cooler as provided in (iv) above)
- bypass valves
- transducers
- nitrogen bottles, if applicable

(viii) Design Cooling Requirements

Separate cooling system shall be designed to cool the heat generated in each monopole for converter stations.

Cooling system shall be capable to operate and guarantee the design temperature specified under steady state conditions, up to max specified design dry bulb ambient temperature. Redundant Uninterrupted Power System/drive for valve cooling for each pole shall be rated for 2 minutes.

(ix) Ambient conditions

Ambient Conditions are specified in Table 2 of the specification.

(x) Materials

The materials in contact with the cooling water as well as for manufacturing of the air-cooled liquid cooler shall be selected in order to minimize the risk of corrosion.

(xi) Measure Against Water Leakage

The design of the valve cooling system shall be made to minimise leakages. The following precautions shall be taken to minimize the risk of water leakage from the system:

- choice of water pipe joint
- number of water pipe joints in the system shall be kept as low as possible, particularly in the IGBT based converter ;
- velocity of de-ionized water in the pipes and in the IGBT based converter

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submodules heat sinks shall be kept low

- water circulation within the pipes shall be free from trapped air bubbles

(xii) Valve Cooling Control and Monitoring

The valve cooling control systems shall be redundant and be equipped with an integrated data collecting unit that is connected to the station sequential event recorder system.

(xiii) Cooling Capacity Control

The water temperature to and from the Converter/IGBT valves are used as an input to the cooling capacity control.

In order to avoid condensation at the pipe lines within the Converter/IGBT valves the inlet fine water temperature shall be kept in an appropriate range.

(xiv) Protections

The following protections/monitoring shall be included:

- Temperature of the water from the valves
- Temperature of the water to the valves
- Water flow through the valves
- Water level in the expansion vessel
- Conductivity of the water from the water processing unit
- Conductivity of the water in the main circuit
- Pressure in the expansion vessel, if required
- Pressure in the nitrogen bottle, if required.

(xv) Leakage Detection

There shall be three leakage detection methods used in parallel by the cooling control system. These methods can, depending on the nature of the leakage, generate trip of the converter and cooling system. However, one of the methods of leakage detection shall generate a leakage alarm if volume of leakage exceeds the reference volume, during the last 24 hours.

Besides these detection methods alarms for frequent make up and for long make up when automatic make-up of cooling water is used, generated by the cooling control program shall be provided. The total schematic of valve cooling system with valve position, flow, temperature, make up details, conductivity, pump running etc. shall be made available to the SCADA system of HVDC terminal.

20. Converter Station DC Outdoor Yard



(a) The DC yard shall comprise of equipment such as HVDC bushings, smoothing reactors (if required), DC filters (as required), DC current and voltage measuring instruments and switchgear, surge arrester, insulators, clamps and connectors.

(b) The specific creepage distance (corresponding to highest DC voltage) for DC yard and other areas shall be maintained as follows:

Table 6

Insulator type	Under light and medium pollution	Under heavy and very heavy pollution
Indoor porcelain or composite insulators for valve hall (other than valves) and indoor smoothing reactor area (if any)	20 mm/ kV	
IGBT Valves	14 mm/ kV	
Outdoor porcelain insulators or bushings with RTV# coating	50 mm/ kV	60 mm/KV
Outdoor composite insulators or bushings	50 mm/ kV	

 # RTV silicon coating shall be in accordance with IS 11310.

Note: Specific creepage distances less than 50 mm/ kV but not less than 45mm/ kV can be accepted for outdoor silicone rubber bushings due to manufacturing limitations and for HVDC equipment requiring necessary internal/ external insulation co-ordination. However, specific creepage distance less than 50 mm/kV and flash distance less than 12 mm/kV shall not be acceptable for outdoor jointed bushing.

(c) **DC wall bushing**

DC wall bushing shall be designed as per IEC-65700. DC wall bushings, used for electrical connection between the equipment inside the valve hall and the outdoor DC yard shall be of polymer housing as per relevant standards. All bushings inside the valve hall including HVDC wall bushing shall be dry type/SF_6 gas filled or combination of both. There shall be no oil filled components inside valve hall.

(d) **DC reactors**

The smoothing reactor/Arm reactor/phase reactor/ DC filter reactor (as applicable) shall be designed as per IEC-60076-6. The reactors shall be of air core type. The reactors shall comply with relevant standards and shall have successfully passed DC

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tests as per their application. Each converter station shall be provided with one spare coil of each reactor with all fitments, hardware and accessories. Minimum four Nos. of insulators of each type for reactors shall be provided as spare.

The reactor shall be designed for Class H for inter turn insulation as per IEC 60085, however, the maximum allowed hot-spot temperature rise shall be limited to one class lower i.e. Class F insulation.

(e) **DC Voltage and Current Measuring Devices**

The DC voltage and DC Current measuring equipment shall be installed at each pole. These equipment can be optical type or conventional type. The DC measuring equipment at pole and neutral bus shall be suitably located based on the control philosophy and different protection zones such that complete pole and neutral equipment are protected. The details of DC Measuring Equipment shall be as per ***'Appendix C.1'***.

(f) **DC Filters (if required)**

Suitable numbers of DC filter per pole per station shall be provided in DC yard to limit harmonic voltages present on the DC lines (pole lines and DMR line) as required by HVDC OEM design.

The design shall be based on passive DC filters. The DC Filters shall consist of Low order filters, Harmonic Filters and High Frequency Filters as per the requirement of project specific studies. The main filter equipment like capacitors, reactors and resistors shall comply with the requirements of relevant IS/IEC standards/ CIGRE documents. A fundamental frequency series blocking filter shall be provided, as per requirement. The required switches shall be provided. It shall be possible to connect and isolate a single DC filter arm without causing any reduction in transmitted power on the affected Pole.

The calculation of DC filter performance and rating shall be based on values of components, detuning, and harmonic voltages and currents. The TSP shall use model as per CIGRE TB 766 and 811 or equivalent for calculating performance and rating of DC filters.

There shall be no limitation on the energization of the DC filter arms by reason of either ambient temperature, frequency, initial mistuning or DC voltage within the ranges defined in this Specification. The DC filter components shall not become overloaded due to detuning or resonance within the DC filter or between the DC filter arms and the HVDC circuit, or the DMR, for any combination of conditions for which the converters are capable of continued operation.

TSP shall ensure that fundamental and 2nd harmonic resonance and adverse amplification does not occur on DC side. A parallel low order (2nd Harmonic) DC Filter

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shall be provided across each converter of each station. Earth resistivity along the DC line route will be considered as 250 ohm-m.

DC filter Performance:

The individual harmonic current (In) at any harmonic shall not exceed the value which could cause mal-operation of the HVDC system control and protection equipment supplied. The maximum equivalent disturbing current (Ieq), up to rated power in forward power direction, without any filter outage, for balanced bipolar and monopolar mode with metallic return or Dedicated Metallic Return (DMR) modes of operation shall be as follows:

Table 7

Operating Mode	Ieq
Balanced bipolar operation	1500 mA
Monopolar mode with metallic or DMR mode	2200 mA

The equivalent disturbing current includes not only the harmonics which flow in the DC Pole conductors and DMR lines but also the harmonics which are induced into the ground wires of the DC transmission line.

Mutual impedance calculation algorithms require that the ground wires be "eliminated" for this configuration; however, as specified herein, the current flow in the ground wires must be eventually taken into account in the calculation of equivalent disturbing current.

In Bipolar operation, the equivalent disturbing current shall be the psophometric weighted residual current of all harmonics of fundamental frequency from the 2nd to the 60th (i.e. 100-3000 Hz) according to the following formula:

$$Ieq(x) = \sqrt{[IeC(x)^2 + IeS(x)^2]}$$

Where,

Ieq(x) is the equivalent disturbing current in milliamps (mA) psophometrically weighted at any point along the transmission corridors specified herein

$IeC\ (x)$ is the magnitude of the RSS equivalent disturbing current component due to harmonic voltage sources at Khavda (mA)

IeS(x) is the magnitude of the RSS equivalent disturbing current component due to harmonic voltage sources at South Olpad Converter Station (mA)

x denotes the relative location along the transmission corridors.

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The equivalent disturbing current at any point along the corridor due to harmonics from either Khavda or South Olpad Converter Stations shall be calculated as follows:

$$Ie(x) = \sqrt{\sum_{n=1}^{n=60}\{\mathrm{Ir}(n,x) * P(n) * Hf\}^2}$$

Where,

$Ir\ (n, x)$ is the magnitude of the equivalent residual rms current at each harmonic in milliamps.

(n) is the psophometric weighting at harmonic "n" as per Consultative Committee for International Telephony and Telegraphy (CCITT)

n denotes the harmonic number.

Hf is the coupling factor which represents the normalized frequency dependent effects of typical coupling impedances to open wire circuits. The coupling factor Hf will be assumed as per table below:

Table 8

Frequency (Hz)	Coupling Factor (Hf)
40-500	0.70
600	0.80
800	1.00
1200	1.30
1800	1.75
2400	2.15
3000	2.55
3600	2.80

As defined above, all harmonics up to the 60th shall be included in the calculation of equivalent disturbing current. The equivalent disturbing current shall be based on a "worst consistent set" of harmonic voltages at either end of the line.

The "worst consistent set" is defined as that set of harmonic driving voltages which could occur at any particular operating condition which results in the highest value of equivalent disturbing current that could occur for a period of longer than ten minutes.

A particular operating condition is defined in terms of:

a) The mode of operation, i.e. bipolar or monopolar in any specified mode of operation.

b) The DC voltage anywhere within the normal range for the mode of operation.

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c) Reduced DC voltage operation on both Poles and reduced DC voltage on one Pole with the other Pole at nominal DC voltage.

d) The modulation index anywhere within the range applicable to the mode of operation as defined above which shall include modulation index associated with reactive power control.

e) Worst case induced voltage from any parallel lines.

f) The converter AC bus voltages anywhere within the normal range specified.

g) The maximum 50Hz negative phase sequence voltage of 1.5% for achievement of performance limits.

h) The DC current anywhere within the range applicable to the mode of operation.

i) Ambient temperature as defined in Table 2.

j) Differences in the smoothing reactor (if installed) harmonic impedances of the Poles

DC filter rating

The rating of the DC filter components shall be based on the assumption that the per pole harmonic voltage is individually maximized at each harmonic for any particular operating mode, and the filter component currents due to the harmonic voltages at the terminals shall be assumed to add as RSS (Root Sum Squared) at each harmonic.

For the rating of the DC filter components, it shall be assumed that any one DC filter arm can be out of service in any converter Pole The possible impact of reduced voltage operation and increased reactive absorption on the ratings of the DC filters shall also be considered.

Short time and transient conditions as well as operation with discontinuous DC current must be fully taken into account. Due allowances shall be made for possible current amplification resulting from resonances between the arms of the DC filters. In the calculation of the impedance of the DC transmission system when used for calculation of DC filter component rating, ±10% tolerance in the respective line length shall be included. AC system voltage and frequency variations as functions of duration specified in Table 2 shall be allowed in the calculation of harmonic voltages and DC filter detuning. In addition, capacitor unit or element failures appropriate to the duration for which the DC filter has to remain connected, shall be allowed for in the calculation of DC filter detuning.



(g) **Surge Arrester**

Surge arresters shall be gapless Metal Oxide arresters and shall be designed and tested as per relevant IS/IEC. The arresters shall be designed to absorb the desired amount of energy during a system disturbance and shall be coordinated with recovery of DC system following a disturbance as applicable. Arresters at appropriate places may be provided as per requirement.

(h) **Fundamental frequency blocking filter:**

A fundamental frequency blocking filter may be installed, if found necessary, to block the 50 Hz induced current in DC line in order to minimize the risk of converter transformer saturation due to possible induced fundamental frequency current from parallel AC lines

This induced current usually results from AC side second harmonic positive sequence voltage and from AC lines running parallel to DC line.

For design purpose, 50 km of parallel un-transposed 765 kV AC Double Circuit line and 50 km of parallel un-transposed 400 kV AC Double circuit line within a radial distance of 70 m to be considered by the TSP to consider any possible inductive and capacitive coupling between the lines. The parallel section of AC lines shall be considered to be located at a point that results in maximum fundamental frequency current at each converter station.

Such a filter is formed of capacitor, reactor, resistor and arrester. Internal arrangement of these components is left to designer but the overall filter should offer significant impedance to 50 Hz current flowing in DC circuit. Blocking filter reactor shall be designed for Class H for inter turn insulation as per IEC 60085, however, the maximum allowed hot-spot temperature rise shall be limited to one class lower i.e. Class F insulation. The reactor may preferably have similar design as smoothing reactor (if any) to share common spare. The AC/DC/PLC/RI reactor shall be designed for Class F insulation as per IEC 60085, however, the maximum allowed hot-spot temperature rise shall be limited to one class lower i.e. Class B insulation.

(i) **DC commutation switches:**

These switches are required for commutating the DC current from one path to the other. They comprise of Dedicated Metallic Return Transfer Breaker (DMRTB), Pole Metallic Return Transfer Breaker (PMRTB), Neutral Bus Grounding Switch (NBGS). These switches shall be rated for transfer of the full load current online without

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converter trip or block leading to power loss. Neutral Bus Switch (NBS) shall also be provided suitably at both ends in all the poles.

21. Dedicated Metallic Return (DMR)

The neutral current return path for bipolar configuration or monopolar configuration shall be via a Dedicated Metallic Return (DMR) conductor connecting both converter terminals.

22. Control and Protection System

It shall be demonstrated that the HVDC control system is stable under all operating conditions and cannot excite oscillations, such as sub-synchronous oscillations, between the HVDC and AC system. The control system shall be tuned for optimal overall performance for all conditions and configurations of the AC system. The details of operator Control and Monitoring are mentioned in ***'Appendix C.2'.***

It shall also be demonstrated, by applying system faults and step responses in current order and power order during the factory acceptance testing (FAT), that the as-built control system does not excite low order harmonic resonance(s) in the AC system and/or between HVDC and AC systems for any system configuration.

The performance of the integrated DC and AC systems shall also be demonstrated using an EMT-type program (such as PSCAD) in order to validate the system performance requirements. In the DPS program, all the HVDC protections shall be modelled. All feeders in the ac converter bus should have the required protections modelled for DPS studies with network equivalent.

DPS studies shall be done with DPS model of Khavda LCC HVDC, DPS model of Khavda Pooling station and RE Park in vicinity. DPS models shall be provided for the LCC HVDC and Khavda Pooling station including RE park shall be provided to TSP.

Software based controls and protection shall be used to permit flexibility in effecting modifications. Protection and controls shall be duplicated for reliability. The control and protection shall provide fast controllability of the HVDC system.

(a) Control System:

(i) The control system shall have redundancy with hot standby. Transfer of controls from Active Control system to Hot standby control system shall be seamless and there shall be no power interruption during this transition. Outage of one control system or part thereof, shall not result in any power reduction.

(ii) The control shall be designed to give fast, stable and proper response to normal control actions as well as during disturbances such as AC and DC faults.

(iii) DC converter terminals shall be either manned by operator or controlled by remote operation of SCADA system. The control system hierarchy shall be as

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follows:

1. Master Control
2. Station/Bipole Control
3. Pole/ Converter Control
4. Valve Control

(iv) The HVDC Station/Bipole shall have control features including but not limited to the following:

1. AC Voltage and Reactive power control
2. DC Voltage and Active power control
3. Frequency control
4. Power modulator, pole power compensation. The modulator, if required, shall have feature which shall provide positive damping of AC network oscillations over the range of frequencies considered during system studies.
5. A. Sub Synchronous Resonance (SSR) Damping Controller (if required) based on studies.

   All necessary studies shall be carried out to ensure that the DC system shall not excite the mechanical, electromechanical or other natural frequencies of the nearby region generators and turbines under any operating mode. It shall be demonstrated by studies that the nearby generators shall not be adversely affected by the HVDC system, particularly with regard to Sub Synchronous Oscillation (SSO)/Sub Synchronous Resonance (SSR) and harmonic injection and self-excitation. Sub Synchronous Damping (SSD) Controller shall be provided for converter stations near Generating stations.

   B. Power Oscillation Damping (POD) Controller in STATCOM mode of operation.
6. RE Park Sub synchronous control interaction studies, Temporary and Transient overvoltage checks, harmonic interactions, stability, HVRT, LVRT etc.
7. Interaction studies among various HVDC links and STATCOMs (planned/ execution) which are electrically coupled nearby e.g. LCC based ±800 kV, 6000 MW converter at KPS-2;, STATCOMS as per following table:

Sr. No.	Capacity of STATCOM	Name of Substation

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1	±300 MVAr	KPS-1 (Section-I)
2	±300 MVAr	KPS-1 (Section-II)
3	±300 MVAr	KPS-3 (Section-I)
4	±300 MVAr	KPS-3 (Section-II)
5	±200 MVAr	Boisar-II (Section-I)
6	±200 MVAr	Boisar-II (Section-II)
7	±300 MVAr	Navsari (New)

8. The TSP shall study all interaction aspects between these converter stations, STATCOMs and devise control strategies to ensure that no adverse interaction takes place among the above stations during steady state and fault recovery. Various fault cases for the purpose of this study shall be finalized with the employer during detailed engineering.

9. The HVDC system shall conform to the performance requirements specified herein. It shall be designed to optimally co-ordinate all aspects of its controls to ensure safe and reliable operation without adversely affecting the connected ac system and shall assist the latter following disturbances. The performance requirements shall be met under all specified ambient conditions, modes of operation, ac system conditions andother parameters as given in this specification

10. Run back/Run up controller (10 points) with provision to be linked to Special protection Scheme (SPS) of System Operator.

11. AC system stability function, such as power swing damping function.

12. Any other Controller as deemed required for stable HVDC system operation with connected AC network.

(b) Protection System

The protection system shall be designed in Main-I and Main-II set up.

(i) HVDC system protection shall consist of two parts:

(A) **AC side protection**

AC side protection function shall cover the zone for converter transformer, AC filters(as applicable), shunt capacitors, shunt reactors, and busbars. These protections shall generally follow the same philosophy as in a typical AC substation i.e. detection of fault by relay and tripping of circuit breaker or may be dealt in similar way as described for DC side protection.

(B) **DC side protection**

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DC side protection shall cover the zones consisting of HVDC AC PLC Area to Converter transformer Primary, Converter Transformer, Area between converter transformer, Phase reactor and the valve hall, Converter Protection Zone, DC Bus bar Protection Zone, DC switchyard including smoothing reactor (if applicable) and DC filters (as applicable), DC line, and DMR line. The protection equipment shall be designed to be fail safe and shall ensure high security to avoid mal-operation/ unwanted shutdown due to protection equipment failures. 'Main-I and Main-II' or 'Main and Standby' protection philosophy shall be adopted for HVDC equipment and system.

(ii) Following a DC Line fault, the HVDC System shall have the facility to restart. The DC transmission system shall be capable of recovery in a controlled and stable manner during recovery following AC and DC system faults. The post fault power order shall be equal to the pre-fault power order unless AC/ DC systems dictate otherwise.

(iii) Protection system shall have two redundant systems with following protections (Some protection can be combined).

a) Converter differential protection
b) Converter Protection
c) AC, DC over current/under current protection
d) AC, Overload Protection.
e) AC, DC bus differential protection
f) AC conductor ground fault protection
g) DC filter protection, if applicable
h) Converter transformer valve winding protection
i) DC line differential protection
j) DC under voltage/ over voltage protection
k) DC line ground fault protection with restarts
l) High Impedance DC ground fault Protection
m) Harmonic Protection on AC side and DC side.
n) Negative Sequence Protection.
o) Phase current unbalance.
p) Dedicated Metallic Return (DMR) protection
q) DMR monitoring
r) AC filter protections, as applicable
s) Protection Block Failure or Repetitive Blocking failure protection
t) Converter arm harmonic protection
u) DC Line Overcurrent Protection



v) DC Line harmonic protection
w) Power module failure monitoring
x) SSTI Protection (corresponding to POWER Plants)
y) SSDC Control Interaction Protection. (Corresponding to RE Plants).

Other Protections required for successful operation of VSC HVDC with HVDC LCC and RE Park in vicinity like transfer trips to RE Park 400 kV bus and LCC HVDC Converter. Provision for transfer Trip options shall be available in TSP's own Protection panels in digital and analog hardware form. Necessary assistance for integrating with OPGW shall also be included.

23. DC Line fault locator

DC online fault locators shall be provided to monitor the entire DC line length and give location of the fault with good accuracy in the range of + 1000 meters for pole conductors. DC line Fault Locators shall utilize a method of measurement of time of arrival at each end of the HVDC line of the steep wave fronts, resulting from a fault on the HVDC, affected by the accuracy of the time measurements. Since the wave fronts shall propagate along the lines at $3x10^8$ m/sec (or 300 metres per microsecond), the time measurements must be in microseconds with an accuracy of ±3 microseconds in order to achieve a location accuracy of approximately ±1 km. Greater precision of fault location would be desirable. The DC online Fault Locator equipment at each station shall be time synchronized to the master clock system at the station in order to facilitate analysis of system disturbances recorded on the DC Line Fault Locators, the transient fault recorders and the alarm monitoring and recording system. Manually re-settable fault counter shall be provided as part of the equipment.

ELECTRIC CHARACTERISTICS

1) Control Panels

Identical control panels shall be provided for each DC Line Fault Locator within its own cubicle(s). The control panel shall include, but not be limited to the following facilities.

- Equipment on/ off control and indication;
- Equipment alarm or failure indications;
- Fault location readout display for the last detected line fault;
- Manual initiation of automatic self-test routines;
- Any other controls or indications

2) Printers



A printer shall be provided for each DC Line Fault Locator or it may be integrated with operator control and monitoring system. The printer shall print the day, hour, minute, second and millisecond of each fault or manual or automatic system test. The printer shall also print the location of each fault in kilometres from the respective station.

If fault locator is integrated with operator control and monitoring system that all these details shall be displayed on Video Display Unit (VDU) and stored in archives in the backup memory.

3) Power Requirements

The equipment shall be suitable for operation from the station battery supply. There shall be no loss of accuracy within specified variations of DC input voltage.

Note: Alternatively, TSP may also propose an integrated solution with the fault locator integrated into the HVDC Control and Protection system meeting the system requirements. If fault locator is integrated with operator control and monitoring system then all these details shall be displayed on Video Display Unit (VDU) and stored in archives in the backup memory.

24. Operations supervision and control

a) The TSP shall provide the control facilities from the operator control desk through a monitor and keyboard/mouse system. These facilities shall include all control operations, digital setting, indicating devices, Station single line diagram and symbols, any other special control devices and meters required for control and monitoring of the complete HVDC system.

b) The layout of the station single line diagram, together with control, indicating and metering devices on the control desk shall be logical, compact, of pleasing appearance, and shall facilitate efficient supervision and operation of the station(s) by the operator. Every detected change of position shall immediately be displayed in the single-line diagram on the station screen, recorded in the event list and printable.

c) Graphic representation of Converter valves and valve cooling piping network shall be provided on station monitoring system. The graphical representation shall also display indicating faulty valve submodules position.

d) The 'Sequence of events' recorder, transient fault recorder, on-line DC Line fault locator, GPS system, Station Master Clock, visual display system, operator control protection and monitoring system shall be a part of the HVDC system.

The details of operator control and monitoring system are provided at 'Annexure-

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Operator Control and Monitoring System'. The Transient Fault Recorder provided for the HVDC system shall be as per '***Appendix C.3***'

25. Telecommunication

For smooth operation of the HVDC system, communication network with high reliability and availability shall be provided for transmission of control and protection signals between the two or more (in case of multi-terminal DC) HVDC terminals. The communication system design shall be as per ***'Annexure- Specific Technical Requirements for communication'.***

A limited remote data transfer of the HVDC system from the Load dispatch centers shall be provided by TSP. All required remote control and remote monitoring facilities shall be provided at each converter station. Complete remote monitoring of each converter station shall be possible from opposite converter station.

Synchro phasor measurement using Phasor Measurement Units (PMUs) along with fibre optic connectivity, Global Positioning System Receiver and communication equipment shall be provided for monitoring AC side of converter bays of HVDC station.

26. Valve Hall

The valve hall shall mainly contain BIGT/IGBT valve, its associated structure, cooling and arresters. No oil filled equipment shall be present inside the valve hall. In case the turret of converter transformers (having oil) is protruding inside the valve hall, suitable fire barrier matching with adjacent valve hall wall fire rating shall be provided. The valve halls shall be provided with interference screening, if required by OEM. In addition, the control cable and cable termination rooms shall be suitably screened to minimize radio interference. Necessary measures shall be taken to take care of high frequency noise emission from valves.

The valve halls shall have ample clearances such that the inspection of valves can be possible and allow access of mobile valve servicing equipment without any dismantling. The valve hall building shall be pressurized to prevent the ingress of unfiltered air. In addition, the building shall be properly sealed to minimize the flow of outside air into it and vice versa. Openings for equipment and services shall be weather proof. The Valve Hall building shall consist of steel framed structure. The steel building shall be pre-engineered building fabricated in the factory and shall be assembled at site. Minimum two Nos. scissor lift for erection and maintenance of valve modules shall be provided per station. Proper cable sealing shall be provided for cable entry into valve hall and control room to avoid entry of water and moisture.

27. Ventilation System and air conditioning for Valve Hall



Each valve hall shall have an independent ventilation and/or air conditioning system. Each ventilation systems shall consist of two 100% capacity systems, one operating and one stand-by.

The ventilation of the valve hall shall be of a positive pressure type. Once through ventilation system will not be acceptable. The ventilation system shall be a closed cycle with fresh air intake limited to a maximum of 20% of the total air requirement. Fresh outdoor air shall be filtered and dehydrated before being blown into the valve hall by the air fans to avoid dust accumulation and condensation on components present in the valve hall. Suitable measures shall be taken to minimise stagnant air. Each valve hall shall be provided with remotely operated motorized exhaust dampers which shall be normally closed and will be opened under high pressure/emergency conditions only.

Air-conditioning of valve hall for reducing the operating temperature of Converters may be used if required. Airconditioning units will be provided with minimum one redundant unit (atleast 25% capacity).

To ensure that the air being supplied to the valve hall is free from dust particles, a minimum three stage dust filtration process shall be supplied. This shall consist of at least the following:

1. Pre-Filters: To remove dust particles down to 10 microns in size with at least 95% efficiency.
2. Fine Filters: To remove dust particles down to 5 microns in size with at least 99% efficiency.
3. Absolute Filters: To remove dust particles down to 0.3 microns in size with at least 99.5% efficiency.

All the filters shall be panel type. Easy access should be available to the filters for replacement/cleaning.

It shall be possible to maintain specified conditions continuously inside the valve hall, both automatically and manually controllable from the station service panel (located in the control room) as well as from the local control panel.

In addition to the alarms for particular parameters like pressure, temperature and relative humidity etc., indicating instruments shall be provided for each valve hall. These parameters shall be integrated with station monitoring system also.

The valve hall shall be kept at a pressure above the atmospheric pressure under all conditions. The test shall be conducted at site to measure the pressure inside the valve hall for 48 hours.

Adequate numbers of de-humidifiers shall be provided for each valve hall as per design requirement.

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28. Air Conditioning System

Air conditioning shall be provided on a continuous basis in the control room, bay kiosks, valve module workshop and storage rooms, control and protection workshops, offices, first aid room, conference room, entrance halls, corridors etc. and all rooms containing electronic equipment.

The air conditioning system for the control room shall consist of two (2) systems each of 100% capacity; one operating and one stand-by. Both units shall be interconnected so that, in the event of breakdown of one unit, the stand-by unit can be placed into service. Stand-by and operating units shall be alternated monthly for regular operation. The operation of the units shall be automatically controlled including sequential start and stop with single command.

If valve base electronics and/or valve cooling control cubicles are located at places other than in the station control room, these areas can be cooled by using split Air Conditioning units of appropriate capacity. At least two units shall be provided, one operating and one stand-by with the facility of automatic changeover after operator assigned time period.

A separate air conditioning system shall be provided for other areas of the service building. This shall also consist of two (2) Nos. each of 100% capacity; one operating and one stand-by.

29. Visual monitoring system (VMS) for watch and ward of station premises:

Visual monitoring system for effective watch and ward of substation premises shall cover all the transformers and reactors, outdoor DC yard, valve halls, indoor and outdoor isolators, earth switches, breakers, AC and DC capacitors, all other major AC Equipment (such as CB, isolators, CT, CVT, SA etc. as applicable), panel room, all entrance doors for the service building, other buildings, all the gates of switchyard and all entry and exit points of control room building and accordingly the location of cameras shall be decided. The camera shall be high definition colour CCD camera with night vision feature. The VMS data partly/completely shall be recorded (minimum for 30 days) at least @25fps (or better) and stored on network video recorder and followed by transfer of the data to a juke box. The system shall use video signals from various cameras installed at different locations, process them for viewing on workstations/monitors in the control room and simultaneously record all the cameras. The operation of cameras shall be integrated with the Network server placed in Control room of HVDC station. Sensors shall also be placed on boundary walls to prevent intrusion from outside and shall be connected to the CCTV system. The VMS data should go only to the intended personnel/ facility and not to the remote server of the Camera (VMS supplier)

Mouse/ keyboard controllers shall be used for pan, tilt, zoom and other functions of the desired camera. The Visual Monitoring System shall have provision of WAN connectivity for remote monitoring.



All camera recordings shall have Camera ID and location/area of recording as well as date/time stamp. The equipment should generally conform to Electromagnetic compatibility requirement for outdoor equipment in EHV substation.

At existing HVAC substations, the visual monitoring system if available shall be augmented as per existing or better specification as required.

30. Building Management System

A fully computerized and automatic Building Management System (BMS) shall control the operation of the mechanical systems serving the valve hall and service building and other systems as detailed below.

Scope of Work

The scope of work shall cover all necessary system provisions (including hardware and software) for synchronizing/integrating the BMS with the control and monitoring of

- Air Conditioning system,
- Valve hall ventilation and air conditioning system
- Fire Fighting Systems including Fire Spray and Hydrant systems, water level in Fire Water Tanks etc.
- Utility Services i.e. Water Storage and Supply,
- Access Control including Motorised Gate at the entrance to the station and for all entrance doors for the control room building including provision of electromagnetic door locks, card readers etc.
- Fire Detection and Alarm System.
- Illumination systems
- VMS

31. Water Supply and Distribution System

The water supply and distribution system shall include the supply, distribution and storage of water in the HVDC Station at least the following purposes.

a) storage of water for the firefighting system;

b) storage of water sufficient for 24 hours of continuous operation of HVDC converter in the event of interruption of water supply to the tanks;

c) water supply for the valve cooling system;

d) water supply for sanitary services;

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Two Nos. 100% capacity water storage RCC tanks shall be provided. Each tank shall be constructed in such a way that there shall be segregation between requirement for fire water storage and water for other purposes such that fire water is not used for other purpose. Both the tanks shall have interconnection piping with isolation valves for both tanks. Separate piping as per IS/IEC standard for firefighting, valve cooling and other purposes shall be provided from the tanks from independent headers.

32. Grounding and Safety:

a) The design of the grounding system shall be based on relevant IS/IEC/IEEE standards.

b) In order to prevent adverse effect (i.e. overheating due to induced circulating current) of magnetic field of air core reactors, special care shall be taken e.g. no closed loops are formed by the earthing conductors and in reinforcement bars of the foundation or other necessary mitigation measure to be provided. Air core reactor manufacturer's guidelines shall be followed.

c) The electrical safety clearances for the DC side shall not be less than the clearances applicable for an AC switchyard at the equivalent BIL level.

d) The total electric field at ground level shall be as prescribed in relevant standards.

e) Fencing and electrical interlocking and mechanical key arrangements shall be provided for all non-accessible areas, for valve halls, and for areas where for equipment mounted directly on ground without suitable height of steel structure, e.g. smoothing reactor area, AC and DC filter areas, as applicable.

f) Safety precautions in regards to gas/oil pipe lines in vicinity of HVDC/ AC lines shall be taken coordination with gas/ petroleum authorities.

33. Cables:

All cables shall be FRLSH type. The High Voltage (6.6 kV to 33 kV) power cables shall be XLPE insulated conforming to IS-7098 Part-2. The Low Voltage power cables shall be 1.1 kV XLPE insulated conforming to IS-7098 Part 1 or relevant IEC standards and/or PVC insulated conforming to IS-1554 Part 1. The control cables shall be 1.1 kV PVC insulated conforming to IS-1554 Part-1. The rating and size of cables shall be determined by TSP. All cables shall be armored except cables used for special purpose as per OEM recommendation. Fibre optic cables conforming to IEC– 60793 and 60794 shall be used to transmit the signals to and from various equipment and panels located in the AC/DC switchyards, Valve Halls,

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control rooms, valve cooling rooms etc.

34. Auxiliary Power Supply System:

The auxiliary power supply system shall have the following:

a) Highly reliable duplicated supply sources from two separate sources with automatic change-over facilities. These sources of auxiliary power shall be from 33 kV side of 2 Nos. of 400/33 kV transformers (50 MVA) at KPS3 HVDC and 33 kV tertiary of existing 2 Nos. 765/400/33 kV ICT at South Olpad. This source shall be stepped down to 433 V by means of station service transformer of minimum 2000 kVA capacity and rated 33/ 0.433 kV.

b) Completely separated secondary distribution (415 V) systems for the auxiliaries of each converter.

c) Duplicated supply by two different 415 V power sources to essential loads

d) Diesel Generator (DG) Set of minimum 1500 kVA capacity per pole shall be provided to meet essential loads. This generator set shall start automatically and cater load immediately in case of loss of all the normal and standby supply sources. The DG sets shall be designed and rated so as to meet the load time characteristics of the essential loads of the entire station as determined by the TSP with a 10% margin on the load.

e) Parallel operation between station service transformers shall not be permitted at any voltage level in order to limit fault currents, prevent back feed into the AC bus and to ensure independence of supply sources. Also, parallel operation shall not be permitted between transformers and the DG set.

f) Suitable protection on all primary MV and LV supply connections shall be provided.

g) The 220 V DC supply system(s) per pole shall consist of at least two independent DC systems; each system consisting of one float-cum-boost charger, one battery bank and one distribution panel. A 48 V DC system consisting of two battery sets, two battery chargers and two distribution boards shall also be supplied for communication panels (wherever supplied). If desired, 48 V supply may be obtained from 220 V DC battery bank by use of adapters, without compromising backup time.

(i) The station services DC system shall cater to the DC loads of HVAC and HVDC switchyards, auxiliary services control, valve and pole control, protection circuits, communication system loads etc.

(ii) Minimum lighting load shall be connected to the station DC system.



(iii) Sizing of 220 V battery and battery charger shall be done based on the number of bays specified (including future bays) as per CEA Regulations and relevant IS. 2 sets of 48 V battery banks for PLCC and communication equipment for present and future scope shall be provided at each new Substation with at least 10-hour battery backup and extended backup, if required.

h) All auxiliaries shall give rated output at voltage variation of ±10% and frequency variation of -5% to +3%. Sizing of LT Switchgear shall be suitable to cater the requirement for all present and future bays. AC and DC distribution boards shall have modules for all the feeders (including future as specified).

i) For substation extensions, existing facilities shall be augmented as required.

An indicative SLD for the Auxiliary Supply System is enclosed at ***'Appendix-C.5'.***

For the requirement of the Auxiliary Power as described above, Essential Load is defined as per below: -

Essential loads: *These are the loads whose failure shall affect the conversion capability of the HVDC system. These loads shall include, but not be limited to, the cooling and other auxiliaries of the converters, the cooling of transformers and reactors, valve hall cooling, etc. In addition, loads that must remain working in case of complete loss of the AC power supply shall also be included in essential loads. These loads shall include, but not be limited to, the station battery chargers, disconnecting switching and circuit breakers operating mechanism, the emergency lighting, fans to keep over pressure in valve halls, etc.*

35. Fire Detection, Alarm and Protection system:

A comprehensive fire detection, alarm and protection system as per Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations, 2023 shall be provided. Valve Hall shall have Air aspiration system (fast and early smoke detection system). Suitable Infra-Red (IR) and Ultra Violet (UV) detector to detect the flashover inside the Valve Hall shall also be provided. The Valve hall wall towards converter transformers shall be suitable for minimum 3-hour fire rating.

Suitable fire detection system using smoke detectors and/or heat detectors shall be provided in HVDC Station for all room and areas. These smoke fire detection systems shall be connected to a separate Fire annunciation system clearly identifying the zone.

Hydrant System:

Suitable No. of hydrants shall be provided for protection of HVDC Station equipment in the yard and HVDC Station building.

HVWS System:

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High Velocity Water Spray (HVWS) system shall be provided for converter transformer, ICTs and Shunt Reactors.

36. Testing and trial operation

All equipment/ components including IGBT valves, Converter Transformers, smoothing reactors, EHV DC Transformer bushings and wall bushings shall be subjected to Type tests, Routine tests, Factory Acceptance Test (FAT), Site Acceptance Test (SAT) as per relevant IS / IEC/ IEEE as applicable. The SAT shall consist of sub-system and system tests and shall be carried out after installation of equipment at site. The sub-system tests cover the major sub-system like valve cooling, AC and DC filters, HVDC converter, auxiliary systems, communication etc. After completion of sub-system tests, system tests covering power transmission tests, transient and dynamic control tests, measurement of electric field and RFI etc. shall be conducted. After completion of all system tests, final trial operation of the HVDC System shall be carried out for continuous period of normal operation of not less than 10 days for each Pole/Bipole separately. The HVDC System shall be declared under Commercial Operation after the successful completion of its Trial Operation.

37. Reactive power exchange

The 400 kV Bus sectionaliser at KPS3 is planned to be normally open. However, the design should also consider the possibility of 400 kV Bus sectionaliser to be kept open/closed based on system conditions.

Each monopole shall have a capability of providing dynamically varying reactive power between 0.95 leading power factor to 0.95 lagging power factor at PCC for any active power between -1250 MW to +1250 MW. This capability shall be achieved at all AC voltages within the continuous operating limits and ambient temperature limits. For voltages outside the continuous operating limits, the reactive power support shall be provided as per LVRT/HVRT strategy.

The control of reactive power exchange with AC grid in response to Q mode or V mode of RPC shall be fully automatic and shall be continuously monitored. The control equipment, however, shall allow both automatic and operator-initiated switching. In the former case, adequate annunciation shall be provided to the operator.

Fault infeed during faults shall be 1 p.u. of rated AC current for dead short circuit at Converter transformer AC bus. Dynamic reactive power support shall be over and above the steady state reactive power support.

The studies of DC Current flowing through breakers on AC side of converter transformer for earth faults on converter side of transformer at locations as applicable and sizing of auxiliary resistor to ensure zero crossings in the total current in the AC breaker.

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Each breaker used for switching shunt reactive elements shall have point-on-wave switching control for energizing its branch, to minimize voltage disturbances while switching capacitors and filters, and minimize DC offset current while switching shunt reactors. Breakers used for switching shunt reactive and filter elements must be capable of de-energizing their branch at the maximum temporary overvoltage conditions specified in this specification, or as determined by the TSP's studies, including full load rejection studies, whichever is greater. The reactive compensation and overvoltage limiting equipment shall be designed such that at any power transfer level up to rated power in either direction, a complete or partial interruption of DC power transfer shall not result in a fundamental frequency over voltage beyond the values specified in this specification.

All the necessary studies of reactive compensation and voltage control shall be performed. The calculations of reactive power exchange and of voltage control shall be based on the most unfavorable combination of tolerances on equipment, connected system configuration and of changes in operating conditions.

38. Pole Blocking

The HVDC System shall recover to 90% of the pre-fault DC power transfer level consistently within about 300 milliseconds from the instant of fault clearing, without sustained oscillation for all inverter system fault conditions. For all rectifier AC system fault conditions, the recovery time, to 90% pre-fault power level, shall be within 100 milliseconds from the instant of fault clearing. This recovery time shall be achieved for all short circuit levels as defined in this specification.

If it is in the interest of the overall improved recovery of the AC/ DC system, in such cases the recovery times other than those specified shall also be acceptable, subject to review

39. Pole Deblocking and Converter Start-up

A coordinated sequence of starting an HVDC Pole shall be established and demonstrated during FAT. The sequence shall be in a such a manner that it will not impact the connected AC system beyond steady state abnormal voltage limits. It shall be possible to start and deblock at minimum DC power specified in this specification earlier while maintaining all the AC and DC filter performance requirements.

40. AC bus fault

The TSP shall demonstrate the response of the power controller to DC voltage changes in the rectifiers and inverter for solid converter AC bus faults, both single phase-to-ground and

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three phase-to-ground.

The HVDC system shall recover to 90% of the pre-fault DC power transfer level consistently within 120 ms from the instant of fault clearing, without sustained oscillation for all inverter AC system fault conditions. For all rectifiers AC system fault conditions, the recovery time, to 90% pre-fault power level, shall be within 100 ms from the instant of fault clearing. This recovery time shall be achieved for the fault levels above the minimum specified in Table-1. Recovery times greater than specified above shall be acceptable only if the higher recovery times results in the overall AC and DC system improvement.

The response time shall be determined in accordance with the general criteria defined in this specification. The specified response for the rectifier AC system and inverter AC system faults shall be demonstrated [400 kV level at KPS3 (HVDC), 400 kV and 765 kV level at KPS3, 765 kV level at KPS2, 765 kV level at Lakadia, 400 kV level at South Olpad HVDC, 400 kV and 765 kV level at South Olpad, 765 kV level at Vadodara, 765 kV level at Ahmedabad, 765 kV level at Boisar-II] for the following conditions:

(i) Single phase-to-ground faults, for five cycle, ten cycle, and twenty cycle fault clearing and with fault levels resulting in voltage reduction to 90%, 70%, 50%, 30%, 20%, and 5% of nominal converter AC bus voltage.

(ii) Three Phase-to-ground faults, for five cycle fault clearing, with fault levels resulting in voltage reduction to 90%, 70%, 50%, 30%, 20% and 0% of nominal converter AC bus voltage.

(iii) Zero impedance three phase 400 kV AC busbar faults at Khavda and South Olpad which are cleared after five cycles and which result in the loss of one DC pole.

(iv) Three phases to ground, five cycle, and Single line to ground, ten cycle faults. The outage of components would include 400 kV single circuits, 400 kV double circuits if these are on same tower, generator, filter bank etc.

(v) Three phase to ground, five cycle, and Single line to ground, ten cycle faults following conditions when system is already running under single contingency and which result in outage of further system components. The outage of components would include 400 kV single circuits, 400 kV double circuits if these are on same tower, generator, filter bank etc. Under such conditions it shall be shown that the system stability is maintained although the time required for recovery may exceed the values given above. For certain cases if there is a need for run back condition on HVDC the same shall be evolved by the TSP.

(vi) TSP shall demonstrate LVRT and HVRT Capability as per the performance criteria mentioned in this document.

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41. DC Line Faults

The DC line fault protection sequence shall detect the fault, de-energize the faulted line Pole by control action, allow a time period for fault deionization (settable between 50 ms to 1000 ms), and then automatically attempt restoration of the DC power transfer on the Pole.

For pole to ground faults, the TSP shall provide a sequence to de-ionize the fault and restart the monopole automatically after a predetermined programmable time. The first restart attempt shall be at pre-fault DC voltage and second restart attempt shall be at reduced DC voltage. The third attempt shall be in STATCOM mode. This constitutes one complete recovery sequence.

All equipment shall be dimensioned considering these 3 restart attempts.

The first restart attempt including fault clearing time and achieving pre-fault power level, shall not exceed 2 seconds for pole to ground faults, however, it shall be endeavor to mininise the fault recovery time. During second restart attempt tap changer may be used to achieve reduced DC voltage. The maximum time for the second restart attempt shall be limited to time taken by tap changer or the time taken by the drive of the breaker/switch to recharge. In case the second attempt fails then the converters shall automatically go into STATCOM mode of operation

The system shall be designed and capable of the following:

a) During the DC line fault the power transfer on the non-faulted Pole shall be completed as quickly the extent possible in order to minimize the impact on the DC power transfer. This should be possible even when telecommunication is out of service.

b) In case a fault occurs within 15 minutes of the last fault then both these faults shall be counted as attempts within single DC line fault recovery sequence. A fault that occurs after 15 minutes of the last fault shall be treated as start of new DC line fault recovery sequence. Maximum cooling period between two consecutive DC line fault recovery sequences shall be 60 minutes during which tripping may be allowed.

The clearing and recovery of a DC line Pole fault shall be demonstrated in bipolar and monopolar mode at 1.0 p.u. power transfer prior to the fault for the particular mode. Faults shall be applied at the line ends and at the line midpoint in both power directions. The demonstration shall include the influence of the function provided to transfer power from the faulted Pole to the other Pole.

Suitable modeling of the DC line, which takes into account the electro-magnetic coupling between the Poles, shall be considered in the above studies.

All high voltage equipment in the VSC station including charging resistors and neutral bus

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arresters shall have adequate thermal capacity to support an unsuccessful automatic restarts. In case DC line is tripped due to line fault, affected pole shall be left in a state ready for manual restart in STATCOM mode.

42. Operation During Reduced AC Voltage Conditions

To assist in the recovery of the network, the Converter Stations shall be able to continue operation with reduced AC bus bar voltages.

In addition to the requirements of operation under over voltage conditions specified in this specification, the converter equipment shall be able to continue operating without blocking of converters with AC bus voltage reduced below 15% of nominal voltage during three phase faults, and to zero on one phase during single line to ground faults, for a period of 1 second followed by voltage recovery to 80%. In this condition, reactive power feed to fault shall be prioritized. The converters shall continue to transmit power to the extent possible under the above reduced voltage conditions. The valves as well as all the cooling equipment shall be rated for these conditions. The cooling system shall not trip during AC system faults.

43. Controlled Shutdown

Each Pole shall be able to be shut down in a controlled manner by the automatic reduction in the power order accompanied by appropriate AC harmonic filter bank switching. The block and isolation of a Pole shall be done without the block or shutdown of other Pole converters.

44. Power Runback

The controls shall be capable of achieving 90% of any step change requested by run-back modulation signals including within 200 milliseconds of receipt of the run-back signal.

45. Cyber security

The designed system shall be compliant with:

a) IEC-27001 Information security management
b) IEC-62443
c) CEA (Cyber Security in Power Sector) Guidelines, 2021



Cyber security shall be incorporated in the overall design of the HVDC controls, protection, communications, HMI and SCADA systems. The TSP shall propose a secure and robust design in the control and LAN systems, using next generation firewalls, dual firewall communication designs, routers, gateways, data diodes, etc. that have built in cyber secure measures.

46. Performance Guarantee for Converter Station (excluding HVDC line)

a) HVDC Station losses: The Guaranteed losses of HVDC converter stations shall include the no load operating state loss and load losses during Operation with 100% rated active power(1250 MW / pole) and 100% rated reactive power (410 MVAr / pole). The Guaranteed losses shall be verified as per IEC 61803 and IEC 62751. The above losses shall be guaranteed at nominal DC voltage (±500 kV at rectifier end) and nominal AC system Voltage (400 kV, 50 Hz) at ambient temperature of 40 deg C and relative humidity of 50%.

b) No load loss shall be guaranteed corresponding to converter transformer set at principal tap## with nominal AC system voltage and nominal frequency. Also refer maximum guaranteed loss figures in table below:

c) The system shall meet various harmonic performance parameters on both AC side and DC side.

Design targets for HVDC station Reliability and Availability^^ and station guaranteed losses shall be as per Table-10.

Table - 10

1	Overall Energy availability of HVDC scheme (a) Overall Performance (b) Excluding transformer	 Not less than 97% Not less than 98%
2	Forced Energy Unavailability (FEU)	Not more than 0.6%
3	Schedule Energy Unavailability (SEU)	Not more than 1%
4	Single Pole outage per station per year	Not more than 8 (with average outage duration of 7.5 hours)
5	Bipole outage per station per year	Not more than 0.2 (with average outage duration of 8 hours)
6	No-load operating state losses	0.2 % of Bipole Rating per station
7	Load losses at operation with 100% rated active power and 100% rated reactive power at nominal DC Voltage	Max-1.0-% of Bipole Rating per station

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##Principal tap is the Tap Position of converter transformers when HVDC converters shall be delivering 1 p.u. power (2500 MW, 0 MVAR) at nominal DC voltage at rectifier (± 500 kV) keeping AC system voltage 400 kV, 50 Hz at 40 deg C ambient temperature and humidity of 50%.

^^The details for calculating Availability are mentioned in ***'Appendix C.4'.***

For the loss guarantee stated above, following equipment/systems shall be considered:

a) Determination of losses

The total losses of the HVDC converter station other than HVDC valves shall be calculated as the sum of the losses determined for each individual equipment in line with IEC 61803. The major components to be included in the loss calculation and guarantees and the method of assessment for each component shall be as follows, as applicable:

1. Converter Transformers as per IEC 60076-57-129
2. Phase/ valve reactors
3. DC Smoothing Reactors
4. Converter Valves as per IEC 62751
5. High frequency damping circuits (if applicable)
6. Reactive Power Equipment, AC Filter
7. Auxiliary Power Transformers
8. DC Filters and 50 Hz blocking filter as per IEC 61803
9. Losses for RI and PLC filters
10. All items covered in IEC 61803

Specific Exclusion:

Equipment specifically excluded from the loss calculations shall be the oil treatment plant and firefighting load, station auxiliary system energy consumption (such as illumination of indoor and outdoor services, Air conditioning and ventilation system for control room, service building, kiosk, battery and battery charger etc.) except auxiliary power consumption required by Converter transformer cooling and Valve cooling system.

b) Guaranteed Failure Rate of Power module.

The maximum annual guaranteed Power module failure rate shall not exceed 1.0 % per pole per station. The failure rate shall not include failures directly attributable to operating and maintenance errors.

c) AC/DC HV Filter Capacitor Failure Rate Guarantee (If applicable)



The maximum guaranteed annual capacitor failure rate shall not exceed 0.15% except first unit failure. The capacitor shall be considered as failed if its Capacitance value varies more than ±5% of the (actual measured) name plate value or as indicated by manufacturer. Leakage of oil from the capacitor and deformation of the capacitor unit shall be considered as a failure even if the capacitance value is within the tolerance limits. Failure rate shall be monitored on per pole per station basis.

d) Flashover Guarantee

Flashover is defined as breakdown of insulation for self-restoring insulation media which leads to outage as defined elsewhere in this specification. TSP shall guarantee that there shall be not more than two pollution related flashovers per station per year for DC yards (base environmental conditions as given in this specification will be considered). In case of a flashover, TSP shall make necessary investigations to establish the cause of the same, propose mitigation measures and implement the same.

e) Guaranteed Failure Rate of Relay Module/ C&P Module/Component

The guaranteed failure rate of relay module/ C&P module/ component shall not be more than 0.5% (except 1st unit failure). This will include individual circuit boards but not computers. The failures directly attributable to operation and maintenance errors and other incidents unrelated to the DC system shall not be included in the calculation. The relay module/ C&P module/ component failure rate shall be monitored on per pole per station basis.

47. Commissioning and start of operation

The purpose of commissioning period is to demonstrate to the Nodal Agency/Independent Engineer's satisfaction that the equipment is ready for its purpose and it functions satisfactorily under normal operating conditions. The testing and commissioning period will have the necessary duration to demonstrate the proper functioning of all the Project equipment and systems.

a) Site Testing

After the installation and preliminary adjustments of equipment, the Site tests shall be performed in the following stages:



- Erection checks
- Commissioning tests
- Sub-system tests
- Sub-system energization tests
- System tests

The site testing has been categorized in above stages for the sake of convenience only. There may be overlapping of two or more stages for particular tests. The TSP shall perform the site testing with complete responsibility.

The TSP shall provide all instruments, equipment and facilities required to perform these site tests. Calibration certificates for the test equipment shall be made available at site prior to the start of the testing.

All special and test equipment necessary to simulate devices or switching sequences and required for commissioning shall be provided by the TSP. Results of the site tests shall be well documented and shall form a part of plant documentation.

48. Mandatory Spares:

The mandatory spares for the HVDC Station shall be as per 'Annexure-B, 4. Mandatory spares for HVDC stations (substation/switchyard level)' of CEA's 'Guidelines for availability of spares and inventories for power transmission system, transmission lines and substation/switchyard) assets, 2020'.

The specific exclusion to the above list is Sl. No. 2.1, Converter Transformer. Other Converter Transformer spares from Sl. No. 2.2. to Sl. No. 2.41 to be provided.

Minimum one No. (single phase two winding) spare Converter transformers of each type and rating per station, shall be provided. The spare Converter Transformers shall be inclusive of all fitments, hardware, bushings, as well coolers if mounted on the tank, accessories and oil complete in all respect.

49. HVDC building:

The Building shall comprise of but not limited to the following facilities:

1. Control and Relay Panel room



2. ACDB and DCDB room
3. Battery room
4. Service Room cum workshop
5. Valve hall
6. Cooling system room
7. AHU Room
8. Valve Hall Ventilation Room
9. Any Other room/facilities as per functional requirement

50. For Type Test requirement of equipment, CEA's 'Guidelines for the Type Tests for major equipment of Power Sector' is to be followed.

51. TSP shall supply complete VSC HVDC control and protection replica system without redundancy along with a real time simulator for both the poles based on project specification mentioned in this document. The software and hardware design philosophy of control and protection replica shall be based on the design of ± 500 kV, 2500 MW Khavda - South Olpad VSC HVDC system for the purpose of dynamic performance testing, commissioning, troubleshooting and optimization during operation and training. Figure-4 shows a general diagram of the scope of Control Replica.

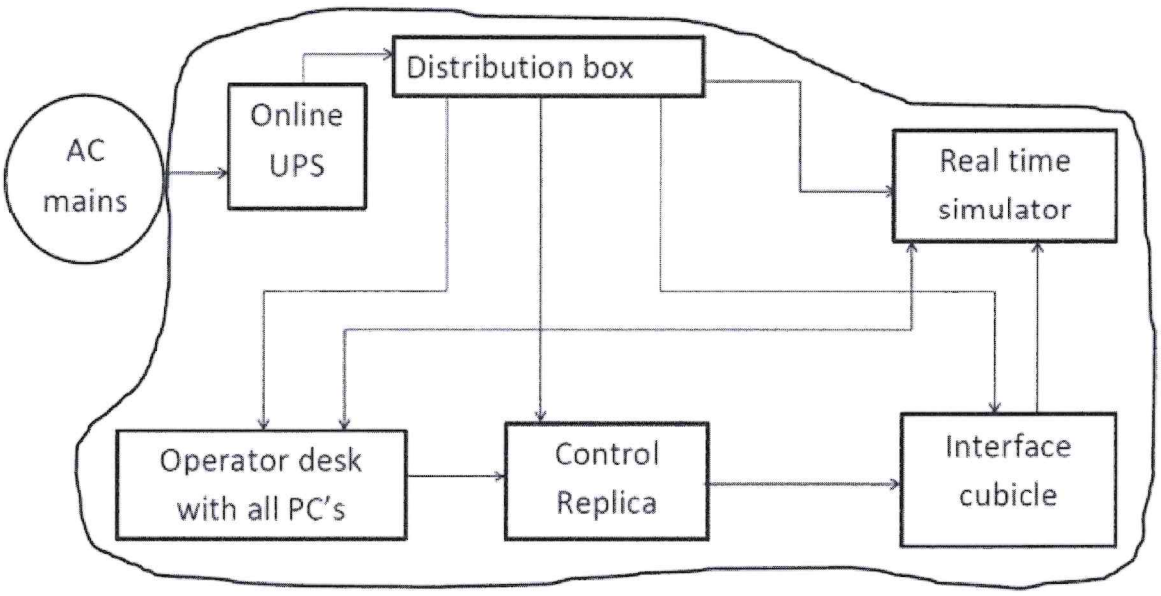


Fig 4 : Scope of contractor for Control Replica

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As show in Figure-4, the supply shall include simulator interface panel, station HMI, Transient Fault Recorder, Station GPS clock, network equipment, Uninterrupted Power Supply (UPS) system, communication cables, cable trays/racks, tools and tackles, suitable furniture including operator desk, spares and other accessories required to implement the Control Replica. The dynamic performance test for 2500 MW Khavda – South Olpad HVDC VSC Bipole may be carried out with Control Replica, and the same shall be delivered to site after completion of site acceptance tests. The simulator shall contain AC network modelled as both voltage sources behind short circuit impedance and detailed AC equivalent network as provided to enable TSP to carry out test cases with both options.

52. Applicable Standards:

All equipment and material shall be designed, manufactured, tested and commissioned in accordance with latest Indian Standards / IEC or IEEE standards, / CIGRE guidelines and the Acts, Rules, Laws and Regulations of India. Some of them are as follows:

Table 11

Sr.No.	Description	Standard
1	Terminology for HVDC transmission	IEC 62747
2	High-voltage direct current (HVDC) power transmission using voltage sourced converters (VSC)	IEC TR 62543
3	Performance of voltage sourced converter (VSC) based high-voltage direct current (HVDC) transmission – Part 1: Steady-state conditions	IEC TR 63363-1
4	High-Voltage Direct Current (HVDC) installations - System tests	IEC 61975
5	High-Voltage Direct Current (HVDC) systems - Guidance to the specification and design evaluation of reactive power exchanges	IEC 62001 (1-5)
6	Bushings for DC Applications	IEC 65700
7	Insulation Coordination	IEC 60071 (1-4,11,12)
8	Application guide for metal oxide arresters without gaps for HVDC converter stations	CIGRE report 33/14-05
9	Converter transformers	IEC 60076-57-129
10	Power transformers - Part 6: Reactors	IEC 600076-6
11	Shunt capacitors for AC power systems having a rated voltage above 1000 V	IEC 60871-(1-4)

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12	Guidelines for the system design of HVDC project	IEC/TR 63127 Ed. 1.0
13	SYSTEMS WITH MULTIPLE DC INFEED	CIGRE 364
14	Guidelines on Asset Management for HVDC Installations	IEC/TR 62978 Ed. 1.0
15	Transformer for HVDC applications	IEC:60076-57-129
16	Surge Arresters – Metal Oxide Surge Arresters without gaps for HVDC converter stations	IEC: 60099-9-Part -9
17	Instrument Transformers	IEC 61869
18	Disconnectors and Earthing Switches	IEC 62271
19	Cyber Security	IEC 62443 IEC 27001
20	UPS, SMPS and Other Power supply units	IEC 62040 IEC 61558
21	Terminology for Voltage Source Converters for high-voltage direct current (HVDC) transmission.	IEC 62747
22	Power losses in voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) systems - Part 2: Modular multilevel converters	IEC 62751
23	Voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) power transmission - electrical testing	IEC 62501
24	Power losses in voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) systems -: Modular multilevel converters- Part 1	IEC 62747
25	Testing and commissioning of VSC HVDC systems	CIGRE 697
26	Dynamic characteristics of inverter-based resources in bulk power systems	IEC 63401
27	IEEE Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems	IEEE P2800-2022
28	Wind Energy Generation Systems	IEC-61400
29	TESTING AND MEASUREMENT TECHNIQUES - POWER QUALITY MEASUREMENT METHODS	IEC 61000-4-30
30	Other items as per relevant and prevailing standards specified elsewhere in the specification for substation works.	

i) CERC (Indian Electricity Grid Code) Regulations, 2023

ii) Manual on Transmission Planning Criteria, 2023

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iii) CEA Technical Standards for Construction of Electrical Plants and Electric Lines Regulations, 2022

iv) CEA Technical Standards for Connectivity to Grid, Regulations, 2007 (including subsequent amendments)



Appendix- C.1

DC Voltage Measuring Equipment

A proven type of voltage divider shall be provided for DC voltage measurement. The accuracy of the device shall not vary more than 0.5% with an ambient temperature change of 50° C. The overall voltage measuring system shall have an accuracy of at least 1.0% of full scale. The response time shall not be longer than 150 micro seconds, accepting an overshoot of up to 20% at that rise time. The measuring system shall achieve proper operation of the control and protection system to which it is connected.

The measurement range shall be sufficient to measure voltages up to 1.5 p.u. Preference shall be given to devices which provide isolation between the HV primary connection and the output signal. If the output signal is not completely isolated from the HV connection, protection shall be provided to limit the possible output signal voltages to less than 2 kV in the event of a fault on the device.

All low-level signals shall be cabled separately from high level signals. The divider shall be so arranged that no leakage current on the surface of the insulator can pass to the measuring circuit. The insulator shall for this reason be continuous without any metallic intermediate flanges. Furthermore, the interior of the divider shall be so arranged that interior leakage currents do not influence the measurement.

For voltage measuring equipment to be erected in the outdoor switchyard, it shall be ensured that discharge activity on the housing shall not cause interference with the output signal.

For each voltage measuring device furnished, all necessary auxiliary power plus any equipment necessary for the transformation of the auxiliary power to an acceptable form shall be provided. Such transformation equipment shall be mounted in the control cubicles.

For power quality measurement compatibility, the transducers including its interface with control and protection panels and display like Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given above.



Direct Current Measuring Equipment

Direct Current Transducers supplied shall be mounted in bushings, if available. In locations where bushings are not available, free-standing transducers shall be provided. For each transducer furnished, the all-necessary auxiliary power plus any equipment necessary for the transformation of the auxiliary power to an acceptable form shall be provided.

The design of the measuring system shall be based on maximum interchangeability where any electronic module shall be compatible with any of the core and coil assemblies.

The transducer output signal shall be of sufficient magnitude to ensure that the content of the signal is usable at all levels of primary current from 1% to 300% of the rated current, with a measurement output possible up to 600% before saturation of the output signal occurs.

In the event of high current (up to 0.2s short circuit current), the DC CT shall remain unsaturated for 20 ms or longer. This time shall be measured from the instant the current attains 10 pu. The DC CT shall be provided with interlock circuits that indicate saturation of the DC CT, as well as DC CT faults.

It shall be ensured that any low-level signals generated are kept shielded from interference due to other higher voltage circuits. The low-level signals shall be cabled separately from high level signals.

It shall be ensured that all DC current measurement outputs are accurately calibrated with all the respective loads connected. Sufficient buffered outputs shall be provided at the time of the initial installation for all future output signal requirements. If required, on-site adjustments to output calibration shall be possible. The sensitivity of the devices supplied for such calibration shall be appropriate for setting the required accuracy.

The electronic module shall be provided with interlock circuits to indicate that the measuring system is fully operable.

Each transducer shall be provided with a capacitive tap.

In case of Optical DC measuring system, the materials used in it shall be non-corrosive in nature.

For power quality measurement compatibility, the transducers including its interface with control and protection panels and display like Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given in this specification.



Stationary Accuracy

The composite accuracy of all DC current measurement systems used for protective purposes shall be equal to or better than ±2% of rated DC current up to 120% of the maximum rated current and ±10% of rated DC current up to 1.2 times peak calculated fault DC current.

All DC current measuring system used for control purposes shall have a composite accuracy of ±0.75% of rated DC current from minimum rated current to 120% of the maximum rated current and ±10% of rated DC current from 120% up to 300% of the rated current.

All transducers used for corresponding functions, e.g. pole differential protection etc shall have matching accuracies equal to or better than ±2% of rated current up to 300% of the rated current.

Dynamic Accuracy

The response of the measuring systems shall be such that a linear current change within 150% of maximum rated current and with a rise time of 45 ms, is tracked by the transducer output with an error which does not exceed +0%, -2% of rated current on any point of the curve. The rise time is defined as the time required for the current to change from 10 to 90% of the full current change. The frequency response shall be within +3% at 1500 Hz.



Appendix C.2

Operator's Control, Monitoring and Support Systems

A. General Requirements

All hardware such as computers, computer peripherals/printers/ accessories, testing equipment etc and networking products shall conform to latest products based on industry standard. It shall be possible to fully monitor and control both stations as described below-

- Operation control of both converter station (from monitors) from Khavda
- Operation control of both converter stations (from monitors) from South Olpad
- In separate operation control mode, all the terminals shall be able to control their own station individually.

The above selection modes shall be separately provided for control of the DC system and the AC systems of either station.

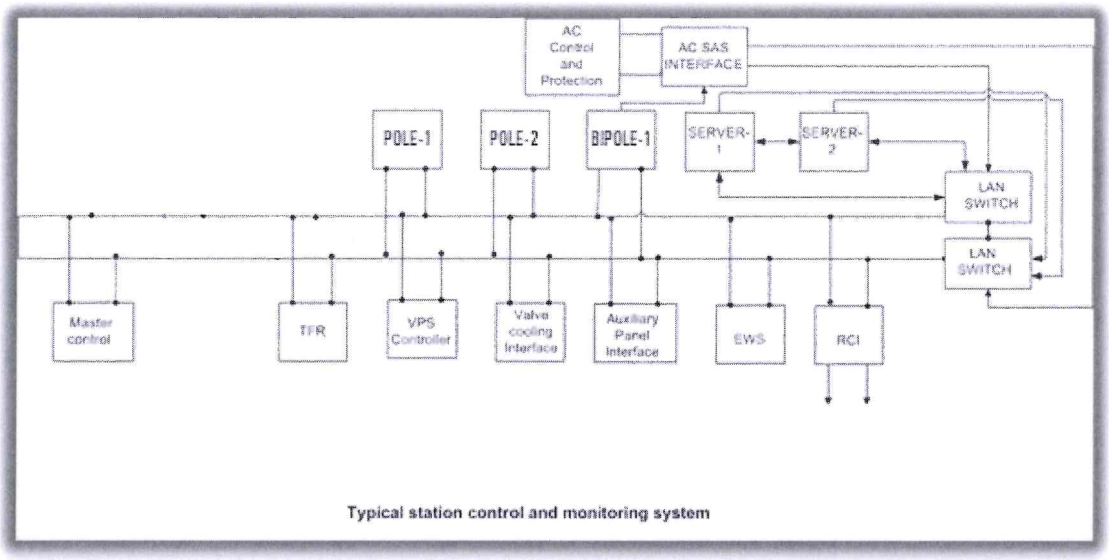
A Station operator desk to be supplied at each converter station shall be able to control the stations. The control shall be possible from TFT Monitors and operator key board/ mouse. In the event of failure of the system, control and monitoring shall be by means of direct control at the Bipole control panels, circuit breaker controls panels etc. generally as shown in 'Figure-A'. This control could be made from PC connected to these control panels and necessary interface shall be provided to achieve this. The control functions to be provided from the equipment control panels shall include at least those listed under 'Table-A' and 'Table -B'. It shall also be possible for operator to know individual alarms by selecting the particular panel on the display monitor.

The TSP shall provide the equipment necessary for the purpose of control, status indication and metering of all equipment (keeping in view the intermediate Bay Kiosks to be provided in AC and DC yard,) Khavda and South Olpad.

The control room shall generally house the following equipment:

- Operator control, monitoring and support system
- DC line fault location equipment, if not integrated within C&P system.
- Transient fault recorders, if not integrated within C&P system.
- Master controller equipment, if not integrated within C&P system.
- Station fire alarm, control and monitoring panel

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'Figure – A'

(System shall be redundant with system A and system B. Only one system has been represented.)

i. HVDC Controls

The station control room at each converter station shall have facilities that include, but not be limited to, the functions shown on Table-A and B

A description of major HVDC control functions is outlined below:

1. **Controlling Station (Master Station) Selector Switch**

Control location selector switches shall be provided in each station control room. These selector switches shall enable the operator to control the HVDC system and/or the HVAC yard of any converter station from either Khavda and South Olpad stations. HVDC and HVAC yard control and monitoring of other converter station shall be provided from TFT Monitors.

2. **Bipole Controls**

Bipole controls shall refer to the common control functions that affect both poles in a Bipole. These functions are typically Bipole power order, power direction, power limit and power ramp rate.

The power flow over the Bipole shall be maintained at the Bipole power order as set by the operator.

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The power ramp rate shall control the timing sequence for loading Bipole at a pre-selected rate (within specified range) set by the operator.

The power limit control shall enable the operator to set different limits to Bipole loading. It shall also be possible to operate each pole separately from Bipole Controls.

3. **Pole/Converter Current Order/Limit**

The power setting divided by voltage shall determine the current order to either pole. However, this shall not preclude the ability to control each pole, by means of a directly entered manual current order signal.

The pole current limit set point shall enable the operator to raise/ lower current limits to optimize link capabilities under varying conditions such as ambient temperature, temporary reduction in capability etc.

4. **HVDC System Control Mode Selection (Per Pole)**

The following basic control modes shall be provided:

a) Active Power Control Mode
b) DC Voltage Control Mode

Disturbance free transfer of any pole from one control mode to another shall be possible.

5. **Miscellaneous Operator Controls**

a) DMR (Dedicated Metallic Return) Line Current Null Control

This control shall enable the operator to null the current flowing in the DMR (Dedicated Metallic Return) Line resulting from unequal sharing of load between poles during balanced operation.

b) Block/ Deblock

This control shall enable the operator to stop (block) or start (deblock) a converter. Automatic sequences shall be provided to fulfil preconditions for deblock. A normal stopping sequence initiated by "block" contact involves a sequence at each end that causes the voltage and current to drop to zero.

c) Pole Start/ Stop

This control shall enable start or stop of the complete pole, comprising converters at either of the rectifiers and the inverter and shall take care of all interlocks, start/stop preconditions and sequences automatically.



d) Direction of Power Transfer

Power flow shall be possible in both directions.

e) Pole Metallic Return/DMR (Dedicated Metallic Return)

This selector switch (or switches) shall enable an automatic sequence from Pole metallic return to DMR and vice versa. This mode change shall be possible even with power flowing in the DC system.

f) DC Filter Connect/ Isolate

Motorized disconnects are specified for switching the filter arms to allow disconnection of a faulty filter bank or arm and for restoration to service as quickly as possible. An automatic switching sequence shall be provided which shall take care of all the interlocks.

g) DC Line Isolator

DC line isolators are specified for maintenance purposes and their electrical operation in local shall be possible. Operation shall be permitted only with pole blocked and station ground connected. Automatic operation shall also be possible if required by any sequences subject to satisfying all interlocks permitting the operation.

h) Grounding Switches in DC Yard

Grounding switches are specified for the DC switchyard area to allow each isolatable section of bus to be grounded. Only local electrical operation is required. However, if operation of any grounding switches is part of any automatic sequence(s), or is specified elsewhere, then those grounding switch(es) shall be operable locally as well as remotely.

i) Valve Hall Ground Switches

Remotely controlled motor operated grounding switches are specified for the valve halls to protect maintenance personnel. The operation of all the valve hall ground switches together as a group shall be possible by initiating a sequence from the control room. Provision shall however be made (key operated switch) for defeating the interlock to permit entry of personnel into the restricted area of the valve hall.

j) Maintenance/Bypass Isolators for Metallic Return Transfer Switch / Bus (MRTS or MRTB)

Electrically local operated isolators shall be provided to establish a ground reference when MRTS is being maintained. These shall be interlocked with the MRTS.

k) Emergency Stop

An emergency stop button on pole basis shall be provided in the control room. Operation of this button shall automatically ramp down at a fast rate the direct power, lead to



blocking of the converters and reach safe shut down with Operation of High speed parallel/ De-parallel switches.

l) HVAC Controls

HVAC controls shall consist of close-open operations for circuit breakers and motor operated disconnectors.

ii. Station Control Facilities

The TSP shall provide the control facilities from the operator control desk through a TFT monitor and keyboard/ mouse system. These facilities shall include all control operations, digital setting, indicating devices, Station single line diagram and symbols, any other special control devices and meters required for control and monitoring of the complete HVDC system. The layout of the station single line diagram, together with control, indicating and metering devices on the control desk shall be logical, compact, and shall facilitate efficient supervision and operation of the station(s) by the operator.

iii. Station Level Status Supervision

The position of each switchgear e.g. Circuit breaker, isolator, earthing switch, transformer tap changer etc. shall be supervised continuously. Every detected change of position shall immediately be displayed in the single-line diagram on the station screen, recorded in the event list and an option to take hard copy printout of event list shall be available. Alarms shall be initiated in the case of spontaneous position changes.

The switchgear positions shall be indicated by two auxiliary switches, normally closed (NC) and normally open (NO), which shall give ambivalent signals. An alarm shall be initiated if these position indications are inconsistent or if the time required for operating mechanism to change position exceeds a predefined limit.

iv. System Indications and Power Measuring Facilities

The TSP shall provide DC and AC system / equipment indication facilities in the station control room at each converter station that shall include, but not be limited to, the functions shown on Table A and Table B. Alarms of slave stations shall be indicated and displayed both at Master Station and slave stations and vice-versa.

Graphic representation of valves and valve cooling piping network shall be provided on station monitoring system. The graphical representation shall also display faulty power modules in different colours indicating faulty power module position.

Pressure, temperature and relative humidity of each valve hall shall also be displayed in the control room. Alarm(s) shall be raised in case any of the parameters exceed limits.

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'Table A' provides a list of minimum AC and DC metering facilities required, which shall be included on TFT monitors.

v. Energy Metering

Energy meters as per relevant CEA Guidelines and Specifications/Regulations for the 765 kV , 400 kV , 220 kV and 132 kV AC switchyards (as applicable) and 33 kV feeders at HVDC terminals shall be provided by the TSP.

B. System Requirements

General

The main control and monitoring systems shall be configured as dual redundant computer-based systems in a main and hot standby configuration generally as shown in 'Figure A'. The operator control, monitoring and support system could be integrated with station control system. Outage of any subsystem or complete loss of one system shall not affect the control and monitoring of the HVDC station. The system shall be based on open system concept in hardware and software and industry standard communication protocols and graphical user interface.

The redundant, computer-based system shall accept control inputs from the Operator by means of TFT monitor/ mouse etc and send these commands to the HVDC and the HVAC control systems.

The system shall gather alarm, status and measurand data from the plant and display it to the Operator on the mimic diagram on TFT monitors, loggers etc. as further defined below. The system shall be so designed that no alarm and status data or control data shall be lost.

Table -A Controls and Indications at Khavda and South Olpad :-

Sl. No.	Signal Name	Khavda	South Olpad
	CONTROLS SIGNALS		
1.	Bipole power order	√	√
2.	Bipole power order ramp	√	√
3.	Bipole power order limit	√	√
4.	Bipole power/current control	√	√
5.	Power direction P1, P2	√	√
6.	Power/Current control P1, P2	√	√
7.	Current order setting	√	√

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Sl. No.	Signal Name	Khavda	South Olpad
8.	Current ramp start/stop	√	√
9.	Current order ramp setting	√	√
10.	Current limit setting	√	√
11.	Master station transfer	√	√
12.	Metallic/DMR switching	√	√
13.	Reduced voltage on/off P1, P2	√	√
14.	Start/Stop and Block/deblock P1, P2	√	√
15.	Power Swing modulation on/off	√	√
16.	DC power /current control	√	√
17.	Emergency stop P1, P2	√	√
18.	Frequency control/on/off	√	√
19.	Frequency target/limits	√	√
20.	Connect/isolate P1, P2	√	√
21.	Joint/separate, Sync/Async	√	√
22.	DC Filter connect/isolate P1, P2	√	√
23.	RPC auto/man off switching	√	√
24.	RPC Volt/Reactive Selection	√	√
25.	RPC MVAr/Voltage set points	√	√
26.	Open line test auto/man P1, P2	√	√
27.	AC Filter (bank/ sub-bank) breaker open/close	√	√
28.	Conv. Trans Breaker open/close	√	√
29.	AC Filter (bank/sub-bank) Disconn open/close	√	√
30.	Conv. Trans Disconn open/close	√	√
31.	Tap changer auto/man P1, P2	√	√
32.	Valve hall Gr. Switch open/close P1, P2	√	√
33.	Khavda Sw. yard Breaker open	√	√
34.	South Olpad Sw. yard Breaker open	√	√
35.	Sub Synchronous Resonance Detected	√	√
36.	Sub Synchronous Damping Control Activated,	√	√
37.	Power Oscillation Damping Activated	√	√
38.	Sub Synchronous Control Interaction Detected	√	√
39.	Sub Synchronous Control Damping activated	√	√
	INDICATIONS		
40.	DC OP Mode Pwr./current	√	√



Sl. No.	Signal Name	Khavda	South Olpad
41.	Gr/metallic return indication. P1, P2	√	√
42.	Power direction P1, P2	√	√
43.	Pole Telecommunication healthy	√	√
44.	Pole blocked/deblock P1, P2	√	√
45.	Master station Khavda-South Olpad- LDC	√	√
46.	STATCOM Mode on	√	√
47.	Power ramp in progress	√	√
48.	Stabilization control on/off	√	√
49.	Full/reduced DC voltage indication P1, P2	√	√
50.	Tap changer Auto/Man indication.	√	√
51.	Pole connect/isolate indication.	√	√
52.	Power direction normal/reverse	√	√
53.	Runback activated indication.	√	√
54.	Frequency control on/off	√	√
55.	Frequency control activated	√	√
56.	AC bay Circuit breakers indication Phase wise.	√	√
57.	AC bay disconnectors indication.	√	√
58.	Bypass Breaker Indication Phase wise	√	√
59.	Pole Discharge Switch Indication	√	√
60.	DC filter con/isolated indication.	√	√
56.	Grid Forming Mode Enabled	√	√
57.	Grid Following Mode Enabled	√	√
58.	Virtual Synchronous Machine Mode Active	√	√
59.	DC Voltage Control Station	√	√
60.	Active Power Control Station	√	√
61.	HVRT / LVRT Activated	√	√

Table -B Indication Signals to RLDC

S. No	Signal Name	RLDC
1.	Bipole power order	√
2.	Power Swing modulation on/off	√
3.	DMR/metallic return indication. P1, P2	√
4.	Pole blocked/deblock P1, P2	√



5.	Runback activated indication.	√
6.	Frequency control on/off	√
7.	Frequency control activated	√
8.	Full/reduced DC voltage indication.	√
9.	AC bay Circuit breakers indication.	√
10.	AC bay disconnectors indication.	√
11.	DC Power Bipole	√
12.	DC Line current/ voltage P1. P2	√
13.	AC side A/MW/MVAR/ P1, P2	√
14.	AC Filter/Cap A. MVAR all banks	√
15.	AC Lines A/MW/MVAR/	√
16.	Station/AC system MW exchange	√
17.	Station/AC System MVAR exch.	√
18.	AC Bus Voltage	√
19.	AC Bus Frequency	√

The system shall also be designed to allow input of signals from the Dispatch centre - for example, load frequency control (LFC) signals. The system shall be capable of meeting the control and monitoring requirements of each converter station and LDC while operating at maximum rating, with a reserve capacity of minimum twenty-five per cent. Equipment bins that are not fully equipped with cards shall be fully wired and be ready to accept additional cards. Power supply units shall be rated to meet the full capacity requirements.

C. Functional Requirements

1. General

The redundant computer-based system shall be a highly reliable integrated system, which shall provide Operator's interface, alarm and monitoring system and operator guidance/ expert system.

The high-voltage apparatus within the station shall be operated from different places:

- Remote control centres
- Station operator control.
- Local Bay controller IED (in the bays)

Operation shall be possible by only one operator at a time. The operation shall depend on the conditions of other functions, such as interlocking, synchro-check etc.

2. Run Time Command Cancellation and Self-Supervision

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Command execution timer (configurable) must be available for each control level connection. If the control action is not completed within a specified time, the command should get cancelled. Continuous self-supervision function with self-diagnostic feature shall be included.

3. **User Configuration**

The monitoring, controlling and configuration of all input and output logical signals and binary inputs and relay outputs for all built-in functions and signals shall be possible both locally and remotely.

It shall also be possible to interconnect and derive input and output signals, logic functions, using built-in functions, complex voltage and currents, additional logics (AND-gates, OR gates and timers). (Multi-activation of these additional functions should be possible).

The Functional requirement shall be divided into following levels:

a) Bay Level Functions.
b) System Level Functions.

D. Computer Information System Requirement:

A computer-based information system shall perform following functions:

- Initiation of commands to control HVDC system.
- Control and monitor the Valve cooling system.
- Monitoring of process data to give brief overview as well as a comprehensive view of each subsystem.
- Sequence of event recording and alarm system including determination of Event Categories (major, warning, alarm).
- Process data archiving and trending.

Soft copy of complete station documentation shall be available on Operator Work Stations.

All the system trends shall be available at least for one-year period and retrievable on demand from the main storage system. The process data logging shall have hourly/ daily logging of station data. Archiving and back up storing facility of the log sheets shall be possible and facilities taking backup on External hard discs/ Drives minimum 2 tera bytes shall be provided.

E. Remote Control, Monitoring and Tele Control systems



The TSP shall provide facilities for coordinated control and monitoring of the HVDC system. All required remote control and remote monitoring facilities shall be provided at each converter station. Complete remote monitoring of each converter station shall be possible from opposite converter station. The HVDC tele-control system equipment shall be used in the processing of signals to be transmitted over the fibre optic communication system between the converter stations of Bipolar scheme.



Appendix C.3

Transient Fault Recorders

1. General

The transient fault recorders (TFR) shall continuously monitor the power system. These could be integrated with operator control and monitoring system or supplied as standalone units.

Below requirements are specified for standalone units. Similar functional requirements will be applicable for integrated TFR.

One recorder per pole shall be provided at each converter station. The TFR may be provided in the form of central unit together with Data Acquisition Units (DAUs). Initiation by any one of the fault detecting sensors or external initiating contacts shall cause the fault recorder to record on all channels. The record shall comprise-fault information, time of fault information and post fault information. The TSP shall determine the number of analog and event inputs required for each recorder and supply these number plus minimum 25% spare channels. The TFR shall also have facility for harmonic analysis upto 100^{th} harmonics, inter-harmonics of waveforms. Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given below. It should also be compatible for checking DC harmonic performance values.

Recorders shall be of solid-state modular construction microprocessor based and without moving parts. First in, first out (FIFO) printing logic shall be used. The necessary software for directly analyzing the records on the memory of the TFR shall also be supplied.

Facilities shall also be provided for data retrieval from TFR and analyse by means of a master station based on compatible PC having minimum configuration of 2.8 GHz clock speed, 1 TB hard disc and 16 GB RAM capacity, complete with 24-inch LED monitor, keyboard/ mouse etc and include laser colour printer with capability to print on A3 and A4 size paper. All necessary software package(s) along with facility to communicate between TFR and PC shall be provided by the TSP.

2. Input Signals

The input signals and starting sensors required for the HVDC system for commissioning and operation shall be determined by the TSP. The input signals to each fault recorder system for a pole shall include, but not be limited to, the following:

- Converter module voltage;

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- Converter arm current
- Converter module energy

- Reactive Power Control Values Active Power Control Values Control references and limits e.g. Id, Iq,Vdc, Pdc. .
- Pole Voltage Order
- Active and Reactive power order
- AC Voltage (Converter)
- Real and Reactive Power Measurement Values
- Real and reactive current Measurement Values
- Pole current order;
- DC line voltage (own pole);
- DC line voltage (other pole);
- DC neutral Bus voltage (Both poles)
- DC line current (own pole);
- DC line current (other pole);
- DC power (each pole and both converters)
- DC power (other pole and both converters)
- DC line to Line Voltage
- Line-Line DC voltage Reference value for the DC voltage control
- DC line current limitations
- Current order
- AC bus voltage (3 phases);
- AC current to each valve group and transformer primary currents.
- Positive Sequence Filtered Current as RMS value (network side)
- Positive Sequence Filtered Current as RMS value (converter side)
- Converter transformer Primary and Secondary voltages.
- Positive Sequence Filtered Line-Line Voltage Line side
- Positive Sequence Filtered line to line Voltage converter side
- AC Positive Sequence filtered Frequency
- DC Current in DMR line
- DC Neutral Current (Own Pole)
- DC Neutral Current (Other Pole)
- Ground Current on DC Side grounding point

The Triggering of TFR shall include all protection initiations and following inputs:

- Pole Block/ Deblock
- Pole gate triggering loss



- Pole last Breaker opened
- Pole DC Protection Voltage level trigger
- Converter Protection operated along with different types
- Pole MR/ GR sequence initiated
- AC Over voltage/ under voltage Protection operated.
- Full voltage/ RVO Changeover
- DC O/V, U/V
- Telecommunication Fail.
- Converter Status including Converter/ Pole Block/ Deblock/ESOF/Transmission status/Rectifier/Inverter etc
- Pole PMR/ DMR sequence initiated
- Binary Converter Status Signals

Each fault recorder shall be equipped with suitable input circuits and starting sensors for all of the input signals. The TSP shall ensure that the characteristics of the input circuits and starting sensors are well matched to the characteristics of the signal sources.

3. Electrical Characteristics

(i) Monitoring Systems

The recorder shall be a digital based type. Operation of the equipment shall be based on programs stored in non-volatile solid-state memory. Programs shall be stable and no inadvertent change of program(s) shall occur.

The recorder shall be equipped with a built-in post fault record- length timer, adjustable over a range of 0.5 to 10 seconds after the fault.

Normally open operation alarm contacts shall close while the fault recorder system is operating and be utilized as inputs to the alarm monitoring and reporting system. A three digit, manually resettable operations counter shall be provided that indicates the number of faults or disturbances recorded.

Facility for automatic storage of information to a PC or an independent storage device (e.g. a disc drive) shall be provided. The output shall be possible to be printed on plain paper in the A4/A3 format.

The recorded information shall include but not necessarily be limited to:

- Station Identification
- Identity of trigger source
- Record Identification for Analog, Event and Sensor traces
- Date/ Time: Year, Day, Hour, Minute, Second, Millisecond
- Analog traces

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- Event traces
- Sensor traces
- Time marker trace which shall allow time interpolation of records to 2 ms.
- Start of record line.

(ii) Operations

The fault recorder shall continuously monitor the power system. Initiation by fault detecting sensors or by other input contacts or pre-selected events shall cause that particular recorder to record the fault information. The other pole recorder shall also record in a slave mode. Operation of any one of the initiating sensors shall start the recording mechanism or otherwise cause all channels to record until the fault clears or the record-length timer setting is exceeded.

The transient fault recorder shall have facility for suitable interface for transmission of recorded analog and digital information to a remote station. This shall be demonstrated by the TSP at site by using inter-station communication.

(iii) Input Circuitry

The input circuits for the recording channels shall be insulated for operation at potentials of 2000 Vrms between channels and between channel and ground. Each input recording channel shall be capable of operating from the output of 1A rms nominal secondaries of current transformers and capacitive voltage transformers with 63.5 V rated secondary. Each channel shall be supplied with a selection of current shunts and voltage multipliers to provide a range of high and low current or voltage ranges which can be selected by straps or similar method. The recorder shall also be capable of operating from the DCCT's and direct voltage devices supplied for the station. Any device required for processing of input signals in order to make them compatible to the equipment shall form an integral part of the supplied equipment. However, such processing of input signals shall in no way distort its waveform. The equipment shall be carefully screened, shielded, earthed and protected as may be required for its safe functioning. It shall be possible to position the reference point of any of the analog channels to any position on the record. The individual traces shall be identified on the record by numbering them in the order they are connected at the input.

The current values of scaling parameters related to the various channels shall be printed on each printout to enable quick interpretation of the records.

(iv) Starting Sensors



The initiating or detecting devices, which start the recording, shall be solid state and automatic self-resetting type.

Each sensor shall be equipped with an indicating lamp, viewable from the front of the cabinet, which operates when the sensor operates. The lamp shall remain 'on' until reset by the station operator. Failure to reset the lamp shall not affect subsequent operation of the sensor. Sensor settings shall be easily adjustable and easily accessible. One starting sensor for at least each of the following types of changes shall be provided.

- Level Changes Over Current Over Voltage Under voltage
- Swing Rate of change of nominal input
- Frequency
- Under frequency
- Over frequency

It shall be possible to adjust the response time of the sensors, in each case, to ensure the most rapid operation consistent with the characteristics of the analogue quantity being monitored.

It shall also be possible to initiate the fault recording, as required, by additional external relay contacts, either NO or NC.

(v) Pre-fault Periods

The recording system shall accurately record power system transient disturbances with a pre-fault period, which shall be settable between 50 to 250 ms.

(vi) Memories

Sufficient memory shall be provided to prevent any loss of records under all normal operating circumstances.

(vii) Time

A means shall be provided to record on the chart the time of occurrence of each fault or disturbance to a resolution of 2 milliseconds or better. The time clock shall be synchronized with the station master clock signal. Facility shall exist to display the time in hour, minutes and seconds on the front of the panel.

(viii) Calibrations

The recording system shall be so designed that each channel may be calibrated separately. Calibration shall be accomplished by applying the calibration level input in the test switches. Controls and switches shall be provided on the front panel to facilitate calibration.

(ix) Resolutions



a) Analog resolution

Analog to digital conversion shall be 12 bits (minimum). The amplitude of the recording shall be adjustable and magnification in fixed steps, of the recording, shall be provided.

b) Events Resolution

The event resolution at the lowest scan rate shall be two milliseconds or better.

c) Transient Response (analog channels)

The transient response delay of the analog input conditioning circuits to a step function input shall be less than 400 microseconds between 10% and 90% values of the step function with overshoot of the final value of the step function being not more than 2%.

(x) Recording Quality

Static trace width	1.5 mm maximum
Residual channel noise	0.1% of full-scale maximum at 50 Hz or any harmonic thereof
Recording resolution	0.1% of full scale
Phase error between channels	Less than 5 degrees at 50 Hz
Crosstalk	Lower than 50 dB (DC to 1500 Hz)

Scale alteration/ expansion facilities shall be provided.

(xi) Alarm Circuits and Indicators

Alarm circuits shall be provided to indicate inability for automatic operation due to power failure, out of paper condition, incorrect switch positioning or other failure(s), which shall be prominently visible on the recorder panel. Each alarm circuit shall include a normally open contact which shall be integrated into the station alarm monitoring and reporting system.

(xii) Power Requirements

The recording system shall be suitable for operation from the station battery supply. There shall be no loss of accuracy in the recording system for specified variations of DC input voltage.

Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given below. It should also be compatible for checking DC harmonic performance values. Most stringent of requirements defined above should be considered.




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Appendix C.4

DEFINITIONS

OUTAGE TERMS

1. Outage

   The state in which equipment or a unit of equipment is unavailable for normal operation due to an event directly related to the same equipment or some unit of equipment.

2. Scheduled Outage

   Scheduled outage is an outage which can be scheduled at least one week in advance. This includes planned maintenance, normally conducted on annual basis, and also unplanned maintenance or repair which can be deferred at least one week subsequent to discovery of the need for maintenance or repair. If the outage is extended due to additional work which would have otherwise caused a forced outage, the excess period is counted as a forced outage.

3. Forced Outage

   The state in which equipment is unavailable for normal operation, but is not in the scheduled outage state, i.e. an outage which is not a scheduled outage.

4. Pole Outages

   An outage which causes a reduction in the Bipole DC power system transfer capacity equal to or less than the power rating of one pole

5. Bipole Outages

   An outage which causes a reduction in the bipolar DC system power transfer capacity greater than the power rating of one pole

CAPACITY TERMS

1. Maximum Continuous Capacity (Pm)



The maximum bipolar HVDC system capacity (MW) for which continuous operation under normal conditions is possible referred on to the rectifier DC bus, i.e. 2500 MW.

2. Outage Capacity (Po)

   The capacity reduction in MW which the outage would have caused if the HVDC system were operating at its maximum continuous capacity (Pm) at the time of the outage.

3. Outage Derating Factor (ODF)

   The ratio of outage capacity (Po) to maximum continuous capacity (Pm). ODF = Po/Pm

OUTAGE DURATION TERMS

1. Actual Outage Duration (AOD)

   The time elapsed in hours between the start and the end of an outage. The time shall be counted to the nearest 1/10th of an hour. Time less than 1/10 of an hour shall be counted as having duration of 1/10 of an hour.

2. Equivalent Outage Duration (EOD)

   The actual outage duration (AOD) in hours, multiplied by the outage derating factor (ODF), so as to take account of partial loss of capacity.

   EOD = AOD x ODF

   Each equivalent outage duration may be classified according to the type of outage involved, i.e. equivalent forced outage duration (EFOD) and equivalent scheduled outage duration (ESOD).

TIME CATEGORIES

1. Period Hours (PH)

   The number of hours in the reporting period.



In a full year the Period Hours are 8760 h (8784 h for a leap year). If the equipment is commissioned part way through a year the period hours shall be proportionately less than 8760 h. (This shall not be applicable for verification of guarantees).

2. Actual Outage Hours (AOH)

   The sum of actual outage durations within the reporting period

   AOH = ∑ AOD

   The actual outage hours (AOH) may be classified according to the type of outage involved, i.e. AFOH and ASOH.

3. Equivalent Outage Hours (EOH)

   The sum of all equivalent outage durations within the reporting period.

   EOH = ∑ EOD

   The equivalent outage hours may be classified according to the type of outage involved, i.e. equivalent forced outage hours (EFOH) and equivalent scheduled outage hours (ESOH).

   If outage duration overlaps the beginning or end of a reporting period, only the EOD which lie within the reporting period shall be included in EOH.

AVAILABILITY AND RELIABILITY TERMS

1. Energy Unavailability (EU)

   Energy unavailability is a measure of the energy which could not have been transmitted due to (scheduled and forced) outages.

   Energy Unavailability % (EU) = EOH/PH x 100

   Forced Energy Unavailability % (FEU) = EFOH/PH x 100

   Scheduled Energy Unavailability % (SEU) = ESOH/PH x 100

2. Energy Availability (EA)

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A measure of the energy which could have been transmitted except for limitations of capacity due to outages, arising from any cause, either forced or scheduled.

Energy Availability % (EA) = (100 - EU)

3. Energy Utilisation (U)

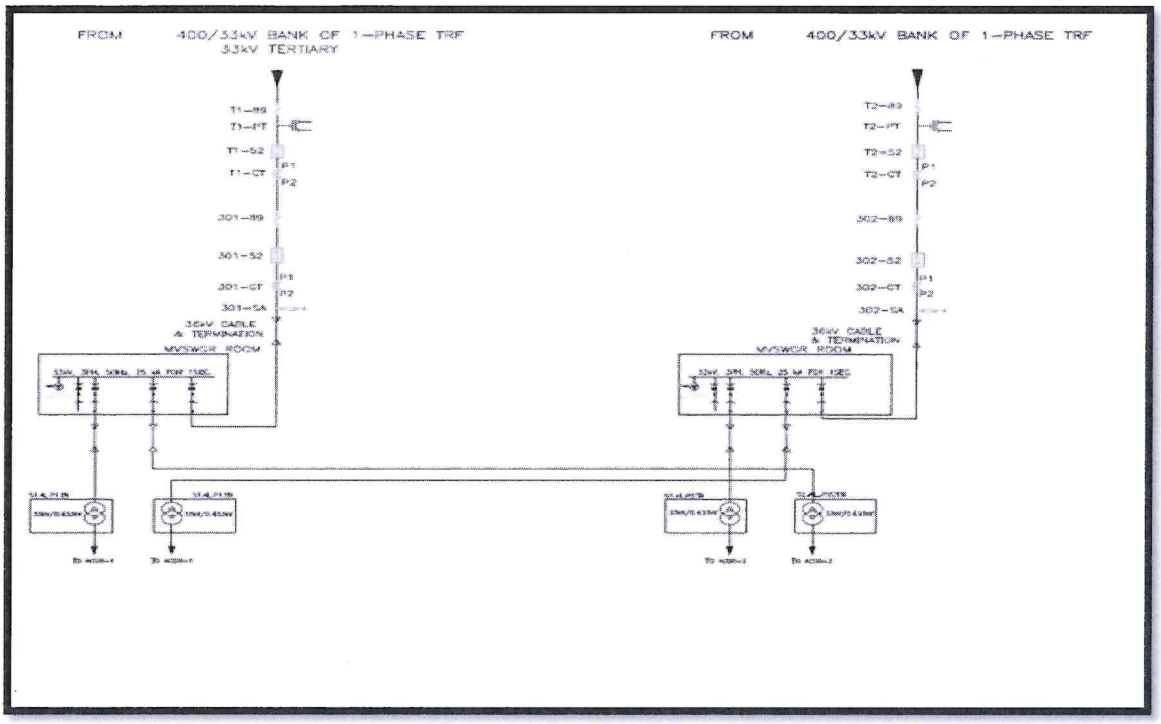
A factor giving a measure of energy actually transmitted over the system.

Energy Utilisation % (U) = [Total energy transmitted/ (Pm x PH)] x 100]



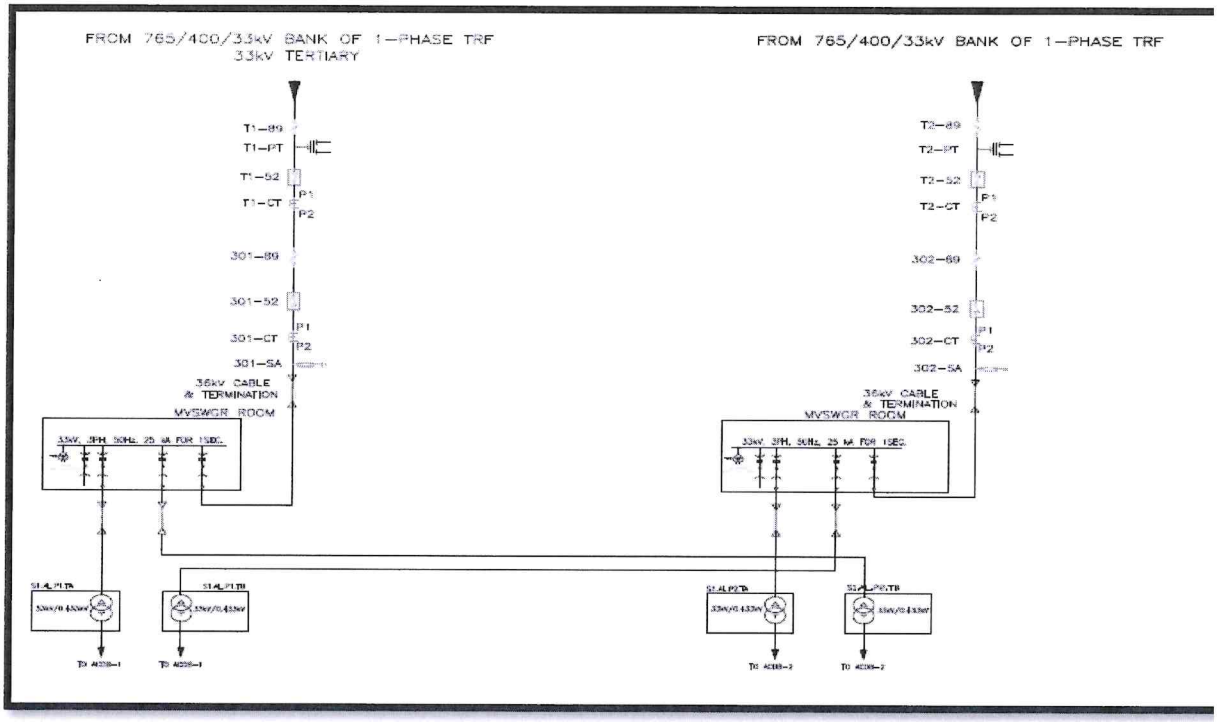
Appendix-C.5

For KPS3:



For South Olpad:

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Annexure – E1

SPECIFIC TECHNICAL REQUIREMENTS FOR ±500 kV HVDC TRANSMISSION LINE

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A.1.0 The design, routing and construction of HVDC transmission lines shall be in accordance with CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time. Other CEA Regulations and MoP guidelines, as applicable, shall also be followed.

A.2.0 Selection of tower type shall be made as per CEA Regulations, however in case lattice type towers are used, the following shall also be applicable:

A.2.1 Steel section of grade E 250 and/or grade E 350 as per IS 2062, only are permitted for use in towers, extensions, gantry structures and stub setting templates. For towers in snowbound areas, steel sections shall conform to Grade-C of IS-2062.

A.2.2 Towers shall be designed as per IS-802:2015, however the drag coefficient of the tower shall be as follows: -

Solidity Ratio	Drag Coefficient
Up to 0.05	3.6
0.1	3.4
0.2	2.9
0.3	2.5
0.4	2.2
0.5 and above	2.0

A.3.0 Transmission Service Provider (TSP) shall adopt any additional loading/design criteria for ensuring reliability of the line, if so desired and /or deemed necessary.

A.4.0 Transmission line shall be designed considering wind zones as specified in wind map given in National Building Code 2016, Vol.1. The developer shall also make his own assessment of local wind conditions and frequent occurrences of high intensity winds (HIW) due to thunderstorms, dust-storms, downburst etc. along the line route and wherever required, higher wind zone than that given in wind map shall be considered for tower design for ensuring reliability of line. Further, for transmission line sections passing within a distance of 50 km from the boundary of two wind zones, higher of the two wind zones shall be considered for design of towers located in such sections.

A.5.0 Selection of reliability level for design of tower shall be as per CEA Regulation (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.

A.6.0 A) For power line crossing of 400 kV or above voltage level (if crossed over the existing line), large angle and dead-end towers (i.e. D/DD/QD) shall be used on either side of power line crossing.

B) For power line crossing of 132 kV and 220 kV (or 230 kV) voltage level, angle towers

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(B/C/D/DB/DC/DD/QB/QC/QD) shall be used on either side of power line crossing depending upon the merit of the prevailing site condition and line deviation requirement.

C) For power line crossing of 66 kV and below voltage level, suspension/tension towers shall be provided on either side of power line crossing depending upon the merit of theprevailing site condition and line deviation requirement.

D) For crossing of railways, national highways and state highways, the rules/regulations of appropriate authorities shall be followed.

A.7.0 The relevant conductor configuration shall be as follows: -

i. Type of conductor: ACSR / AAAC / AL59

Basic parameters for Transmission Line associated with HVDC Bipole link:

Transmission line	**ACSR Conductor specified**	**AAAC conductor based on 53 % conductivity of AL Alloy (Size as per IEC-1089)**	**Minimum size of AL59 conductor based on 59% conductivity of AL Alloy (Size as per Swedish -SS-420814)**	**Sub-conductor Spacing**
±500 kV HVDC transmission lines *(Quad bundle configuration per pole)*	Lapwing: Stranding 45/4.78 mm-Al + 7/3.18 mm-Steel; 38.22 mm diameter; 807.5 mm^2, Aluminium area; Maximum DC Resistance at 20°C (Ω/km): 0.0358; Minimum UTS: 188.0 kN	Stranding details: 61/4.38mm, 39.5 mm diameter; 921 mm^2 Aluminium alloy area; Maximum DC Resistance at 20°C (Ω/km): 0.0361; Minimum UTS: 244.0 kN	Stranding details: 61/4.36mm, 39.2 mm diameter; 910 mm^2 Aluminium alloy area; Maximum DC Resistance at 20°C (Ω/km): 0.0326; Minimum UTS: 199.0 kN	457 mm

Note: *The transmission lines shall have to be designed for a maximum operating conductor temperature of 85 deg C.*

A.8.0 The required pole to pole spacing shall be governed by the tower design as well as minimum live metal clearances under different insulator swing angles. However, pole to pole clearance shall not be less than 12.5 m.

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A.9.0 All electrical clearances including minimum live metal clearance, ground clearance and minimum mid span separation between earth wire and conductor as given below shall be considered:

1) Minimum live metal clearances for ±500 kV line:

a.(i) Swings and Clearances:

Wind Pressure Condition	Minimum Electrical Clearance
a) Swing angle (0º)	3.75 m

(ii) Swings and Clearances: For Jumper

Wind Pressure Condition	Minimum Electrical Clearance
a) Swing angle (0º)	3.75 m
b) Swing angle (15º)	3.15 m
c) Swing angle (57º)	1.1 m

(b) Minimum ground clearance: 12.5 m

c) Minimum mid span separation between earthwire and Pole conductor: 9.0 m

A.10.0 Shielding angle shall not exceed 10 deg for Pole.

A.11.0 Two numbers of Dedicated Metallic Return (DMR) line shall be provided for the ±500 kV HVDC transmission line. Design and selection of conductor of DMR shall be done by the TSP based on sound engineering practice, minimum power losses, meeting the statutory clearances and other technical requirement of RfP.

A.12.0 At least one out of two earth wires shall be OPGW and second earth wire, if not OPGW, shall be either of Galvanized Stranded Steel (GSS) or Aluminum Alloy Conductor Steel Reinforced (AACSR) or any other suitable conductor type depending upon span length and other technical consideration. However, minimum size of Galvanized Stranded Steel (GSS) shall be 7/4.5 mm and diameter 13.50 mm.

A.13.0 Each tower shall be earthed such that tower footing impedance does not exceed 10 ohms. Pipe type or Counterpoise type earthing shall be provided in accordance with relevant IS. Additional earthing shall be provided on every 7 to 8 km distance for direct earthing of both shield wires. If site condition demands, multiple earthing or use of earthing enhancement compound shall be used.

A.14.0 Pile type foundation shall be used for towers located in river or creek bed or on bank of river having scourable strata or in areas where river flow or change in river course is anticipated, based on detailed soil investigation and previous years' maximum flood

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discharge of the river, maximum velocity of water, highest flood level, scour depth and anticipated change in course of river based on river morphology data of at least past 20 years to ensure availability and reliability of the transmission line.

A.15.0 Transmission line route shall be finalized, in consultation with appropriate authorities soas to avoid the habitant zones of endangered species and other protected species. Bird diverters, wherever required, shall be provided on the line. In order to optimize the route use of GATISHAKTI platform shall also be made.

A.16.0 The transmission lines shall be designed with porcelain/glass/ Composite Insulators as per site pollution severity level in the concerned area. However, minimum creepage distance and insulator length shall be as per follows:

Sl. No.	Description	Type of Insulator	Insulator for ±500 kV HVDC Transmission Lines
1.	Minimum Creepage Distance for both Light and medium as well as for Heavy and very heavy pollution level	Composite Insulator	27500 mm
	Minimum Creepage Distance for Light and medium pollution level	Porcelain/Glass Insulator	22345 mm
2.	Minimum length of insulator	Composite/ Porcelain/Glass Insulator	6970 mm

A.17.0 Wherever, transmission lines are passing through cyclone prone areas i.e. areas upto 60 km from coast following shall also be applicable:

a) Terrain category-I, with terrain roughness factor (K2) of 1.08 shall be considered for tower design.

b) Importance factor for cyclonic region (K4) of 1.3 shall be considered for tower design.

c) The number of consecutive spans between the section points/ angle point shall not exceed 10 spans or 3km instead of conventional practice of 15 spans or 5km, in order to reduce the failure of such towers in coastal areas due to cascading effect. The section shall be terminated with tension tower/ angle tower and angle of deviation should be based on the site requirement.

A.18.0 Wherever, transmission lines are passing through cyclone prone areas (i.e. areas upto 60 km from coast)/ creek regions/ aggressive soil areas following shall also be applicable:

d) The fabricated tower parts and stubs shall have a minimum overall zinc coating of

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900 g/m^2 of surface area except for plates and sections below 5 mm thickness which shall have a minimum overall zinc coating of 610 g/m^2 of surface area. The average zinc coating for all sections and plates of 5 mm and above thickness shall be maintained as 127 microns and that for plates and sections below 5 mm shall be maintained as 87 microns.

e) Ready mix concrete of M30 Grade shall be used to avoid use of locally available saline water. However, design mix concrete of M30 Grade conforming to IS 456 with potable water can be used at locations where transportation of ready-mix concrete is not feasible. Minimum cement content in any case shall not be less than 330 kg/m^3.

f) The surface of the reinforced steel shall be treated with epoxy-based coating to enhance corrosion performance of foundation. Use of epoxy coated reinforcement in foundation shall be as per IS 13620. In addition, two (2) coats of bituminous painting of minimum 1.6 kg/m^2 per coat shall be applied on all exposed faces of foundation (i.e. pedestal and base slab).

g) Double coat of 20 mm thick cement plaster shall be provided on all exposed concrete surface up to 300 mm below ground level to give protection to concrete surface from environmental and saline effect.

h) Before coping of chimney top portion, three coats of anti-corrosive paint of minimum 30-35 microns dry film thickness each shall be applied on the stub in the 50 mm coping portion as well as up to 350 mm above CL portion.

A.19.0 The raised chimney foundation is to be provided in areas prone to flooding/water stagnation like paddy field /agricultural field and undulated areas to avoid direct contact of water with steel part of tower. The top of the chimney of foundation should be at least above HFL (High Flood Level) or the historical water stagnation/ logging level (based on locally available data) or above High Tide Level or 500 mm above Natural Ground level (whichever is higher).

A.20.0 The TSP shall abide by the Guidelines of CEA w.r.t. shifting of transmission lines for NHAI projects and other projects.

A.21.0 Safety precautions in regard to gas/oil pipelines in vicinity of Transmission lines shall be taken in coordination with gas/ petroleum authorities.



Annexure – E2

SPECIFIC TECHNICAL REQUIREMENTS FOR HVAC TRANSMISSION LINE

A.1.0 The design, routing and construction of transmission lines shall be in accordance with Chapter V, Part A of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time. Other CEA Regulations and MoP guidelines, as applicable, shall also be followed.

A.2.0 Selection of tower type shall be made as per CEA Regulations, however in case lattice type towers are used, the following shall also be applicable:

A.2.1 Steel section of grade E 250 and/or grade E 350 as per IS 2062, only are permitted for use in towers, extensions, gantry structures and stub setting templates. For towers in snowbound areas, steel sections shall conform to Grade-C of IS-2062.

A.2.2 Towers shall be designed as per IS-802:2015, however the drag coefficient of the tower shall be as follows: -

Solidity Ratio	Drag Coefficient
Up to 0.05	3.6
0.1	3.4
0.2	2.9
0.3	2.5
0.4	2.2
0.5 and above	2.0

A.3.0 Transmission Service Provider (TSP) shall adopt any additional loading/design criteria for ensuring reliability of the line, if so desired and /or deemed necessary.

A.4.0 Transmission line shall be designed considering wind zones as specified in wind map given in National Building Code 2016, Vol.1. The developer shall also make his own assessment of local wind conditions and frequent occurrences of high intensity winds (HIW) due to thunderstorms, dust-storms, downburst etc along the line route and wherever required, higher wind zone than that given in wind map shall be considered for tower design for ensuring reliability of line. Further, for transmission line sections passing within a distance of 50 km from the boundary of two wind zones, higher of the two wind zones shall be considered for design of towers located in such sections.

A.5.0 Selection of reliability level for design of tower shall be as per CEA Regulation (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.

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A.6.0 A) For power line crossing of 400 kV or above voltage level, large angle and dead-end towers (i.e. D/DD/QD) shall be used on either side of power line crossing.

B) For power line crossing of 132 kV and 220 kV (or 230 kV) voltage level, angle towers (B/C/D/DB/DC/DD/QB/QC/QD) shall be used on either side of power line crossing depending upon the merit of the prevailing site condition and line deviation requirement.

C) For power line crossing of 66 kV and below voltage level, suspension/tension towers shall be provided on either side of power line crossing depending upon the merit of the prevailing site condition and line deviation requirement.

D) For crossing of railways, national highways and state highways, Regulations of appropriate authorities shall be followed.

A.7.0 The relevant conductor configuration shall be as follows: -

Name : KPS3 – KPS3 (HVDC) 400 kV 2xD/C Line

Type of conductor: ACSR / AAAC / AL59

Basic parameters:

Transmission line	**ACSR Conductor specified**	**Equivalent AAAC conductor based on 53% conductivity of Al Alloy**	**Equivalent minimum size of AL59 conductor based on 59% conductivity of AL Alloy***	**Sub-conductor Spacing**
400 kV D/C (Quad Bundle) transmission lines	**Moose: Stranding** 54/3.53mm-Al + 7/3.53 mm-Steel; 31.77 mm diameter; 528.5 mm^2, Aluminium area; Maximum DC Resistance at 20°C (Ω/km): 0.05552; Minimum UTS: 161.20 kN	**Stranding details:** 61/3.55mm 31.95mm diameter; 604 mm^2 Aluminium alloy area; Maximum DC Resistance at 20°C (Ω/km): 0.05506; Minimum UTS: 159.80 kN	**Stranding details:** 61/3.31 mm 29.79 mm diameter; 525 mm^2 Aluminium alloy area; Maximum DC Resistance at 20°C (Ω/km): 0.0566; Minimum UTS: 124.70 kN	457 mm

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Note:

1. **To select any size above the minimum, the sizes mentioned in the Indian standard i.e IS-398(part-6) should be followed.*
2. *The transmission lines shall have to be designed for a maximum operatingconductor temperature of 85 deg C.*

A.8.0 The required phase to phase spacing and horizontal spacing for 400 kV line shall be governed by the tower design as well as minimum live metal clearances for 400 kV voltage level under different insulator swing angles. However, the phase to phase spacing for 400 kV lines shall not be less than 8 m respectively.

A.9.0 All electrical clearances including minimum live metal clearance, ground clearance and minimum mid span separation between earth wire and conductor as given below shall be considered.

Minimum live metal clearances for 400 kV line:

i. a). Under stationary conditions:

From tower body: 3.05 m

b). Under Swing conditions

Wind Pressure Condition	Minimum Electrical Clearance
a) Swing angle (22º)	3.05 m
b) Swing angle (44º)	1.86 m

ii. Minimum ground clearance for 400 kV: 8.84 m

iii. Minimum mid span separation between earth-wire and conductor for 400 kV line: 9.0 m

A.10.0 Shielding angle shall not exceed 20 deg for 400 kV transmission line.

A.11.0 The Fault current for design of line shall be 63 kA for 1 sec for 400 kV.

A.12.0 In case of 400 kV voltage class lines, at least one out of two earth wires shall be OPGW and second earth wire, if not OPGW, shall be either of Galvanized Stranded Steel (GSS) or Aluminum Alloy Conductor Steel Reinforced (AACSR) or any other suitable conductor type depending upon span length and other technical consideration.

A.13.0 Each tower shall be earthed such that tower footing impedance does not exceed 10 ohms. Pipe type or Counterpoise type earthing shall be provided in accordance with relevant IS. Additional earthing shall be provided on every 7 to 8 km distance at tension tower for

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direct earthing of both shield wires. If site condition demands, multiple earthing or use of earthing enhancement compound shall be used.

A14.0 Pile type foundation shall be used for towers located in river or creek bed or on bank of river having scourable strata or in areas where river flow or change in river course is anticipated, based on detailed soil investigation and previous years' maximum flood discharge of the river, maximum velocity of water, highest flood level, scour depth and anticipated change in course of river based on river morphology data of at least past 20 years to ensure availability and reliability of the transmission line.

A.15.0 Transmission line route shall be finalized, in consultation with appropriate authorities so as to avoid the habitant zones of endangered species and other protected species. Bird diverters, wherever required, shall be provided on the line. In order to optimize the route use of GATISHAKTI platform shall also be made.

A.16.0 Wherever, transmission lines are passing through cyclone prone areas i.e. areas upto 60 km from coast following shall also be applicable:

a) Terrain category-I, with terrain roughness factor (K2) of 1.08 shall be considered for tower design for exposed open terrain with few or no obstruction which also includes open sea coasts, open stretch of water, desert and flat treeless plains.

b) Importance factor for cyclonic region (K4) of 1.3 shall be considered for tower design.

c) The number of consecutive spans between the section points/ angle point shall not exceed 10 spans or 3 km instead of conventional practice of 15 spans or 5 km, in order to reduce the failure of such towers in coastal areas due to cascading effect. The section shall be terminated with tension tower/ angle tower and angle of deviation should be based on the site requirement.

A.17.0 Wherever, transmission lines are passing through cyclone prone areas (i.e. areas up to 60 km from coast)/ creek regions/ aggressive soil areas following shall also be applicable:

a) The fabricated tower parts and stubs shall have a minimum overall zinc coating of 900 g/m^2 of surface area except for plates and sections below 5 mm thickness which shall have a minimum overall zinc coating of 610 g/m^2 of surface area. The average zinc coating for all sections and plates 5 mm and above thickness shall be maintained as 127 microns and that for plates and sections below 5 mm thickness shall be maintained as 87 microns.

b) Ready mix concrete of M30 Grade shall be used to avoid use of locally available saline water. However, design mix concrete of M30 Grade conforming to IS 456 with potable water can be used at locations where transportation of ready-mix concrete is not feasible. Minimum cement content in any case shall not be less than 330 kg/m^3.

c) The surface of the reinforced steel may be treated with epoxy-based coating to

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enhance corrosion performance of foundation. Use of epoxy coated reinforcement in foundation shall be as per IS 13620. In addition, two (2) coats of bituminous painting of minimum 1.6 kg/m^2 per coat shall be applied on all exposed faces of foundation (i.e. pedestal and base slab).

d) Double coat of 20 mm thick cement plaster shall be provided on all exposed concrete surface up to 300 mm below ground level to give protection to concrete surface from environmental and saline effect.

e) Before coping of chimney top portion, three coats of anti-corrosive paint of minimum 30-35 microns dry film thickness each shall be applied on the stub in the 50mm coping portion as well as up to 350 mm above CL portion.

A.18.0 The raised chimney foundation is to be provided in areas prone to flooding/water stagnation like paddy field /agricultural field and undulated areas to avoid direct contact of water with steel part of tower. The top of the chimney of foundation should be at least above HFL (High Flood Level) or the historical water stagnation/ logging level (based on locally available data) or above High Tide Level or 500 mm above Natural Ground level (whichever is higher).

A.19.0 Routing of transmission line through protected areas of India shall be avoided to the extent possible. In case, it is not possible to avoid protected areas, the towers of the transmission line up to 400 kV level which are installed in protected areas shall be designed for Multi-circuit (4 circuits) configuration of same voltage level considering reliability level of at least two (2). The top two circuits of these multi-circuit towers shall be used for stringing of the transmission line under present scope and the bottom two circuits shall be made available for stringing of any future transmission line of any transmission service providers/ State transmission utilities/Central transmission utilities passing through the same protected area. Further, the configuration and coordinates of such transmission towers shall be submitted to CEA, CTU and BPC by the TSP.

A.20.0 The TSP shall abide by the Guidelines of CEA w.r.t. shifting of transmission lines for NHAI projects and other projects.

A.21.0 Safety precautions in regards to gas/oil pipe lines in vicinity of transmission lines shall be taken in coordination with gas/ petroleum authorities.

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ANNEXURE-E3

SPECIFIC TECHNICAL REQUIREMENTS FOR HVAC EQUIPMENT

The 400 kV switchyard at **KPS3 (HVDC) S/s, extension of KPS3 S/s and extension of South Olpad S/s** shall be GIS type generally conforming to the requirements of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 as amended from time to time.

All other CEA Regulations/guidelines as amended up to date and MoP guidelines shall also be followed.

B.1.0 Salient features of Substation Equipment and Facilities

The design and specification of substation equipment are to be governed by the following factors:

B.1.1 Insulation Coordination

The system design parameters for substations/switchyards shall be as given below:

Sl. No.	Description of parameters	400 kV KPS3 (HVDC) / KPS3 GIS Extn.	400 kV South Olpad GIS Extn
		400 kV System	400 kV System
1.	System operating voltage	400 kV	400 kV
2.	Maximum voltage of the system (rms)	420 kV	420 kV
3.	Rated frequency	50 Hz	50 Hz
4.	No. of phases	3	3
5.	Rated Insulation levels		
i)	Lightning Impulse withstand voltage for (1.2/50 micro sec.) for Equipment other than Transformer and Reactor for Insulator String	1425 kV p 1550 kV p	1425 kV p 1550 kV p
ii)	Switching impulse withstand voltage (250/2500 micro sec.) dry and wet	1050 kV p	1050 kV p
iii)	One-minute power frequency dry withstand voltage (rms)	650 kV	650 kV
6.	Corona extinction voltage	320 kV	320 kV

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Sl. No.	Description of parameters	400 kV KPS3 (HVDC) / KPS3 GIS Extn.	400 kV South Olpad GIS Extn
		400 kV System	400 kV System
7.	Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz	1000 micro-volts at 266 kV rms	1000 micro-volts at 266 kV rms
8.	Minimum creepage distance for insulator string/ longrod insulators/ outdoor bushings	13020 mm (31 mm/ kV)	13020 mm (31 mm/ kV)
9.	Minimum creepage distance for switchyard equipment	13020 mm (31 mm/ kV)	13020 mm (31 mm/ kV)
10.	Max. fault current	63 kA	63 kA
11.	Duration of fault	1 Sec	1 Sec

B.1.2 Switching Scheme

The switching schemes, as mentioned below, shall be adopted at various voltage levels of substation/switchyard:

Substation	400 kV side
400 kV KPS3 (HVDC)	One and Half breaker
400 kV KPS3 Extn	One and Half breaker
400 kV South Olpad Extn.	One and Half breaker

Notes: -

i) For one and half breaker switching scheme, any double circuit line consisting of two numbers of feeders and originating from the same transmission or generating switchyard shall not be terminated in one diameter.

ii) Two transformers of the same HV rating shall not be connected in the same diameter and similarly, two bus reactors of same HV rating shall also not be connected in the same diameter.

iii) A diameter in one and half breaker scheme is a set of 3 circuit breakers with associated isolators, earth switches, current transformers etc for controlling of 2 numbers of feeders.

iv) TSP shall plan distribution of line and transformer feeders to bus bar in such a way that all power can be evacuated successfully without crossing thermal limit at any point of bus-bar.



v) *400 kV Bus Sectionaliser shall be placed such that each section shall have proper distribution of Pole(s), ICT, Feeders and filter bank(s)/sub-bank(s) so as to have maximum operational flexibility.*

vi) *In case of GIS substation where the bus scheme is One and Half breaker scheme, the diameters shall be complete with feeder/line side isolator and GIS duct of the future bay shall be brought outside the GIS hall/building with extension/interface module suitably.*

B.2.0 Substation

Equipment and facilities (Voltage level as applicable):

The switchgear shall be designed and specified to withstand operating conditions and duty requirements. All equipment shall be designed considering the following minimum capacity.

Sl. No.	Description of bay	Ampacity		
		400 kV KPS3 (HVDC) GIS S/s	400 kV KPS3 GIS Extn	400 kV South Olpad GIS Extn
		400 kV	400 kV	400 kV
1.	Bus Bar	4000 A	4000A	4000A
2.	Line bay	3150 A	3150A	--NA--
3.	Converter bay	3150 A	--NA--	3150 A
3.	ICT bay	3150 A	--NA--	--NA--
4.	Bus Reactor bay	3150 A	--NA--	--NA--
5.	Bus Sectionaliser bays	4000 A	--NA--	--NA--

B.2.1 400/33 kV, 50 MVA Transformers [for exclusively supplying auxiliary power to HVDC terminal]

50 MVA, 400/33 kV, 3-Phase Transformers shall conform to CEA's "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above voltage class)" available on CEA website.

B.2.2 420 kV, 3-Phase, Shunt Reactor

125 MVAR, 420 kV, 3-Phase Reactor shall conform to CEA's "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above voltage class)" as amended up to date available on CEA website.

B.2.3 400 kV GIS Substation equipment

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GIS (Gas Insulated Switchgear) shall be Indoor type in accordance to IEC: 62271-203. The switchgear shall be designed and specified to withstand operating conditions and duty requirements. All the switchgear such as Circuit Breaker, isolator, earth switch including CT, PT etc. shall be GIS type. The Surge Arrestor and Voltage Transformer shall be either GIS or outdoor AIS type.

The GIS assembly shall consist of separate modular compartments e.g. Circuit Breaker compartment, Bus bar compartment filled with SF6 Gas and separated by gas tight partitions so as to minimize risk to human life, allow ease of maintenance and limit the effects of gas leaks failures and internal arcs etc. These compartments shall be designed to minimize the risk of damage to adjacent sections and protection of personnel in the event of a failure occurring within the compartments. Rupture diaphragms with suitable deflectors shall be provided to prevent uncontrolled bursting pressures developing within the enclosures under worst operating conditions, thus providing controlled pressure relief in the affected compartment. The arrangement of gas sections or compartments shall be such as to facilitate future extension of any make without any drilling, cutting or welding on the existing equipment. To add equipment, it shall not be necessary to move or dislocate the existing switchgear bays. The layout of Gas Insulated Bus Ducts shall be properly planned to optimize the length of bus ducts and for easy accessibility for maintenance. The length of busbars, bus ducts, isolator sections shall be optimized considering effects of fast transient voltage due to isolator operations.

The bus bar modules including auxiliary bus modules (wherever applicable) shall be provided with suitable End Piece (Interface) module on both sides with the test link facility for future extension as per provisions of future requirement. The end piece module shall be designed in such a way so that future GIS module may be tested without extending test voltage to existing bus and vice-versa by removing the test link.

TSP shall make available the complete details for the design of interface module such as cross section, enclosure material, enclosure dimensions (inner and outer), Flange diameter (inner and outer), conductor cross-section and connection arrangement, bolt spacing and dimension, rated gas pressure, Gasket detail etc. Further, adequate space for GIS busbar interface module shall be taken into account for future scope.

Each section shall have plug-in or easily removable connection pieces to allow for easy replacement of any component with the minimum disturbance to the remainder of the equipment. Inspection windows (View Ports) shall be provided for Disconnector Switches and both type of earth switches i.e. Maintenance and fast operating.

Local control cabinets (LCC) shall be provided as per requirement. The alarm and annunciation of GIS equipment shall be wired to the SCADA System.



The material and thickness of the enclosures shall be such as to withstand an internal flash over without burns through for a period of 300 ms at rated short time withstand current. The material shall be such that it has no effect of environment as well as from the by-products of SF6 breakdown under arcing conditions. This shall be validated with Type Test.

Service continuity requirement for GIS:

The GIS equipment with the given bus switching arrangement shall be divided into different gas compartments. During the work such as a fault repair or major maintenance, requiring the dismantling of a gas compartment for which more than one compartments may need to be de-gassed.

TSP shall meet the following Service continuity conditions (to the extent possible) with ensuring equipment and operating personnel's safety:

- For One and half breaker bus switching scheme, during a fault in Circuit Breaker compartment, no bus bar and feeder is permitted out of service during maintenance and repair/replacement.
- During a fault in a GIS compartment other than the Circuit Breaker compartment, maximum of one bus bar and/or one feeder is permitted out of service during maintenance and repair/replacement.

UHF sensors in GIS for PD (Partial Discharge) detection:

The adequate number of Ultra High frequency (UHF) sensors shall be provided in the offered GIS along with suitable portable type Partial Discharge (PD) measuring instrument for detection of Partial discharge (of 5 pC and above as per IEC 60270). The number and location of these sensors shall be based on laboratory tests on the typical design of GIS as per recommendations of CIGRE Document No. 654 (Application Guide for sensitivity verification for UHF Partial discharge detection system for GIS).

B.2.3.1 Circuit Breakers (GIS)

GIS Circuit breakers shall in general be of C2-M2 class and comply with IEC-62271-100. The rated break time shall not exceed 40 ms (milli second) for 400 kV. Circuit breakers shall be suitable for single phase and three phase auto reclosing. Each breaker shall have two sets of trip circuits which would be connected to separate DC supplies for greater reliability. The Circuit breakers controlling 400 kV lines wherever required shall be provided with pre-insertion closing resistor of about 400 ohms with 8 ms insertion time or Controlled Switching Device (CSD) for lines longer than 200 km. The short line fault capacity shall be same as the rated capacity and this is proposed to be achieved without use of opening



resistors. Controlled switching device shall be provided in Circuit Breaker of switchable line reactor bay and in 400 kV and above Main and Tie bay circuit breakers of line with non-switchable line reactors, Bus reactors and Transformers.

B.2.3.2 Isolators (GIS)

The isolators shall comply with IEC 62271-102 in general. Earth switches shall be provided at various locations to facilitate maintenance. Main blades and earth blades shall be interlocked and interlock shall be fail safe type. All isolators and earth switches shall be motor operated type.

Isolator shall be of extended mechanical endurance class-M2 and suitable for Bus Transfer Current Switching duty as per IEC standard. High speed earthing switches shall be provided for grounding purpose at overhead line terminations and cable terminations and shall have fault making capability as specified. Earth switch for line isolator shall be of earthing switch class E1 and shall be suitable for induced current switching duty as defined for Class-B as per relevant standard.

B.2.3.3 Current Transformers (GIS)

Current Transformers shall comply with IEC 61869 in general. All ratios shall be obtained by secondary taps only. Generally, Current Transformers (CT) shall have five cores (four for protection and one for metering) whereas; CT in Tie bays shall have six cores (four for protections and two for metering) suitably distributed on both sides of CB (for 400 kV and above voltage class). The burden and knee point voltage shall be in accordance with the requirements of the system including possible feeds for telemetry. Accuracy class for protection core shall be PX and for metering core it shall be 0.2S. The rated burden of cores shall be closer to the maximum burden requirement of metering and protection system (not more than 20 VA for metering core) for better sensitivity and accuracy.

The instrument security factor shall be less than 5 for CTs up to 400 kV voltage class.

B.2.3.4 Voltage Transformer (GIS)

The voltage transformers shall conform to IEC-61869. Voltage transformers shall be of electromagnetic type with SF6 gas insulation. The earth end of the high voltage winding and the ends of the secondary winding shall be brought out in the terminal box. The voltage transformers shall be located as a separate bay module and will be connected phase to ground and shall be used for protection, metering and synchronization. The voltage transformers shall be of inductive type, nonresistant and shall be contained in their own-SF6 compartment, separated from other parts of installation. The voltage transformer shall be effectively shielded against high frequency electromagnetic

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transients. The voltage transformer shall have three secondary windings out of which two shall be used for protection and one for metering. The voltage transformer should be thermally and dielectrically safe when the secondary terminals are loaded with the guaranteed thermal burdens. The accuracy class for protection cores shall be 3P. The accuracy of 0.2 on metering core should be maintained throughout the entire burden range on all the three windings without any adjustments during operation. The rated burden of cores shall be closer to the maximum burden requirement of metering and protection system (not more than 50 VA for metering core) for better sensitivity and accuracy.

B.2.3.5 Surge Arresters (GIS) (if applicable)

336 kV Station High (SH) duty gapless type Surge arresters with thermal energy (Wth) of minimum 12 kJ/kV respectively shall be provided for 420 kV system conforming to IEC 60099-4 in general. Other characteristics of Surge arrester shall be chosen in accordance with system requirements. Surge arresters shall be provided at line entrances, near transformers and reactors so as to achieve proper insulation coordination. A leakage current monitor with surge counter shall be provided with each surge arrester.

B.2.3.6 SF_6 to Air Bushing

Outdoor bushings, for the connection of conventional external conductors to the SF6 metal enclosed switchgear, shall be provided. Bushings shall generally be in accordance with the requirements of IEC-60137. The creepage distance over the external surface of outdoor bushings shall not be less than 31 mm/kV. SF6 to air Bushing shall be of Polymer / composite type and shall be robust and designed for adequate cantilever strength to meet the requirement of seismic condition. The electrical and mechanical characteristics of bushings shall be in accordance with IEC-60137. Polymer/composite insulator shall be seamless sheath of silicon rubber compound. The housing and weather sheds should have silicon content of minimum 30% by weight. It should protect the bushing against environmental influences, external pollution and humidity. The hollow silicon composite insulators shall comply with the requirements of IEC 61462 and the relevant parts of IEC-62217.

B.2.4 400 kV AIS Substation equipment (as applicable)

B.2.4.1 Capacitive Voltage Transformers (AIS)/ AC Voltage Transformer/ AC Voltage Divider

Capacitive Voltage transformers/AC Voltage Transformer/ AC Voltage Divider shall comply with IEC 61869 in general. These shall have three secondaries out of which two shall be used for protection and one for metering. The Accuracy class for protection cores shall be 3P and for metering core shall be 0.2. The Capacitive voltage transformers on lines shall

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be suitable for Carrier Coupling. The Capacitance of CVT for 400 kV shall be of 4400/8800 pF depending on PLCC requirements. The rated burden of cores shall be closer to the maximum burden requirement of metering and protection system (not more than 50 VA for metering core) for better sensitivity and accuracy.

For power quality measurement compatibility, the transducers including its interface with control and protection panels and display like Transient fault recorders should be compatible with IEC 61000-4-30 Class A in order to check compatibility with Grid Connectivity requirements over and above the requirements given above.

B.2.4.2 Surge Arresters (AIS)

336 kV Station High (SH) duty gapless type Surge arresters with thermal energy (Wth) of minimum 12 kJ/ kV conforming to IEC 60099-4 in general shall be provided for 400 kV systems. Other characteristics of the Surge arrester shall be chosen in accordance with system requirements. Surge arresters shall be provided at line entrances, near transformers and reactors so as to achieve proper insulation coordination. Surge Arresters shall be provided with porcelain/ polymer housing fitted with pressure relief devices. A leakage current monitor with surge counter shall be provided with each surge arrester.

B.2.5 Protection Relaying and Control System

The protective relaying system proposed to be provided for transmission lines, auto-transformers, reactors and bus bars to minimize the damage to the equipment in the events of faults and abnormal conditions, is dealt in this section. All main protective relays shall be numerical type with IEC 61850 communication interface and should have interoperability during integration of numerical relays to communicate over IEC61850 protocol with RTU/SAS/IEDs of different OEMs. All numerical relays shall have built in disturbance recording feature.

The protection circuits and relays of transformer and reactor shall be electrically and physically segregated into two groups each being independent and capable of providing uninterrupted protection even in the event of one of the protection groups failing, to obtain redundancy, and to take protection systems out for maintenance while the equipment remains in service.

a) Transmission Lines Protection

400 kV transmission lines shall have Main-I numerical three zone distance protection scheme with carrier aided inter-tripping feature. 400 kV lines shall also have Main-II numerical distance protection scheme like Main-I but from different make that of Main-I.

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The Main-I and Main-II protection relays of same make may be provided only if they are of different hardware and manufacturing platform or different principle of operation.

However, Line Current Differential relay (with back up distance protection feature) as Main–I and Main-II shall be considered at both ends for short lines (line length below 30 km) having Fibre Optic communication link. Differential relay at remote end shall be provided by the TSP. Associated power and control cabling and integration with SAS at remote end shall be provided by respective bay owner.

Further, all 400 kV lines shall be provided with single and three phase auto-reclosing facility to allow reclosing of circuit breakers in case of transient faults. These lines shall also be provided with distance to fault locators to identify the location of fault on transmission lines.

All 400 kV lines shall also be provided with two stages over voltage protection. Over voltage protection and distance to fault locator may be provided as in-built feature of Main-I and Main-II protection relays. Auto reclose as built-in function of Bay Control Unit (BCU) is also acceptable.

The Main-I and Main-II protection relays shall be fed from separate DC sources and shall be mounted in separate panels.

For 400 kV transmission lines, directional IDMT earth fault relay should be provided as standalone unit or in-built feature of Main-I and Main -II feature.

b) Auto Transformer Protection

These shall have the following protections:

i) Numerical Differential protection

ii) Numerical Restricted earth fault protection

iii) Numerical Back-up Directional Over-current and earth fault protection on High Voltage (HV) and Intermediate Voltage (IV) side

iv) Numerical Over fluxing protection on HV and IV side

v) Numerical Overload alarm

Further, Numerical Back-up Over-current and earth fault protection on HV and IV side of autotransformer shall not be combined with other protective functions in the main relays and shall be independent relays. Besides these, power transformers shall also be provided

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with Buchholz relay, Magnetic Oil Gauge (MOG) with low oil level alarm, protection against high oil and winding temperature and pressure relief device etc.

Suitable monitoring, control (operation of associated circuit breaker and isolator) and protection for LT auxiliary transformer connected to tertiary winding of auto-transformer for the purpose of auxiliary supply shall be provided. The over current and other necessary protection shall be provided for the auxiliary transformer. These protection and control may be provided as built in feature either in the bay controller to be provided for the auxiliary system or in the control and protection IEDs to be provided for autotransformer.

c) 400 kV Reactor Protection

Reactor shall be provided with the following protections:

i) Numerical Differential protection.

ii) Numerical Restricted earth fault protection

iii) Numerical Back-up impedance protection

Besides these, reactors shall also be provided with Buchholz relay, MOG with low oil level alarm, protection against oil and winding temperatures and pressure relief device, etc.

d) Bus bar Protection

The high speed low impedance type bus bar differential protection, which is essential to minimize the damage and maintain system stability at the time of bus bar faults, shall be provided for 400 kV. Duplicated bus bar protection is envisaged for 400 kV bus-bar protection. Bus bar protection scheme shall be such that it operates selectively for each bus and incorporate necessary features required for ensuring security. The scheme shall have complete bus bar protection for present as well as envisaged future bays i.e. input / output modules for future bays shall also be provided.

Bus Bar protection system for new substation shall be de-centralized (distributed) type.

In case, the bus section is provided, then each side of the bus section shall have separate set of bus bar protection schemes.

For existing substations, the existing bus bar protection shall be augmented as per requirement.

e) Local Breaker Back up Protection



This shall be provided for each 400 kV circuit breakers and will be connected to de-energize the affected stuck breaker from both sides.

Notes:

1. *LBB and REF relays shall be provided separately from transformer differential relay.*
2. *LBB relay may also be provided as built-in protection function of distributed bus bar protection scheme; however in such case separate LBB relay shall be provided for tie bays (in case of One and Half breaker scheme).*
3. *Over fluxing and overload protection can be provided as built-in feature of differential relay.*
4. *In 400 kV switchyard, if spare bay of half diameter is identified as future, Tie CB relay panel shall be with Auto-reclosure feature.*

B.2.6 Substation Automation System

a) For all the new substations, a state-of-art Substation Automation System (SAS) conforming to IEC-61850 shall be provided. The distributed architecture shall be used for Substation Automation system, where the controls shall be provided through Bay control units. The Bay control unit is to be provided bay-wise for voltage level 400 kV and above. All bay control units as well as protection units are normally connected through an Optical fibre high speed network. The control and monitoring of circuit breaker, dis-connector, re-setting of relays etc. can be done from Human Machine Interface (HMI) in the control room.

The functions of control, annunciation, disturbance recording, event logging and measurement of electrical parameters shall be integrated in the Substation Automation System.

At new substations, the Substation Automation System (SAS) shall be suitable for the operation and monitoring of the complete substation including proposed future bays/elements.

In existing substations with a Substation Automation System (SAS), augmentation of existing SAS shall be done for bays under the present scope.

In existing Substations where Substation automation is not provided, control functions shall be done through control panels.

Necessary gateway and modems (as required) shall be provided to send data to RLDC/SLDC as per their requirement and shall be provisioned with 2+2 redundancy i.e. 2 channels for Main Control Centre and 2 channels for Backup Control Centre. In order to

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meet this requirement, suitable redundancy at port and card level need to be ensured by the TSP to avoid any single point of failure which may lead to interruption in real-time grid operation. Accordingly, all the hardware for communication services of station as stated above shall support dual redundancy for data transmission of station to respective main and backup RLDCs. Any augmentation work at RLDC/SLDC is excluded from TSP's scope. However, all the configuration work at substation end required to send data to RLDC/SLDC shall be in the scope of TSP.

b) Time synchronization equipment

Time synchronization equipment complete in all respect including antenna, cable, processing equipment required to receive time signal through GPS or from National Physical Laboratory (NPL) through INSAT shall be provided at new substations. This equipment shall be used to synchronize SAS and IEDs etc.

B.3.0 Substation Support facilities

Certain facilities required for operation and maintenance of substations as described below shall be provided at new substation. In existing substation, these facilities have already been provided and would be extended/ augmented as per requirement.

B.3.1 Fire Fighting System

Fire-fighting system for substation including transformer and reactor shall conform to CEA (Measures Relating to Safety and Electric Supply) Regulations, 2023 as amended time to time.

Further, adequate water hydrants and portable fire extinguishers shall be provided in the substations. The main header of firefighting system shall be suitable for extension to bays covered under the future scope; necessary piping interface in this regard shall be provided.

Optical Beam type heat detection for GIS hall fire protection system shall be provided for all the GIS halls.

At existing substations, the fire-fighting systems, as available, shall be augmented/ extended to meet the additional requirements.

B.3.2 Oil evacuating, filtering, testing and filling apparatus

To monitor the quality of oil for satisfactory performance of transformers, shunt reactors and for periodical maintenance necessary oil evacuating, filtering, testing and filling apparatus would be provided at new substations. Oil storage tanks of adequate capacities for storage of transformer oil would be provided.

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Online Transformer Oil Drying Out System shall be provided in line with the provisions of Standard Specification and Technical Parameters for Transformers and Reactors (66 kV and above voltage class) as amended up to date available on CEA website.

B.3.3 Illumination

Normal and emergency AC and DC illumination shall be provided adequately in the control room and other buildings of the substation. The switchyard shall also be provided with adequate illumination.

Lighting of the entire control room building, fire-fighting pump house, other building (if any) and switchyard shall be done by LED based low power consumption luminaires.

B.3.4 Control Room

For new substation, substation control room shall be provided to house substation workstations for station level control (SAS) along with its peripheral and recording equipment, AC and DC distribution boards, DC batteries and associated battery chargers, Fire Protection panels, Telecommunication panels and other panels as per requirements. Air conditioning shall be provided in the building as functional requirements. Main cable trenches from the control room shall have adequate space provision for laying of cables from control room for all the future bays also.

Common control may be constructed for HVDC and HVAC systems.

At existing substations, the adequacy of size of control room shall be ascertained and the same shall be augmented as per requirement.

B.3.5 GIS hall

The Gas Insulated Switchgear (GIS) of each voltage level along with other associated equipment shall be housed inside separate GIS building. The panels i.e. Bay level units, bay mimic, relay and protection panels, RTCC panels, PLCC panels, panels for tele-communication system etc. are to be placed in a separate room in the GIS building. The size of the room shall be such that all the panels for the bays under present scope shall be accommodated. The panel room shall be air-conditioned. Further, the temperature of the room shall be monitored through substation automation system by providing necessary temperature transducers. Ventilation system of suitable capacity shall be provided for each GIS hall.

One EOT Crane of suitable capacity for erection and Maintenance of largest GIS component/assembly and all plant installed in the GIS switchgear room shall be provided in each GIS hall. The crane shall be capable of fulfilling all special requirements for erection

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and maintenance of GIS equipment. The capacity of the crane shall be sized to lift the heaviest GIS switchgear component.

For extension of existing GIS, existing facilities shall be suitably augmented/ extended for GIS equipment under present scope.

B.3.6 Control Concept

All the EHV circuit breakers in substation/switching stations shall be controlled and synchronized from the switchyard control room/remote control center. All the isolators shall have control from remote/local whereas the earth switches shall have local control only.

B.4 General Facilities

a. Line Gantry/Towers are envisaged for bays under present scope only. However, for adjacent future line bay, tower shall be designed for extension (considering Quad conductors for 765 kV and 400 kV future lines) wherever applicable.

b. Bay extension works at existing substation shall be executed by TSP in accordance with the requirement/provisions mentioned above. However, interface points shall be considered keeping in view the existing design/arrangement at the substation.

c. TSP has to arrange for construction power and water on its own.

d. All outdoor steel structures including anchor/foundation bolts shall be fully galvanized. The weight of the zinc coating shall be at least 610 g/m^2. However, for coastal/creek regions it shall be at least 900 g/m^2.

e. In 765 kV and 400 kV switchyard, if spare bay of half diameter is identified as future, all the equipment for Tie and Future Bay shall be designed considering the current rating of line bay i.e. 3150A.

f. Boundary wall shall be brick masonry wall with RCC frame or Stone masonry wall or Precast RCC wall under present scope along the property line of complete substation area including future switchyard area to prevent encroachment and unauthorized access. Minimum height of the boundary wall shall be of 1.8 m from finished ground level (FGL).

g. All electrical equipment shall be installed above the Highest Flood Level (HFL) and where such equipment is not possible to be installed above the Highest Flood Level, it shall be ensured that there is no seepage or leakage or logging of water.



B.5 EXTENSION OF EXISTING SUBSTATION

The following drawings/details of existing substation is attached with the RFP documents for further engineering by the bidder.

Sl. No.	Drawing Title	Drawing No./Details	Rev. No.
A.	**400 kV South Olpad GIS S/s**		
1.0	Single Line Diagram	The substation is under bidding in separate scheme. Thus, drawings are not available at this stage.	
2.0	General Arrangement		
3.0	Earthmat Layout		
4.0	Visual Monitoring System		
5.0	Bus Bar Protection		
6.0	Substation Automation System (SAS)		
B.	**400 kV KPS3 GIS S/s-Section I**		
1.0	Single Line Diagram	023012-E-IS-SY-1L-0001	H
2.0	General Arrangement	023012-E-IS-SY-EL-0002	C
3.0	Earthmat Layout	Drawings are yet to be finalized by developer.	
4.0	Visual Monitoring System		
5.0	Bus Bar Protection		
6.0	Substation Automation System (SAS)		
C.	**400 kV KPS3 GIS S/s-Section II**		
1.0	Single Line Diagram	The substation is under bidding in separate scheme. Thus, drawings are not available at this stage.	
2.0	General Arrangement		
3.0	Earthmat Layout		
4.0	Visual Monitoring System		
5.0	Bus Bar Protection		
6.0	Substation Automation System (SAS)		

Bidder is also advised to visit the substation sites and acquaint themselves with the topography, infrastructure such as requirement of roads, cable trench, drainage etc. and also the design philosophy.

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Annexure – F

SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION

The communication requirement shall be in accordance to CEA (Technical Standards for Communication System in Power System Operations) Regulations, 2020, CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, CERC (Communication System for inter-State transmission of electricity) Regulations, 2017, and CEA (Cyber Security in Power Sector) Guidelines, 2021, all above documents as amended from time to time.

The complete ISTS communication system commissioned by TSP under the RFP shall be the asset of ISTS and shall be available for usage of ISTS requirements as suggested by CTU from time to time.

The communication services viz. SCADA, VoIP, PMU, AGC and AMR (wherever applicable) have been identified as critical services and therefore shall be provisioned with 2+2 redundancy i.e. 2 channels for Main Control Centre and 2 channels for Backup Control Centre. In order to meet this requirement, suitable redundancy at port and card level need to be ensured by the TSP to avoid any single point of failure which may lead to interruption in real-time grid operation.
PMU to PDC communication (wherever required) shall be through 2 channels to the PDC (main) as there is no backup PDC at present.
Accordingly, all the hardware for communication services of station as stated above shall support dual redundancy for data transmission of station to respective main and backup RLDCs.

In order to meet the requirement for grid management and operation of substations, Transmission Service Provider (TSP) shall provide the following:

For smooth operation of the HVDC system, communication network with high reliability and availability shall be provided for transmission of control and protection signals between the two or more (in case of multi-terminal DC) HVDC terminals. The communication system design shall be as follows:

- Main-I
- Main-II (as hot standby to Main-I)
- Back-up communication

The TSP shall supply, install and commission SDH equipment required for the converter stations at **KPS3 and South Olpad** and the necessary repeater stations. The repeater stations for fibre optic communication are also included in the scope of the TSP. The number and locations of repeaters shall be finalized after survey by TSP.



COMMUNICATION SYSTEMS GENERAL

Duplicated (2X100%) main communication systems (Main-I and Main-II) at KPS3 and South Olpad terminal and its repeaters shall comprise first cubicle of Main Fibre Optic Terminal equipment (FOTE) and second cubicle of Standby FOTE and be provided to meet the requirements of the control, protection, data transfer and telephone systems. System shall be based on the fibre optic communication between the converter stations through ± 500 KV DC lines. Each Main and Standby FOTE system shall be independent of each other. TSP to design the optical fibre Communication system between the converter stations in such a way that communication is available even when there is complete failure of one FOTE system. All repeater stations required for the communication system shall be provided by TSP. The TSP shall provide all required equipment, accessories, routers, modems and facilities etc., as required, for successful commissioning and use of the communication channels at KPS3 and South Olpad HVDC Bipole terminal.

The backup communication link shall also be provided through OPGW on AC Lines. Necessary support shall be provided by the TSP to other TSP/s whose existing communication network is required to be configured for backup communication. Configuration work shall be done by the backup communication system owner/s for the KPS3 and South Olpad HVDC link in coordination with the TSP. TSP shall be responsible for all interface requirements with the Communication system of the other TSP(s) whose OPGW/Communication equipment are required for successful commissioning of the backup communication link including hardware/accessories etc

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C.1.0 Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard.

(i) TSP shall supply, install and commission one or more no. FODP (120 F or higher) alongwith panel and approach Cable (24F each) with all associated hardware fittings from gantry tower to Control Room for all the incoming lines envisaged under the present scope.

(ii) TSP shall supply, install and commission 2 Nos. STM-16 (FOTE) equipment locally patched (in redundant mode connected with separate fibre pairs of same OPGW) alongwith panel/s supporting minimum Five (5) directions with MSP (Multiplex Section Protection – 1+1, excluding local patching) at KPS3 (HVDC) S/s with necessary interfaces to meet the voice and data communication requirement among KPS3 HVDC, KPS3 GIS, South Olpad (HVDC)/ Repeater Stations. The

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suitable DC Power Supply and backup to be provided for each communication equipment operational in redundant mode.

(iii) FODP and FOTE equipment with panels shall be provided in Control Room of KPS3 (HVDC) S/s. FOTE and FODP Eq can be accommodated in same panel to optimize space.

(iv) The FOTE under present scope at HVDC shall be integrated by TSP with the existing FOTE at control room of **KPS3 GIS**. TSP to provide necessary FODP sub rack / Splice trays/ Patch cords etc. and optical interfaces/equipment in the existing FOTE/FODP panels in control room for providing required optical directions with the existing FOTE for onwards data transmission.

(v) The new communication equipment under the present scope shall be compatible for integration with existing regional level centralized NMS. The local configuration of the new communication equipment shall be the responsibility of TSP. The configuration work in the existing centralized NMS for integration of new Communication equipment shall be done by Regional ULDC Team, however all the necessary support in this regard shall be ensured by TSP.

(vi) TSP shall supply, install and commission Firewall in redundant mode (1+1) in line with the specification attached at **Annexure F.1**.

(vii) The maintenance of all the communication equipment and software thereof including FOTE, FODP, approach cable, Repeater Station, PMU, DCPS along with Battery Bank and Firewall shall be the responsibility of TSP.

C.2.0 Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s.

(i) TSP shall supply, install and commission one or more No. FODP (96 F) or higher) alongwith panel and approach Cable (24F each) with all associated hardware fittings from gantry tower to Control Room for all the incoming lines envisaged under the present scope.

(ii) TSP shall supply, install and commission 2 Nos. of STM-16 (FOTE) equipment locally patched (in redundant mode connected with separate fibre pairs of same

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OPGW) alongwith panel/s supporting minimum four(4) directions with MSP (Multiplex Section Protection – 1+1, excluding local patching) at South Olpad (HVDC) S/s with necessary interfaces to meet the voice and data communication requirement among South Olpad (HVDC), South Olpad GIS, KPS3 (HVDC) and Repeater Stations. The suitable DC Power Supply and backup to be provided for each communication equipment operational in redundant mode.

(iii) FODP and FOTE equipment with panels shall be provided in Control Room of South Olpad (HVDC) S/s. FOTE and FODP Eq can be accommodated in same panel to optimize space.

(iv) The FOTE under present scope at HVDC shall be integrated by TSP with the existing FOTE at control room of **South Olpad GIS**. TSP to provide necessary approach cables/FODP sub rack / Splice trays/ Patch cords etc. and optical interfaces/equipment in the existing FOTE/FODP panels in control room for providing required optical directions with the existing FOTE for onwards data transmission.

(v) The new communication equipment under the present scope shall be compatible for integration with existing regional level centralized NMS. The local configuration of the new communication equipment shall be the responsibility of TSP. The configuration work in the existing centralized NMS for integration of new Communication equipment shall be done by Regional ULDC Team, however all the necessary support in this regard shall be ensured by TSP.

(vi) TSP shall supply, install and commission Firewall in redundant mode (1+1) in line with the specification attached at **Annexure F.1**.

(vii) The maintenance of all the communication equipment and software thereof including FOTE, FODP, approach cable, Repeater Station, PMU, DCPS along with Battery Bank and Firewall shall be the responsibility of TSP.

C.3.0 KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line.

On KPS3 – KPS3 (HVDC) 400 kV 2xD/C line, TSP shall supply, install and commission One (1) No. OPGW cable containing 24 Fibres (24F) on one E/W peak and conventional earth wire on other E/W peak **on each of the D/C lines**.

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The TSP shall install this OPGW from gantry of KPS3 GIS up to the gantry of KPS3 (HVDC) S/s with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called **OPGW Hardware** hereafter) and finally terminate in Joint Boxes at end Substations. The transmission line length is 2 kms (approx.) where repeater is not required to meet link budget requirement of KPS3 GIS – KPS3 (HVDC).

C.4.0 4 No. of 400 kV line bays at KPS3 for KPS3 – KPS3 (HVDC) 400 kV 2xD/C line

(i) TSP shall supply, install and commission one or more No. FODP (144 F or higher) along with panel and required Approach Cable (24F) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room.

(ii) TSP shall supply, install and commission 2 Nos. of STM-16 (FOTE) equipment along with panel/s supporting minimum three (3) directions with MSP (Multiplex Section Protection – 1+1, excluding local patching) at KPS3 GIS with necessary interfaces to meet the voice and data communication requirement between, KPS3 (HVDC) and KPS3 GIS. The suitable DC Power Supply and backup to be provided for each communication equipment operational in redundant mode.

(iii) FOTE/FODP panel shall be installed in the new Bay Kiosk/ Switchyard Panel Room (SPR). The FOTEs under present scope shall be integrated by TSP with the existing/proposed FOTE at control room of **KPS3 GIS**. TSP to provide necessary FODP sub rack / Splice trays/ Patch cords etc. and optical interfaces/equipment in the existing FOTE/FODP panels in control room for providing required optical directions with the existing FOTE for onwards data transmission.

In case spare optical direction is not available in the existing FOTE at the control room, the TSP shall coordinate with station owner to reconfigure the directions in existing FOTE at control room. Alternatively, the TSP may integrate the FOTE under the present scope with existing FOTE in the nearby Kiosk connected to the control room FOTE (if available with spare direction). For this purpose, TSP shall provide necessary FODP sub rack / Splice trays/ Patch cords etc. and suitable optical interfaces/ equipment in the existing FOTE/FODP panels in another Kiosk (SPR).

(iv) FOTE and FODP can be accommodated in same panel to optimize space.



(v) The new communication equipment under the present scope shall be compatible for integration with existing regional level centralized NMS. The local configuration of the new communication equipment shall be the responsibility of TSP. The configuration work in the existing centralized NMS for integration of new Communication equipment shall be done by Regional ULDC Team, however all the necessary support in this regard shall be ensured by TSP.

C.5.0 ±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW).

On ±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return), TSP shall supply, install and commission One (1) no. OPGW cable containing 24 Fibres (24F) on one E/W peak and conventional earth wire on other E/W peak. OPGW diameter shall be in line with earthwire parameters mentioned in Annexure-E1 (Specific technical requirements for HVDC transmission line).

The TSP shall install this OPGW from gantry of KPS3 (HVDC) up to the gantry of South Olpad (HVDC) S/s with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called **OPGW Hardware** hereafter) and finally terminate in Joint Boxes at end Substations. The transmission line length is 600 km (approx.) where repeaters are required to meet link budget requirement of KPS3 (HVDC) – South Olpad (HVDC).

TSP shall finalize the location and number of repeater stations depending upon the actual site conditions. Further TSP shall comply to the requirements mentioned as per **Appendix-F.1**.

Maintenance of OPGW Cable, OPGW Hardware and repeater equipment and items associated with repeater shelter shall be responsibility of TSP.

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Specific Requirement for Phasor Measurement Units (PMUs)

TSP shall supply, install and commission required No. of Phasor Measurement Units (PMUs) PMUs at all the locations under the scope of TSP under this RFP as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 (along with all amendments if any), and all the applicable Regulations, Standards, Guidelines issued time to time. These PMUs shall be provided with GPS clock and LAN switch and shall connect with LAN switch of control room of respective substations/ generating stations with Fibre Optic cable. These PMUs shall be connected with the FOTE at Substation/ generating stations for onwards data transmission to the PDC (Phasor Data Concentrator) located at respective RLDC. Configuration work in existing PDC at RLDC for new PMU integration shall be done by respective RLDC, however all the necessary support in this regard shall be ensured by TSP. The maintenance of all the PMUs and associated equipment shall be the responsibility of TSP.

Note: Existing Station owner/s to provide necessary support to integrate different equipment and applications of new extended bays with the existing substation e.g. Communication (through FOTE), Voice etc. for smooth operation and monitoring of new added grid elements.



Appendix-F.1

Repeater Requirements

FOTE to be provided by TSP in repeater station/s shall be 2x STM-16 (FOTE) equipment (in redundant mode connected with separate fibre pairs of same OPGW/UGFO/Approach Cable)

- If the repeater location is finalized in the Control Room of a nearby substation, TSP shall provide 1 no. OPGW (48F) on a single Earthwire peak with OPGW Hardware and mid-way Joint Boxes etc. of the line crossing the main line and 1 no. Approach Cable (48F) with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the repeater equipment in substation control room.

  TSP shall co-ordinate for Space and DC power supply sharing for each operational communication equipment at repeater station in redundant mode.

  TSP shall provide FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link.

OR

- If the repeater location is finalized in the nearby substation premises, the TSP shall identify the Space for repeater shelter in consultation with station owner. Further TSP shall provide 1 no. OPGW (48F) on a single Earthwire peak with OPGW Hardware and mid-way Joint Boxes etc. of the line crossing the main line and 1 no. Approach Cable (48F) / UGFO (48F) with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the substation where the repeater shelter is to be housed.

  TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems for each operational communication equipment at repeater station in redundant mode.

OR

- If the repeater location is finalized on land near the transmission tower. TSP shall make the provisions for Land at nearby tower for repeater shelter. Further TSP shall

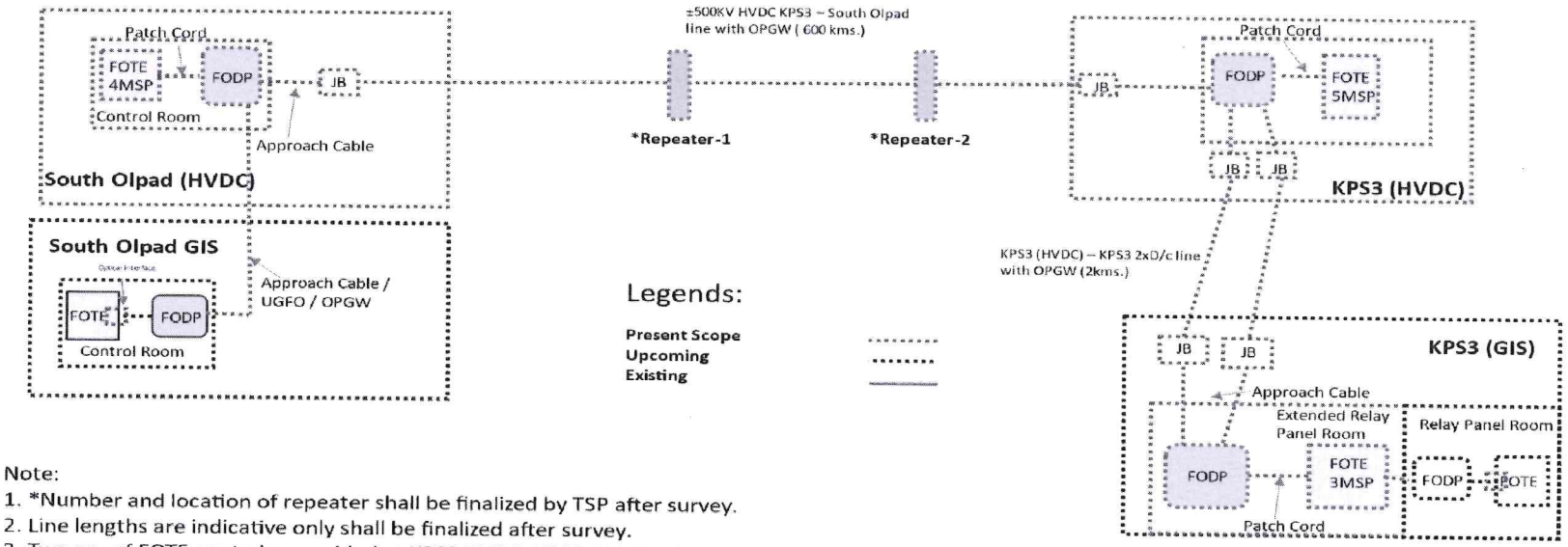
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provide 1 no. Approach Cable (48F) / UGFO (48F) with all associated hardware fittings to establish connectivity up to the location of repeater shelter.
TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems for each operational communication equipment at repeater station in redundant mode.

Maintenance of OPGW Cable and **OPGW Hardware**, repeater equipment and items associated with repeater shelter shall be responsibility of TSP.



Proposed Communication for Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C



Note:
1. *Number and location of repeater shall be finalized by TSP after survey.
2. Line lengths are indicative only shall be finalized after survey.
3. Two no. of FOTE are to be provided at KPS3 HVDC, KPS3 GIS SPR & South Olpad HVDC Stations.
4. The existing FOTE at KPS3 GIS SPR and South Olpad GIS shall be integrated with respective FOTE to be provided at HVDC stations.

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Figure F.1

Annexure-F.1

Next Generation Firewall (NGFW)

TSP shall provide 2 NGFW one in Main and another in Standby mode having electrical ethernet interfaces/ports and placed between FOTE and SAS gateway/s at the substation. All ethernet based applications shall be terminated in the firewall ports directly (e.g. PMU, AMR, VOIP, SAS/SCADA etc.). Each port of firewall shall work as a separate zone. Firewall shall be hardware based with features of Block/Allow/drop and IPSec VPN (network encryption).

The number of ports/interfaces in each firewall (i.e. Main and Standby) shall be minimum 16 Nos. TSP shall provide either single firewall or multiple firewalls to meet this interfaces requirement, each for main as well as standby firewall. Minimum throughput of firewall shall be 300 Mbps.

The Firewall shall be managed/ configured as standalone at present and shall also have compatibility to manage/configure through Centralized Management Console (CMC) remotely in future.

Firewall shall be tested and certified for ISO15408 Common Criteria for least EAL4+. Further, the OEM must certify that it conforms to Secure Product Development Life Cycle requirements as per IEC62443-4-1. The firewall shall generate reports for NERC-CIP Compliance.

The specifications for the firewalls are given at **Annexure-F.2** and schematic diagram showing firewall placement given at **Figure F.2**.

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Annexure F.2

Specifications of Next Generation Firewall (NGFW)

1. NGFW shall have following features including but not limited to:
   Encryption through IPSec VPN (Virtual Private Network), Deep Packet Inspection (DPI), Denial of service (DoS) and Distributed Denial of Service (DDoS) prevention, Port Block/ Allow, rules/ policies for block/allow, IP (Internet Protocol) and Media Access Control (MAC) spoofing protection, threat detection, Intrusion Prevention System (IPS), Anti-Virus, Anti-Spyware, Man In The Middle (MITM) attack prevention.
2. The proposed firewall shall be able to handle (alert, block or allow) unknown /unidentified applications e.g. unknown TCP and UDP packets. It shall have the provision to define application control list based on application group and/or list.
3. Firewall shall have feature and also have capability to update the definition/ Signatures of Anti-Virus online as well as offline. Firewall shall also be compatible to update the definitions/signatures through CMC. There shall be a defined process for security patching and firmware up-gradation. There shall be a feature to field validate firmware checksum. The same shall also be validated before using the OEM provided file/binary in the process of firmware up-gradation and security patching
4. Firewall shall have Management Console port to configure remotely.
5. Firewall shall be EMI/EMC compliant in Substation environment as per IEC 61850-3.
6. Firewall shall be rack mounted in existing standard equipment cabinets.
7. Firewall shall have support of SCADA applications (IEC-60870-5-104), ICCP, PMU (IEEE C37.118), Sub-Station Automation System (IEC 61850), Ethernet and other substation environment protocols.
8. Client based Encryption/ VPN must support different Operating System platforms e.g. Windows, Linux and Mac.
9. The solution must have content and comprehensive file detection policies, blocking the files as function of their types, protocols and directions.
10. Firewall shall have logging facility as per standard logs/events format. Firewall shall have features to export the generated/stored logs/events in csv (Comma Separated Value) and also any other standard formats for offline usage, analysis and compliance. Firewall shall have suitable memory architecture and solution to store and be enable to export all logs/events for a period of last 90 days at any given time.
11. Firewall shall have features and be compatible with local as well as central authentication system (RADIUS, LDAP, or TACACS+) for user account and access right management. It shall also have Role Based User management feature.
12. Firewall shall have the capability to configure sufficient number of VLANs.
13. Firewall shall have the capability to support sufficient number of sessions.
14. Firewall shall have provision to configure multiple IP Sec VPNs, at least 100 Nos. (one-to-many or many-to-one). Shall support redundant operation with a similar router after creation of all the IP Sec VPN. IPSec VPN shall support encryption protocols as

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AES128, AES256 and hashing algorithms as MD5 and SHA1. IPSec VPN throughput shall support at least 300 Mbps

15. Firewall shall be capable of SNMP v3 for monitoring from Network Management system. It shall also have SNMPv3 encrypted authentication and access security
16. Firewall shall support in Active/Passive or Active-Active mode with High Availability features like load balancing, failover for firewall and IPsec VPN without losing the session connectivity.
17. Firewall should have integrated traffic shaping (bandwidth, allocation, prioritisation, etc.) functionality
18. Shall support simultaneous operation with both IPv4 and IPv6 traffic
19. Firewall shall be compatible with SNTP/NTP or any other standards for clock synchronization
20. Firewall shall have the features of port as well as MAC based security
21. Firewall shall support exporting of logs to a centralized log management system (e.g. syslog) for security event and information management.
22. Firewall time shall be kept synchronised to official Indian Timekeeping agency, time.nplindia.org.
23. Firewall product shall be provided with all applicable updates at least until 36 months since the applicable date of product shipping to the concerned utility.



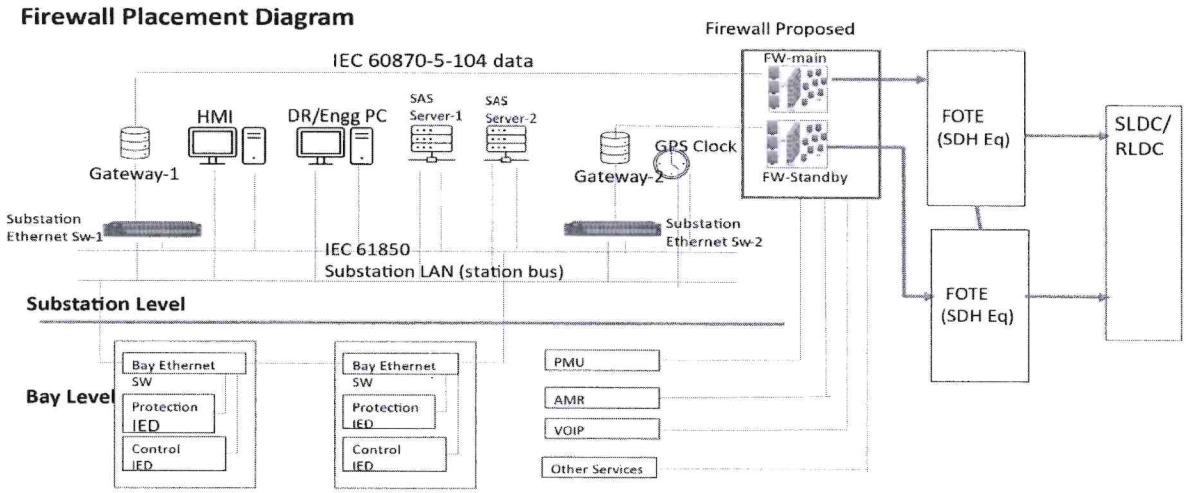


Figure F.2

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C.6.0 PLCC and PABX:

Power line carrier communication (PLCC) equipment complete for speech, tele-protection commands and data channels shall be provided on each transmission line. The protections for transmission line and the line compensating equipment shall have hundred percent back up communication channels i.e. two channels for tele-protection in addition to one channel for speech plus data for each direction. The PLCC equipment shall in brief include the following:

(i) Coupling device, line traps, carrier terminals, protection couplers, HF cables, PABX (if applicable) and maintenance and testing instruments.

(ii) At new substation, a telephone exchange (PABX) of 24 lines shall be provided at as means of effective communication among various buildings of the substation, remote end substations and with control centers (RLDC/SLDC) etc.

(iii) Coupling devices shall be suitable for phase to phase coupling for 400 kV Transmission lines. The pass band of coupling devices shall have sufficient margin for adding communication channel in future if required. Necessary protection devices for safety of personnel and low voltage part against power frequency voltages and transient over voltage shall also be provided.

(iv) The line traps shall be broad band tuned suitable for blocking the complete range of carrier frequencies. Line Trap shall have necessary protective devices such as lightning arresters for the protection of tuning device. Decoupling network consisting of line traps and coupling capacitors may also be required at certain substation in case of extreme frequency congestion.

(v) The carrier terminals shall be of single side-band (SSB) amplitude modulation (AM) type and shall have 4 kHz band width. PLCC Carrier terminals and Protection couplers shall be considered for both ends of the line.

(vi) PLCC equipment for all the transmission lines covered under the scheme shall be provided by TSP as per following configuration. CVT and Wave trap for all the line bays under present scope shall be provided by TSP.

Sl. No	Line name	PLCC configuration
1.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C line	1 set Analog PLCC + 1 set Digital Protection Coupler for each circuit at both ends. OR 2 Sets of Digital Protection Coupler for each circuit at both ends with physically diverted path.

Further, CVT and Wave trap for all line bays under present scope shall be provided by TSP where analog PLCC is required.

(vii) All other associated equipment like cabling, coupling device and HF cable shall also be provided by the TSP.

(viii) 2 sets of 48 V battery banks for PLCC and communication equipment shall be provided at each new Substation with at least 10 hours battery backup and extended backup, if required.

Annexure-G

Frequently Asked Queries:

1.0 Transmission Line:

1.1 Please clarify that whether shutdowns for crossing of existing transmission lines of POWERGRID/STUs/ Power Evacuation Lines from Generation Plants/ Any other Transmission Licensee will be given to TSP on chargeable basis or free of cost.

Reply: Shutdowns for crossing of existing transmission lines of POWERGRID/ STUs/ Power Evacuation Lines from Generation Plants/ Any other Transmission Licensee will be given to TSP by the concerned owner of the lines as per their own terms and conditions. As far as shutdown of ISTS lines are concerned the same can be availed by approaching respective Regional Power Committee.

1.2 We understand that the suggested swing angle criteria are applicable for Suspension Insulator in Suspension Tower. Further, you are requested to provide similar swing angle and clearance criteria for Pilot Insulator with Jumper and Jumper.

Reply: It is clarified that the swing angle criteria (as mentioned in RFP) for transmission lines is applicable for Suspension Insulator in Suspension Tower. Further, as per Clause 3.0 of Specific Technical Requirements for transmission lines, Transmission service Provider (TSP) shall adopt any additional loading/design criteria for ensuring reliability of the line, if so desired and /or deemed necessary.

1.3 We request you to kindly allow that use of diamond configuration at Power line crossings and the existing owner of the lines may be directed to allow the same for the successful bidders.

Reply: Power line crossing including Diamond configuration is responsibility of the TSP. TSP shall formally submit the profile of the crossing section to the owner of the existing line suggesting proposed crossing alternatives. The crossing will have to be carried out as per approval of owner of the existing line.

1.4 It is requested you to kindly provide present status of Forest Clearances if any transmission line corridor area falling in wildlife forest / reserve forest/ mangroves.

Reply: Based on the preliminary route survey, the process of initiation of forest

clearance for the forest stretches, if any, enroute the proposed line alignment will be initiated by way of writing letters to the concerned authority(ies). However, it may be noted that it will be the responsibility of TSP for obtaining forest clearance for the forest stretches as provided in the survey report and also for any forest area encountered during detailed survey.

2.0 Substation

2.1 We understand that space for storage of O&M spare shall be provided by existing owner within the station boundary without any cost. Kindly confirm.
Reply: Space for storage of O&M spares shall be arranged by TSP on its own.

2.2 We presume that the O&M for the end Termination bays will be in the scope of the TSP and TSP shall not be liable for any payment towards O&M to the existing owner of the substation. Kindly confirm.
Reply: Operation and maintenance of the bays is solely responsibility of the TSP. TSP shall follow CEA,s " Operation and Maintenance (O&M) guidelines and Standard Format for Memorandum of Understating between New TSP and Existing TSP" issued by CEA vide its letter No. I/28514/2023 dated 22.06.2023. Copy of the guideline is available on CEA website at following link:
https://cea.nic.in/wp-content/uploads/pse td/2023/06/om_guidelines.pdf

2.3 With reference to subject scheme of existing sub-station, we assumed following scope of work:

(a) We assumed internal road is available and need not to consider in the present scope of work.

(b) Drainage is available and need not to consider in the present scope of work.

(c) Cable trench extension in adjacent to Main cable trench only under present scope of work.

(d) Levelled area being provided by developer for bay extension.

Reply: Regarding requirement of internal road, drainage, cable trench, leveling of the bay extension area, bidder is advised to visit site and acquaint themselves with the provisions/facilities available at substation.

2.4 Kindly provide the soil investigation report of soil parameters of existing substation.

Reply: Bidder is advised to visit the substation site and ascertain the requisite parameters.

2.5 Kindly confirm, energy accounting of aux. power consumption. Whether it will be on chargeable basis or part of transmission loss.
Reply: It will be on chargeable basis.

2.6 We understand that VMS requirement is for unmanned stations only. For Manned stations VMS is not compulsory.
Reply: VMS shall be provided in line with requirements of RfP document.

2.7 It is understood that Construction water and power shall be provided free of cost to TSP by respective substation owner for construction of new bays.
Reply: Arrangement of construction power and water is in the scope of TSP.

2.8 It is understood that existing fire hydrant system shall be extended by the TSP for bay extension.
Reply: Existing fire hydrant system shall be extended from existing system (if required)

2.9 Please clarify that Status of land acquisition for Substations. Whether the lands have been acquired by BPC and will be transferred to TSP.
Reply: The acquisition of land for substation is in the scope of TSP.

2.10 We understood that no any dedicated metering CT and CVT required for Line/feeders. Further, we understood that requisite Energy meters for various 765 kV, 400 kV and 220 kV Feeders shall be provided and installed by CTU free of cost to TSP.
Reply: Dedicated metering CT and CVT are not required for line/feeders. Metering core of existing CT/CVT can be used provided accuracy class is matching with metering requirement. Requisite Special Energy Meters shall be provided and installed by CTU at the cost of TSP in C&P panel subject to space availability, else, in separate metering panel (to be provided by TSP at its cost).

3.0 Communication

3.1 What are the usage of OPGW, FOTE, PMU etc. under communication requirement of RFP?
Reply: User shall be responsible for providing compatible equipment along with appropriate interface for uninterrupted communication with the concerned control center and shall be responsible for successful integration with the

communication system provided by CTU.

Communication systems e.g. OPGW, FOTE, PMU etc. are required for grid operation through RLDC/SLDC, speech communication, tele-protection and tele-metering.

3.2 Is space for installation of communication panels are provided to TSP in existing Substations incase new bays are in the scope of TSP?

Reply: The space related issues are deliberated in the RFP itself. TSP to carry out survey of the existing substation for physical space requirement. In case space is not available in the existing substation then TSP shall accommodate the same in the respective bay SPR (Switchyard Panel Room)/Bay Kiosk/ Relay panel room in case of GIS s/s. Further, TSP to connect and integrate the proposed FOTE with the existing FOTE in the control room.

In Case 132 kV Substation TSP shall accommodate the said panels either by extension of existing control room or other arrangements.

3.3 How is the OPGW laying done in case of LILO lines?

Reply: In case LILO lines are on same towers (e.g. both Line in and Line Out portion are on same towers, generally done LILO of S/C lines). Then 2x24F OPGW shall be required to install by TSP on both earthwire peak on 400 kV and 765 kV lines where two E/W peaks are available. On 220 kV and 132 kV lines where only one E/W peak is available TSP to install one no. 48F OPGW.

Incase LILO lines are on different towers (e.g. both Line In and Line Out portion are on different towers, generally done LILO of D/C lines). Then 1x24F OPGW shall be required to install by TSP on one earthwire peak, on both Line in and Line Out portions of 400 kV and 765 kV lines. On 220 kV and 132 kV lines where only one E/W peak is available TSP to install one no. 24F OPGW in place of conventional earthwire.

3.4 How is the OPGW laying done in case Multi circuit Towers?

Reply: In case two different lines are using common multi circuit portion for some distance (originating from different stations, may be terminating on same or on different stations). Two No. 24F OPGW to be installed on both E/W peaks for common M/C portion of 765 kV and 400 kV lines.

Incase 220/132 kV lines using multi circuit portion where single E/W peak is available one no. 48F may be installed for common multi circuit portion.

Schedule: 2

Scheduled COD

[Note: As referred to in the definition of "Element", "Scheduled COD", and in Articles 3.1.3 (c), 4.1 (b) and 4.3 (a) of this Agreement]

Sl. No.	Name of the Transmission Element	Scheduled COD	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
1.	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	48 months from SPV transfer	100%	All Elements are required to be commissioned simultaneously as their utilization is dependent on commissioning of each other.
2.	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal			

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Sl. No.	Name of the Transmission Element	Scheduled COD	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
	station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*			
3.	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.			
4.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations			
5.	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)			

Schedule: 3

Safety Rules and Procedures

[Note: As referred to in Articles 5.6 of this Agreement]

1: **Site Regulations and Safety:**

The TSP shall establish Site regulations within sixty (60) days from fulfilment of conditions subsequent, as per Prudent Utility Practices setting out the rules to be observed till expiry of the Agreement at the Site and shall comply therewith.

Such Site regulations shall include, but shall not be limited to, rules in respect of security, safety of the Project, gate control, sanitation, medical care, and fire prevention, public health, environment protection, security of public life, etc.

Copies of such Site regulations shall be provided to the Nodal Agency and the CEA for the purpose of monitoring of the Project.

2: **Emergency Work:**

In cases of any emergency, the TSP shall carry out all necessary remedial work as may be necessary.

If the work done or caused to be done by any entity, other than the TSP, the TSP shall, reimburse the actual costs incurred, to the other Party carrying out such remedial works.

3: **Site Clearance:**

In the course of execution of the Agreement, the TSP shall keep the Site reasonably free from all unnecessary obstruction, storage, remove any surplus materials, clear away any wreckage, rubbish and temporary works from the Site, and remove any equipment no longer required for execution of the Agreement. After completion of all Elements of the Project, the TSP shall clear away and remove all wreckage, rubbish and debris of any kind from the Site, and shall leave the Site clean and safe.

4: **Watching and Lighting:**

The TSP shall provide and maintain at its own expense all lighting, fencing, and watching when and where necessary for the proper construction, operation, maintenance / repair of any of the Elements of the Project, or for the safety of the owners and occupiers of adjacent property and for the safety of the public, during such maintenance / repair.

Schedule: 4

Computation of Transmission Charges

1.1 General

The Monthly Transmission Charges to be paid to the TSP for providing Transmission Service for any Contract Year during the term of the Agreement shall be computed in accordance with this Schedule and paid as per Sharing Regulations.

Illustration regarding payment of Transmission Charges under various scenarios (considering definitions of Contract Year, Expiry Date & Monthly Transmission Charges above) is as below: -

Illustration-1: In case the Project Elements achieve COD as per Schedule

Quoted Transmission Charges: **Rs. 140 Million**

Completion Schedule:

Element No.	Completion Schedule in Months	Scheduled CoD of the Element	Actual CoD of the Element	% Charges recoverable on Scheduled CoD of the Element
Element 1	28	1-Feb-2018	1-Feb-2018	25%
Element 2	38	1-Dec-2018	1-Dec-2018	75%

Tariff Payable as follows:

Transmission Charges for Element 1			Transmission Charges for Element 2		
1-Feb-18 to 31-Mar-18	140 X 25% X ((28+31)/365)	5.65		--	0.00
1-Apr-18 to 30-Nov-18	140 X 25% X (244/365)	23.39		--	0.00
1-Dec-18 to 31-Mar-19	140 X 100% X (121/365)				46.41
2	140 X 100% X 1				140
3	140 X 100% X 1				140
4	140 X 100% X 1				140
5	140 X 100% X 1				140
.....					
.....					
36 (1-Apr to 30-Nov)	140 X 100% X (244/365)				93.59

Illustration-2: In case of extension of Scheduled COD as per Article 4.4.1 & 4.4.2 of this Agreement

Quoted Transmission Charges: **Rs. 140 Million**

Completion Schedule:

Element No.	Completion Schedule in Months	Scheduled CoD of the Element	Actual CoD of the Element	% Charges recoverable on Scheduled CoD of the Element
Element 1	20	1-Feb-2018	1-Jul-2018	25%
Element 2	28	1-Oct-2018	1-Dec-2018	75%

Tariff Payable as follows:

Transmission Charges for Element 1			Transmission Charges for Element 2		
1-Feb-18 to 31-Mar-18	--	0.00		--	0.00
1-Apr-18 to 30-Jun-18	--	0.00		--	0.00
1-Jul-18 to 30-Nov-18	140 X 25% X (153/365)	14.67		--	0.00

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1-Dec-18 to 31-Mar-19	140 X 100% X (121/365)	46.41
2	140 X 100% X 1	140
3	140 X 100% X 1	140
4	140 X 100% X 1	140
5	140 X 100% X 1	140
.....		
.....		
36 (1-Apr to 30-Nov)	140 X 100% X (244/365)	93.59

Illustration-3: In case of delay in achieving COD of Project & all individual Elements (COD of the Project achieved in Contract Year 1)

Quoted Transmission Charges: **Rs. 140 Million**

Completion Schedule:

Element No.	Completion Schedule in Months	Scheduled CoD of the Element	Actual CoD of the Element	% Charges recoverable on Scheduled CoD of the Element
Element 1	20	1-Feb-2018	1-Dec-2018	25%
Element 2	28	1-Oct-2018	1-Dec-2018	75%

Tariff Payable as follows:

Transmission Charges for Element 1			**Transmission Charges for Element 2**		
1-Feb-18 to 31-Mar-18	--	0.00		--	0.00
1-Apr-18 to 30-Sept-18	--	0.00		--	0.00
1-Oct-18 to 30-Nov-18	--	0.00	1-Oct-18 to 30-Nov-18	--	0.00
1-Dec-18 to 31-Mar-19	140 X 100% X (121/365)				46.41
2	140 X 100% X 1				140
3	140 X 100% X 1				140
4	140 X 100% X 1				140
5	140 X 100% X 1				140
.....					
.....					
36 (1-Apr to 30-Nov)	140 X 100% X (244/365)				93.59

Illustration-4: In case of delay in achieving COD of Project & all individual Elements (COD of the Project achieved in Contract Year other than Contact Year 1)

Quoted Transmission Charges: **Rs. 140 Million**

Completion Schedule:

Element No.	Completion Schedule in Months	Scheduled CoD of the Element	Actual CoD of the Element	% Charges recoverable on Scheduled CoD of the Element
Element 1	38	1-Oct-2019	1-May-2020	25%
Element 2	38	1-Oct-2019	1-May-2020	75%

Tariff Payment to be paid as:

Transmission Charges for Element 1			**Transmission Charges for Element 2**		
1-Oct-19 to 31-Mar-20	--	0.00	1-Oct-19 to 31-Mar-20	--	0.00
1-Apr-20 to 30-Apr-20	-	0.00	1-Apr-20 to 30-Apr-20	-	0.00
1-May-20 to 31-Mar-21	140 X 100% X (335/365)				128.49
2	140 X 100% X 1				140
3	140 X 100% X 1				140
4	140 X 100% X 1				140
5	140 X 100% X 1				140
.....					
.....					
36 (1-Apr to 30-Apr)	140 X 100% X (30/ 365)				11.51

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Illustration5: In case of delay in achieving COD of Element but Project COD achieved on time

Quoted Transmission Charges: **Rs. 140 Million**

Completion Schedule:

Element No.	Completion Schedule in Months	Scheduled CoD of the Element	Actual CoD of the Element	% Charges recoverable on Scheduled CoD of the Element
Element 1	20	1-Feb-2018	1-Jul-2018	25%
Element 2	30	1-Dec-2018	1-Dec-2018	75%

Tariff Payable as follows:

Transmission Charges for Element 1			**Transmission Charges for Element 2**		
1-Feb-18 to 31-Mar-18	--	0.00		--	0.00
1-Apr-18 to 30-Jun-18	--	0.00		--	0.00
1-Jul-18 to 30-Nov-18	140 X 25% X (153/365)	14.67		--	0.00
1-Dec-18 to 31-Mar-19	140 X 100% X (121/365)				46.41
2	140 X 100% X 1				140
3	140 X 100% X 1				140
4	140 X 100% X 1				140
5	140 X 100% X 1				140
.....					
.....					
36 (1-Apr to 30-Nov)	140 X 100% X (244/365)				93.59

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Illustration-6: In case of early commissioning of Project

Quoted Transmission Charges: **Rs. 140 Million**
Completion Schedule:

Element No.	Completion Schedule in Months	Scheduled CoD of the Element	Actual CoD of the Element	% Charges recoverable on Scheduled CoD of the Element
Element 1	38	1-Oct-2019	1-Jul-2019	25%
Element 2	38	1-Oct-2019	1-Jul-2019	75%

Tariff Payment to be paid as:

Transmission Charges for Element 1		**Transmission Charges for Element 2**
1-July-19 to 31-Mar-20	140 X 100% X (274/365)	105.09
2	140 X 100% X 1	140
3	140 X 100% X 1	140
4	140 X 100% X 1	140
5	140 X 100% X 1	140
.....		
.....		
36 (1-Apr to 30-Jun)	140 X 100% X (91/365)	34.91

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Illustration-7: In case of early commissioning of an element

Quoted Transmission Charges: **Rs. 140 Million**
Completion Schedule:

Element No.	Completion Schedule in Months	Scheduled CoD of the Element	Actual CoD of the Element	% Charges recoverable on Scheduled CoD of the Element
Element 1	38	1-Oct-2019	1-Apr-2019	25%
Element 2	38	1-Jul-2019	1-Jul-2019	75%

Tariff Payment to be paid as:

Transmission Charges for Element 1			**Transmission Charges for Element 2**		
1-Apr-2019 to 30-Jun-19	140 X 25% X (91/365)	8.72	1-Apr-2019 to 30-Jun-19	--	0.00
1-July-19 to 31-Mar-20	140 X 100% X (274/ 365)				105.09
2	140 X 100% X 1				140
3	140 X 100% X 1				140
4	140 X 100% X 1				140
5	140 X 100% X 1				140
.....					
.....					
36 (1-Apr-30-Jun)	140 X 100% X (91/365)				34.91

The Transmission Charges shall be payable on monthly basis as computed above.

1.2 Computation of Monthly Transmission Charges

The Monthly Transmission Charges for any month m in a Contract Year n shall be calculated as below:

For AC System:

a. If Actual Transmission System Availability for the month m of contract year n is greater than or equal to 98% and less than or equal to 98.5%;

Monthly Transmission Charges MTC(m) = Tmn *1

a. If Actual Transmission System Availability for the month m of contract year n exceeds 98.5% and less than or equal to 99.75%;

Monthly Transmission Charges MTC(m) = Tmn * (AA/ 98.5%)

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c. If Actual Transmission System Availability for the month m of contract year n is greater than 99.75%;

Monthly Transmission Charges MTC(m) = Tmn * (99.75% / 98.5%)

d. If Actual Transmission System Availability for the month m of contract year n is less than 98%and greater than or equal to 95.00%;

Monthly Transmission Charges MTC(m) = Tmn * (AA/ 98%)

e. If Actual Transmission System Availability for the month m of contract year falls below 95%;

Monthly Transmission Charges MTC(m) = Tmn * (AA/ 98%) - 0.02 * (Tmn * (AA/ 95%)

For DC System:

a. If Actual Transmission System Availability for the month m of contract year n is greater than or equal to 95% and less than or equal to 96%;

Monthly Transmission Charges MTC(m) = Tmn *1

b. If Actual Transmission System Availability for the month m of contract year n exceeds 96% and less than or equal to 99.75%;

Monthly Transmission Charges MTC(m) = Tmn * (AA/ 96%)

c. If Actual Transmission System Availability for the month m of contract year n is greater than 99.75%;

Monthly Transmission Charges MTC(m) = Tmn * (99.75% / 96%)

d. If Actual Transmission System Availability for the month m of contract year n is less than 95% and greater than or equal to 92.00%;

Monthly Transmission Charges MTC(m) = Tmn * (AA/ 95%)

e. If Actual Transmission System Availability for the month m of contract year falls below 92%;

Monthly Transmission Charges MTC(m) = Tmn * (AA/ 95%) - 0.02 * (Tmn * (AA/ 92%)

where:

- AA is the actual Availability, as certified by RPC, as per procedure provided in Schedule 6.
- m is the month in Contract Year 'n'
- Tmn= Transmission Charges for the month 'm' in Contract Year 'n' = (=Transmission Charge/ no. of days in the Year n)* no. of days in month m

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Provided, no Transmission Charges shall be paid during the period for which the RLDC has not allowed the operation of the Element/Project due to the failure of the TSP to operate it as per the provisions of the Grid Code.

1.3 RLDC Fee & Charges

The payment of RLDC fee & charges, in accordance with relevant regulations of CERC, shall be the responsibility of the TSP.

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Schedule: 5

Quoted Transmission Charges

[Quoted Transmission Charges from Annexure - 21 of the RFP of the Selected Bidder to be inserted here]

[To be incorporated from the Bid of the Selected Bidder submitted during the e-reverse auction after its selection]

Quoted Transmission Charges: Rs. ..... Million

Proportionate Transmission Charges payable for each Element of the Project:

Sl. No.	Name of the Transmission Element	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project
1.	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	100%
2.	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*	
3.	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.	
4.	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations	
5.	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)	

Note: * The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC and HVAC switchyards shall be implemented by the TSP

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Schedule: 6

Appendix –IV to Central Electricity Regulatory Commission

(Terms and Conditions of Tariff) Regulations, 2024

Procedure for Calculation of Transmission System Availability Factor for a Month

1. Transmission system availability factor for nth calendar month ("TAFPn") shall be calculated by the respective transmission licensee, verified by the concerned Regional Load Dispatch Centre (RLDC) and certified by the Member-Secretary, Regional Power Committee of the region concerned, separately for each AC and HVDC transmission system and grouped according to sharing of transmission charges. In the case of the AC system, transmission System Availability shall be calculated separately for each Regional Transmission System and inter-regional transmission system. In the case of the HVDC system, transmission System Availability shall be calculated on a consolidated basis for all inter-state HVDC systems.

2. Transmission system availability factor for nth calendar month ("TAFPn") shall be calculated by considering the following:

   i) **AC transmission lines**: Each circuit of AC transmission line shall be considered as one element;

   ii) **Inter-Connecting Transformers (ICTs):** Each ICT bank (three single- phase transformers together) shall form one element;

   iii) **Static VAR Compensator (SVC):** SVC, along with SVC transformer, shall form one element;

   iv) **Bus Reactors or Switchable line reactors:** Each Bus Reactors or Switchable line reactors shall be considered as one element;

   v) **HVDC Bi-pole links:** Each pole of the HVDC link, along with associated equipment at both ends, shall be considered as one element;

   vi) **HVDC back-to-back station:** Each block of the HVDC back-to-back station shall be considered as one element. If the associated AC line (necessary for the transfer of inter-regional power through the HVDC back-to-back station) is not available, the HVDC back-to-back station block shall also be considered unavailable;

   vii) **Static Synchronous Compensation ("STATCOM"):** Each STATCOM shall be considered as a separate element.

3. The Availability of the AC and HVDC portion of the Transmission system shall be calculated

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by considering each category of transmission elements as under:

TAFPn (in %) for AC system:

$$= \frac{(o \times AVo)+(p \times AVp)+(q \times AVq)+(r \times AVr)+(u \times AVu)}{(o+p+q+r+u)} \times 100$$

Where,

o	=	Total number of AC lines.
AVo	=	Availability of o number of AC lines
p	=	Total number of bus reactors/switchable line reactors
AVp	=	Availability of p number of bus reactors/switchable line reactors
q l	=	Total number of ICTs
AVq	=	Availability of q number of ICTs
r	=	Total number of SVCs
AVr	=	Availability of r number of SVCs
u	=	Total number of STATCOM
AVu	=	Availability of u number of STATCOM

TAFMn (in %) for HVDC System:

$$= \frac{\sum_{x=1}^{s} Cxbp\ (act) \times AVxbp + \sum_{y=1}^{t} Cy\ (act)btb \times AVybtb}{\sum_{x=1}^{s} Cxbp + \sum_{y=1}^{t} Cy\ btb} \times 100$$

4. The availability for each category of transmission elements shall be calculated based on

Where

Cxbp(act)	=	Total actual operated capacity of x^{th} HVDC pole
Cxbp	=	Total rated capacity of x^{th} HVDC pole
AVxbp	=	Availability of x^{th} HVDC pole
Cybtb(act)	=	Total actual operated capacity of y^{th} HVDC back-to-back station block
Cybtb	=	Total rated capacity of y^{th} HVDC back-to-back station block
AVybtb	=	Availability of y^{th} HVDC back-to-back station block
s	=	Total no of HVDC poles
t	=	Total no of HVDC Back to Back blocks

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the weightage factor, total hours under consideration and non-available hours for each element of that category. The formulae for calculation of the Availability of each category of the transmission elements are as per **Appendix-V**. The weightage factor for each category of transmission elements shall be considered as under:

(a) For each circuit of the AC line – The number of sub-conductors in the line multiplied by ckt-km;

(b) For each HVDC pole- The rated MW capacity x ckt-km;

(c) For each ICT bank – The rated MVA capacity;

(d) For SVC- The rated MVAR capacity (inductive and capacitive);

(e) For Bus Reactor/switchable line reactors – The rated MVAR capacity;

(f) For HVDC back-to-back stations connecting two Regional grids- Rated MW capacity of each block; and

(g) For STATCOM – Total rated MVAR Capacity.

5. The transmission elements under outage due to the following reasons shall be deemed to be available:

i. Shut down availed for maintenance of another transmission scheme or construction of new element or renovation/upgradation/additional capitalization in an existing system approved by the Commission. If the other transmission scheme belongs to the transmission licensee, the Member Secretary, RPC may restrict the deemed availability period to that considered reasonable by him for the work involved. In case of a dispute regarding deemed availability, the matter may be referred to the Chairperson, CEA, within 30 days.

ii. Switching off of a transmission line to restrict over-voltage and manual tripping of switched reactors as per the directions of the concerned RLDC.

iii. Shut down of a transmission line due to the Project(s) of NHAI, Railways and Border Road Organization, including for shifting or modification of such transmission line or any other infrastructure project approved by Ministry of Power. Member Secretary, RPC may restrict the deemed availability period to that considered reasonable by him for the work involved; Provided that apart from the deemed availability, any other costs involved in the process of such shutdown of transmission line shall not be borne by the DICs.

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Provided that such deemed availability shall be considered only for the period for which DICs are not affected by the shutdown of such transmission line.

6. For the following contingencies, the outage period of transmission elements, as certified by the Member Secretary, RPC, shall be excluded from the total time of the element under the period of consideration for the following contingencies:

   i) Outage of elements due to force majeure events beyond the control of the transmission licensee. However, whether the same outage is due to force majeure (not design failure) will be verified by the Member Secretary, RPC. A reasonable restoration time for the element shall be considered by the Member Secretary, RPC, and any additional time taken by the transmission licensee for restoration of the element beyond the reasonable time shall be treated as outage time attributable to the transmission licensee. Member Secretary, RPC may consult the transmission licensee or any expert for estimation of reasonable restoration time. Circuits restored through ERS (Emergency Restoration System) shall be considered as available;

   ii) Outage caused by grid incident/disturbance not attributable to the transmission licensee, e.g. faults in a substation or bays owned by another agency causing an outage of the transmission licensee's elements, and tripping of lines, ICTs, HVDC, etc., due to grid disturbance. However, if the element is not restored on receipt of direction from RLDC while normalizing the system following grid incident/disturbance within reasonable time, the element will be considered not available for the period of outage after issuance of RLDC's direction for restoration;

   iii) The outage period which can be excluded for the purpose of sub-clause (i) and (ii) of this clause shall be declared as under:

      a. Maximum up to one month by the Member Secretary, RPC;

      b. Beyond one month and up to three months after the decision at RPC;

      c. Beyond three months by the Commission for which the transmission license shall approach the Commission along with reasons and steps taken to mitigate the outage and restoration timeline.

7. Time frame for certification of transmission system availability: (1) The following schedule shall be followed for certification of availability by the Member Secretary of the concerned RPC:

- Submission of outage data along with documentary proof (if any) and TAFPn calculation by Transmission Licensees to RLDC/ constituents
  – By the 5th of the following month;

- Review of the outage data by RLDC / constituents and forward the same to respective RPC – by 20th of the month;

- Issue of availability certificate by respective RPC – by the 3rd of the next month.

Appendix-V

FORMULAE FOR CALCULATION OF AVAILABILITY OF EACH CATEGORY OF TRANSMISSION ELEMENTS

For AC transmission system

$$AVo = \frac{\sum_{i=1}^{o} Wi(Ti - TNAi)/Ti}{\sum_{i=1}^{o} Wi}$$

$$AVq = \frac{\sum_{k=1}^{q} Wk(Tk - TNAk)/Tk}{\sum_{k=1}^{q} Wk}$$

$$AVr = \frac{\sum_{l=1}^{r=1} Wl(Tl - TNAl)/Tl}{\sum_{l=1}^{r} Wl}$$

$$AVp = \frac{\sum_{m=1}^{p} Wm(Tm - TNAm)/Tm}{\sum_{m=1}^{p} Wm}$$

$$AVu = \frac{\sum_{n=1}^{u} Wn(Tn - TNAn)/Tn}{\sum_{n=1}^{u} Wn}$$

$$AV_{xbp} = \frac{(Tx - TN)}{Tx}$$

AV_{ybtb} (Availability of an individual HVDC Back-to-back Blocks) $= \frac{(Ty - TNAy)}{Ty}$

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For the HVDC transmission system

For the new HVDC commissioned but not completed twelve months:

For first 12 months: [(AV_{xbp} or AV_{ybtb})x95%/85%], subject to a ceiling of 95%.

Where,

o	=	Total number of AC lines;
AVo	=	Availability of o number of AC lines;
p	=	Total number of bus reactors/switchable line reactors;
AVp	=	Availability of p number of bus reactors/switchable line reactors;
q	=	Total number of ICTs;
AVq	=	Availability of q number of ICTs;
r	=	Total number of SVCs;
AVr	=	Availability of r number of SVCs;.
U	=	Total number of STATCOM;
AVu	=	Availability of u number of STATCOMs;
W*i*	=	Weightage factor for *i*th transmission line;
W*k*	=	Weightage factor for *k*th ICT;
W*l*	=	Weightage factors for inductive & capacitive operation of *l*th SVC;
Wm	=	Weightage factor for mth bus reactor;
Wn	=	Weightage factor for nth STATCOM.

T*i*, , T*k*, T*l*, , T*m*, T*n*, T*x*, T*y*	The total hours of ith AC line, kth ICT, lth SVC, *m*th Switched Bus Reactor & nth STATCOM, xth HVDC pole, yth HVDC back-to-back blocks during the period under consideration (excluding time period for outages not attributed to transmission licensee for the reasons given in Para 5 of the procedure)
T_{NAi} ,T_{NAk} T_{NAl}, T_{NAm},	The non-availability hours (excluding the time period for outages not attributable to transmission licensee taken as deemed availability as T_{NAn}, T_{NAn}, T_{NAx}, T_{NAy} per Para 5 of the procedure) for ith AC line, *k*th ICT, lth SVC , *m*th Switched Bus Reactor, nth STATCOM, xth HVDC pole and ythHVDC back-to-back block.

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Schedule: 7

Entire Bid (both financial bid and technical bid) of the Selected Bidder to be attached here

Schedule: 8

Contract Performance Guarantee

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution. Foreign entities submitting Bids are required to follow the applicable law in their country.)

In consideration of the ..... [Insert name of the SPV or Selected Bidder on behalf of the TSP, or Lead Member in case of the Consortium, with address] agreeing to undertake the obligations under the Transmission Service Agreement dated .....and the other RFP Project Documents and the Nodal Agency and the PFC Consulting Limited, agreeing to execute the *RFP Project Documents* with the Selected Bidder, regarding setting up the Project, the ..... [Insert name and address of the bank issuing the guarantee and address of the head office] (hereinafter referred to as "Guarantor Bank") hereby agrees unequivocally, irrevocably and unconditionally to pay to ..... (being the Nodal Agency) _at .....[Insert the Place from the address of the Nodal Agency indicated in the TSA] forthwith on demand in writing from the Nodal Agency or any Officer authorized by it in this behalf, any amount up to and not exceeding Rupees ..... Crores (Rs. .....) only [Insert the amount of the bank guarantee] on behalf of M/s. ..... [Insert name of the Selected Bidder or SPV].

This guarantee shall be valid and binding on the Guarantor Bank up to and including .....and shall not be terminable by notice or any change in the constitution of the Bank or the term of the Transmission Service Agreement or by any other reasons whatsoever and our liability hereunder shall not be impaired or discharged by any extension of time or variations or alternations made, given, or agreed with or without our knowledge or consent, by or between parties to the respective agreement.

Our liability under this Guarantee is restricted to Rs. ..... Crores (Rs. .....) only. Our Guarantee shall remain in force until ..... [Insert the date of validity of the Guarantee as per Article 0 of this Agreement]. The Nodal Agency, shall be entitled to invoke this Guarantee up to three hundred sixty five (365) days of the last date of the validity of this Guarantee.

The Guarantor Bank hereby expressly agrees that it shall not require any proof in addition to the written demand from ..... (in its roles as the Nodal Agency), made in any format, raised at the above mentioned address of the Guarantor Bank, in order to make the said payment to Nodal Agency.

The Guarantor Bank shall make payment hereunder on first demand without restriction or conditions and notwithstanding any objection by ..... [Insert name of the Selected Bidder], ... [Insert name of the TSP] and /

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or any other person. The Guarantor Bank shall not require Nodal Agency to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse against Nodal Agency in respect of any payment made hereunder.

THIS BANK GUARANTEE shall be interpreted in accordance with the laws of India.

The Guarantor Bank represents that this BANK GUARANTEE has been established in such form and with such content that it is fully enforceable in accordance with its terms as against the Guarantor Bank in the manner provided herein.

THIS BANK GUARANTEE shall not be affected in any manner by reason of merger, amalgamation, restructuring, liquidation, winding up, dissolution or any other change in the constitution of the Guarantor Bank.

THIS BANK GUARANTEE shall be a primary obligation of the Guarantor Bank and accordingly Nodal Agency shall not be obliged before enforcing this BANK GUARANTEE to take any action in any court or arbitral proceedings against), KPS III HVDC TRANSMISSION LIMITED or the Selected Bidder, as the case may be, to make any claim against or any demand on), KPS III HVDC TRANSMISSION LIMITED or the Selected Bidder, as the case may be, or to give any notice to), KPS III HVDC TRANSMISSION LIMITED or the Selected Bidder, as the case may be, or to enforce any security held by the Nodal Agency or to exercise, levy or enforce any distress, diligence or other process against), KPS III HVDC TRANSMISSION LIMITED or the Selected Bidder, as the case may be.

The Guarantor Bank acknowledges that this BANK GUARANTEE is not personal to Nodal Agency and may be assigned, in whole or in part, (whether absolutely or by way of security) by Nodal Agency to any entity to whom the Nodal Agency is entitled to assign its rights and obligations under the Transmission Service Agreement.

The Guarantor Bank hereby agrees and acknowledges that Nodal Agency shall have a right to invoke this Bank Guarantee either in part or in full, as it may deem fit.

Notwithstanding anything contained hereinabove, our liability under this Guarantee is restricted to Rs. ..... Crores (Rs. .....) only and it shall remain in force until .....[Date to be inserted on the basis of Article 0of the Transmission Service Agreement], with an additional claim period of three hundred sixty five (365) days thereafter. This BANK GUARANTEE shall be extended from time to time for such period, as may be desired by ..... [Insert name of the Selected Bidder or Lead Member in case of the Consortium or SPV]. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only if Nodal Agency serves upon us a written claim or demand.

..... [Insert Name of the SPV]

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In witness where of:

Signature .....

Name: .....

Power of attorney No.: .....

For:

..... [Insert Name of the Bank]

Banker's Seal and Full Address, including mailing address of the Head Office

..... [Insert Name of the SPV]

Adani Energy Solutions Limited

| _____ 2024

Schedule: 9

Methodology for determining the Relief Under Force Majeure Event & Change in Law during Construction Period

The relief in the form of revision in tariff due to Force Majeure Event leading to extension of Scheduled COD for a period beyond one hundred eighty (180) days and/ or Change in Law during the construction period shall be as under:

$\Delta T = [(P \times d)] \div [1-(1+ d)^{(-n)}]$

Where,

ΔT = Change in Transmission Charges for each year

P = Sum of cumulative increase or decrease in the cost of the Project due to Change in Law and interest cost during construction corresponding to the period exceeding one hundred eighty (180) due to Force Majeure Event leading to extension of Scheduled COD for a period beyond one hundred eighty (180) days

n = number of years over which the Transmission Charges has to be paid

d = Discount rate as notified by the CERC, applicable on the Bid Deadline

The increase in Transmission Charges as stated above shall be applicable only if the value of increase in Transmission Charges as calculated above exceeds 0.30% (zero point three percent) of the quoted Transmission Charges of the TSP.

Annexure A7

Form-I

Application Form for Grant of Transmission licence

1. **Particulars of the Applicant**

S No	Particulars	Details
i.	Name of the Applicant	Adani Energy Solutions Limited
ii.	Status	Public Limited Company
iii.	Address	Adani Corporate House, Shantigram Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad - 382421
iv.	Name, Designation & Address of the Contact Person	Shri Prashant Kumar, Head-Regulatory, Adani Energy Solutions Limited, C/o 12th Floor South Wing, KP Epitome, Makarba, Ahmedabad - 380051
v.	Contact Telephone No	9810866555
vi.	Fax No	079-25556601
vii.	Email ID	prashant.kumar1@adani.com
viii.	Place of Incorporation/ Registration	New Delhi
ix.	Year of Incorporation/ Registration	2013
x.	Following documents are to be enclosed	
	a) Certificate of Registration	Annexure A3
	b) Copy of Board Resolution	Annexure A7

2. **Particulars of the Project for which licence is being sought:**

a) Transmission Lines:

S No	Name (end-points Location)	Voltage Class (kV)	Length* (km)	Type (S/C or D/C)
1	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)	500 KV	673	D/C
2	KPS3 – KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line	400 KV	0.8	D/C

*As per survey report

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b) Sub-stations:

S No	Name (Location)	Voltage Level (s) (kV)	Transformer (Nos. and MVA capacity)	Reactive/Capacitive compensation (device with MVAR Capacity)	No. of bays
1	KPS3 (HVDC) [VSC] terminal station	± 500 kV	2500 MW	-	-
2	KPS3 (HVDC) [VSC] terminal station	± 500 kV	2500 MW	-	-
3	KPS3 (HVDC) S/s	400 kV	100 MVA	125MVAR - 2	• 400 ICT Bay – 2 Nos. • 400 kV reactor bay- 2 Nos. • 400 kV Bays (GIS) – 8 Nos.

C) Commissioning Schedule:

Sr. No.	Name of the Transmission Element	Scheduled COD in months from Effective Date
1	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard*	48 months from SPV transfer
2	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s*	
3	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN. 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal	
4	KPS3 - KPS3 (HVDC) 400 kV 2xD/C (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations	

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Sr. No.	Name of the Transmission Element	Scheduled COD in months from Effective Date
5	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)	

d) Identified Long-Term transmission customers of the Project:

1. Central Transmission Utility of India Limited (Nodal Agency)

e) Any other relevant information: Nil

3. Levelised transmission charges in case of project selected through the transparent process of competitive bidding and estimated completion cost of the project in other cases: **Rs 23917.69** million per annum

4. In case applicant has been selected in accordance with the guidelines for competitive bidding, enclose:

(a) Recommendation of selection by the Empowered Committee

(b) Evaluation report made public by the Bid Process Coordinator

} Not Available

5. List of documents enclosed:

Name of the Document

a) **Certificate of Registration: Annexure A3**
b) **Copy of Board Resolution: Annexure A7**

Adani Energy Solutions Limited

Prashant Kumar

(Signature of the Applicant)

Date: 01.12.2025

Place: Ahmedabad

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Energy Solutions

CERTIFIED TRUE COPY OF THE RESOLUTION PASSED AT THE MEETING OF THE MANAGEMENT COMMITTEE OF BOARD OF DIRECTORS OF ADANI ENERGY SOLUTIONS LIMITED (FORMERLY KNOWN AS ADANI TRANSMISSION LIMITED) ("THE COMPANY") HELD ON TUESDAY, THE 27TH DAY OF AUGUST, 2024 AT ADANI CORPORATE HOUSE, SHANTIGRAM, S. G. HIGHWAY, AHMEDABAD – 382 421

"RESOLVED THAT in supersession with all earlier resolutions passed in this regard Mr. M. R. Krishna Rao, Mr. Vivek Gautam, Mr. Molay Kumar Maitra, Mr. Tanmay Vyas, Mr. Praveen Tamak, Mr. Narendra Ojha, Mr. Bhavesh Kundalia, Mr. Prashant Kumar, Mr. Naresh Desai, Mr. Afak Pothiawala, Mr. Matulya Shah and Mr. Rajesh Sirigirisetty (hereinafter referred to as "**Authorised Signatories**") be and are hereby severally Authorised to sign and submit petitions, affidavits, agreements, declarations, undertakings, deeds, Bills, submission of details of Bank Accounts or change of Bank Accounts and other documents in connection therewith or incidental thereto before Central Electricity Regulatory Commission (CERC), Appellate Tribunal for Electricity (APTEL), Power Grid Corporation of India Limited (PGCIL), Central Transmission Utility of India Ltd (CTUIL), Power System Operation Corporation Limited (POSOCO), Regional Power Committees and Regional Load Dispatch Centers and other regulatory authorities for and on behalf of the Company.

RESOLVED FURTHER THAT the Authorised Signatories be and are hereby further severally authorised (a) to issue notices, affidavit and other documents, communications to Long Term Transmission Customers and other Parties / agencies, including Central Transmission Utility of India Limited. and WRLDC/SRLDC (b) to file Petition, Affidavit, Notices and other documents before Regulatory Commission or other Electricity body, Appellate Tribunal for Electricity and Supreme Court for issues arising out of Transmission Service Agreement and Bulk Power Transmission Agreement, (c) to engage, appoint or remove any pleaders or advocates, and sign vakalatnamas, power of attorney for such engagement or appointment and (d) to file appeal and defend the interest of the Company."

Certified True Copy
For Adani Energy Solutions Limited
(formerly known as Adani Transmission Limited)

Jaladhi Shukla
Company Secretary
Membership No. F5606

Adani Energy Solutions Limited

Adani Energy Solutions Limited

Adani Energy Solutions Ltd
(formerly known as Adani Transmission Limited)
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