TRANSMISSION SERVICE AGREEMENT

FOR

DEVELOPMENT AND OPERATION OF INTRA-STATE TRANSMISSION SYSTEM

FOR TRANSMISSION OF ELECTRICITY THROUGH TARIFF BASED COMPETITIVE BIDDING

CONSISTING OF (i) KAVATHAMPALAYAM 765/400 KV AIS SS ALONG WITH 765 KV & 400 KV TRANSMISSION LINES AND (ii) EDAYARPALAYAM 400/230-110 KV AIS SUBSTATION

BETWEEN THE

TAMIL NADU TRANSMISSION CORPORATION LIMITED (TANTRANSCO)

(NODAL AGENCY)

AND

KAVATHAMPALAYAM SS DEVELOPMENT LIMITED

12.02.2026

CONTENTS

1	Definitions and Interpretations	5
2	Effectiveness and Term of Agreement	18
3	Conditions Subsequent	20
4	Development of the Project	24
5	Construction of the Project	29
6	Connection and commissioning of the Project	34
7	Operation and Maintenance of the Project	39
8	Availability of the project	40
9	Insurances	41
10	Billing And Payment of Transmission Charges	43
11	Force Majeure	52
12	Change in Law	56
13	Events of Default and Termination	59
14	Liability and Indemnification	64
15	Assignments and Charges	69
16	Governing Law and Dispute Resolution	71
17	Representation and Warranties	73
18	Independent Engineer	75
19	Miscellaneous Provisions	77

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 “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 has submitted the Contract Performance Guarantee and acquired one hundred percent (100%) of the equity shareholding of …… (Insert the name of 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 State 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 State Commission for the adoption of the Transmission Charges under Section 63 of the Electricity Act, 2003, along with a certification from the Tender Scrutiny and Evaluation committee in accordance with the Bidding Guidelines issued by the TANTRANSCO.

F) The TSP agrees to the terms and conditions of this Agreement, for making available the Intra-State transmission system and charge the Transmission Charges in accordance with the terms and conditions of this Agreement.

G) The payment of the Transmission Charges by the Nodal Agency to the Licensee shall be governed as per this Agreement.

H) The terms and conditions stipulated in the Transmission License issued by the State 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 State 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

11 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 thereunder including those issued/ framed by the State 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 Schedule 6 of this Agreement;

"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;

"Bidding Consortium / Consortium" shall refer to a maximum of two (2) companies including lead member (along with their permitted successors and legal assigns) 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 issued by TANTRANSCO as per Section – 63 of the Electricity Act as amended from time to time;

"Bid Process Coordinator (BPC)" shall mean Tamil Nadu Transmission Corporation Limited (TANTRANSCO). As specified in the Tariff Based Competitive-Bidding Guidelines issued by TANTRANSCO, the BPC is responsible for carrying out the bidding process for selection of Transmission Service Provider;

"Business Day" shall mean a day other than Sunday or a statutory holiday, on which the banks remain open for business in the State of Tamil Nadu;

"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;

"Central 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;

"Central Government" or **"GOI"** shall mean the Government of India;

"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/ Intra State Transmission System (as the case may be) as per the provisions of the IEGC/ State Grid Code, 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 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 in the form of e-BG, 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) In accordance with Article 3 of this Agreement and which shall include the additional bank guarantee furnished by the TSP under this Agreement, if any;

"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;

"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;

"Due Date" in relation to any Invoice shall mean the forty five (45th) day after the date on which any Invoice is received and duly acknowledged by the Nodal Agency (or, if that day is not a Business Day, the immediately following Business Day), and by such date, the Invoice is payable by the Nodal Agency;

"Effective Date" for the purposes of this Agreement, shall have the same meaning as per Article 2 of this Agreement;

"Electricity (Late Payment Surcharge and related matters) Rules, 2022" shall mean the rules notified by the Ministry of Power, Government of India, vide Notification No. G.S.R. 416(E) dated 03.06.2022, as amended from time to time, which govern the payment of late payment surcharge by a distribution licensee to a generating company, transmission licensee or trading licensee for delay in payment of charges beyond the due date, and include all subsequent amendments, modifications, clarifications, and re-enactments thereof (hereinafter referred to as LPS Rules, 2022).

"Electrical Inspector" shall mean a person appointed as such by the State 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 Intra-State Transmission System, which will be owned, operated and maintained by the concerned 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 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;

"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;

"Independent Engineer" shall mean an agency/ company, appointed by Nodal Agency in accordance with the Guidelines for Encouraging Competition in Development of Transmission Projects issued by Ministry of Power, Government of India, dated 10.08.2021.

"Indian Governmental Instrumentality" shall mean Government of India, Government of Tamil Nadu 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 CERC or TNERC or tribunal or judicial or quasi-judicial body in India but excluding the CTU, TSP and the Nodal Agency;

"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 / Nodal Agency's substations (as the case may be) which shall include, without limitation, all other transmission lines, gantries, sub-stations and associated equipment not forming part of the Project;

"Invoice" shall mean a Monthly Transmission Charges Invoice or Monthly Bill comprising the Monthly Transmission Charges, as per Schedule 4 hereof, a Supplementary Invoice or any other Invoice or Bill raised by any of the Parties;

"Licensee" shall be the TSP under this Agreement, consequent to having been awarded a Transmission License by the State Commission and shall be referred to as the TSP or the 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 State Commission;

"Lead Member of the Bidding Consortium" or "Lead Member" shall mean a company who commits at least 26% equity stake in the SPV, meets the technical requirement as specified in the RFP and so designated by other Member(s) in Bidding Consortium;

"Letter of Credit" or **"LC"** shall mean an unconditional, irrevocable, revolving Letter of Credit opened by the Nodal Agency in favour of the TSP with any scheduled bank;

"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 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;

"Nodal Agency" shall mean Tamil Nadu Transmission Corporation Ltd. (TANTRANSCO), which shall execute and implement the Transmission Service Agreement (TSA);

"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;

"Notification" shall mean any notification, issued in the Gazette of India/State Government;

"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 more than fifty percent (50%) of the paid - up equity capital directly 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;

"Project" shall mean Transmission system for Development of (i) Kavathampalayam 765/400 kV AIS SS along with 765 kV & 400 kV Transmission Lines and (ii) Edayarpalayam 400/230-110 kV AIS Substation 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 Consents, Clearances and Permits 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 State Transmission Utility;

"Rebate" shall have the meaning as ascribed to in Article 10.3 of this Agreement;

"RFP" shall mean Request For Proposal dated 12.02.2026 along with all schedules, annexures and RFP Project Documents attached thereto, issued by the BPC for 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, and

c. 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/ SLDC 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 Tamil Nadu Transmission Corporation Limited (TANTRANSCO), KAVATHAMPALAYAM SS DEVELOPMENT LIMITED and the Successful

Bidder for the purchase of one hundred (100%) per cent of the shareholding of the KAVATHAMPALAYAM SS DEVELOPMENT LIMITED for the Acquisition Price, by the Successful Bidder on the terms and conditions as contained therein;

"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;

"State Commission" or **"TNERC"** shall mean the Tamil Nadu Electricity Regulatory Commission referred to in sub-section (1) of section 82 of the Electricity Act, 2003 or its successors and assigns;

"State Government" shall mean the Government of Tamil Nadu**;**

"STU" or **"State Transmission Utility"** shall mean Tamil Nadu Transmission Corporation Limited (TANTRANSCO);

"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 KAVATHAMPALAYAM SS DEVELOPMENT 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 pursuant to the provisions of Article 13.3 of this Agreement;

"Target Availability" shall have the meaning as ascribed hereto in Article 8.2 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 3.3.2, 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 State Commission, payable to the TSP by the Nodal Agency, as per provisions of TSA;

“Transmission License” shall mean the license granted by the State 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;

“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 more than fifty percent (50%) paid-up equity directly in the Parent Company of the Bidding Company or the Member in a Bidding Consortium, as the case may be;

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:

a. The Selected Bidder, on behalf of the TSP, has provided the Contract Performance Guarantee, as per terms of Article 3 of this Agreement; and

b. The Selected Bidder has acquired for the Acquisition Price, one hundred percent (100%) of the equity shareholding of Tamil Nadu Transmission Corporation Limited (TANTRANSCO) in KAVATHAMPALAYAM SS DEVELOPMENT LIMITED along with all its related assets and liabilities as per the provisions of the Share Purchase Agreement. and

c. 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 STU or its successors or an agency as decided by the Energy Department, Government of Tamil Nadu 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 STU or its successors or an agency as decided by Energy Department, Government of Tamil Nadu 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 State Commission at least two (2) years before the date of expiry of the Transmission License, seeking the State 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 State 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 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 Intra-State transmission 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 Licensee) of this Agreement shall supersede the corresponding provisions of relevant Regulations.

ARTICLE: 3

3 CONDITIONS SUBSEQUENT

3.1 Satisfaction of conditions subsequent by the TSP

3.1.1 Within thirty (30) days from the date of issue of Letter of Intent, the Selected Bidder, shall:

a. Provide the Contract Performance Guarantee for an amount of **Rs.85 Crores**, to the Tamil Nadu Transmission Corporation Ltd. (TANTRANSCO) and

b. Acquire, for the Acquisition Price, one hundred percent (100%) equity shareholding of KAVATHAMPALAYAM SS DEVELOPMENT LIMITED from Tamil Nadu Transmission Corporation Limited (TANTRANSCO), who shall sell to the Selected Bidder, the equity shareholding of KAVATHAMPALAYAM SS DEVELOPMENT 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 State Commission for the grant of Transmission License and for the adoption of tariff as required under Section-63 of the Electricity Act.

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, 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 State Commission;

b. To obtain the order for adoption of Transmission Charges by the State

Commission, as required under Section 63 of the Electricity Act 2003;

c. To submit to the Nodal Agency, STU & Independent Engineer, the Project Execution Plan, immediately after award of contract(s). 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, STU & 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, STU & 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; and

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.

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 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 pay to the Nodal Agency, damages for delay as per Article 3.3.2.

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 between six (6) Months to nine (9) Months from the Effective Date, the TSP shall pay 0.05 % (zero point zero five percent) of the Performance Security as Damages for each day's delay until the fulfilment of such Conditions Subsequent;

(ii) further, the TSP fails to fulfil the conditions specified in Article 3.1.3 within a period of nine (9) to twelve (12) months from the Effective Date, the TSP shall pay 0.1 % (zero point one percent) of the Performance Security as Damages for each day's delay until the fulfilment of such Conditions Subsequent,

subject to a maximum of 15% (Fifteen per cent) of Performance Security and upon reaching such combined limit (i) & (ii) above, 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 STU and the Lenders' Representative in order to enable the Lenders to exercise right of substitution in accordance with Article 15.3 of this Agreement.

(iii) Appropriation of Contract Performance Guarantee:

Upon occurrence of a TSP Default or failure to meet any Condition Subsequent, the Nodal Agency shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to encash the damages for delay and appropriate from the Performance Security the amounts due for it as per Article 3.3.2.

(iv) Upon any encashment and appropriation from the Contract Performance Guarantee, either under this clause or any other clause in this agreement, the TSP shall, within 15 (fifteen) days thereof, replenish, in case of partial appropriation, to the original level of the Contract Performance Guarantee, and in case of appropriation of the entire Contract Performance Guarantee provide a fresh Contract Performance Guarantee, as the case may be, failing which the Nodal Agency shall be entitled to terminate this Agreement in accordance with the provisions herein.

3.3.3 If the Nodal Agency elects to terminate this Agreement as per the provisions of Article 3.3.2, the TSP shall be liable to pay to the Nodal Agency an amount equal to the Contract Performance Guarantee. The Nodal Agency shall be entitled to recover this amount of damages by invoking the original Contract Performance Guarantee.

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 STU 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 3.3.2 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 STU 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 thereunder;

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 Central Government and State 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 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 STU, on a monthly basis, progress reports with regard to the Project and its execution (in accordance with prescribed form) to enable the Nodal Agency and STU 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 Act, Rules, Guidelines issued by Government of Tamil Nadu/ 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. A-1/2021- FSC- Part(5) dated 16.11.2021 and No.: P45021/2/2017-PP (BE-II)-Part-4 Vol.II dated 19.07.2024 issued by Ministry of Power 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 be deemed to have included Selected Bidder and/ or TSP).

j. 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, Office Memorandum (OM) No.

F.18/37/2020-PPD dated 08.02.2021, OM No. F.12/1/2021-PPD (Pt.) dated 02.03.2021, OM No. F.7/10/2021-PPD dated 08.06.2021 and Order (Public Procurement No 4) bearing File No. F.7/10/2021-PPD 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 and Tamil Nadu Transparency in Tenders Act, 1998, Tamil Nadu Transparency in Tender Rules, 2000 and Tamil Nadu Transparency in Tender (Public Private Partnership Procurement) Rules, 2012 issued by GoTN and as amended from time to time are also applicable;

k. 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.

l. 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 STU 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 Grid Code 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 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 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. 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) deleted;

(b) deleted;

(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 are 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.

5.1.6 The TSP agrees that, in future, the additional and /or augmentation work, if any in the substations to be constructed in the Project will be executed as decided by Nodal Agency. The TSP shall extend necessary support to Nodal Agency/ other TSPs, in case it is decided to execute the additional works by Nodal Agency itself or through other TSP(s). O&M Charges shall be paid as per prevailing norms of the State Commission. Any dispute arising in this regard shall be resolved by the State Level Committee on Transmission The decision of the State Level Committee on Transmission shall be binding on all parties.

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 STU, 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 format). The Nodal Agency/STU 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 / components (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 are not available, IEC/ IEEE or equivalent International Standards and Codes shall be followed.

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 equipment/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, STU & Independent Engineer shall have access, at all reasonable times, to the Site 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 equipment, 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 equipment, transmission line material and workmanship etc. would be checked in accordance with the Article 5.4.

b) Progress in the activities specified in Conditions 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 STU 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 STU and/ or the Nodal Agency. However, such intimation by the Independent Engineer and/ or STU 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 STU and/ or the Nodal Agency may carry out random inspections during the Project execution, as and when deemed necessary by them. If the shortfalls, as intimated to the TSP, are not remedied to the satisfaction of the STU 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 Energy Department, Government of Tamil Nadu, STU 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), SLDC, 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.

d. It has satisfactorily met all the testing requirements as per Articles 6.1.4

6.1.4 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 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.

6.4 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 damages for each day of delay

beyond sixty days (60) days, 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 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 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

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 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 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 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 damages not covered by the Contract Performance Guarantee, then such balance amount shall be deducted from the Transmission Charges payable to the TSP, if any. 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 3.3.2 to the extent the Contract Performance Guarantee is valid for an amount in excess of Rs.85 Crores (Rupees Eighty-Five Crore 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 State 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 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 Nodal Agency or STU 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 or STU 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 affect and maintain or cause to be affected 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

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 STU 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 & STU

9.4.1 The Nodal Agency and STU 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 this Agreement, 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.

10.1.1 Delivery of Invoices:

10.1.1.1 TSP's Invoices

a. Commencing with the month following the month in which the COD of an Element (which is first Commissioned) occurs, the TSP shall submit to Nodal Agency by the fifth day of such and each succeeding month (or, if such day is not a Business Day, the immediately following Business Day) an Invoice in the agreed form (the "Monthly Transmission Charge Invoice") signed by the authorised signatory of the TSP setting out the computation of the Monthly Transmission Charges to be paid by the Nodal Agency to the TSP in respect of the immediately preceding month in accordance with this Agreement; and

b. Each Monthly Transmission Charge Invoice shall include detailed calculations of the amounts payable under it, together with such further supporting documentation and information as Nodal Agency may reasonably require/ request, from time to time.

10.1.1.2 Nodal Agency Invoices

a. The Nodal Agency shall (as and when any amount becomes due to be paid by TSP), on the fifth day of the month (or, if such day is not a Business Day, the immediately following Business Day) submit to the TSP an Invoice in the agreed form (the "Nodal Agency Invoice") setting out the computation of any amount that may be payable to it by the TSP for the immediately preceding month pursuant to this Agreement.

b. The Nodal Agency's Invoice shall include detailed calculations of the amounts payable under it, together with such further supporting documentation as the TSP may reasonably require/request, from time to time.

10.1.2 Payment of Invoices:

10.1.2.1 Any amount payable under an Invoice shall be paid in immediately available and freely transferable clear funds, for value on or before the Due Date, to such account of the TSP or Nodal Agency as shall have been previously notified to Nodal Agency or the TSP, as the case may be.

10.1.2.2 Where in respect of any month there is both:

a. an amount payable by the Nodal Agency to TSP pursuant to a Monthly Transmission Charge Invoice and

b. an amount payable by the TSP to Nodal Agency pursuant to a Nodal Agency's Invoice,

the two amounts, to the extent agreed to be set off against each other except for such amount/invoice which are disputed and the balance, if any, shall be paid by Nodal Agency to the TSP or by TSP to Nodal Agency, as the case may be.

10.1.2.3 The Nodal Agency shall pay the amount payable under the Monthly Transmission Charge Invoice and the Supplementary Bill on the Due Date to such account of the TSP, as shall have been previously notified by the TSP to the Nodal Agency in accordance with Article 10.1.2.6 below.

10.1.2.4 All payments made by the Nodal Agency shall be appropriated by the TSP in the following order of priority:

i. towards Late Payment Surcharge, payable to the TSP, if any;

ii. towards earlier unpaid Monthly Transmission Charge Invoice, if any;

iii. towards earlier unpaid Supplementary Bill, if any;

iv. towards the then current Monthly Transmission Charge Invoice, if any; and

v. towards the then current Supplementary Bill.

except for disputed amount/invoice to be dealt with as per Article 10.4

10.1.2.5 All payments required to be made under this Agreement shall only include any deduction or set off for:

i. deductions required by the Law; and

ii. amounts claimed by the Nodal Agency from the TSP, through an Invoice submitted to the TSP, to be payable by the TSP, and not disputed by the TSP within thirty (30) days of receipt of the said Invoice and such deduction or set-off shall be made to the extent of the amounts not disputed. It is clarified that the Nodal Agency shall be entitled to claim any set off or deduction under this Article, after expiry of the said thirty (30) day period.

Provided further, the maximum amounts that can be deducted or set-off by the Nodal Agency taken together under this Article in a Contract Year shall not exceed Rs.30 Crores (Rupees Thirty Crores Only), except on account of payments under sub Article (i) above.

10.1.2.6 The TSP shall open a bank account at …… [Insert identified place of account] (the "Designated Account") for all payments to be made by the Nodal Agency to the TSP, and notify the Nodal Agency of the details of such account at least ninety (90) days before the Scheduled COD of the first Element to the Nodal Agency. The Nodal Agency shall, on the day of payment, notify the TSP of the payment made to the Designated Account. The Nodal Agency shall also designate a bank account at …… [Insert identified place] for payments to be made by the TSP to Nodal Agency and notify the TSP of the details of such account ninety (90) days before the Scheduled COD of the first Element.

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:

10.3.1 Rebate: In case the Nodal Agency pays to the TSP through any mode of payment in respect of a Monthly Transmission Charge Invoice or Supplementary Bill, the following shall apply:

a. For payment of Invoices through any mode of payment, a Rebate of 1.5% shall be allowed on the Monthly Transmission Charge Invoice or Supplementary Bill for payments made in full within five (5) days of the receipt of the Invoice. Explanation: In case of

computation of '5 days', the number of days shall be counted consecutively without considering any holiday. However, in case the last day or 5th day is an official holiday, the 5th day for the purpose of rebate shall be construed as the immediate succeeding working day.

b. A rebate of 1% shall be allowed where payments are made on any day after 5 days and within a period of 30 days of the receipt of the Invoice.

c. Applicable rate of Rebate at (a) and (b) above shall be based on the date on which the payment has been actually credited to the TSP's account. Any delay in transfer of money to the TSP's account, on account of a statutory holiday, public holiday, or any other reasons shall be to the account of the Nodal Agency provided that the Invoice is not submitted on the day immediately preceding a statutory holiday or public holiday.

d. No Rebate shall be payable on the bills raised on account of Change in Law relating to taxes, duties and cess;

Provided that if the Nodal Agency fails to pay a Monthly Transmission Charge Invoice/ Supplementary Bill or part thereof within and including the Due Date, the TSP shall recover such amount as per provisions of Article 10.4.3.1 (f).

10.3.2 Late Payment Surcharge: Any amount due from one Party to the other, pursuant to this Agreement and remaining unpaid after the Due Date, shall bear Late Payment Surcharge as per the rate of interest specified in the Electricity (Late Payment Surcharge and Related Matters) Rules, 2022. Such Late Payment Surcharge shall be calculated on Simple Interest and shall accrue from the Due Date until the amount due is actually received by the payee.

10.4 Disputed Bills, Default in payment by the Nodal Agency & Annual Reconciliation:

10.4.1 Disputed Invoices

10.4.1.1 If either Party does not question or dispute an Invoice within thirty (30) days of receiving it, the Invoice shall be considered correct, complete and conclusive between the Parties.

10.4.1.2 If either Party disputes any item or part of an item set out in any Invoice,

then that Party shall serve a notice (an "Invoice Dispute Notice") on the other Party setting out (i) the item or part of an item which is in dispute, (ii) its estimate of what such item or part of an item should be, (iii) and with all written material in support of its claim.

10.4.1.3 If the invoicing Party agrees to the claim raised in the Invoice Dispute Notice issued pursuant to Article 10.4.1.2, the invoicing Party shall revise such Invoice within seven (7) days of receiving such notice from the disputing Party and if the disputing Party has already made the excess payment, the invoicing Party shall refund to the disputing Party, such excess amount within fifteen (15) days of receiving such notice. In such a case, the excess amount shall be refunded along with interest at the same rate as the Late Payment Surcharge, which shall be applied from the date on which such excess payment was made to the invoicing Party and up to and including the date on which such payment has been received as refund.

10.4.1.4 If the invoicing Party does not agree to the claim raised in the Invoice Dispute Notice issued pursuant to Article 10.4.1.2, it shall, within fifteen (15) days of receiving the Invoice Dispute Notice, furnish a notice to the disputing Party providing (i) reasons for its disagreement; (ii) its estimate of what the correct amount should be; and (iii) all written material in support of its counter-claim.

10.4.1.5 Upon receipt of notice of disagreement to the Invoice Dispute Notice under Article 10.4.1.4, authorised representative(s) or a director of the board of directors/member of board of each Party shall meet and make best endeavours to amicably resolve such Dispute within fifteen (15) days of receiving such notice of disagreement to the Invoice Dispute Notice.

10.4.1.6 If the Parties do not amicably resolve the dispute within fifteen (15) days of receipt of notice of disagreement to the Invoice Dispute Notice pursuant to Article 10.4.1.4, the matter shall be referred to Appropriate Commission for Dispute resolution in accordance with Article 16.

10.4.1.7 If a Dispute regarding a Monthly Transmission Charge Invoice or a Supplementary Invoice is settled pursuant to Article 10.3.1 or by Dispute resolution mechanism provided in this Agreement in favour of the Party that issues the Invoice Dispute Notice, the other Party shall refund the amount, if any incorrectly charged and collected from the disputing Party or pay as required, within five (5) days of the Dispute either being amicably resolved by the Parties pursuant to Article 10.4.1.5 or settled by Dispute resolution mechanism, along with interest (at the same rate as Late Payment Surcharge) or Late Payment Surcharge from the date on

which such payment had been made to the invoicing Party or the date on which such payment was originally due, as may be applicable.

10.4.1.8 For the avoidance of doubt, it is clarified that despite a Dispute regarding an Invoice, the Nodal Agency shall, without prejudice to its right to Dispute, be under an obligation to make payment, of the lower of (a) an amount equal to simple average of last three (3) months Invoices (being the undisputed portion of such three months Invoices) and (b) Monthly Invoice which is being disputed, provided such Monthly Invoice has been raised in accordance with this Agreement.

10.4.2 Payment of Supplementary Bill

10.4.2.1 Either Party may raise a bill on the other Party ("Supplementary Bill") for payment on account of:

i. adjustments (if any) required by the Regional Energy Account / State Energy Account (as the case may be); or

ii. quarterly or annual reconciliation as per Article 10.4.5; or

iii. Change in Law as provided in Article 12,

and such Bill shall be paid by the other Party in accordance with the provisions of this Article.

10.4.3 Payment Security Mechanism:

10.4.3.1 Establishment of Letter of Credit:

(a) Not later than one (1) Month prior to the Scheduled COD of the first Element of the Project, Nodal Agency shall, through a scheduled bank, open a Letter of Credit in favour of the TSP, to be made operative from a date prior to the Due Date of its first Monthly Transmission Charge Invoice under this Agreement and shall be renewed annually.

(b) The draft of the proposed Letter of Credit shall be provided by Nodal Agency to the TSP not later than the Financial Closure of the Project and shall be mutually agreed between the Parties.

(c) The Letter of Credit shall have a term of twelve (12) Months and shall be for an amount:

i. for the first Contract Year or for each subsequent Contract Year, equal to one point one (1.1) times the estimated

average Monthly Transmission Charges based on Target Availability of the Elements or Project with Scheduled COD in such Contract Year, as the case may be;

ii. Provided that, the TSP shall not make any drawal before the Due Date and shall not make more than one drawal in a month.

Provided further that if at any time, such Letter of Credit amount falls short of the amount specified in Article 10.4.3.1, otherwise than by reason of drawal of such Letter of Credit by the TSP, the Nodal Agency shall restore such shortfall within seven (7) days.

(d) Nodal Agency shall cause the scheduled bank issuing the Letter of Credit to intimate the TSP, in writing, regarding establishing of such Letter of Credit.

(e) In case of drawal of the Letter of Credit by the TSP in accordance with the terms of this Article 10.4.3.1, the amount of the Letter of Credit shall be reinstated within seven (7) days from the date of such drawal.

(f) If Nodal Agency fails to pay a Monthly Transmission Charge Invoice / Supplementary Bill or part thereof within and including the Due Date, then, unless an Invoice Dispute Notice is received by the TSP as per the provisions of Article 10.4.1.2, the TSP may draw upon the Letter of Credit, and accordingly the bank shall pay without any reference or instructions from the Nodal Agency, an amount equal to such Monthly Transmission Charge Invoice/Supplementary Bill or part thereof plus Late Payment Surcharge, if applicable, in accordance with Article 10.3.2 above, by presenting to the scheduled bank issuing the Letter of Credit, the following documents:

i. a copy of the Monthly Transmission Charge Invoice/ Supplementary Bill which has remained unpaid by Nodal Agency;

ii. a certificate from the TSP to the effect that the Invoice at item (i) above, or specified part thereof, is in accordance with the Agreement and has remained unpaid beyond the Due Date; and

iii. calculations of applicable Late Payment Surcharge, if any.

Provided that failure on the part of the TSP to present the documents for negotiation of the Letter of Credit shall not attract any Late Payment Surcharge on the Nodal Agency.

(g) Nodal Agency shall ensure that the Letter of Credit shall be renewed not later than thirty (30) days prior to its expiry.

(h) All costs relating to opening and maintenance of the Letter of Credit shall be borne by the Nodal Agency. However, the Letter of Credit negotiation charges shall be borne and paid by the TSP.

(i) If a Nodal Agency fails to pay (with respect to a Monthly Bill or Supplementary Bill) an amount exceeding thirty percent (30%) of the most recent undisputed Monthly Bill, for a period of seven (7) days after the Due Date and the TSP is unable to recover the amount outstanding to the TSP through the Letter of Credit,

(i) the TSP shall issue a notice to Nodal Agency within seven (7) days from such period highlighting the nonpayment of such amount by Nodal Agency;

(ii) If Nodal Agency still fails to pay such amount within a period of thirty (30) days after the issue of notice by TSP as mentioned in (i) above, the TSP shall approach the RLDC / SLDC (as the case may be) requesting for the alteration of the schedule of dispatch of the lowest cost power of Nodal Agency from the Central Generating Stations/ State Generating Stations (as the case may be), and the RLDC / SLDC shall continue to reschedule the lowest cost power till all the dues of the TSP are recovered;

- Provided that in this case, the quantum of electricity and the corresponding period in which it would be rescheduled for dispatch shall be corresponding to the amount of default. This electricity will then be dispatched to other utilities by the concerned RLDC/SLDC, as the case may be, during the peak hours, i.e., 7pm to 10 pm. The price of this electricity will be determined as per the UI rate;

- Provided further that the revenue from such diverted power would be used to pay the dues first of the generating company (which would include the capacity charges as well as the energy charges) and the remainder would be available for covering the default amount and the balance (if any), after recovering both the charges, would be paid to the defaulting Nodal Agency.

10.4.4 Payment Intimation

Nodal Agency shall remit all amounts due under an Invoice raised by the TSP to the TSP's account by the Due Date and notify the TSP of such remittance on the same day. Similarly, the TSP shall pay all amounts due under an Invoice raised by Nodal Agency by the Due Date to Nodal Agency's account and notify Nodal Agency of such payment on the same day.

10.4.5 Quarterly and Annual Reconciliation

10.4.5.1 Parties acknowledge that all payments made against Monthly Bill(s) and Supplementary Bill(s) shall be subject to quarterly reconciliation at the beginning of the following quarter of each Contract Year and annual reconciliation at the end of each Contract Year to take into account Regional Energy Account/ State Energy Account, adjustments in Transmission Charges payments, Rebates, Late Payment Surcharge, Incentive, Penalty, or any other reasonable circumstance as may be mutually agreed between the Parties.

10.4.5.2 The Parties, therefore, agree that as soon as all such data in respect of any quarter of a Contract Year or a full Contract Year, as the case may be, is available and has been finally verified and adjusted, the TSP and Nodal Agency shall jointly sign such reconciliation statement. Within fifteen (15) days of signing of a reconciliation statement, the TSP or Nodal Agency, as the case may be, shall raise a Supplementary Bill for the payments as may be due as a result of reconciliation for the relevant quarter/ Contract Year and shall make payment of such Supplementary Bill for the adjustments in Transmission Charges payments for the relevant quarter/Contract Year.

10.4.5.3 Interest / Late Payment Surcharge shall be payable in such a case from the date on which such payment had been made to the invoicing Party or the date on which any payment was originally due, as may be applicable. Any dispute with regard to the above reconciliation shall be dealt with in accordance with the provisions of Article 16.

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 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

- radioactive 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:

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 Schedule 6 of this Agreement. For the event(s) for which the Element(s) is/are deemed to be available as per Schedule 6 of this Agreement 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 by 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 State Commission, under which the Transmission License for the Project was granted if made applicable by such State 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 in:

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 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.

The successful bidder is required to submit the “Detailed BOQ and cost based on quoted transmission charges” to the Nodal Agency before signing of transmission agreement. Variation in any particular component due to change in law will be calculated as per provision of TSA.

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 the Nodal Agency's obligations as prescribed under this Agreement 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

   - 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;
   - 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 State Commission as per the provisions of Tamil Nadu Electricity Regulatory Commission (Licensing) Regulations, 2005 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 98%, for a period of six (6) consecutive months or for 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/Ultimate Parent Company 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. deleted.

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 Energy Department, Government of Tamil Nadu, STU 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 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 Energy Department, Government of Tamil Nadu, STU 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 any agency of GoTN for a period of 5 years.

13.3 <u>Procedure for Nodal Agency's non-fulfilment of Role</u>

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 Energy Department, Government of Tamil Nadu, STU 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, and any other Project related 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 State Commission may, as per the provisions of the Electricity Act, 2003, revoke the Transmission License of the 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, 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.

13.7.2 If Agreement is terminated on account of TSP's Event of Default, the TSP shall be entitled for Termination Payment equivalent to 65% of the valuation of Project Assets. Upon such payment, the Nodal Agency shall take over the Project Assets.

13.7.3 Valuation of Project Assets as mentioned above shall be taken up by the Nodal Agency by employing the services of a Valuation Agency registered with the Insolvency and Bankruptcy Board of India (IBBI).

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 TNERC 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 on 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 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 TNERC 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 Rs.6 Crores (Rupees Six Crore Only)**.**

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.

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 agree(s) 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 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 State 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 Tamil Nadu Electricity Regulatory Commission (Licensing) Regulations, 2005, 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 Chennai.

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 defence 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 State Commission.

16.4 Parties to Perform Obligations:

Notwithstanding the existence of any Dispute and difference referred to the State Commission as provided in Article 16.3 and save as the State 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;

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 issued by Ministry of Power dated 10.08.2021.

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. Deleted

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 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 KAVATHAMPALAYAM SS DEVELOPMENT LIMITED shall not be less than 100% (hundred percent) till COD of the Project and shall not be less than 51% (fifty one percent) up to a period of two (2) years after COD of the Project.

In case the Selected Bidder is a Bidding Consortium, then the members of such Bidding Consortium shall be allowed to divest its equity as long as they hold the minimum equity specified in (a) above. The minimum equity shareholding of Lead Member of Bidding Consortium shall not be less than twenty six percent (26%) up to a period of (2) two years after COD of the project.

For clarity, the equity shareholding to be held by the Bidding Company/Consortium is given in following table:

S. No.	Year from COD	Shareholding to be held by the Bidding Company/ Bidding Consortium	Minimum shareholding to be held by the lead member in Bidding Consortium	Shareholding which can be held by entity outside the Bidding Consortium
1	Up to COD	100%	26%	-
2	COD – 2nd anniversary	Minimum 51%	26%	49%

If the equity shareholding of Bidding Company/ Bidding Consortium is diluted (reduced) after two (2) years from the Commercial Operation Date (COD), the new entities acquiring the shares must have a minimum of two (2) years' experience in the Operation and Maintenance (O&M) of at least one 400 kV Substation or above. All necessary documents proving this experience must be submitted to the Nodal Agency.

The Selected Bidder shall only invest in the equity share capital of KAVATHAMPALAYAM SS DEVELOPMENT LIMITED. In case, any equity is to be infused by the Affiliate/Parent Company/Ultimate Parent Company, the same shall be done through the Selected Bidder only.

19.1.2 Deleted

19.1.3 Subject to Article 19.1.1, all transfer(s) of shareholding of KAVATHAMPALAYAM SS DEVELOPMENT LIMITED by the entity referred to in Article 19.1.1 above, shall be after prior written intimation to the Nodal Agency.

19.1.4 Deleted

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:

1. 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

2. 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 damages or the method of calculating the 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 Deleted

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 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 State 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.

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 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) …… [Insert Name of the Nodal Agency]

Address :

Attention
Email :
Fax. No. :
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), 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 three (3) years 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:

(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.

1. For and on behalf of TSP

……..

[Signature, Name, Designation and Address]

2. For and on behalf of .....[Insert name of the 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

: State Transmission Utility

……
[Signature]

.....
[Insert Name, Designation and Address of the Witness]

SCHEDULES

Schedule: 1

Project Description and Scope of Project

Scope of the Project:

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date
1	**Establishment of Kavathampalayam 765/400 kV Substation:** a) Supply and Erection of 765 kV bus with 4 dia comprising of following: • 2 nos. of feeder bays for connecting Ariyalur 765 kV DC feeders with Switchable Line Reactors. (240 MVAr -3×80 MVAr) • 2 nos. for the HV bay of ICTs. (765/400 kV, 500 MVA, Single PhaseICTs-7nos. Including 1 No. switchable Spare ICT) • 2 nos. bay for 240 MVAr (3×80MVAr) Bus Reactors with 1 No. Bay arrangement for Single Phase Switchable Reactor spare unit • 2 nos. of feeder bays for connecting Virudhunagar 765 kV DC feeders with Switchable Line Reactors,240 MVAr (3×80 MVAr) • 1No.bay arrangement for Single Phase Switchable Line Reactor spare unit for all 765 kV line feeders. b) Supply and Erection of 400 kV Bus with 5 dia comprising of following: • 2 nos. of feeder bays for connecting Edayarpalayam 400 kV DC Feeders. • 2 nos. of feeder bays for connecting Rasipalayam 400 kV DC Feeders • 2 nos. of feeder bays for connecting Palavady 400 kV DC Feeders • 2 nos. for the LV side of ICTs. • 2 nos. of spare bays with equipment	30 months

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date
	c) Supply and Erection of 765/400 kV, 500 MVA ICTs- 7 Nos. (2×1500 MVA ICT Bank + 1No. Single Phase 500 MVA Spare ICT) with Nitrogen fire quenching system and online gas and Tan Delta monitoring system. d) Supply and Erection of 765 kV, 3×80 MVAr single phase line Reactor with 1 no. spare-13 Nos. with Nitrogen fire quenching system and online gas and Tan Delta monitoring system. e) Supply and Erection of 765 kV, 3 x 80 MVAr single phase bus Reactor with 1 no. spare - 7 Nos. with Nitrogen fire quenching system and online gas and Tan Delta monitoring system.	
2	a) 400kV Multi Circuit (MC) line with Quad Moose conductor for making LILO of *Rasipalayam to Palavadi feeder (Circuit 1 and 2)* at Kavathampalayam 765/400 kV SS. b) OPGW (Optical Ground Wire) cable with 48 optical fibres shall be used as the optical fibre communication ground wire, including all necessary accessories, for the erection of 400 kV Multi circuit (MC) transmission lines in one of the designated tower peaks. c) An earth wire shall be provided for the 400 kV Multi circuit (MC) transmission lines in the other designated tower peaks.	30 months
3	**Establishment of Edayarpalayam 400/230-110 kV substation:** **A. Supply and Installation of 400kV Quad Moose ACSR Double Bus with 5 Nos Full Dia (2 Main Bays + 1 Tie Bay) comprising for the following Bays:** a) 2 Nos. of 400kV line bays to PGCIL, for terminating 400 kV DC Quad line from Pugalur PGCIL 400 kV HVDC station.	30 months

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date
	b)1 No. of 400 kV Line Bay to PGCIL, for terminating 400KV DC Quad line II from Myvadi PGCIL 400 kV SS. c) 2 Nos. 400 kV line Bays for terminating the 400 kV DC Quad line from proposed Kavathampalayam 765 kV AIS to the proposed Edayarpalayam 400 kV AIS d) 2 Nos. ICT HV Bays for 2 Nos 500 MVA, 400/230/33 kV 3 Phase ICTs. e) 2 Nos. of 400KV, 3 Phase 125 MVAR Bus reactor Bays. f) 1 No. ICT HV Bay for 1 No 200 MVA, 400/110/33 kV 3 Phase ICTs. **B. Supply and Installation of 400kV Quad Moose ACSR Double Bus with 3 Nos half Dia (1 Main Bay + 1 Tie Bay) comprising the following Bays:** a) 1 No. of 400 kV Line Bay to PGCIL, for terminating 400 kV DC Quad line I from Myvadi PGCIL 400 kV SS. b) 2 Nos. 400KV Spare feeder bays. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also, the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. c) 1 No. ICT HV Bay for 1 No. 500 MVA, 400/230/33 kV future 3 Phase ICTs. d) 2 Nos. ICT HV Bays for 2 Nos. 200 MVA, 400/110/33 kV 3 Phase ICTs. **C. Supply and Installation of 230kV Quad Moose ACSR Double Bus with Single Breaker scheme comprising the following Bays:** a) 2 Nos. 230 kV ICT IV Bays for 2 Nos 500 MVA, 400/230/33KV 3 Phase ICTs. b) 1 No. 230KV ICT IV Bay for 1 No Future 500 MVA, 400/230/33 kV 3 Phase ICT. The foundations for all equipment in these Bays shall be proposed without	

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date
	equipment due to rocky terrain. Also, the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. c) 5 Nos. 230 kV Line Bays with allied equipment for the following 230 kV Line Connectivity. • 230 kV Edayarpalayam – Selvapuram Feeder (Future 230 kV Edayparpalayam – Othakkalmandapam Feeder.I) • 230 kV Edayarpalayam – Othakkalmandapam Feeder.II • 230 kV Edayarpalayam – Ponnapuram Feeder (Future 230 kV Edayarpalayam – KongalNagaram Feeder). • 230 kV Edayarpalayam – Palladam Feeder. • 230 kV Edayarpalayam – Kalivelampatty Feeder d) 1 No 230 kV future Bay for Terminating the future 230 kV Line. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also, the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. e) 1 No 230 kV Bus Coupler Bay for an alternate feeding path for circuits and allows for Busbar switching without interrupting power supply to connected feeders. **D. Supply and Installation of 110kV Quad Moose ACSR Double Bus with Single Breaker scheme comprising the following Bays:** a) 3 Nos. 110 kV ICT IV Bays for 3 Nos 200 MVA, 400/110/ 33 kV 3 Phase ICTs. b) 7 Nos.110 kV Line Bays with allied equipment for the following 110 kV Line Connectivity. • 110 kV Edayarpalayam – Othakkalmandapam Feeder	

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date
	• 110 kV Edayarpalayam – Podanur Feeder • 110 kV Edayarpalayam – Arasur Feeder • 110 kV Edayarpalayam – Irugur Feeder • 110 kV Edayarpalayam – Kethanur Feeder • 110 kV Edayarpalayam – Poolavadi Feeder • 110 kV Edayarpalayam – Edayarpalayam Feeder (Existing 110KV Edayarpalayam AIS) c) 1 No 110 KV future Bay for Terminating the future 110 kV Line. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also, the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. d) 1 No 110 kV Bus Coupler Bay for an alternate feeding path for circuits and allows for Busbar switching without interrupting power supply to connected feeders. e) Supply and Installation of 500 MVA, 400/230/33 kV3 Phase ICTs - 2 Nos, with Nitrogen Injection Fire Prevention and Extinguishing Systems (NIFPES) Online DGA and Tan delta monitoring system. f) Supply and Installation of 200MVA, 400/110/33KV 3 phase ICTs - 3 Nos with Nitrogen Injection Fire Prevention and Extinguishing System (NIFPES), Online DGA and Tan delta monitoring system. g) Supply and Installation of 400kV, 3 phase 125MVAr Bus Reactor - 2 Nos. with Nitrogen Injection Fire Prevention and Extinguishing System (NIFPES) Online DGA and Tan delta monitoring system.	
4	a) 765kV Double Circuit (DC) line with Hexa zebra conductor from Kavathampalayam 765/400 kV SS to Ariyalur 765/400 kV SS. b) OPGW (Optical Ground Wire) cable with 48 optical fibers shall be used as the optical fiber communication ground wire, including all necessary	36 months

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date
	accessories, for the erection of 765 kV double circuit (DC) transmission lines in one of the designated tower peaks. c) An earth wire shall be provided for the 765 kV double circuit (DC) transmission lines in the other designated tower peaks.	
5	a) 400kV Double Circuit (DC) line with Quad Moose conductor from Kavathampalayam 765/400kV SS to Edayarpalayam 400-230-110 kV SS. b) OPGW (Optical Ground Wire) cable with 48 optical fibers shall be used as the optical fiber communication ground wire, including all necessary accessories, for the erection of 400 kV double circuit (DC) transmission lines in one of the designated tower peaks. c) An earth wire shall be provided for the 400 kV double circuit (DC) transmission lines in the other designated tower peaks.	36 months
6	**Bay Extension at Ariyalur 765 kV SS comprising of following:** Supply and Erection of 765 kV Bays as per Latest CEA guidelines: a) 765 kV Bay Extension for 2 nos. feeder bays in different Dias. b) 765 kV, 240MVAr Switchable Line Reactors (3×80MVAr) - 2 sets. (6Nos.) with Nitrogen Fire Quenching System and online Gas and Tan delta monitoring system	36 months

Note:

1. *TANTRANSCO shall provide land for establishment of the Kavathampalayam 765/400kV Substation at Kavathampalayam village Uthukuli Taluk, Tiruppur District and shall be handed over to TSP on as-is-where-is basis.*
2. *TANTRANSCO shall provide land for establishment of the Edayarpalayam Substation at Kallapalayam village, Sulur Taluk, Coimbatore District and shall be handed over to TSP on as-is-where-is basis.*

3. *The Land Area of approx. 99.16 acres for development of Kavathampalayam 765 kV SS and approx. 27.25 acres for development of Edayarpalayam 400 kV Substation shall be arranged within 6 months of TSA signing.*
4. *Land for development of Substations (Kavathampalayam and Edayarpalayam) shall be provided through Right-of-Use (RoU) basis by TANTRANSCO to the TSP, at an annual lease charge of Rs 1 per site per Year. This RoU agreement will be formalized and will remain in effect, co-terminus with the Transmission Service Agreement (TSA)*, until its Termination.

SPECIFIC TECHNICAL REQUIREMENTS FOR TRANSMISSION LINES

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/ guidelines as amended up to date and Ministry of Power (MoP) guidelines, as applicable, shall also be followed.

A.1.0 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.2.0 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.3.0 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.4.0 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.5.0 Transmission line shall be designed considering wind zones as specified in wind map given in National Building Code 2016, Vol.1. The Bidder shall also make its 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.6.0 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.7.0

a) In case of construction of transmission line of Voltage level of 400 kV and above, under crossing of the existing transmission line shall not be allowed. In the case where it is inevitable to under-cross the existing transmission line then TSP shall seek prior approval from Chief Electrical Inspector, CEA with detailed study ensuring that all statutory electrical clearances and Electric Field limit of 10 kV/m at 1 m and 1.8 m from ground level is not violated.

b) 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.

c) For power line crossing of 132 kV and 220 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.

d) 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.

e) For crossing railways, national highways and state highways, the Rules/Regulations of appropriate authorities shall be followed.

Note: The existing drawings provided above and in subsequent amendments to the RfP are as received from the developer of existing substation and provided only for reference. Bidders shall follow the RfP for scope of work. Actual site conditions may be different due to other schemes being executed or subsequent revisions by the developer. Therefore, Bidders are advised to visit the substation sites and acquaint themselves with the actual site conditions, layout, topography, infrastructure such as the requirement of roads, cable trench, drainage, boundary etc. and also the design philosophy.

Proposed Edayarpalayam 400 kV SS connectivity SS UTM Coordinate details

Edayarpalayam 400 KV SS	Kavathampalayam 765 kV SS	Pugalur PGCIL 400 kV SS	Myvadi PGCIL 400 kV SS
Zone-43P 728907.151 E 1207603.453 N	Zone-43P 767496 m E 1244646 m N	Zone- 43P 819424.00 mE 1213275.00 mN	Zone- 43 P 754648.00 mE 1172282.00 mN

A.8.0 (a) The relevant conductor configuration shall be as follows: -

Type of conductor: ACSR / AAAC / AL59

Basic parameters:

Transmission line	**ACSR Conductor specified**	**Equivalent AAAC conductor based on 53.5% conductivity of Al Alloy**	**Equivalent minimum size of AL59 conductor based on 59% conductivity of AL Alloy***	**Sub-conductor Spacing**
765 kV D/C (Hexa Bundle) Transmission Lines	Zebra: Stranding 54/3.18 mm-Al + 7/3.18 mm-Steel, 28.62 mm diameter 428 mm^2, Aluminium area, Maximum DC Resistance at 20°C (Ω/km): 0.06868 Minimum UTS: 130.32 kN	Stranding details: 61/3.19 mm, 28.71 mm diameter; 487.5 mm^2 Aluminium alloy area Maximum DC Resistance at 20°C (Ω/km) : 0.06815 Minimum UTS: 135.6 kN	Stranding details: 61/3.08 mm, 27.72 mm diameter; 454 mm^2 Aluminium alloy area Maximum DC Resistance at 20°C (Ω/km) : 0.0653 Minimum UTS: 108 kN	457 mm
400 kV D/C (Twin Bundle) transmission line	**Moose: Stranding**54/3.53 mm-Al +7/3.53mm-Steel, 31.77 mm diameter 528.5 mm^2, Aluminium area,	**Strandingdetails:**61/3.55 mm 31.95mm diameter; 604mm^2 Aluminiumalloyarea Maximum DC Resistance at	**Strandingdetails:** 61/3.31 mm 29.79 mm diameter; 525mm^2 Aluminiumalloyarea Maximum DC Resistance at	450 mm

Transmission line	**ACSR Conductor specified**	**Equivalent AAAC conductor based on 53.5% conductivity of Al Alloy**	**Equivalent minimum size of AL59 conductor based on 59% conductivity of AL Alloy***	**Sub-conductor Spacing**
	Maximum DC Resistance at 20°C (Ω/km): 0.05552	20°C (Ω/km):0.05506	20°C (Ω/km):0.0566	
400 kVD/C (Quad Bundle) transmission lines	**Moose: Stranding**54 /3.53mm-Al +7/3.53mm-Steel, 31.77 mm diameter 528.5 mm^2, Aluminium area, Maximum DC Resistance at 20°C (Ω/km): 0.05552	**Stranding details:**61/3.55 mm 31.95mm diameter; 604mm^2 Aluminiumalloy area Maximum DC Resistance at 20°C (Ω/km):0.05506	**Stranding details:** 61/3.31mm 29.79 mm diameter; 525mm^2 Aluminiumalloy area Maximum DC Resistance at 20°C (Ω/km):0.0566	457 mm

Note:

1. **To select any size above the minimum, the sizes mentioned in the Indian standard IS-398(part-6) shall be followed.*
2. *The transmission lines shall have to be designed for a maximum operating conductor temperature of 85 ^{o} C.*

A.9.0 The required phase to phase spacing and horizontal spacing for 765 kV and 400kV line(s) shall be governed by the tower design as well as minimum live metal clearances for 765 kV voltage level under different insulator swing angles. However, the phase to phase spacing for 765 kV and 400 kV lines shall not be less than 15 m and 8m respectively.

A.10.0 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:

a) Minimum live metal clearances for 765 kV line:

(i) Under stationary conditions

From tower body: For 765 kV D/C: 6.1 m
For 765 kV S/C: 5.6 m

(ii) Under swing conditions

Wind Pressure Condition	Minimum Electrical Clearance
a) Swing angle (25º)	4.4 m
b) Swing angle (55º)	1.3 m

b) Minimum ground clearance for 765 kV line: 18 m

c) Minimum mid span separation between earth-wire and conductor for 765 kV line: 9.0 m

b) Minimum live metal clearances for 400 kV line:

(i) Under stationary conditions

From tower body: 3.05 m

(ii) Under swing conditions

Wind Pressure Condition	Minimum Electrical Clearance
a) Swing angle (22º)	3.05 m
b) Swing angle (44º)	1.86 m

(iii) Minimum ground clearance for 400 kV line: 8.84 m

(iv) Minimum mid span separation between earth-wire and conductor for 400 kV line: 9.0 m

A.11.0 Shielding angle shall not exceed 10 deg for 765 kV D/C and 20 deg for400 kV D/C transmission line.

A.12.0 The Fault current for design of line shall be 50 kA for 1 sec for 765 kV and 63 kAfor1 sec for400 kV.

A.13.0 In case of 765 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) conductor type or any other suitable conductor type depending upon span length and other technical consideration.

In case of 400 kV and above 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 Aluminium Alloy Conductor Steel Reinforced (AACSR) or any other suitable conductor type depending upon span length and other technical consideration.

A.14.0 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 kms distance for direct earthing of both shield wires.If site condition demands, multiple earthing or use of earthing enhancement compound shall be used.

A.15.0 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.16.0 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 transmission line. In order to optimize the route, use of GATISHAKTI platform shall also be made.

A.17.0 Wherever, the 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 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 shall be maintained as 127 microns and that for plates and sections below 5 mm 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 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).

(d) Double coat 20 mm thick cement plaster shall be provided on all exposed concrete surface as well 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 50 mm 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 High Flood Level (HFL) 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 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, TRANTRANSCO 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 pipelines in vicinity of Transmission lines shall be taken in coordination with gas/ petroleum authorities.

A.22.0 The stringing of the transmission line in the forest area shall be carried out through drones.

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.

A.24.0 RoW width and Span in different terrain shall be as per Schedule VII of CEA (Technical Standards for Construction of Electrical plants and Electric Lines) Regulations 2022 and RoW guidelines issued vide CEA-PS-14-86/2/2019-PSETD Division dated 24.09.2024.

SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION

The proposed **765/400 kV** Kavathampalayam substation shall be Conventional **Air Insulated Substation (AIS) type** conforming to the requirements of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.

The **existing 765 kV Ariyalur Substation (SS)** will be an Air Insulated Substation (AIS) type. Its design and construction will generally comply with the requirements set out in the CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, including any subsequent amendments.

The proposed 400 kV Edayarpalayam SS shall be **AIS 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.

Other CEA Regulations/guidelines as amended up to date and MoP guidelines, as applicable, 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	Proposed 765/400 kV Kavathampalayam SS		Existing 765 kV Ariyalur SS
		765 kV System	400 kV System	765 kV System
1.	System Operating Voltage	765 kV	400 kV	765 kV
2.	Maximum voltage of the system (rms)	800 kV	420 kV	800 kV
3.	Rated Frequency	50 Hz	50 Hz	50 Hz
4.	No. of Phases	3	3	3
5.	Rated Insulation Levels			

Sl No	Description of parameters	Proposed 765/400 kV Kavathampalayam SS		Existing 765 kV Ariyalur SS
		765 kV System	400 kV System	765 kV System
i)	Lightning Impulse withstand voltage for (1.2/50 micro sec.) - for Equipment other than Transformer and Reactor - for Insulator String	2100 kVp 2100 kVp	1425 kVp 1550 kVp	2100 kVp 2100 kVp
ii)	Switching Impulse withstand voltage (250/2500 micro sec.) dry and wet	1550 kVp	1050 kVp	1550 kVp
iii)	One-minute power frequency dry withstand voltage (rms)	830 kV	630 kV	830 kV
6.	Corona Extinction Voltage	508 kV	320 kV	508 kV
7.	Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz	2500 micro-volts at 508 kV rms	1000 micro-volts at 266 kV rms	2500 micro-volts at 508 kV rms
8.	Minimum creepage distance for insulator string/ long rod insulators/ outdoor bushings	24800 mm (31 mm/ kV)	13020 mm (31 mm/ kV)	24800 mm (31 mm/ kV)
9.	Minimum creepage distance for switchyard equipment	20000 mm (25 mm/ kV)	10500 mm (25 mm/ kV)	20000 mm (25 mm/ kV)
10.	Max. Fault Current	50 kA	63 kA	50 kA
11.	Duration of Fault	1 sec	1 Sec	1 sec

Sl No	Description of parameters	400/230-110 kV Edayarpalayam AIS				
		400 kV System	**230 kV System**	**110 kV System**	**33 kV System**	**11 kV System**
1.	System Operating Voltage	400 kV	230 kV	110 kV	33 kV	110 kV
2.	Maximum voltage of the system (rms)	420 kV	245 kV	132 kV	36 kV	132 kV
3.	Rated Frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
4.	No. of Phases	3	3	3	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 kVp 1550 kVp	1050 kVp 1050 kVp	550 kVp 550 kVp	170kVp	75kVp
ii)	Switching Impulse withstand voltage (250/2500 micro sec.) dry and wet	1050 kVp	NA	NA	NA	NA
iii)	One-minute power frequency dry withstand voltage (rms)	630 kV	460 kV	230 kV	70 kV	28 kV
6.	Corona Extinction Voltage	320 kV	156 kV	NA	NA	NA
7.	Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz	1000 micro-volts (at 320 kV rms)	1000 micro-volts (at 156 kV rms)	NA	NA	NA
8.	Minimum creepage distance for insulator string/ long rod insulators/ outdoor bushings	13020 mm (31 mm per kV)	7595 mm (31 mm per kV	4092 mm (31 mm per kV	900 mm (25 mm/ kV)	300 mm (25 mm/ kV)
9.	Minimum Creepage distance for Switch yard Equipment	10500 mm (25 mm/ kV)	6125 mm (25 mm/ kV)	3300 mm (25 mm/ kV)	900 mm (25 mm/ kV)	300 mm (25 mm/ kV)
10.	Max. Fault Current	63 kA	50 kA	40 kA	25 kA	25 kA
11.	Duration of Fault	1 Sec	1 Sec	1 Sec	3 Sec	3 Sec
12.	Minimum Clearance					
a.	Phase to Phase	4000mm	3350mm	1700mm	1200mm	900mm

Sl No	Description of parameters	400/230-110 kV Edayarpalayam AIS				
		400 kV System	230 kV System	110 kV System	33 kV System	11 kV System
b.	Phase to Earth	3500mm	1700mm	1000mm	600mm	300mm
c.	Ground Clearnce	8000mm	5500mm	4600mm	3650mm	3650mm
d.	Sectional Clearance	10000mm	4270mm	3350mm	2750mm	2600mm
13.	System Neutral Earthing	Effectively Earthed	Effectively Earthed	Effectively Earthed	Effectively Earthed	Effectively Earthed

B.1.2 Switching Scheme

The switching schemes, as mentioned below, shall be adopted at various voltage levels of substation/switchyard:

Substation	765 kV side	400 kV side
New 765/400 kV KavathampalayamSS (AIS)	One and half breaker	One and half breaker
Existing 765 kV AriyalurSS (AIS)	One and half breaker	--
New 400 kV Edayarpalayam SS (AIS)	--	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 applicable for 765kV SS only.

(ii) Two transformers of 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 2 (two) numbers of bays.

(iv) All 400 kV Transmission line length is within 200 KM. Hence the line reactor is not proposed. Only the 125 MVAR 3 phase bus reactors are proposed.

(v) 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 the thermal limit at any point of bus bar.

(vi) Space Provision for Future Bus Sectionalizer:

One (1) set of future bus sectionalizer for 400 kV shall comprise 2 Nos. of bus sectionalizer bays with associated Circuit Breakers, Isolators and Current Transformers for both buses.

(vii) In one and half breaker scheme, both main bay and tie bay shall be completed for controlling a feeder. Further, all associated interconnection work shall also be in the present scope of TSP.

a.400 *kV Bay (One and half Breaker with Double bus) shall be* **I** *configuration and as follows:*

Configuration	**No of bays (1½ CB system)**
ICT –Tie- Line Bay (Full Dia)	03 (Three)
400 kV Bus Reactor – Tie – Line (Full Dia)	02 (Two)
ICT – Tie – Space provision for future Line *complete civil* works (Half Dia)	02 (Two)
Space provision for Future ICT Complete Civil works – Tie – Line (Half Dia)	01 (one)
Total (Full Dia)	05 (Five)
Total (Half Dia)	03 (Three)

b. 230 *kV Bay configuration (Single breaker with Double bus scheme) as follows:*

Configuration	**No of bays *(Double bus scheme)***
a. 230 kV ICT bay b. 230 kV Line Bay	02 (Two) 05 (Five)
c. 230KV Bus coupler bay	01 (One)
d.230KV Spare Line Bay with *complete civil works*	01 (one)
e.230KV ICT IV Bay with complete civil works	01 (one)
Total	10 (Ten)

c. 110 kV Bay configuration (Single breaker with Double bus scheme) as follows:

Configuration	**No of bays *(Double bus scheme)***
a. 110 kV ICT bay b. 110 kV Line Bay	03 (Three) 07 (Seven)
c. 110KV Bus coupler bay	01 (One)
d. 110KV Spare Line Bay with *complete civil works*	01 (one)
Total	12 (Twelve)

(i) Note: However, while using single phase ICTs, and Reactor the status of equipment in idle condition shall be reviewed. (i.e., in energized or de-energized condition). If they are kept in energized condition, separate bay provision has to be made.

(ii) <u>Kavathampalayam Substation:</u>

765 kV Bay configuration at Kavathampalayam Substation shall consist of 04 Nos. of full diameter (one diameter consist of two Nos. Main and associated Tie bays) for termination of ICT /Bus Reactor/Line bays.

400 kV Bay configuration at Kavathampalayam 765/400kV Substation shall consist of 05 Nos. of full diameter (one diameter consist of two Nos. Main and associated Tie bays) for termination of ICT /Bus Reactor/Line bays.

Further, all associated interconnection work shall also be in the present scope of TSP.

The following drawings/details of proposed Kavathampalayam 765 /400 kV Substation are attached with the RfP documents for further engineering by the bidder.

Sl. No.	Drawing Title	Drawing No./Details	Rev. No.
A.	Kavathampalayam 765 /400 kV **SS**		
1.0	Single Line Diagram	Attached	
2.0	FMB Sketch	Attached	

Note: The above list of Drawing is indicative. The same shall be used for formulation of Master Drawing List (MDL) in DREAMS System.

(iii) **<u>Existing 765 kV Ariyalur SS:</u>** "For Kavathampalayam to Ariyalur 765 kV D/C transmission line, both circuits shall be terminated in existing half diameters for which two numbers of main bays (Bay Nos.704 and 707 as shown in Ariyalur765 kV SS SLD Drawing TB-0-394-510-001 REV.5A) along with Two Numbers Line Reactor Bays shall be constructed under present scope at Ariyalur SS. Further, all associated interconnection work shall also be in the present scope of TSP."

(iv) In one and half breaker scheme, both main bay and tie bay shall be completed for controlling a feeder. Further, all associated interconnection work shall also be in the present scope of TSP.

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 capacity.

Sl. No	Description of bay	765/400 kV KavathampalayamSS		Existing 765 kV AriyalurSS
		765 kV	400 kV	765 kV
1.	Bus Bar	4000 A	4000 A	4000 A
2.	Line bay	3150 A	3150 A	3150 A
3.	ICT bay	3150 A	3150 A	N/A
4.	Reactor Bay	3150 A	NA	NA
5.	Bus Coupler Bay	NA	2000	2000

B.2.1 (765/√3)/(400/√3)/33 kV, Single Phase Autotransformer

500 MVA, (765/√3)/ (400/√3)/ 33 kV, 3-phase autotransformer with Nitrogen injection Fire prevention and extinguishing scheme and online DGA and usage of 33kV Tertiary winding for auxiliary supply shall conform to CEA's "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above voltage class)" available on CEA's website.

Spare 1-phase Transformer unit shall be placed and connected in such a way that the spare unit can be utilized to replace in case of fault in any unit of any of the transformer banks (including for future transformer banks) without physically moving it.

B.2.2 (765/√3) kV, Single Phase Shunt Reactor

(125MVAr, 420kV, 3-Phase Reactor with Nitrogen injection Fire prevention and extinguishing scheme and online DGA 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's website.

80 MVAr, 765/√3 kV, 1-Phase Reactor (including arrangement for 3-phase bank formation of 240 MVAr) 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.

Spare 1-phase Shunt Reactor unit shall be placed and connected in such a way that the spare unit can be utilized for all the bus and switchable line reactor banks (including for future reactor banks) without its physical movement.

Neutral Grounding Reactor and Surge Arrester for 765 kV Switchable Line Reactors (as applicable):

The neutral of the switchable line reactors (wherever provided) shall be grounded through adequately rated Neutral Grounding Reactors (NGR) to facilitate single phase auto-reclosure, provided that the NGR shall be provided with suitable bypass arrangement so that the switchable line reactor can be used as Bus Reactor as and when required. The neutral of bus reactor shall be solidly grounded.

NGR shall be oil filled or dry type air core for outdoor application. NGR shall conform to CEA's "Standard Specifications and Technical Parameters of Transformers and Reactors (66 kV and above Voltage Class)" as amended up to date. Technical parameters of NGR shall be as specified in Annexure-A of above-mentioned document.

The surge arresters (rated voltage of arrester in co-ordination with ohmic value of NGR shall be decided by the TSP) shall be provided and physically located between the neutral of shunt reactor (brought out at 145 kV class bushing) and neutral grounding reactor. The surge arresters shall be of heavy duty station class gapless Metal oxide (ZnO) type conforming in general to IEC-60099-4. Surge Arresters shall be hermetically sealed units, of self-supporting construction, suitable for mounting on structures.

The Ohmic value of NGR for each circuit at KavathampalayamSS end of 765 kV CBE-ARIYALUR 2xS/C line shall be 450 Ohm.

B.2.3 765 kV & 400 kV AIS Substation equipment (as applicable)

B.2.3.1 Circuit Breakers (AIS)

The circuit breakers and accessories shall conform to IEC: 62271-100, IEC: 6 2271-1 and shall be of SF6Type. The circuit breakers shall be of class C2-M2 (as per IEC) with regard to restrike probability during capacitive current breaki ng and mechanical endurance. The rated break time shall not exceed 40 ms f or 765 kV and 400 kV circuit breakers. 765 kV and 400 kV Circuit breakers sh all be provided with single phase and three phase auto reclosing. Each breake r would have two sets of trip circuits which would be connected to separate DC supplies for greater reliability. The Circuit breakers controlling 765 kV lines sha ll be provided either with pre-insertion closing resistor of about 450 ohms maxi mum with 9 ms insertion time or with Controlled Switching Device. The Circuit breakers controlling 400 kV lines shall be provided with pre insertion closing re sistor of about 400 ohms with 8 ms insertion time or Controlled Switching Devi ce (CSD) for lines longer than 200 km. The short line fault capacity shall be sa me as the rated capacity and this is proposed to be achieved without use of op ening resistors. The controlled switching device shall be provided in Circuit bre

akers of switchable line reactor and in Main and Tie circuit breakers of line wit h non-switchable line reactors, bus reactors and Transformers of voltage class 400 kV and above.

TECHNICALPARAMETERS:

420 KV Circuit Breaker:

Sl. No	Description	Requirement
1	Rated continuous current(A)at design Ambient temperature	3150
2	Rated Short circuit current breaking Capacity at rated voltage	63 KA with percentage DC Component as per IEC-56
		Corresponding to minimum Opening time under operating Conditions specified
3	Symmetrical interrupting capability (kAr ms)	63
4	Rated short circuit making current (kAp eak)	157.5
5	i)Short time current carrying capability for one sec.(kArms) ii)Out of phase breaking current capacity (kA rms)	63 15.75
6	Rated operating duty	0-0.3sec CO-3min CO Cycle
7	Re closing	Single Phase & three phase auto closing
8	First pole to clear factor	1.3
9	Rated line charging interrupting current at 90 deg.Leading power factor angleA (rms)	400
	(The breaker shall be able to interrupt the rated line charging current with test voltage Immediately before opening equal to the product of U/√3&1.4 as perIEC:62271-100	
10	Temperature rise over the design ambient temperature	As per IEC:62271-100
11	Total break time as per IEC (ms)	45
12	Rated break time as per IEC (ms)	40
13	Total closing time (ms)	Not more than150.
14	Operating mechanism	spring–spring

15	Max. difference in the instants of Closing/opening of contacts Within a pole Between poles(opening) Between poles (closing)	 2.5 3.3 5.0
16	The above voltage shall be at rated control voltage and rated operating and quenching Media pressures	
17	Trip coil closing Voltage	220 V DC with variation as specified
18	Noise level at base and upto 50m (distance from base of breaker)	140 dB(MAX)
19	Rated terminal load	As per IEC
20	Auxiliary contacts	Besides requirement of Specification, The bidder shall wire up 10No+10NC Contacts for future use of purchaser per phase
21	No of terminals in common control cabin et	All contacts & control circuits to be Wired out up to common control Cabinet plus 24 terminals exclusively for Purchaser's use.
22	Maximum allowable switching over voltage Under any switching condition	2.3 p.u

245 KV SF6 CIRCUIT BREAKER:

Sl. No.	ITEM	REQUIREMENTS
1	Rated voltage (KVrms) (nominal/max)	230KV
2	Highest System Voltage	245 KV
3	Frequency (Hz).	50
4	Neutral grounding	Solidly earthed
5	Continuous current rating	2000A
6	Type KV	Outdoor SF6
7	Mounting	
8	Number of Poles	3

9	Type of operation	Individually Operated single Poles
10	Height of concrete plinth	300 Mm
11	Minimum height of the lowest part of the support insulator from ground level(mm)	2550 mm
12	Operation mechanism	Spring–Spring(Motor operated spring charged)
13	Auto re closing duty	Single and three phase
14	Rated operating duty cycle	O-0.3Sec.-CO-3Min-CO as per IEC–62271-100
15	First pole to clear factor	1.3
16	Type of tripping	Tripfree
17	Maximum closing time(ms)	150 ms
18	Maximum total break time(ms) Atrated breaking capacity	Less than 60 ms
19	1.2/50 micro second impulse with stand voltage (dry)(KVp)	1050
20	1 minute power frequency with stand voltage (KVrms)(wet)	460
21	Max.radio interference voltage (microvolts) at 1.1 times maximum phase voltage	500
22	Minimum corona extinction voltage (KVrms)	176
23	Rated breaking current capacity: (i)Line charging at rated voltage at 90 degrees leading powerfactor	125 A
24	(ii)Short circuit current: (a) AC component(KA)	50 Corresponding to minimum

	(b) %DC component	Opening time as per IEC– 62271-100
25	Rated short circuit making current capacity (KA)	125
26	Permissible limit of temperature rise	As per IS applicable
27	Max.acceptable difference in the instants of closing/opening of contacts: (i) Within a pole(ms) (ii) Between poles(ms)	 3.3 5
28	Min.creepage distance of support insulator (mm)	6125
29	Short time current carrying capability for three seconds(KA)	50
30	Rating of auxiliary contacts	10 A at 220 V DC
31	Breaking capacity of auxiliary contacts	5 A DC with the circuit time constant less than 20msat the rated voltage.
32	Noise level at base and upto 50 metres	140 dB(max.)
33	Seismic acceleration	0.3g
34	Capacitance Current Switching Line Charging Cable Charging Capacitor Banks	Conforming to Class C1 as per IEC 62271-100
35	Mechanical Endurance Test	Conforming to class M1 as per IEC62271-100

132 KV SF6 CIRCUIT BREAKER

Sl.No.	ITEM	REQUIREMENTS
1	Rated voltage (KV rms) (nominal/max)	110 KV
2	Highest System Voltage	132 KV
3	Frequency(Hz).	50
4	Neutral grounding	Solidly earthed

5	Continuous current rating	2000A
6	Type KV	Outdoor SF6
7	Mounting	Hot dip galvanized / Epoxy painted steel support structure
8	Number of Poles	3
9	Type of operation	Gang operated poles
10	Height of concrete plinth	300 mm
11	Minimum height of the lowest part of the support insulator from ground level(mm)	2550 mm
12	Clearances (a)Centre to Centre distance between poles (b)Line to Ground	 1700 mm 4572 mm
13	Operation mechanism	Spring–Spring(Motor operated spring charged)
14	Auto reclosing duty	Single and three phase
15	Rated operating duty cycle	O-0.3Sec.-CO-3Min-CO as per IEC–62271-100
16	First pole to clear factor	1.3
17	Type of tripping	Trip free
18	Maximum closing time(ms)	150 ms
19	Maximum total breaktime(ms) At rated breaking capacity	Less than 60ms
20	1.2/50 micro second impulse withstand voltage (dry)(KVp) (i) To earth(KVp) (ii) Across open contacts with impulse on one terminal and power frequency voltage on Opposite terminal (KVp/KVrms)	 550 550
21	1 Minute power frequency with stand voltage (KV rms)(wet)	230

22	Rated breaking Current Capacity: (i)Line charging at rated voltage at 90 degrees leading power factor	50A
	Short circuit current: AC Component(KA) DC Component	40 Corresponding to minimum Opening time as perIEC–62271-100
24	Rated short circuit making current capacity (KA)	78.75
25	Permissible limit of temperature rise	As per IS applicable
26	Max.acceptable difference in the instants of Closing / opening of contacts: (i) Within a pole(ms) (ii) Between poles(ms)	5 10
27	Min.creepage distance of support insulator(m m)	3400
28	Short time current carrying capability for three seconds(KA)	40
29	Rating of auxiliary contacts	10 A at 220VDC
30	Breaking capacity of auxiliary contacts	5 A DC with the circuit time constant less than 20ms at the rated voltage.
31	Noise level at base and up to50metres	140 dB(max.)
32	Seismicacceleration	0.3g
33	Capacitance Current switching Line Charging CableCharging CapacitorBanks	Conforming to Class C1 as perIEC62271-100
34	MechanicalEnduranceTest	Conforming to class M1 as per IEC62271-100

B.2.3.2 Isolators (AIS)

The isolators shall comply with IEC 62271-102 in general.765 kV Isolator design shall be double break or vertical break or knee-type. 400 kV Isolators shall be double break type. All Isolators and earth switches shall be motor operated. Earth switches shall be provided at various locations to facilitate maintenance. Isolator rated for 400 kV shall be of extended mechanical endurance class - M2 as per IEC-62271-102. Main blades and earth blades shall be interlocked and interlock shall be fail safe type. 765 kV and 400 kV earth switch for line isolator shall be suitable for induced current switching duty as defined for Class-B.

PRINCIPAL TECHNICAL PARAMETERS OF 420 KV ISOLATORS

S. No.	TECHNICAL PARAMETERS	SPECIFICATION
1	Rated Frequency(Hz)	50
2	System Neutral Earthing	Effectively Earthed
3	No. of Phases(Poles)	3
4	Temperature Rise	As per relevant IS/IEC Publication
5	Safe Duration of overload: a)150% of rated current. b) 120%of rated current.	 5 Minutes 30 minutes
6	Suitable for: Rated voltage (KV rms) Frequency(Hz)	 420 50
7	Type of disconnect (AB)	Centre Break Horizontal
8	Rated normal current (Amp.rms)	3150
9	Rated short time withstand current of disconnects and earthing switches for one sec. duration (KA rms)	63
10	Rated dynamic with stand current(KA)	157.5
11	Rated short circuit current of Earth Break (KA peak).	100

12 12.1	**Rated insulation level:** 1.2/50 micro second lightning impulse with stand voltage (+ve or-ve polarity) a) To earth (KV_p) b) Across the open disconnect voltage applied to. i)One terminal, lightning impulse (KVp) ii) Opposite terminal, power frequency kVp)	 1425 1425 240
12.2	250/2500 micro seconds switching impulse with stand voltage a) To earth(KVp) b) Across terminals of open disconnect(KV rms) i) One terminal, switching impulse (kVp) ii) Opposite terminal subjected to power Frequency voltage (KVrms)	 1050 900 345
12.3	Rated 1 minute power frequency with stand voltage (KVrms) a. To earth KV(rms) b. Across terminals of open disconnect	 520 610
13	Minimum creepage distance of support and rotating insulator(mm)	10500
14 14.1	**Rated Mechanical Terminal Load:** Fort wo column disconnect a.Straight load(N) b.Across load(N)	 1600 530
14.2	For pantograph disconnect a.Straight load(N) b.Across load(N)	 2000 800
15	Rated magnetizing / capacitive current make and break capacity(Amp.rms)	0.7

16	Rated contact zone for P.G.isolator when fixed contacts are supported on flexible conductors. a) Horizontal deflection(Metres) b) Vertical deflection(Metres) c) Total amplitude of longitudinal movement with respect to support conductor(Meters)	 0.5 0.3 0.4
17	Phase to Phase spacing for installation (mm)	7000
18	Minimum clearance (mm): a)Phase to earth b)Phase to Phase	 3500 4000
19	Height of centre line of terminal pad above ground level(mm)	8200
20	Maximum radio interference voltage at1 MHz and 1.1 x rated phase to earth voltage (micro volts)	500
21	Minimum corona extinction voltage(KV rms)	320
22	Rating of auxiliary contacts.	10 A at 220V DC with breaking capacity of 2A DC with time constant not less than 20 milli second
23	Seismic level(Horizontal Acceleration)	0.3g
24	Operating time	12 sec.or less.

230 KV ISOLATORS

SL. NO	DESCRIPTION	230 KV,200OA Double Break Centre Rotating AB switches	
		WE	WOE
01	Manufacturer's Name & Address		
02	Manufacturer's Type and Designation	Double break,	
03	Standard to which equipment conforms	IS 9921 (Part I to V)	
04	Rated Voltage KV	230KV	

05	Maximum design voltage at which the isolator can operate KV	245 KV
06	Derating factor, if any, for specified test conditions	Unity
07	Current rating. Main Switch: Continuous current A Dynamic Current KA Three seconds short time Current Earth Switch: Short time current	2000A 100KA Peak 50KA rms – 3Sec 50KA rms – 3Sec
08	Safe duration of over load a. 150% of rated current b. 120% of rated current	 5 Minutes 15 Minutes
09	Capacity to interrupt magnetizing current A	15 A
10	Capacity to interrupt line charging Current A	5 A
11	Maximum Temperature : a) Of current carrying parts when carrying rated continuous current Degree C b) Ambient temperature (Maximum/Average for which (a) is applicable) Degree C	 Within the specified limits of value as per IS 9921 (Part – II) of 1982 Within the specified limits of value as per IS 992 (Part – II) of 1982
12	Number of Poles	Three
13	Operation : Main Switch ii) Earth Switch	Motor Operating Mechanism Bottom Operating Mechanism (Manual) — Motor Operating Mechanism ------
14	Number of breaks per circuit per pole i) Main Switch	3 per Circuit/ 2 per Pole
	ii) Earth Switch	3 per Circuit/1 per Pole
15	Total Length of break per pole (min. air dist., across the isolating distance) mm	3200 mm

16	Insulation Level : Dry one Min. power frequency withstand voltage i) Across isolating distance : KV rms. ii) To earth & between poles : KV rms. Wet one Min. Power Frequency Withstand Voltage. i) Across isolating distance : KV rms. ii) To earth & between poles : KV rms. 1.2/50 micro second impulse withstand voltage Across isolating distance : KV peak ii) To earth & between poles : KV peak	 530 KV rms 460 KV rms 530 KV rms 460 KV rms 1200 KV peak 1050 KV peak
17 a)	Switch contacts Type of Contacts for Main Switch/Earth Switch a) Type of contacts i) Fixed contacts ii) Moving contacts (Main switch) (Earth Switch) b) Material i) Fixed contacts ii) Moving contacts c) Area of contacts: Sq.mm i. Main Switch: ii. Earth Switch: d) Whether contacts are silver plated e) Thickness of silver coating f) Contact pressure g) No. of operation isolator can make without deterioration of contacts.	 Reverse loop Turn & Twist for Main Banging type for Earth HDEC Flat HDEC Tube 1150Sqmm 750Sqmm Yes, Silver Plated As required High pressure More than 1000 operations

18	Earthing Switch a. Rated Current Carrying Capacity - Amps Short time Current rating: 3Sec:KA Peak withstand: KA	 No rated Current but earth switch capacity to carry short time current only. 50 KA 78.75KA
19	Contact support i) Material and size of channel ii) Material and size of plate Clearance	 125x40x3 formed Channel (HDG) 10mm thick MS Plate (HDG)
20	i) Between Poles ii) Between Live Parts and Earth iii) Between live parts and ground iv) Between live parts when Switch is open: On the same pole Between adjacent pole. Between fixed contact and Blade in open position	 3500mm for a Phase spacing of 4000mm Equal to dry arcing distance of the insulator 5775mm 3200mm(approx) 4000mm(approx) 3200mm(approx)
21	Type of operating mechanism Manual operation Isolator. i. Main Switch: ii. Earth Switch: i)Type (Reduction gear type1:20) ii) Type of the operating handle hinge pin from ground level.	 Motor Operated Manual operated Worm and Work shaft Crank type handle 1100mm from ground level

22	Bearing Rotating Insulating stack & Operating Guide (i) Location Type (iii)Qty. of bearings (iv)Size. (v)Bearing No. b) Material and size of housing c) No. of bushes, joints, location & size d) Make of bearing	 Below Rotating Insulator Tapper Roller/Ball bearing 2 Nos below rotating stack 50mm ID 32210 MS Housing /Alu Gravity die cast 90mm OD 12 Nos Tandem Pipe clamps 16 ID Standard make

23	Operating GI pipe i) Tandem Pipe : Class of G.I. Pipe No. of Pipes Wall thickness of G.I. Pipe Dia of tandem G.I. Pipe : mm Size of shackle and screw No. of Clamp and material and size ii) Down Pipe : Class of G.I. Pipe Wall thickness Dia. of down Pipe Type of Joint : Between Rotating stool bearing and down pipe Between down pipe and operating mechanism	 B Class 32NB 3 Nos for WE & 2 Nos for WOE 3.1mm 32 mm NB GI Pipe Not required WE - 6 Nos MS Flat WOE - 6 Nos MS Flat 10mm thick 10mm thick B Class 50 NB GI Pipe 3.1mm 50 NB GI Pipe - 60.25 mm Universal Joint Vernier Flange
24	Type and Material of Isolator terminals	Pad type Copper terminal
25	Type and Material of Terminal Connectors	LM 6 Alu Alloy gravity die casting clamp Al Connector
26	Motor Details: Rated Voltage Rated Current Type of Motor Conforming to IS Other details	 3Ph 415V 1.2A Squirrel Cage Induction Motor IS325 1.0HP

27	Type of Interlock	Electrical interlock between Insulator and corresponding Circuit breaker. Mechanical interlock between main switch and earth switch
28	Type of Switch base	Rigid fabricated Base
29	Maximum torsional strength Kg.m	45 Kgm
30	Maximum bending strength that will be subjected on the post insulator on the opening and closing of isolator	400Kgs
31 32	Rated Mechanical terminal loads i) Straight Load NKg. ii)Cross Load NKg. Nuts and Bolts Size, Material and Grade in live parts. Size, Material and Grade in other parts. Whether hot dip galvanised Conforming to IS.	 82Kgs 28Kgs M10 and less than M10 are Stainless steel of AISI 304Grade M12 and above are HEG of grade 4.6 Yes. Hot dip galvanised/Electroplated IS 2629, IS2623 & IS 5358
33	Insulator base plate Material and size of elevator plate below fixed insulator Material and size of stud & bolts Material & size of rotating insulator base plate	 250x75x5mm thick HDG MS Plate/Formed Channel Not applicable 10mm thick MS HDG Plates
34	Phase spacing	4000mm
35	Radio interference voltage at 1 MHz and 1.1 x rated phase to earth voltage (micro Volts)	Not less than 1000 micro volts
36	Minimum corona extinction voltage (kV RMS)	156KV rms
37	Rating of auxiliary contacts.	10A

38	Terminal Stud : a) Dimensional Drawing No. b) Whether Horizontal or Vertical c) Diameter (mm) d) Length e) TPI, if threaded.	 As per Board drawing Vertical As per Board drawing As per Board drawing Not applicable
39	Seismic Acceleration	0.3G
40	Operating time	10 to 12 sec
41	Torque required to operate the group operating switch Kg.m	45 Kgm
42	Clamp Body : a) (i) Alloy Composition (ii) Plating, if any b) Bolts : (i) Alloy Composition (ii) Tensile Strength c) Types of Washers used d) Range of diameter of conductors that can be received. e) Maximum temperature rise when carrying rated current at 45 Degree C ambient temperature. f) Weight of each type of clamp Kg.	 LM 6 Alu Alloy Not applicable MS Hot dip galvanized 300N Spring /Flat washers Suitable for ACSR Twin Moose conductors/3"' IPS Al tube Not more than 45Deg C 1.0Kg/4.0Kgs Approx
43	Gear Details Make Type Rating Quantity Other Details.	Standard reputed make Worm/Worm shaft/Spur 80Kg.M 1 Set Double reduction

44	Indication mechanism for position of switch Control Cabinet: Materials Thickness Degree of protection Cable gland Type Size No Whether removable gland provided	 M.S.Sheet 3mm thick IP 55 Double Compression type 25mm and 19mm 1 No/ 2Nos Yes. Provided	
45	Switch Design: Rotating/Tilting/Lifting Insulator Horizontal/Vertical Break	Rotating Vertical	Rotating Horizontal
46	Operating mechanism Reciprocating/Torsional	Reciprocating	
47	Base: Constructional feature Size of steel section used (mm) Overall size (mm) d) Total weight (Kg)	 Fabricated with Steel 2Nos, 125x65x 8mm thick 125x275x3600mm (approx) 98Kgs + 5%	
48	Actual Dimensions of switch per phase	5500x3600x400mm	
49	Weight of the Isolator/Pole	202 Kgs + 5%	180 Kgs + 5%
	Weight of the Isolator (Without Insulator) Weight of Insulator	886 Kgs + 5% 631 Kgs + 5%	732 Kgs + 5% 631 Kgs + 5%
50	Dimensions of Switch L X B X H m	 8.5 x 3.8 x 5.7 m (approx.)	
51	Shipping dimensions of largest package Metres	As per drawings	
52	No. of AB Switches fabricated per shift per day No. of Shifts.		

B.2.3.3Current Transformers (AIS)

Current Transformers shall comply with IEC 61869 in general. All ratios shall be obtained by secondary taps only. Generally, Current Transformers (CT) for 765 kV and 400 kV shall have six cores (four for protection and two for metering). The burden and knee point voltage shall be in accordance with the requirements of the system including possible feeds for telemetry. The accuracy class for protection core shall be PX and for the metering core it shall be 0.2S. The rated burden of cores shall be closer to the maximum burden requirement of the 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 and less than 10 for CTs of 765 kV voltage class.

B.2.3.4Capacitive Voltage Transformers (AIS)

Capacitive Voltage Transformers 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 whereas the Capacitance of CVT for 765 kV shall be 8800 pF. 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 (AIS)

624 kV, 336 kV Station High (SH) duty gapless type Surge arresters with thermal energy (W_{th}) of minimum 13 kJ/kV, 12 kJ/kV conforming to IEC 60099-4 in general shall be provided for 800 kV, 420 kV systems respectively. Other characteristics of Surge arrester shall be chosen in accordance with system requirements. Surge arresters shall be provided at line entrances near Transformers and Reactor 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.2.4 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 IEC 61850 protocol with RTU/SAS/IEDs of different OEMs. All numerical relays shall have built in disturbance recording feature.

The protection circuits and relays of the 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

765 kV & 400 kV lines shall have Main-I and Main –II and shall be Phase Segregated Line current Differential protection with built-in Distance protection function (a minimum of three forward zones and one reverse zone selectable distance protection scheme with carrier aided inter-tripping feature). Differential relay for Main I & II current differential protection with built-in Distance protection function (a minimum of three forward zones and one reverse zone selectable distance protection scheme with carrier aided inter-tripping feature) at remote end sub-station shall be provided by the TSP. The associated power and control cabling and integration with SAS at remote end sub-station shall be provided by Transmission service provider. Main II shall be also have numerical Line Current differential with in build 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.

Line Current Differential relay (with in-built distance protection feature) as Main–I and Main-II shall be provided at both ends for short lines (line length below 10km). Differential relay for main I & main II at remote end shall be provided by the TSP. The associated power and control cabling and integration with SAS at remote end shall be provided by Transmission service provider.

Further, all 765 kV & 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 765 kV and 400 kV lines shall also be provided with two stages over voltage protection. The over voltage protection and distance to fault locator may be provided as in-built feature of Main-I and Main-II protection relays.

The Main-I and Main-II protection relays shall be fed from separate DC sources and shall be mounted in separate panels.

For765 kV & 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.

In case of loop in loop out of transmission lines, the existing protection scheme shall be studied and suitable up-gradation (if required) shall be carried out.

The Numerical relay shall be equipped with sufficient binary output contacts for the protection scheme implementation.And equipped with sufficient numbers of programmable of opto isolated input and programmable potential free outputs with wetting voltage for digital inputs for field programmable to 48V/110V/220V DC.

b) Auto Transformer Protection

Protection scheme shall be comprised of 2 Nos. numerical multifunction protection relays i.e. One for Group-A Protection and another for Group-B Protection. Group-A Numerical multifunction protection relays of different make or different hardware platform and protection algorithm with respect to Group-B numerical multifunction protection relay.

These shall have the following protections in main I & main II relays. (But from different Make).

i) Numerical Differential Protection – Low impedance
ii) Numerical Restricted Earth Fault Protection – Low Impedance
iii) Numerical directional Back-up 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 Thermal Overload Protection

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) 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
iv) Neutral Displacement Protection

Protection scheme shall be comprised of 2 Nos. numerical multifunction protection relays i.e. One for Group-A Protection and another for Group-B

Protection. Group-A Numerical multifunction protection relays of different make or different hardware platform and protection algorithm with respect to Group-B numerical multifunction protection relay.

Wherever CT and VT are wired to the numerical relays, the relay should be provided with built in supervision of CT and VT respectively.

For application in 400KV/765KV diameter bays, the CT inputs of main breaker and tie breaker bays shall be wired separately to protection relays and the vector sum of the CTs shall be calculated internally in the protection relays.

Reactor Bushing CTs to be used for differential and REF Protection.

For Backup impedance protection use the CTs of the main breaker and tie breaker in order to provide protection for the tee section of this diameter also.

The Main CT and Tie CT shall be wired to separate CT modules so as to arrive at the vector sum of these CTs internally in the respective numerical relays.

Besides these, reactors shall also be provided with Buchholz relay, Magnetic Oil Gauge (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 765 kV & 400 kV buses. Duplicated bus bar protection is envisaged for 765 kV and 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 future bays envisaged i.e. input / output modules for future bays for the bus section under present scope shall also be provided.

Bus-bar protection scheme shall include one overall check zone protection in addition to single/multiple zones specified.

Also include provision for protection IN/OUT for each zone and check zone and be transient free in operation.

The relay shall incorporate dynamic bus replica and provide necessary end zone fault protection depending on the bus bar protection CT’s location.

Separate IN/OUT switch selection for Bus-bar and LBB protection function.

Bus Bar protection system for new substation shall be de-centralized (distributed) type.

In case, the bus section is provided, then each side of bus section shall have separate set of bus bar protection schemes.

Peripheral Units (Pus) shall be provided by the respective TSP.

For existing substations, the existing bus bar protection shall be augmented as per requirement and integration of new bays to existing system shall be in the scope of TSP.

e) Local Breaker Back up Protection

This shall be provided for each 765 kV & 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 with retrip function 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 765 kV & 400 kV switchyard, if spare bay of half diameter is identified as future, Tie CB relay panel shall be with Auto-reclosure feature.*

B.2.5 Substation Automation System

(a) For all the new substations, 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 220 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) from 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 the 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 the existing substations with a Substation automation system (SAS), augmentation of existing SAS and integration to existing system shall be done for bays under the present scope.

In the 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 Synchronisation Equipment

Time Synchronization Equipment complete in all respects including antenna, cable and processing equipment required to receive time signal through GPS/NavIC 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 the operation and maintenance of substations as described below shall be provided at the new substation. In existing substation, these facilities have already been provided and will be extended/ augmented as per requirement.

B.3.1 ACand DC power supplies

For catering the requirements of three phase and single phase AC supply and DC supply for various substation equipment (for present and future scope), the following arrangement is envisaged:-

i) For LT Supply at each new Substation, two (2) Nos. of LT Transformers (minimum 800 kVA for substations with highest voltage rating as 765 kV) shall be provided which shall be fed from two independent sources as per the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007.

Metering arrangement with Special Energy Meters (SEMs) shall be provided by TSP at 33 kV tertiary of Transformer for drawing auxiliary supply at new substation. Such SEMs shall be provided by STU at the cost of the TSP. Accounting of such energy drawn by the TSP shall be done by RLDC/RPC as part of Regional Energy Accounting.

Additionally, Active Energy Meters may be provided at the same point in the 33 kV tertiary of Transformer by local SEB/DISCOM for energy accounting.

ii) 2 sets of 220 V battery banks for control and protection and 2 sets of 48 V battery banks for PLCC/ communication equipment shall be provided at each new Substation. Each battery bank shall have a float-cum-boost charger.

At new substation, 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. 48 V DC can be achieved from 220 V DC battery bank using adapter, if so desired by TSP, without compromising backup time.

iii) Suitable AC and DC distribution boards and associated LT Switchgear shall be provided at new substation.
For new substation, following switch boards shall be considered with duplicate supply with bus coupler/ sectionalizer and duplicate outgoing feeders except for Emergency lighting distribution board which shall have only one incoming feeder:

a) 415 V Main Switchboard – 1 No.
b) AC distribution board – 1 No.
c) Main lighting distribution board – 1 No.
d) Emergency lighting distribution board – 1 No.
e) 220 Volt DC distribution board – 2 Nos.
f) 48 Volt DC distribution board – 2 Nos.

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).

iv) At new Substation, one No. of DG set (minimum 500 kVA for substations with highest voltage rating as 765 kV) shall be provided for emergency applications.

v) At new substation, sizing of battery and battery chargers shall be done based on the number of bays specified (including future bays).

vi) For substation extensions, existing facilities shall be augmented as required.

B.3.2 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 from time to time.

Further, adequate water hydrants and portable fire extinguishers shall be provided in the substations. The main header of the firefighting system shall be suitable for extension to bays covered under the future scope; necessary piping interface in this regard shall be provided.

At existing substations, the fire-fighting systems as available shall be extended to meet the additional requirements.

B.3.3 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.
Necessary equipment for monitoring bay elements of the TSP at existing ss shall 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 & above Voltage Class) as amended up to date available on CEA website.

B.3.4 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.

The 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 luminaries.

B.3.5 Control Room

For the new substation, substation control room shall be provided to house substation work stations 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 the control room for all the future bays.

At existing substations, the adequacy of size of control room shall be ascertained and the same shall be augmented as per requirement.

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.3.7 Visual Monitoring System (VMS) for watch and ward of substation premises:

Visual Monitoring System for effective watch and ward of substation premises shall cover all the transformers and reactors, all other major AIS Equipment (such as CB, isolators, CT, CVT, SA etc. as applicable), GIS bays, panel room, all the gates of switchyard and all entry and exit points of control room building and accordingly the location of cameras shall be decided. In addition to the gates of the switchyard, the cameras shall also be located around the boundaries at suitable locations. The camera shall be high definition color CCD camera with night vision feature. The VMS data partly/completely shall be recorded (minimum for 15 days) at least @25fps (or better) and stored on network video recorder. 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 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.

Advisory on deployment of CCTV issued by Ministry of Electronics and Information Technology (MEITY) shall be followed.

At existing substations, the visual monitoring system if available shall be augmented as per existing or better specification as required.

B.4.0 General Facilities

a) Line Gantry/Towers are envisaged for bays under the present scope only. However, for adjacent future line bay, gantry/tower shall be designed for extension (considering hexa conductors for 765 kV and quad conductors 400 kV future lines) wherever applicable.

b) Bay extension works at existing substation shall be executed by TSP in accordance with the requirements/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 gm/m2, however, for coastal/ creek regions, it shall be at least 900 gm/m^2 (if applicable).

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. 3150 A.

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 HFL, it shall be ensured that there is no seepage or leakage or logging of water.

h) As per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022/CEA Manual on Transmissions Planning

criteria 2023, line approaching substation shall normally be perpendicular to the substation boundary for a stretch of 2-3 km. Accordingly, TSP shall ensure that line terminations at substations are arranged in a manner to avoid hindrance to future line terminations at the substations.

B.5.0 EXISTING ARIYALUR 765 KV SUBSTATION:

The following drawings/details of existing substation are attached with the RfP documents for further engineering by the bidder.

Sl. No.	Drawing Title	Drawing No./Details	Rev. No.
A.	**Ariyalur 765 KV SS**		
1.0	Single Line Diagram	TB-0-394-510-001	5A
2.0	Section Layout	TB-0-394-316-003	05
3.0	Earthmat Layout	TB-0-394-316-007	03
4.0	Substation Automation System (SAS)	KY8E-SA	D
5.0	Visual Monitoring System	TB-0-394-316-005	02

Note: The existing drawings provided above and in subsequent amendments to the RfP are as received from the developer of existing substation and provided only for reference. Bidders shall follow the RfP for scope of work. Actual site conditions may be different due to other schemes being executed or subsequent revisions by the developer. Therefore, Bidders are advised to visit the substation sites and acquaint themselves with the actual site conditions, layout, topography, infrastructure such as the requirement of roads, cable trench, drainage, boundary etc. and also the design philosopy

Proposed Coimbatore 765 KV Substation Connectivity SS UTM Coordinate details

Coimbatore 765 KV SS	Ariyalar 765 KV SS	Virudhunagar 765 KV SS	Edayarpalayam 400 KV SS	Rasipalayam 400 KV SS	Palavadi 400 KV SS
Zone – 43P 728907.151 E 1207603.453 N	Zone -44p 281597 mE 1317852mN	Zone -44p 170598 mE 1046543 mN	767496 mE 1244646 mN	772794 mE 1198975 mN	179568 mE 1346566 mN

SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION

1. KAVATHAMPALAYAM 765/400kV SS

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, CEA (Cyber Security in Power Sector) Guidelines, 2021, CERC Guidelines on “Interface Requirements” 2024 and all above documents as amended from time to time.

-

The communication services viz. SCADA, AGC (wherever applicable), VoIP, AMR and PMU 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

The complete InSTS communication system commissioned by TSP under the RFP shall be the asset of InSTS and shall be available for usage of InSTS requirements as suggested by STU from time to time.

In order to meet the requirement for grid management and operation of substations, Transmission Service Provider (TSP) shall provide the following**:**

C.1.0 Requirement for KavathampalayamSubstation

(I) TSP shall supply, install & commission FODP with minimum 240 Fiber capacity along with panel and approach Cable (48F each except LILO portion of Kavathampalayamwhere 24Fx2 approach cable shall be required) 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 & commission the following communication equipment for establishment of Kavathampalayam765/400KV SS:

1. 2 Nos. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 765kV lines
2. 2 Nos. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 400kV lines
3. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 765kV and 400kV lines.
4. 1 No. Hybrid EPAX with necessary interfaces, necessary cables and associated materials, VoIP phones (Minimum of 3 nos) and necessary analog telephones to implement the voice communication requirement for Kavathampalayam SS and for its voice communication with remote end substations and communication network. Necessary point for telephone interface for VoiP and analog phones shall be provided in each kiosk/ Switch yard panel room.
5. Full fledged repeater station comprising Necessary Optical Amplifiers with necessary cables and associated materials shall be installed for optical communication links between Kavathampalayamto Ariyalur as well as forKavathampalayamto Virudhunagar 765 kV feeder / Lines. The suitable 48V DC Power Supply system complete including chargers, battery banks and DCDB with associated materials and cables shall be provided for communication equipment. The location repeater station for optical communication links shall be decided during project execution stage.
6. TSP shall supply essential spares where each set of essential spares comprising each type of hardware modules for FOTE Equipment and for repeater station OLTE Equipment separately for 400 KV lines application and for 765 KV Lines application. Quantity of number of sets spares shall be as per detailed tender specification.
7. TSP shall supply essential spares where each set of essential spares comprising each type of hardware modules for Digital Tele Protection Coupler Equipment separately for 400 KV lines application and for 765 KV Lines application. Quantity of number of sets spares shall be as per detailed tender specification.
8. TSP shall supply essential spares where each set of essential spares comprising each type of hardware modules for Hybrid EPAX and associated hardware devices. Quantity of number of sets spares shall be as per detailed tender specification.
9. TSP shall supply essential spares comprising each type of hardware modules for FOTE Equipment, Hybrid EPAX, DTPC and associated hardware devices. Quantity of spare shall be as per detailed tender specification.

Necessary direction shall also be provided in the FOTE for Greenko Generators, however required optical interfaces shall be provided by Greenko at the time of connectivity. The suitable DC Power Supply and backup to be provided for communication equipment.

Necessary optical interfaces to be provided by the TSP in the FOTE of RasipalayamSS and PalavadiSS as per link budget requirement after change of fiber length due to LILO at KavathampalayamSS.

(III) Location of FODPs and FOTEs shall be as per engineering approval during project stage.

DTPCs housed in panels for designated lines shall be located in the respect Kiosk/ SPR.

(IV) 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. NMS complete with life time license covering all the network elements in this project, necessary hardware, softwares, furniture etc with neccessary NBI interface supporting the various features and functions as per UNMS requirements shall be provided in case there is no proper NMS with NBI in TANTRANSCO for the offered FOTEs.

(V) TSP shall supply, install & commission Firewall in redundant mode (1+1) in line with the specification attached at **Annexure F.1**.

(VI) The maintenance of all the communication equipment and software thereof including FOTE, FODP, PMU, approach cable, DCPS along with Battery Bank & Firewall shall be the responsibility of TSP.

C.1.1 FOTE Requirement for Virudhunagar Substation

TSP shall supply, install & commission the following communication equipment for Virudhunagar 765 kV Substation end

1. 1 No. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 765kV lines
2. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 765kV lines.

3. 1 No. Self sustaining VOIP gate way with necessary interfaces, necessary cables and associated materials, VoIP phones (Minimum of 2 nos} and necessary analog telephones to implement the voice communication requirement for its voice communication with remote end substations and communication network.

4. 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 integration 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).

C.2.0 FOTE requirement at Ariyalur 765 kV SS.

TSP shall supply, install & commission the following communication equipment for **at Ariyalur** 765 kV Substation end

1. 1 No. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 765kV lines
2. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 765kV lines.
3. 1 No. Self sustaining VOIP gate way with necessary interfaces, necessary cables and associated materials, VoIP phones (Minimum of 2 nos) and necessary analog telephones to implement the voice communication requirement for its voice communication with remote end substations and communication network.

4. 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 integration with the existing FOTE for onwards data transmission.

(i) TSP shall supply, install & commission FODP with minimum 144 Fiber capacity 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.

(ii) Location of FODPs and FOTEs shall be as per engineering approval during project stage. The FOTE under present scope shall be integrated by TSP with the existing FOTE at control room of AriyalurSS which shall be communicating with respective control center. 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 integration with the existing FOTE for onwards data transmission.

(iii) 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 & 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.

(vi) The maintenance of all the communication equipment and software thereof including FOTE, FODP, approach cable, PMU, DCPS alongwith Battery Bank shall be the responsibility of TSP.

C.2.1 **Development of Kavathampalayam765 kV SS along with Transmission line up to Existing Ariyalur 765 kV SS:**

For Multi Circuit Tower Configuration: Two (2) No. OPGW cable each containing 48 Fibres(48F) to be installed & commissioned by the TSP on both the Earth wire peaks

For Double Circuit Tower configuration 1 No. OPGW cable each containing 48 Fibres (48F) to be installed & commissioned on one earth wire peak and conventional earth wire on other E/W peak.

The TSP shall install 48 F OPGW cables from gantry of Kavathampalayam SS to gantry of Ariyalur 765 kV SS with all associated hardware including Vibration Dampers, mid-way & gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at Ariyalur 765 kV SS. To meet link budget

requirement of Kavathampalayam765 kV SS to Ariyalur 765 kV SS (including service loops and sag etc.).TSP shall finalize the location of repeater station 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 & repeater equipment & items associated with repeater shelter shall be the responsibility of TSP.

C.3.0 Kavathampalayamto Edayarpalayam 400 kV D/C line

1. On Kavathampalayamto Edayarpalayam 400 kV D/C line, TSP shall supply,install & commission One (1) no. OPGW cable containing 48 Fibres (48F) on one E/W peak and conventional earth wire on other E/W peak.

2. The TSP shall install this OPGW from gantry of KavathampalayamPS up to the gantry of EdayarpalayamSS with all associated hardware including Vibration Dampers, midway & gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at end Substations. The transmission line length is __ kms (approx.) where repeater is not required to meet link budget requirement of Kavathampalayamto Edayarpalayam link. However, after survey link length may exceed to __ kms. To meet link budget requirement of Kavathampalayamto Edayarpalayam link (including service loops and sag etc.) 1 set of FOTE at repeater station to be provided by TSP.

3. TSP shall finalize the location of the repeater station depending upon the actual site conditions. Further TSP shall comply to the requirements mentioned as per Appendix-F.1 IV.

4. Maintenance of OPGW Cable, OPGW Hardware & repeater equipment & items associated with repeater shelter shall be the responsibility of TSP.

V. TSP shall supply, install & commission the following communication equipmentfor at Edayarpalayam 400 kVSubstation end

1 2 Nos. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 400kV lines at Edayarpalayam 400kV SS.

2 Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 400 kV lines.

3 1 No. Self sustaining VOIP gate way with necessary interfaces, necessary cables and associated materials, VoIP phones (Minimum of 2 nos) and necessary analog telephones to implement the voice communication requirement for its voice communication with remote end substations and communication network.

4 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 integration 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).

C.4.0 LILO of 400 kV Rasipalayam – Palavadiline at Kavathampalayam SS

On LILO of 400 kV Rasipalayam – PalavadiD/C line at Kavathampalayam SS, TSP shall supply, install & commission OPGW and earthwire as per Tower Configurations:

I. For Multi Circuit Tower Configuration: Two (2) No. OPGW cable each containing 48 Fibres (48F) to be installed & commissioned by the TSP on both the Earth wire peaks
II. For Double Circuit Tower configuration (for both 48 F Loop In and Loop Out portion): Two No. OPGW cable containing 48 Fibres (48F) on each earth wire peak for both Loop In and Loop Out Lines.

The TSP shall install 48 F OPGW cables from gantry of Kavathampalayam SS up to the LILO tower with all associated hardware including Vibration Dampers, mid-way & gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at Kavathampalayam SS. The LILO line length is __ kms (approx.) After LILO, fiber length for links Palavadi to Kavathampalayamand Kavathampalayamto Rasipalayam may exceed to __kms. To meet link budget requirement of Palavadi to Kavathampalayamand Kavathampalayamto Rasipalayam link (including service loops and sag etc.) 1 set of FOTE at repeater station to be provided by TSP. TSP shall finalize the location of repeater station 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 & repeater equipment & items associated with repeater shelter shall be the responsibility of TSP.

C.4.1. TSP shall supply, install & commission the following communication equipment for at Rasipalayam 400 kV Substation end

i. 1 No. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 400 kV lines
ii. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 400 kV lines.
iii. 1 No. Self sustaining VOIP gate way with necessary interfaces, necessary cables and associated materials, VoIP phones (Minimum of 2 nos) and necessary analog telephones to implement the voice communication requirement for its voice communication with remote end substations and communication network.
iv. 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 integration 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).

C.4.2 TSP shall supply, install & commission the following communication equipment for **at Palavadi 400 kV** Substation end

i. 1 No. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 400 kV lines
ii. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 400 kV lines.
iii. 1 No. Self sustaining VOIP gate way with necessary interfaces, necessary cables and associated materials, VoIP phones (Minimum of 2 nos) and necessary analog telephones to implement the voice communication requirement for its voice communication with remote end substations and communication network.
iv. 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 integration 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).

C.5.0 Specific Requirement for Phasor Measurement Units (PMUs)

TSP shall supply, install & commission required No. of Phasor Measurement Units (PMUs) as per the “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. The PMUs shall be provided with LAN switch and shall connect with LAN switch of control room of respective substations/ generating stations with Fiber 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 & 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

Optical Repeater Requirements

1.1.1 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 Earth wire peak with OPGW Hardware & mid-way Joint Boxes etc. of the line crossing the main line 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 / MPLST-TP of suitable capacity as per engineering approval) with suitable interfaces required for link budget of respective link.

OR

1.1.2 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 Earth wire 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 / MPLST-TP of suitable capacity as per engineering approval)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

1.1.3 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 / MPLST-TP of suitable capacity as per engineering approval)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.

1.1.4 Whereever fibre optic line length exceeds the sufficient driving capacity of FOTE equipment at both ends of transmission line, necessary optical repeater station is to be provided at intermittent location ie at suitable

sub-station of TANTRANSCO or other locations as mentioned above for which TSP shall provide necessary communication equipment, Auxiliary power supply system with associated materials. These material are deemed to be under the tender scope. Necessary engineering drawing approval shall be obtained from TANTRANSCO / concerned plant owners of the location for optical repeater station equipment's proposed to be located in TANTRANSCO station

Annexure-F.1

Next Generation Firewall (NGFW)

TSP shall provide 2 NGFW one in Main & another in Standby mode having electrical Ethernet interfaces/ports and placed between FOTE & 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 & 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**.

The specification of the NGFW is subject to the directives, recommendations, guidelines of concerned authorities such as CEA, CERT-TRANS etc as and when issued shall be applicable to the above NGFW specification.

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) & Distributed Denial of Service (DDoS) prevention, Port Block/ Allow, rules/ policies for block/allow, IP (Internet Protocol) & Media Access Control (MAC) spoofing protection, threat detection, Intrusion Prevention System (IPS), Anti-Virus, Anti-Spyware, Man InThe Middle (MITM) attack prevention.

2. The proposed firewall shall be able to handle (alert, block or allow) unknown /unidentified applications e.g. unknown TCP & 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 & 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 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.

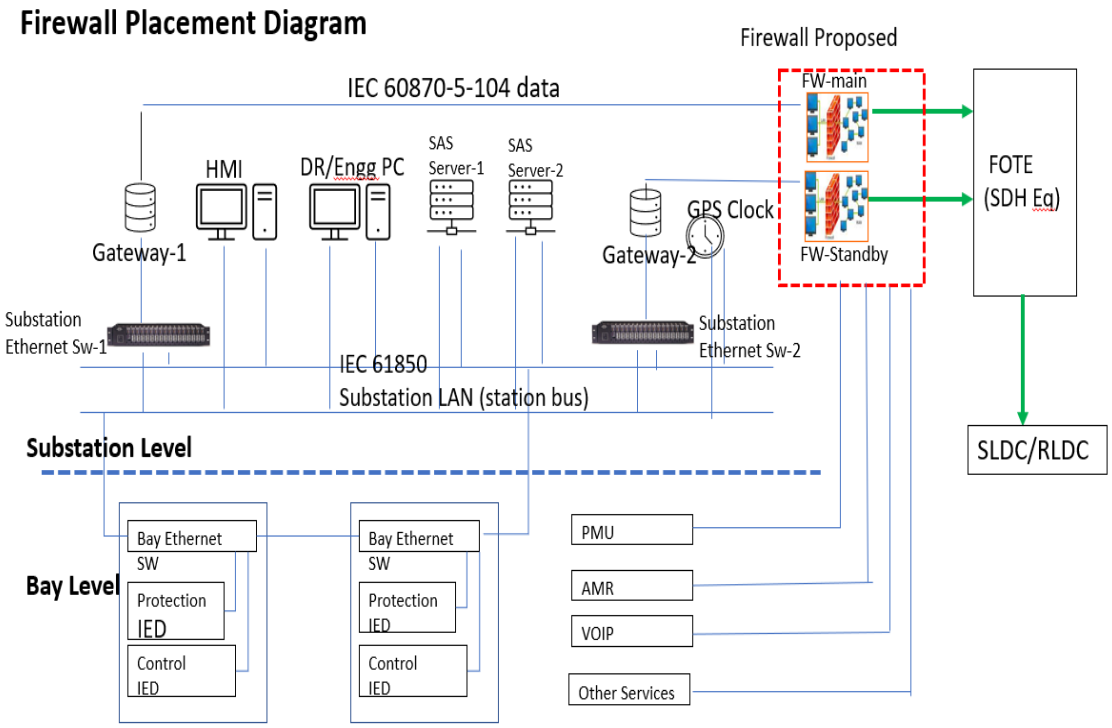

Firewall Placement Diagram
Firewall Proposed
IEC 60870-5-104 data
FW-main
FW-Standby
FOTE
(SDH Eq)
SLDC/RLDC
HMI
DR/Engg PC
SAS
Server-1
SAS
Server-2
GPS Clock
Gateway-1
Gateway-2
Substation
Ethernet Sw-1
Substation
Ethernet Sw-2
IEC 61850
Substation LAN (station bus)
Substation Level
Bay Level
Bay Ethernet
SW
Protection
IED
Control
IED
Bay Ethernet
SW
Protection
IED
Control
IED
PMU
AMR
VOIP
Other Services

Figure F.2

Annexure – G

Communication system integration in UNMS/CSMS

TSP is to ensure integration of communication system into UNMS/CSMS as per following:

"The new communication equipment/ system under the present scope shall be compatible for integration with existing regional level NMS system/ Centralized Supervision & Monitoring System (CSMS) i.e. Regional UNMS. The local configuration of the new communication equipment/ system at the station end shall be the responsibility of TSP as per followings. The configuration work in the existing centralized NMS/ UNMS at Control center end, for integration of new Communication equipment/ system shall be done by Regional ULDC Team/ NMT, however all the necessary support in this regard shall be ensured by TSP.

Requirement for integration of Communication Equipment/ system with Regional UNMS:

1. TSP shall ensure that NMS/EMS/NE supplied by them is NBI compliant and all FCAPS functionality is supported in the NBI such as NE Inventory, Hardware Inventory– Shelf/Slot/Card/SFP/Port, Topology, Protections, Alarms, Performance-real time & periodic, Performance KPI parameters (E-1, STM, Ethernet), Remote Configuration, Cross Connects, Trails & Circuits, Services Provisioning (NE), E-1, STM, Ethernet, TX & RX Trace, loop back and details are published in the NBI guide for the configuration parameters.

2. TSP shall be obliged to provide/share all necessary documentations such as NBI Guide/MIB/IDL/WSDL/API files etc. for onward integration of their NMS/EMS/NE with regional UNMS.

3. The following support shall be provided by TSP for integration of their supplied equipment with regional UNMS:
    - Enabling & activating NBI license in their EMS/NMS and providing NBI login access along with User credentials
    - Assist in verifying NBI Connectivity with UNMS vendor for the successful communication and retrieval of data.
    - Assist in troubleshooting (if required) for NBI connectivity along with UNMS vendor for the communication and retrieval of data.

4. For standalone NE which is not integrated with any EMS/NMS, TSP shall provide modality of complete FCAPS data acquisition as above through industry standard programmatic methods and provide the CLI command manual."
   Please note :Where ever MPLS-TP links are implemented for subject project the sutiable MPLS capacity is applicable.

II. EDAYARPALAYAM 400/ 230-110 kV AIS SUBSTATION

Preface: Work towards an establishment of 400/230-110 kV AIS at Edayarpalayam was awarded to Turnkey contractor on 07.01.2020. In this contract, approx. 21% of civil works were completed and the electrical works were not taken up. Hence due to poor progress of work, the contract was terminated on 11.01.2024. The Balance scope of work as discussed below has to be taken up under TBCB Basis. Bidder is advised visit the Edayarpalayam SS site and ascertain the requisite details.

The proposed 400/230-110 kV Edayarpalayam substation shall be Conventional Air Insulated Substation (AIS) type conforming to the requirements of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.

Other CEA Regulations/guidelines as amended up to date and MoP guidelines, as applicable, shall also be followed.

A.1.0: SALIENT FEATURES OF THE PROPOSED WORK AT EDAYARPALAYAM

Other Equipment:

i. Supply and installation of 400KV, 230 KV and 110 KV circuit breakers (Provision of circuit breaker with PIR for 400 kV line (for main& Tie breakers) have been considered. 400kV main and Tie breakers connected to Tr dia are with CSD without PIR), isolators, Current transformers, Capacitive voltage transformer/ Potential transformer, surge arrestors, as per OEM instructions.

ii. Station Auxiliary supply with 2x500KVA, 11KV/0.433 KV Energy efficient Distribution transformer with structure and materials from different feeding Sources with SCADA compatible RMU.

iii. Complete control & relay panels and protection system panels applicable for substation Automation system for Kiosk type Architecture.

iv. Fire extinguishers and Fire Protection alarm system for Control room, cable gallery and for all the Kiosk buildings

v. Air conditioning of the control room and Kiosk rooms, as per heat load calculation.

vi. L.T switchgear for AC system from Tertiary winding of ICTs, Two sources from TNPDCL supply and DG set.

vii. DC system from Station Battery sets with FC+Float cum Boost Chargers.

viii. DG Set (250 KVA) with AMF Panel and Fuel tanks.

ix. Batteries 220V, 400AH, 220V 300AH & 48V, 600 Ampere Hour Lead Acid Tubular with transparent SAN container & Battery Chargers with Dropper diodes.

x. 1.1 KV Grade Power &various sizes of control cables along with complete accessories.

xi. Lattice structures (Galvanized) towers, beams and support structures, all equipment support structure as per manufacturer's design. For 400 kV yard, lattice structures beam and support structures to be designed as per relevant latest IS with reference to the corresponding wind zone.

xii. Solid core insulators, insulatorstrings andhardware clamps and connectors, Aluminium bus bar, earthing materials, bay marshalling box, spacers, cable supporting angles / channels, cable trays, junction box, buried cable trench etc.

xiii. Design and laying of main earth grid. All the equipment, cable trays, auxiliary earth mat etc. to be earthed by connecting them to the earth grid. The designed value shall be as minimum as possible. The DSLP Protection schemes as per standard.

xiv. Supply of 110 KV UG Cable termination Kits and accessories at take offstructure and gantry Tower at Substation end for 7 Nos 110 KV Feeders with in the Substation premises along with Sheath bonding design for Substation to OHL Tower schemes.

xv. Complete lighting and illumination for switch yard (LED lights), Control room, kiosk building and administrative building with required Lux levels as per latest BIS.

xvi. For 400 KV Outdoor yard, there is no space for providing LCLM. Hence lighting arrangement shall not be made on 400 kV Substation tower. Alternate arrangement shall be made for lighting to obtain desired Lux levels.

xvii. FO Cable with HDPE Pipe for connectivity of all Kiosks to the SAS LAN in the control room building.

xviii. Complete installation of Visual Monitoring system with 25 Nos. of high resolution CCTV Camera for day and night monitoring of the entire Switch Yard area and Control room for security of premises with all accessories including CCTV Camera, Digital Video Recorder and LED TV, with work station at Control Room building.

xix. Soil treatment of Outdoor Rocky yard as per latest standards for achieving required soil resistivity. Designing of Earthing system and measurement of soil resistivity as per standards.

xx. Pre commissioning and Commissioning of all equipment and materials shall be made as per relevant standards and Grid codes.

NOTE:

1. TANTRANSCO will hand over the land for construction of 400/220-110 kV AIS at Edayarpalayam village in Coimbatore District to TSP, as is where is, basis.

2. The Bidder is advised visit the Edayarpalayam SS site and ascertain the requisite soil parameters.

B. CIVIL WORKS:

a. DETAILS OF WORK COMPLETED AT EDAYARPALAYAM 400KV SS SITE:

Sl. No.	Description of work	Progress of Civil Works Completed
1	Cutting and Filling the yard	Leveling by cutting and filling the yard 97% completed.
2	Control room	i. Parapet 50% completed ii. GF and FF Roof slab completed iii. Inner plastering 90% completed
3	Compound wall All types: (A – 448.620 mtr B – 77.800 mtr C – 100.000 mtr D – 119.700 mtr E – 181.000 mtr F – 76.070 mtr G – 40.000 mtr H – 60.000 mtr J – 327.650 mtr Total = 1430.840 mtr (A&B Type Drawing not approved)	a. Excavation - 241/904.42 m b. PCC - 241/904.42 m c. Raft Concrete - 241/904.42m d. Wall Ist lift - 226/904.42m e. Wall IInd Lift - 181/904.42 m f. Wall IIIrd Lift - 181/904.42 m g. Wall IV thLift - 90/904.42 m Note: Out of 904.42 mtr (which is excluding A&B type) 241 mtr (E&H Type) is partially completed.
4	Tower foundation: 169 Nos. (400KV, 230KV and 110KV yard)	Partially completed: a. Excavation : 94/169 Nos completed b. PCC : 68/169 Nos completed c. Raft Concrete : 52/169 Nos completed d. Pedestal Concrete : 41/169 Nos completed
5	Equipment Foundations – 1662 Nos. (400 KV, 230 kV and 110 kV yard)	Partially completed: a. Excavation : 241/1662 Nos completed b. PCC : 96/1662 Nos completed c. Raft Concrete : 93/1662 Nos completed d. Pedestal Concrete : 06 Nos Completed

DETAILED CIVIL WORKS FOR THE EDAYARPALAYAM 400 KV SUBSTATION :

i. Rock cutting for 50 cm of depth in all 400 KV, 230 KV & 110 KV Yards for providing special earth mat.
ii. Refilling with Gravel to a depth of 50 cm in all 400 KV, 230 KV & 110 KV Yards.
iii. Design and construction of Control room cum administrative building including aluminum doors, windows, electrification, septic tank with internal water supply and sanitary arrangements for the substation based on the line sketch to be provided along with specification.

iv.The following Kiosk building with size of 10 m x 3.3 m has been proposed to erect the Bay Protection Panels.

a)	400 KV Bays	-	8 Nos.
b)	230 KV Bays	-	4 Nos.
c)	110 KV Bays	-	4 Nos.
Total	16 Nos.		

v. RCC Foundation for Auto transformers, Bus and line reactors, breakers, distribution transformer and for all equipment:

vi. RCC foundation works for SS towers, support structures, lightning masts, lighting poles, panels and control cubicles of equipment wherever required.

vii. Supply & erection of substation towers, support structures, lighting cum lightning mast.

viii. Refilling of excavated earth, removal of surplus earth and levelingthe yard.

ix. Cable Trench along with covers and sump pits with appropriate slope in cable ducts to avoid water stagnation. Provision of pump to discharge rain water collected in the sump pits. Cable trench crossings with roads.

x. Rain water harvesting system.

xi. Stone spreading and anti weeding in switchyard.

xii. Permanent watering arrangements for earth pits.

xiii. Construction of compound wall, fire protection wall, retaining Wall, gates, security room.

xiv. Construction of roads within the substation and access road if required.

xv. Permanent water supply for control room cum administrative building.

xvi. Foundation for DG set

xvii. Drainage system in the sub station

xviii. Soil investigation

xix. Provision of basic amenities

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	400/230-110 kV Edayarpalayam AIS				
		400 kV System	**230 kV System**	**110 kV System**	**33 kV System**	**11 kV System**
1.	System Operating Voltage	400 kV	230 kV	110 kV	33 kV	110 kV
2.	Maximum voltage of the system (rms)	420 kV	245 kV	132 kV	36 kV	132 kV
3.	Rated Frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
4.	No. of Phases	3	3	3	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 kVp 1550 kVp	1050 kVp 1050 kVp	550 kVp 550 kVp	170kVp	75kVp
ii)	Switching Impulse withstand voltage (250/2500 micro sec.) dry and wet	1050 kVp	NA	NA	NA	NA
iii)	One-minute power frequency dry withstand voltage (rms)	630 kV	460 kV	230 kV	70 kV	28 kV
6.	Corona Extinction Voltage	320 kV	156 kV	NA	NA	NA
7.	Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz	1000 micro-volts (at 320 kV rms)	1000 micro-volts (at 156 kV rms)	NA	NA	NA
8.	Minimum creepage distance for insulatorstring/ long rod insulators/ outdoorbushings	13020 mm (31 mm per kV)	7595 mm (31 mm per kV	4092 mm (31 mm per kV	900 mm (25 mm/ kV)	300 mm (25 mm/ kV)
9.	Minimum Creepage distance for Switch yardEquipment	10500 mm (25 mm/ kV)	6125 mm (25 mm/ kV)	3300 mm (25 mm/ kV)	900 mm (25 mm/ kV)	300 mm (25 mm/ kV)
10.	Max. FaultCurrent	63 kA	50 kA	40 kA	25 kA	25 kA
11.	Duration of Fault	1 Sec	1 Sec	1 Sec	3 Sec	3 Sec
12.	Minimum Clearance					
a.	Phase to Phase	4000mm	3350mm	1700mm	1200mm	900mm
b.	Phase to Earth	3500mm	1700mm	1000mm	600mm	300mm
c.	GroundClearnce	8000mm	5500mm	4600mm	3650mm	3650mm
d.	Sectional Clearance	10000mm	4270mm	3350mm	2750mm	2600mm

Sl No	Description of parameters	400/230-110 kV Edayarpalayam AIS				
		400 kV System	230 kV System	110 kV System	33 kV System	11 kV System
13.	System Neutral Earthing	Effectively Earthed	Effectively Earthed	Effectively Earthed	Effectively Earthed	Effectively Earthed

B.1.2 Switching Scheme

The switching schemes, as mentioned below, shall be adopted at various voltage levels of substation/switchyard: (Full dia = 2 Main + 1 Tie, Half Dia = 1 Main + 1 Tie)

Substation	400 kV side	230 kV side	110 kV side
400/230-110 kV EdayarpalayamSS (AIS)	One and half breaker with Double bus scheme (5 nos full dia and 3 nos half dia in I configuration)	Single breaker with Double bus	Single breaker with Double bus

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 applicable for 765 kV SS only

(ii) Two transformers of 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 2 (two) numbers of feeders.

(iv) All 400KV Transmission Line length is within 200Km. Hence the Line Reactors are not proposed. Only the 125MVAR 3 Phase Bus Reactors is proposed.

(v) 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 the thermal limit at any point of bus bar.

(vi) In one and half breaker scheme, both main bay and tie bay shall be completed for controlling a feeder. Further, all associated interconnection work shall also be in the present scope of TSP.

400 *kV Bay (One and half Breaker with Double bus) shall be* **I** *configuration and as follows:*

Configuration	No of bays (1½ CB system)
ICT –Tie- Line Bay (Full Dia)	03 (Three)
400 kV Bus Reactor – Tie – Line (Full Dia)	02 (Two)
ICT – Tie – Space provision for future Line *complete civil works(Half Dia)*	02 (Two)
Space provision for Future ICT Complete Civil works – Tie – Line (Half Dia)	01 (one)
Total (Full Dia)	05 (Five)
Total (Half Dia)	03 (Three)

b. 230 *kV Bay configuration (Single breaker with Double bus scheme) as follows:*

Configuration	No of bays *(Double bus scheme)*
a. 230 kV ICT bay b. 230 kV Line bay	02 (Two) 05 (Five)
c. 230kV Bus coupler bay	01 (One)
d.230kV Spare Line bay with *complete civil works*	01 (one)
e. 230 kV ICT IV bay with complete civil works	01 (one)
Total	10 (Ten)

c. 110 kV Bay configuration (Single breaker with Double bus scheme) as follows:

Configuration	No of bays *(Double bus scheme)*
a. 110 kV ICT bay b. 110 kV Line bay	03 (Three) 07 (Seven)
c. 110KV Bus coupler bay	01 (One)
d. 110KV Spare Line bay with *complete civil works*	01 (one)
Total	12 (Twelve)

(vii) Note: However while using single phase ICTs, and Reactor the status of equipment in idle condition shall be reviewed.(ie., in energized or de-energized condition). If they are kept in energized condition, separate bay provision has to be made.

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 capacity.

Sl. No	Description of bay	Edayarpalayam 400/230-110 kV AIS SS		
		400 kV	230 kV	110 kV
1.	Bus Bar	3150 A	2000 A	2000 A
2.	Line bay	3150 A	2000 A	2000 A
3.	ICT bay	3150 A	2000 A	2000 A
4.	Reactor Bay	3150 A	NA	NA
5.	Bus Coupler bay	NA	2000 A	2000 A

B.2.1 Auto transformer

500 MVA, 400/230/33 kV, 200 MVA, 400/110/33 kV, 3-phase autotransformers with Nitrogen Injection Fire Prevention and Extinguishing scheme and on line DGA and usage of 33kV Tertiary winding for station auxiliary shall conform to CEA's "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above voltage class)" available on CEA's website.

TECHNICAL REQUIREMENTS 400/ 230 / 33 KV AUTO TRANSFORMER

Sl. No	DESCRIPTION	REQUIREMENT
1.	Maximum continuous rating (MVA)	
	(a)HV	500
	(b)IV	500
	(c)LV	167 MVAr(Reactive) 5 MVA(Active)
2.	Maximum continuous rating and cooling	
	(a)ONAN	60%
	(b)ONAF	80%
	(c)ODAF	100%
3.	Type of cooling	(a)ONAN/ONAF/ODAF
		(b)1x100%orseparately2x50% coolerbank (c)2X100%coolingpumpsout whichoneisconnectedstand-by (d)2fansasstand-byoneforeach coolerbank.
	Max.Temperature rise over ambient temperature of 45 deg. C	

4.	(a)Winding	55ºC			
	(b)Oil	50ºC			
	(c)Limit of hot spot temperature with average ambient temperature of 32ºC.	98ºC			
	(d)Maximum hot spot temperature	140ºC			
5.	Maximum flux density at normal voltage and frequency	1.6Tesla			
6.	(i) Rated voltage(KV) (a)H.V.winding (b)I.V. winding (c)L.V.winding	400 230 33			
	(ii) Voltage variation	·10%			
7.	Number of phases	3phase			
8.	Rated frequency	50·5%			
9.	Voltage Ratio(KV)	400/230/33KV			
10.	(i) Type of connection				
	(a)H.V.	Star			
	(b)I.V.	Star			
	(c)L.V.	Delta			
	(ii) Vector group	YnaOd11			
	(iii) Neutral	Effectivelyearthed			
11.	Type of winding				
	(a)H.V.	Continuous disc			
	(b)I.V.	Continuous disc			
	(c)L.V.	Continuous disc			
12.	Max.currentdensityofwinding	300 A/cm.			
13.	Insulation levels	HV	IV	LV	Neutral
	(1) Winding voltage KV(rms)	400	230	33	--
	(2) Highest system voltage KV(rms)	420	245	52	36
	(3) Lightning impulse with stand	1300	950	250	170
	(4) Separate source voltage (KVrms)	630	460	95	75
	(5) Switching impulse with stand voltage	1050	--	--	--
14.	Duration of short circuit with stand capacity	2 seconds			
15.	(a)Tap changer	OLTC with remote control panel			
	(b)Tapping range	On 230 KV side of series winding for HV variation of +10%to–10% in steps of 1.25%			
16.	D.C.voltage for relays etc.	220 Volts			
	Percentage impedance (Tolerance ±10%)	Principal Tap	Highest Tap	Lowest Tap	

17.	HV–IV	12.5					
	HV–LV	45.0					
	IV –LV	30.0					
18.	Cooling medium / insulating oil	Virgin,high grade in hibited,confirming to latest IEC-60296(inhibiting oil)					
19.	MaximumLosses.						
	(a)No-loadloss	125KW(Max)					
	(b)Loadloss	450KW(Max)					
	(C)Auxiliaryloss	21 KW(Max)					
20.	Termination arrangement	Bushing type suitable for outdoor operation.					
21.	Terminal bushings	HV	IV	LV	Neutral		
	Systemvoltage	400	230	33	--		
	(a) Voltage rating(KV rms)	420	245	52	36		
	(b) Current rating (Amps)	1250	2000	3150	2000		
	(c)Impulse with stand voltage(KVPeak)	1425	1050	250	170		
	(d)One min PF with stand voltage	695K Vrms	505K Vrms	105K Vrms	77K Vrms		
	(e)Max partial discharge voltage	10pc	10pc	10pc			
22.	Bushing Current transformers:						
	a) C.T.Ratio	HV		IV		LV	Neutral
		Core-I	Core-II	Core-I	Core-II	Core-I	Core-I
		1000/1	1600/1	1600/1	1600/1	1837/1.5	1600/1 a
	b) Accuracy class	5P20		5P20			PS
	c) VA Burden	30		30			
	Tank:						

23.	(i) Type	Conventional type with bolted upper flange		
	(ii)Thickness(mm) (a)Bottom (b)Sides (c)Top (iii)Pressurereleasedevice 41.Type 42.Number (iv) (a)Suitableopeningattopcoverfor Oildrain&Inthebottomofthetankfor Nitrogeninjectionfirepreventionsystem.	 16 10 12 Safety valve type spring operated 2		
24.	Clearances(mm)	400KV	230KV	33KV
	(a)PhasetoPhase	4000	2300	690
	(b)PhasetoEarth	3500	2100	630
25.	Noise level	Less than 81db		
26.	Oil preservation Main Conservator OLTC Conservator	 Aircell type with 2 Nos. Silicagel breathers associated with oil seal in parallel,each one with a valve 1no.silicagelbreatherwithoil seal.		
27.	Expected life period of the transformer	25Years		
28.	Tan delta of windings	<0.5%		
29.	Tan delta of condenser bushing	<0.4%		

TECHNICAL REQUIREMENTS 400 / 110 / 33 KV AUTO TRANSFORMER

Sl. No	DESCRIPTION	REQUIREMENT
1.	Maximum continuous rating(MVA)	
	(a) HV	200
	(b) IV	200
	(c) LV	65
	Maximum continuous rating and cooling	

2.	(a)ONAN	60%				
	(b)ONAF	80%				
	(c)ODAF	100%				
3.	Type of cooling	(a)ONAN/ONAF/ODAF				
		(b)1x100% or separately 2x50% cooler bank (c) 2X100% cooling pumps out of which one is connected stand-by (d) 2 fans as stand-by one for each cooler bank.				
4.	Max.Temperature rise over ambient temperature of 45 deg.C					
	(a)Winding	55ºC				
	(b)Oil	50ºCC				
	(c)Limit of hot spot temperature with average ambient temperature of 32º C	98ºC				
	(d)Maximum hot spot temperature	140 degC				
5.	Maximum flux density at normal voltage and frequency	1.6 Tesla				
6.	(i) Rated voltage(KV) (d) H.V. winding (e) I.V. Winding (f) L.V.Winding	 400 110 33				
	(ii) Voltage variation	·10%				
7.	Number of phases	Threephase				
8.	Rated frequency	50·5%				
9.	Voltage Ratio (KV)	400/110/33KV				
10.	(i) Type of connection					
	(a) H.V.	Star				
	(b) I.V.	Star				
	(c) L.V.	Delta				
	(ii) Vector group	YnaOd11				
	(iii) Neutral	Effectivelyearthed				
11.	Type of winding					
	(a)H.V.	Continuous disc				
	(b)I.V.	Continuous disc				
	(c)L.V.	Continuous disc / helical				
12.	Max. current density of winding	300 A/cm.				
	Insulationl evels		HV	IV	LV	Neutral

13.	(1) Winding voltage KV(rms)	400	110	33	--
	(2) Highest system voltage KV(rms)	420	145	52	36
	(3) Lightning impulse withstand voltage(KVp)	1300	550	250	170
	(4) Power frequency withstand Voltage (KVrms)	630	275	95	38
	(5) Switching impulse with stand voltage	1050	--	--	--
14.	Duration of short circuit withstand capacity	2 seconds			
	(a)Tap changer	OLTC with remote control panel			
	(b)Tapping range	On 110 KV side of series winding for HV variation of +10% to– 10% in steps of 1.25%			
16.	D.C. voltage for relaysetc.	220 Volts			
17.	Percentage impedance (Tolerance±10 %)	Principal Tap	Highest Tap	Lowest Tap	
	HV–IV	12.5			
	HV–LV	30			
	IV –LV	16			
18.	Cooling medium / insulating oil	EHV grade transformer oil conforming to IS:335.			
19.	MaximumLosses.				
	(a)No-loadloss	66KW(Max)			
	(b)Load loss	375 KW(Max)			
	(C)Auxiliary loss	9 KW(Max)			
20.	Termination arrangement	Bushing type suitable for outdoor operation.			
21.	Terminal bushings	HV	IV	LV	Neutral
	System voltage	400	110	33	--
	(a)Voltage rating(KVrms)	420	145	52	36
	(b)Current rating(Amps)	800	800	2000	2000
	(c)Impulse with stand voltage(KVPeak)	1300	650	250	170
	Bushing Current transformers:				

22.	a) C.T.Ratio	HV		IV		LV	Neutral
		Core-I	Core-II	Core-I	Core-II	Core-I	Core-I
		400/1	1200/1	1200/1	1200/1	1837/1.5	1200/1
	b) Accuracy class	5P20	PS	PS	PS	5P20	
	c) VA Burden	30		30		30	
	a) Knee point voltage shall be more than s 40*I*(Rct+Ra) where Rct=Secondary resistance of the current Transformer Ra=lead resistance(2 ohms),Ra=lead resistance(2ohms) b) Magnetizing current shall be less than 30 milli amperes at half the knee point voltage						
23.	Tank:						
	(i) Type	BELL/Conventional					
	(ii)Thickness(mm) (d)Bottom (e)Sides (f)Top (iii) Pressurereleasedevice 43.Type 44.Number (iV)(iv)(a)Suitable opening at top cover For Oil drain & In the bottom of the tank forNitrogen injection fire Prevention system.	 16 10 12 Safety valve type spring operated 2					
24.	Clearances(mm)	400KV		110KV		33KV	
	(a)PhasetoPhase	4000		1220		650	
	(b)PhasetoEarth	3500		1080		408	
25.	Noiselevel	Lessthan81db					
26.	Oilpreservation Main Conservator OLTC Conservator	 Air cell type with 2Nos. Silicagel breathers associated with oil seal in parallel,each one with a valve 1no.silicagel breather with oil seal.					

27.	Expected life period of the transformer	25Years

B.2.2 Bus Reactor

125 MVAr, 420 kV, 3-Phase Reactor with Nitrogen injection Fire Prevention and Extinguishing scheme and online DGA 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's website.

B.2.3 400 kV, 230 kV and 110 kV AIS Substation equipment (as applicable)

B.2.3.1 Circuit Breakers (AIS)

For all equipment, the Guaranteed Particulars shall be enclosed.

The circuit breakers and accessories shall conform to IEC: 62271-100, IEC: 62271-01 and shall be of SF6Type. The circuit breakers shall be of class C2-M2 (as per IEC) with regard to restrike probability during capacitive current breaking and mechanical endurance. The rated break time shall not exceed 40 ms for 400 kV circuit breakers and 60 ms for 230 kV and 110 kV Circuit breakers.

400 kV and 230kV Circuit breakers shall be provided with Single phase and three phase auto reclosing.

Each breaker would have two sets of trip circuits which would be connected to separate DC supplies for greater reliability.

The Circuit breakers controlling 400 kV lines shall be provided with pre insertion closing resistor of about 450 ohms (max) with 8 ms minimum insertion time 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. 400 kV Circuit breakers shall be provided with Controlled switching device for controlling of ICT and Bus reactor.

The Controlled switching device shall be provided in 400 kV CBs of switchable Bus reactors and in Main and Tie circuit breakers of Bus reactors and ICTs of voltage class 400 kV and above.

420 KV Circuit Breaker:

Sl.No	Description	Requirement
1	Rated continuous current(A)at design Ambient temperature	3150
2	Rated Short circuit current breaking Capacity at rated voltage	64 KA with percentage DC Component as per IEC-56
		Corresponding to minimum Opening time under operating Conditions specified
3	Symmetrical interrupting capability(k Arms)	63
4	Rated short circuit making current (k Apeak)	157.5
5	i)Short time current carrying capability for one sec.(kArms) ii)Out of phase breaking current capacity (kA rms)	63 15.75
6	Rated operating duty	0-0.3sec CO-3min CO Cycle
7	Re closing	Single Phase & three phase auto closing
8	First pole to clear factor	1.3
9	Rated line charging interrupting current at 90 deg.Leading power factor angleA (rms)	400
	(The breaker shall beable to interrupt the rated line charging current with test voltage Immediately before opening equal to the product of U/√3&1.4 as perIEC:62271-100	
10	Temperature rise over the design ambient temperature	As per IEC:62271-100
11	Total break time as per IEC(ms)	45
12	Rated break time as per IEC(ms)	40
13	Total closing time(ms)	Not more than150.
14	Operatingmechanism	spring–spring
15	Max.difference in the instants of Closing/opening of contacts Within a pole Between poles(opening) Between poles (closing)	2.5 3.3 5.0
16	The above voltage shall be at rated control voltage and rated operating and quenching Mediapressures	

17	Trip coil closing Voltage	221 VDCwithvariationas specified
18	Noise level at base and upto 50m (distance from base of breaker)	141 dB(MAX)
19	Rated terminal load	As per IEC
20	Auxiliary contacts	Besides requirement of Specification,The bidder shall wire up 10No+10NC Contacts for future use of purchaser per phase
21	No of terminals in common control ca binet	All contacts & control circuits to be Wired out up to common control Cabinet plus 24 terminals exclusively for Purchaser'suse.
22	Maximum allowable switching over voltage Underany switching condition	2.3p.u

B.2.3.2 Isolators (AIS)

The isolators shall comply with IEC 62271-102 in general. 420 kV Isolator design shall be Center rotating Horizontal double break and 245 kV, 145 kV Isolator shall be of Center rotating Double break type.

420 kV, 245 kV and 145 kV Bus Earth switches shall be of Vertical operated single break type. Earth switches shall be provided at required locations to facilitate maintenance.

All Isolators shall be motor operated. Isolator rated for 420 kV, 245 kV and 145 kV shall be of extended mechanical endurance class - M2 as per IEC-62271-102. Main blades and earth blades shall be interlocked and interlock shall be fail safe type. 420 kV, 245 kV and 145 kV earth switches for line isolator shall be suitable for induced current switching duty as defined for Class-B

B.2.3.3Current Transformers (AIS)

Current Transformers shall comply with IEC 61869 in general. All ratios shall be obtained by secondary taps only. Generally, Current Transformers (CT) for 420 kV, 245 kV and 145 kV shall have five cores (four for protection and one for metering). The burden and knee point voltage shall be in accordance with the requirements of the system including possible feeds for telemetry. The rated burden of cores shall be closer to the maximum burden requirement of the

metering and protection system (not more than 20 VA for metering core) for better sensitivity and accuracy.

The accuracy class for protection core shall be PS. The accuracy class for the metering core it shall be 0.2S or shall be equal to or better than the accuracy class of the meter specified in the CEA Regulations 2006. The instrument security factor shall be less than 5 for CTs up to 400 kV.

B.2.3.4.1. 400 kV Capacitive Voltage Transformers (AIS)

Capacitive Voltage Transformers shall comply with IEC 61869 in general. These shall have three secondary's 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 420 kV shall be of 4400pF 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 200 VA, for meteringcore,for better sensitivity and accuracy.

B.2.3.4.2 230 kV, 110 kV Potential Transformers.

Potential Transformers shall comply with latest revisions and amendments thereof the IS: 3156 and IEC standards, 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 rated burden of cores shall be closer to the maximum burden requirement of metering and protection system, not more than 200 VA, for metering core,for better sensitivity and accuracy.

B.2.3.5 Surge Arresters (AIS)

390 kV, 216 kV, 96 kV Station High (SH) duty gapless type Surge arresters with thermal energy (Wth) of minimum 8 kJ/kV, 5 kJ/kV, 5 kJ/kV respectively, conforming to IEC 60099-4 in general shall be provided for 420 kV, 245 kV and 145 kV systems respectively. Other characteristics of Surge arrester shall be chosen in accordance with system requirements. Surge arresters shall be provided at line entrances near Transformers and Reactor 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.2.4 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 IEC 61850 protocol with RTU/SAS/IEDs of different OEMs. All numerical relays shall have built in disturbance recording feature.

The protection circuits and numerical relays of the elements shall be electrically and physically segregated into two groups with different make 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

230kV voltage level Transmission lines shall have Main-I and II numerical relay with minimum three forward zone distance protection scheme and minimum one reverse zone selectable distance protection scheme with carrier aided inter-tripping feature. Main II shall be also have 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

400 kV lines shall have Main-I and Main –II and shall be Phase Segregated Line current Differential protection with built-in Distance protection function(a minimum of three forward zones and one reverse zone selectable distance protection scheme with carrier aided inter-tripping feature). Differential relay for Main I & II current differential protection with built-in Distance protection function(a minimum of three forward zones and one reverse zone selectable distance protection scheme with carrier aided inter-tripping feature) at remote end sub-station shall be provided by the TSP. The associated power and control cabling and integration with SAS at remote end sub-station shall be provided by Transmission service provider. Main II shall be also have numerical Line Current differential with in build 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.

Transmission lines with distance protection shall, in general, have carrier aided or fibre optic based inter- tripping or blocking.

For short lines (less than 10km) or cable or combination of overhead and cable, Line differential protection shall be used with built-in backup distance protection. Line Differential relay with built in distance protection feature / Distance relay of

different make as Main–I and Main-II shall be provided accordingly similar make shall be provided by TSP at remote end for compatibility . The associated power and control cabling and integration with SAS at remote end shall be provided by TSP

Further, all 230kV and above voltage level lines shall be provided with single and three phase auto-reclosing facility to allow reclosing of circuit breakers in case of transient faults. For 110kV and below voltage class shall be suitable for three phase auto reclosing. These lines shall also be provided with distance to fault locators to identify the location of fault on transmission lines.

The Numerical relay shall be equipped with sufficient binary output contacts for the protection scheme implementation. And equipped with sufficient numbers of programmable of opto isolated input and programmable potential free outputs with wetting voltage for digital inputs for field programmable to 48V/110V/220V DC.

All 400 kV and above voltage level lines shall also be provided with two stages over voltage protection. The 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.

For110 kVtransmission lines, directional IDMT over current and earth fault backup protection relay should be provided as standalone unit or in-built feature of Main-I and Main -II feature.

In case of loop in loop out of transmission lines, the existing protection scheme shall be studied and suitable up-gradation (if required) shall be carried out.

The earth wire used in 110kV and above voltage class lines shall be Optical Ground wire.

b) Autotransformer Protection

Protection scheme shall be comprised of 2 Nos. numerical multifunction protection relays i.e. One for Group-A Protection and another for Group-B Protection. Group-A Numerical multifunction protection relays of different make or different hardware platform and protection algorithm with respect to Group-B numerical multifunction protection relay.

These shall have the following protections:

i) Numerical Differential Protection – Low impedance
ii) Numerical Restricted Earth Fault Protection – Low Impedance
iii) Numerical directional Back-up 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 Thermal Overload Protection
vi) Tertiary winding protection

Further, Numerical directional 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) 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
iv) Neutral Displacement Protection

Protection scheme shall be comprised of 2 Nos. numerical multifunction protection relays i.e. One for Group-A Protection and another for Group-B Protection. Group-A Numerical multifunction protection relays of different make or different hardware platform and protection algorithm with respect to Group-B numerical multifunction protection relay.Wherever CT and VT is wired to the numerical relays, the relay should be providedwith built in supervision of CT and VT respectively.

For application in 400KV/765KV diameter bays, the CT inputs of main breaker and

tie breaker bays shall be wired separately to protection relays and the vector sum of

the CTs shall be calculated internally in the protection relays.

Reactor Bushing CTs to be used for differential and REF Protection.

For Backup impedance protection use the CTs of the main breaker and tie breaker in

order to provide protection for the tee section of this diameter also.

The Main CT and Tie CT shall be wired to separate CT modules so as to arrive at the

vector sum of these CTs internally in the respective numerical relays.

Besides these, reactors shall also be provided with Buchholz relay, Magnetic Oil Gauge (MOG) with low oil level alarm, protection against oil and winding temperatures and pressure relief device, etc.

d) BusBar 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/230kV/110 kV buses. 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 future bays envisaged i.e. input / output modules for future bays for the bus section under present scope shall also be provided.

Bus-bar protection scheme shall include one overall check zone protection in addition to single/multiple zones specified.

Also include provision for protection IN/OUT for each zone and check zone and be transient free in operation.

The relay shall incorporate dynamic bus replica and provide necessary end zone fault protection depending on the bus bar protection CT’s location.

Separate IN/OUT switch selection for Bus-bar and LBB protection function.

Bus Bar protection system for new substation shall be de-centralized (distributed) type.

In case, the bus section is provided, then each side of bus section shall have separate set of bus bar protection schemes.
Peripheral Units (Pus) shall be provided by the TSP.

For existing substations, the existing bus bar protection shall be augmented as per requirement and integration of new bays in the existing system in the scope of TSP.

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 providedwith re-trip function as built-in protection function along with 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.*

Common for Clause **B.2.3.1 TO B 2.3.5**

- For All Equipment the Guaranteed Particulars shall be enclosed.
- All the Type Test shall be made as per BIS/IEC standards and validity of Type test report shall confirm to CEA guidelines.

Sr No	Name of Equipment	Validity of Type test (in years)
1	Power Transformer	5
2	LT Transformer	5
3	Shunt Reactor	5
4	OLTC	10
5	Bushing of Power Transformers/ Reactors	7
6	Fittings and accessories for ICTs & Reactors	10
7	Circuit Breaker	10
8	Isolator	10
9	Lighting Arrester	10
10	Wave Trap	10
11	Instrument transformer	7
12	GIS & Hybrid GIS	10
13	LT Switchgear	10
14	Cable and associated accessories	10
15	Relays	7
16	Capacitors	10
17	Battery & Battery Charger	7
18	Conductor & Earth wire	10
19	Insulators (Porcelain/Glass)	10
20	Composite Insulators	5
21	PLCC	5

Note: For all other equipment's validity of type test shall be 10 years from date of LOA

B.2.6 Substation Automation System

(a) For all the new substations, 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 220 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) from 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 the 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 the existing substations with a Substation automation system (SAS), augmentation of existing SAS shall be done for bays under the present scope.

In the 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 Synchronisation Equipment

Time Synchronization Equipment complete in all respects including antenna, cable and processing equipment required to receive time signal through GPS/NavIC 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.2.7. Scientific Instruments

To have a reliable and efficient Power Network, it is necessary to keep the various equipment of the system in healthy working conditioning. The conditioning monitoring of the power plays a vital role in foreseeing any deterioration of performance of the system/ equipment and to facilitate corrective actions in advance to prevent partial/complete un-planned outages of the system.

Hence a need arises to have diagnostic measurements for assessing the condition of critical equipment of the system. Diagnostic measurements are necessary to identify/ foresee the possible failures and to plan maintenance & repair schedules thereby avoiding expensive repairs and forced outages.

The Testing Instruments with Latest Diagnostic Features are required to carry out routine preventive testing of substation equipment /Protection Relays which will help reducing the downtime during Power outages. This has necessitated requirement for the provision of Scientific Instruments.

B.3.0 Substation Support Facilities

Certain facilities required for the operation and maintenance of substations as described below shall be provided at the new substation. In existing substation, these facilities have already been provided and will be extended/ augmented as per requirement.

B.3.1 ACand DC power supplies

For catering the requirements of three phase and single-phase AC supply and DC supply for various substation equipment (for present and future scope), the following arrangement is envisaged:

i) For LT Supply at each new Substation, two (2) Nos. of LT Transformers (minimum 500 kVA for substations with highest voltage rating as 400 kV) shall be provided which shall be fed from two independent sources as per the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007.

Metering arrangement with Special Energy Meters (SEMs) shall be provided by TSP at 33 kV tertiary of Transformer for drawing auxiliary supply at new substation. Such SEMs shall be provided by CTU at the cost of the TSP. Accounting of such energy drawn by the TSP shall be done by RLDC/RPC as part of Regional Energy Accounting.

Additionally, Active Energy Meters may be provided at the same point in the 33 kV tertiary of Transformer by local SEB/DISCOM for energy accounting.

ii) 2 sets of 220 V, 400 AH and 2 sets of 220V, 300 AH battery banks for control and protection and 2 sets of 48 V, 400 AH battery banks for PLCC/ communication equipment shall be provided at each new Substation. Each battery bank shall have 3 no.s of FC+float-cum-boost charger.

At new substation, 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. 48 V DC can be achieved from 220 V DC battery bank using adapter, if so desired by TSP, without compromising backup time.

iii) Suitable AC and DC distribution boards and associated LT Switchgear shall be provided at new substation.
For new substation, following switch boards shall be considered with duplicate supply with bus coupler/ sectionalizer and duplicate outgoing feeders except for Emergency lighting distribution board which shall have only one incoming feeder:

g) 415 V Main Switchboard – 1 No.
h) AC distribution board – 3 Nos.
i) Main lighting distribution board – 1 No.
j) Emergency lighting distribution board – 1 No.
k) 220 Volt DC distribution board – 4 Nos.
l) 48 Volt DC distribution board – 2 Nos.
m) 200A DC changeover switch with panel – 8 Nos.
n) 800A AC changeover switch – 12 Nos.

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).

iv) At new Substation, one No. 250 KVA DG set (minimum 250 kVA for substations with highest voltage rating as 400 kV) shall be provided for emergency applications.

v) At new substation, sizing of battery and battery chargers shall be done based on the number of bays specified (including future bays) and not less than quantity specified in B.3.1 (ii)

vi)

Normal Voltage	Variation in Voltage	Frequency in Hz	Phase/ Wire	Neutral connection
415V	±10%	50±5%	3/4Wire	Solidly Earthed
240V	±10%	50±5%	1/2Wire	Solidly Earthed
220V	190V to 240V	DC	Isolated 2 wire System	-
110V	95V to 120V	DC	Isolated 2 wire System	-
48V	--	DC	2 wire System (+)earthed	-

Sl. No.	DRAWINGS/ DOCUMENTS TITLE
1.00	**DRAWING FOR SWITCHYARD**
1.01	Overall General Arrangement Drawing
1.02	Single Line Diagram
1.03	Electrical layout plan & section
1.04	Structure loading diagram cum layout arrangement
1.05	DSLP Calculation & layout
1.06	Switchyard Foundation & cable Trench Layout
1.07	Indoor Cable Trench Layout (As applicable for Control Room Building, GIS Hall ,Switchyard panel Room, FFPH Building)
1.08	Buried CableTrench layout
1.09	Erection Key Diagram (plan & section) & Erection Bill of Quantity
1.10	Earth grid layout
1.11	Indoor Illumination layout (As applicable for Control Room Building, FFPH Building, Transit Camp, Switch yard panel Room)
1.12	Outdoor illumination Layout
1.13	SLD of LTAC / DC System
1.14	Panel arrangement layout in Control Room Building
1.15	Panel arrangement layout in Switch yard panel room /LCR Room of GIS Hall
1.16	Fire detection and alarm system for control Room building, GIS Building and Switchyard panel room
1.17	Air Conditioning Layout (As applicable for Control Room Building, LCR room in GIS Hall ,Switchyard panel Room)
1.18	LT Station Layout
1.19	Power and control cable schedule
2.00	**DESIGN CALCULATION**
2.01	DSLP Calculation

2.02	Lighting system design calculation (if applicable)
2.03	Earthing system design calculation (if applicable)
2.04	Battery sizing calculation (if applicable)
2.05	Hydrolic Calculation for Fire protection (if applicable)
2.06	AC and ventilation calculation for GIS Building(if applicable)
2.07	EOT crane sizing calculation
Sl. N.	DRAWINGS/DOCUMENTSTITLE
3.00	AUTO TRANSFORMER
3.01	Design Review
3.02	Guaranteed Technical Particulars
3.03	Outline General Arrangement Drawing with Bill of material (OGA parts list) & Shipping details
3.04	Foundation Plan
3.05	GA& Schematic Drawing of Cooler Control Cabinet / Marshalling Box and Write up
3.06	GA & Schematic Drawing of Common Marshalling Box and Write Up (as Applicable))
3.07	GA & Schematic Drawing of Drive Mechanism Box and Write up
3.08	Bushing dwg and GTP (HV, IV, LV and Neutral as applicable)
3.09	Radiator Details
3.10	Magnetising Characteristics of bushings CT
3.11	Rating and Diagram plate
3.12	Valve Schedule plate rating
3.13	Twin-Bi directional roller
3.14	Type Test Report
3.15	Instruction Manual
4.00	REACTOR
4.01	Design Review
4.02	Guaranteed Technical Particulars
4.03	Outline General Arrangement Drawing with Bill of material (OGA parts list) & Shipping details
4.04	Foundation Plan
4.05	Bushing dwg and GTP (HV and Neutral)
4.06	GA & schematic drawing of Marshalling Box and Write up
4.07	Magnetization Characteristics of Reactor Core and bushing CTs
4.08	Rating and diagram plate
4.09	Twin bi-directional roller
4.10	Radiator Details
4.11	Type test Report
4.12	Instruction Manual
5.0	NEUTRALGROUNDINGREACTOR(NGR)
A	Air Core NGR

5.01	Design Review
5.02	Guaranteed Technical Particulars
5.03	General Arrangement Drawing with pedestal details and Bill of material (OGA parts list) & Shipping details
5.04	Foundation Plan
5.05	Rating and diagram plate
B	Oil Filled Type NGR
5.06	Design Review
5.07	Guaranteed Technical Particulars
5.08	General Arrangement Drawing with Bill of material (OGA parts list)& Shipping details
5.09	Foundation Plan including Combined Foundation for NGR & LA
5.10	Rating and diagram plate
6.00	CIRCUITBREAKER
6.01	GA drg of SF6 CB
6.02	OGA drawing of control unit
6.03	OGA drawing of support insulator, interrupter insulator
6.04	Support structure & foundation plan drawing
6.05	Electrical schematic diagram
6.06	Rating and name plate drawing
6.07	Hydraulic/SF6gasconnectiondiagram
6.08	Schematic diagram of operating mechanism
6.09	Wiring diagram
6.10	Terminal connector and corona rings
6.11	Sectional view of interrupter
6.12	GTP
6.13	Type Test Reports
6.14	Instruction Manual
7.00	ISOLATOR
7.01	GA drawing of Isolator without earth switch
7.02	Contact blade assembly (main & earth switch)
7.03	Terminal pad & hinge contacts
7.04	GA of MOM–main switch
7.05	Schematic & wiring drg. For main switch
7.06	Nameplate- details
7.07	GA of terminal connectors
7.08	GA of post insulator for isolator
7.09	GTP
7.10	Type Test Report
7.11	Instruction Manual
8.00	INSTRUMENTTRANSFORMER(CT/CVT/IVT)

8.01	GTP
8.02	General Arrangement
8.03	Sectional view
8.04	Sec.terminal box GA
8.05	GA of Junction box
8.06	Data sheet of junction box
8.07	Wiring drg of JB incl. interpole
8.08	Terminal connectors
8.09	Schematic & rating plate
8.10	Porcelain insulator
8.11	Corona ring
8.12	Type Test Reports
8.13	Instruction Manual
9.00	SURGEARRESTER
9.01	GA of Surge Arrester
9.02	GTP
9.03	Porcelain insulator
9.04	Cross sectional view
9.05	Arrestor and unit name plate
9.06	Grading rings
9.07	Insulating base / surge counter detail
9.08	Outline drg of surge counter
9.09	Circuit diagram of surge counter
9.10	GA of ZnO element
9.11	Line terminal bracket with corona rings
9.12	Drawing showing pressure relief arrangement.
9.13	Type Test Report
9.14	Instruction Manual
10.00	BUSPOSTINSULATOR
10.01	GA drawing & GTP
10.02	Type Test Reports
11.00	Marshaling Box, Junction Boxes
11.01	GA Drawings
11.02	Schematic Drawing
11.03	TypeTest reports
12.00	Conductor, Al Tube & GS Earth Switch
12.01	Type Test Reports(if applicable)
13.00	DISC INSULATOR (if applicable)

13.01	GA drawing
13.02	TypeTest Reports
14.00	LONG ROD POLYMER INSULATOR
14.01	Ga drawing
14.02	TypeTest Reports
15.00	INSULATOR STRINGS WITH HARDWARE ASSEMBLY
15.01	GADRG
15.02	Component drawings
15.03	TypeTest Reports
16.00	CLAMPS & CONNECTORS
16.01	Drawings
16.02	TypeTest Reports
17.00	HORN GAP FUSE
17.01	GA OF HG FUSE
17.02	TypeTest Reports
18.00	BATTERY AND BATTERYCHARGER
18.01	GTP
18.02	Drawings
18.03	TypeTest Reports
19.00	ILLUMINATION
19.01	GTP of all types of fittings / fixtures & Cotrol gear
19.02	GA drg. Of lighting poles/posts
19.03	Wiring drgs. Of panel / LDBs to fixtures
19.04	GA of Junction box
19.05	GA street lighting panel / outdoor lighting panel
19.06	GAof Receptacles
20.00	LT SWITCHGEAR
20.01	GA drg of ACDB
20.02	SLDof ACDB
20.03	GA drg of 220V DCDB
20.04	SLD of 220V DCDB
20.05	GA drg of 50V DCDB
20.06	SLD of 50V DCDB
20.07	Datasheet
20.08	Sch. Of each type of module
20.09	TypeTest Reports
20.10	InstructionManual

21.00	HT Power Cable
21.01	GTP & Catalogue
21.02	TypeTest Reports
22.00	POWER & CONTROL CABLE
22.01	Type Test Reports for PowerCable
22.02	TypeTestReportsforControlCable
23.00	CONTROL AND RELAY PANELS and SUBSTATION AUTOMATION SYSTEM (SAS)
23.01	GTP & detailed technical literature & O&M manuals of all types of relays, SAS Equipment
23.02	Type Test Reports of all relays & equipment
	GA and schematic drgs. for:-
a)	Relay and protection panels for all type line (s)
b)	Relay and protection panels for all type auto transformer(s) including tertiary loading
c)	Relay and protection panels for bus / line reactor(s)
d)	Relay and protection panels for tie bay(s)
e)	Relay and protection panels forTBC bay(s)
f)	Relay and protection panels for BC bay(s)
g)	Bus bar protection panel(s)
h)	Circuit Breaker relay panel(s)
23.03	Panel Construction Details
23.04	SAS Architecture
23.05	Relay Settings
24.00	Visual Monitoring System
24.01	GTP / Catalogue of VMS Equipment and Camera
24.02	VMS Architectural Drawing
25.00	PLCC EQUIPMENT
25.01	GTP & technical literature
25.02	Type Test Reports of all PLCC equipment
25.03	GA & GTPs for wave trap
25.04	GA drg of PLCC terminal
25.05	Digital / Analog Protection coupler
25.06	SNR calculation (if applicable)
25.07	Coupling device
25.08	GTP of HF cable
25.09	Testing & maintenance equipment
25.10	Frequency Planning
26.00	DG SET
26.01	GTP
26.02	Drawings / manuals

27.00	AIRCONDITIONING&VENTILATIONSYSTEM
27.01	GTP
27.02	Drawings
27.03	A/Csizing calculation
28.00	LT TRANSFORMER
28.01	GTP
28.02	Drawings
28.03	TypeTest Reports
29.00	CONTROL ROOM BUILDING / TRANSIT CAMP/ FFPH BUILDING/ SWITCH YAYD PANEL ROOM /INDOOR HT SWITCH GEAR ROOM/TOWNSHIP BUILDINGS (AS applicable)
30.01	Architectural drawing
a)	Plan,Section & elevation
b)	Doors and Window Schedule
30.02	Building design calculation (if applicable)
30.03	Civil Construction Drawings
31.0	SWITCH YARD CIVIL CONSTRUCTION DRAWING (AS APPLICABLE)
31.01	Tower Foundation
31.02	Equipment Foundation
31.03	Transformer Foundation
31.04	Reactor Foundation
31.05	Road Construction including culverts,rail cum roads
31.06	Switch yard fencing and Gate
31.07	Cable trench section
31.08	Drain Section
31.09	Rain water harvesting
31.10	Boundary wall
31.11	DG Set foundation
31.12	LT transformer foundation
31.13	Car parking Shed / Security Room
31.14	OutDoor GIB foundations
31.15	Outdoor Sf6 /Air Bushing Foundation
31.16	BMK / Lighting pole foundation
31.17	Fire wall
31.18	Contour layout
31.19	Drawing of formation level
31.20	Soil investigation Report
31.21	Any other foundation in Switchyard
32.00	DESIGN,FABRICATION & PROTO CORRECTED DRAWINGS OF ALL TYPES OF TOWERS & BEAMS

33.00	DESIGN,FABRICATION DRAWINGS FOR EQUIPMENT SUPPORT STRUCTURES
34.00	MISCELLANEOUSCIVILDRGS

Note: The above list of Drawing is indicative. The same shall be used for formulation of Master Drawing List (MDL) in DREAMS System.

B.3.2. a. 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 from time to time. Further, adequate portable fire extinguishers shall be provided in the substations.

b.Fire Protection Alarm system for Main control Room building, Cable gallery, Kiosk building with smoke detector shall conform to CEA.

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.

The lighting of the entire control room building, other building (if any) and switchyard shall be done by LED based low power consumption luminaries.

B.3.4 Control Room

For the new substation, substation control room shall be provided to house substation work stations 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 the control room for all the future bays.

The civil works for Control room were completed for Ground floor and first floor roof slab.

B.3.5 KIOSK Building:

The following Kiosk building with size of 10 m x 3.3 m has been proposed to erect the Bay Protection Panels.

a)	400 KV Bays	-	8 Nos.
b)	230 KV Bays	-	4 Nos.
c)	110 KV Bays	-	4 Nos.
	Total		16 Nos.

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.3.7 Visual Monitoring System (VMS) for watch and ward of substation premises:

Visual Monitoring System for effective watch and ward of substation premises shall cover all the transformers and reactors, all other major AIS Equipment (such as CB, isolators, CT, CVT, SA etc. as applicable), GIS bays, panel room, all the gates of switchyard and all entry and exit points of control room building and accordingly the location of cameras shall be decided. In addition to the gates of the switchyard, the cameras shall also be located around the boundaries at suitable locations. The camera shall be high definition color CCD camera with night vision feature. The VMS data partly/completely shall be recorded (minimum for 15 days) at least @25fps (or better) and stored on network video recorder. 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 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.

Advisory on deployment of CCTV issued by Ministry of Electronics and Information Technology (MEITY) shall be followed.

At existing substations, the visual monitoring system if available shall be augmented as per existing or better specification as required.

B.4.0 GeneralFacilities

a) Line Gantry/Towers are envisaged for bays under the present scope only. However, for adjacent future line bay, gantry/tower shall be designed for extension (considering Quad Moose conductors for 400 kV future lines) wherever applicable.

b) TSP has to arrange for construction power and water on its own.

c) All outdoor steel structures including anchor/foundation bolts shall be fully galvanized. The weight of the zinc coating shall be at least 610 gm/m2, however, for coastal/ creek regions, it shall be at least 900 gm/m^2 (if applicable).

d) In 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. 3150 A.

e) 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).

f) All electrical equipment shall be installed above the Highest Flood Level (HFL) and where such equipment is not possible to be installed above HFL, it shall be ensured that there is no seepage or leakage or logging of water.

g) As per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022/CEA Manual on Transmissions Planning criteria 2023, line approaching substation shall normally be perpendicular to the substation boundary for a stretch of 2-3 km. Accordingly, TSP shall ensure that line terminations at substations are arranged in a manner to avoid hindrance to future line terminations at the substations.

B.5.0 The following drawings/details of proposed Edayarpalayam 400kV Substation are attached with the RfP documents for further engineering by the bidder.

Sl. No.	Drawing Title	Drawing No./Details	Rev. No.
A.	**Edayarpalayam 400kV SS**		
1.0	Single Line Diagram	TR-GCC-CBE-EDPLM-EL-001	3
2.0	Compound wall and Overall plant layout	GID-433-CV-UAV-XE-3010	R1
3.0	SS -Contour	Attached	
4.0	Geo Technical Report	Attached	
5.0	SAS ARCHITECHTURE	Attached	

Note: The above list of Drawing is indicative. The same shall be used for formulation of Master Drawing List (MDL) in DREAMS System.

The existing drawings provided above and in subsequent amendments to the RfP are as received from the developer of existing substation and provided only for reference. Bidders shall follow the RfP for scope of work. Actual site conditions may be different due to other schemes being executed or subsequent revisions by the developer. Therefore, Bidders are advised to visit the substation sites and acquaint themselves with the actual site conditions, layout, topography, infrastructure such as the requirement of roads, cable trench, drainage, boundary etc. and also the design philosophy.

Proposed Edayarpalayam 400 kV SS connectivity SS UTM Coordinate details

Edayarpalayam 400 KV SS	Kavathampalayam765 kV SS	Pugalur PGCIL 400 kV SS	Myvadi PGCIL 400 kV SS
Zone-43P 728907.151 E 1207603.453 N	Zone-43P 767496 m E 1244646 m N	Zone- 43P 819424.00 mE 1213275.00 mN	Zone- 43 P 754648.00 mE 1172282.00 mN

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, CEA (Cyber Security in Power Sector) Guidelines, 2021, CERC Guidelines on “Interface Requirements” 2024 and all above documents as amended from time to time.

The communication services viz. SCADA, AGC (wherever applicable), VoIP, AMR and PMU 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.

The complete InSTS communication system commissioned by TSP under the RFP shall be the asset of InSTS and shall be available for usage of InSTS requirements as suggested by STU from time to time.

In order to meet the requirement for grid management and operation of substations, Transmission Service Provider (TSP) shall provide the following**:**

C.1.0 Communication EquipmentRequirement for Edayarpalayam Substation

(I) TSP shall supply, install & commission the following communication equipment for establishment of **Edayarpalayam** 400kV SS:

1. 1 No. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 230kV lines
2. 2 Nos. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 230 kV lines
3. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 400kV and 230kV lines.
4. 1 No. Hybrid EPAX with necessary interfaces, necessary cables and associated materials,VoIP phones (Minimum of 3 nos) and necessary analog telephones to implement the voice communication requirement for EdayarpalayamSS and for its voice communication with remote end substations and communication network. Necessary point for telephone

interface for VoiP and analog phones shall be provided in each kiosk/ Switch yard panel room.

5. TSP shall supply essential spares where each set of essential spares comprising each type of hardware modules for FOTE Equipment, OLTE Equipment separately for 400 KV lines application and for 230 KV Lines application. Quantity of number of sets spares shall be as per detailed tender specification.
6. TSP shall supply essential spares where each set of essential spares comprising each type of hardware modules for Digital Tele Protection Coupler Equipment separately for 400 KV lines application and for 230 KV Lines application. Quantity of number of sets spares shall be as per detailed tender specification.
7. TSP shall supply essential spares where each set of essential spares comprising each type of hardware modules for Hybrid EPAX and associated hardware devices. Quantity of number of sets spares shall be as per detailed tender specification.
8. Location of equipment:
   - Location of FODPs and FOTEs shall be as per engineering approval during project stage.
   - DTPCs housed in panels for designated lines shall be located in the respect Kiosk/ SPR.

(II) 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. NMS complete with life time license covering all the network elements in this project, necessary hardware, softwares, furniture etc with neccessary NBI interface supporting the various features and functions as per UNMS requirements shall be provided in case there is no proper NMS with NBI in TANTRANSCO for the offered FOTEs.

(III) TSP shall supply, install & commission Firewall in redundant mode (1+1) in line with the specification attached at **Annexure F.1**.

(IV) The maintenance of all the communication equipment and software thereof including FOTE, DTPCs,FODP, PMU, approach cable, DCPS along with Battery Bank & Firewall shall be the responsibility of TSP.

C.2.0 Development of Edayarpalayam400 kV SS along with Transmission line up to Myvadi 400 kV PGCIL SS/ Pugalur 400 kV HVDC Station/ Kavathampalayam 765 kV SS

For Multi Circuit Tower Configuration: Two (2) No. OPGW cable each containing 48 Fibres (48F) to be installed & commissioned by the TSP on both the Earth wire peaks

For Double Circuit Tower configuration 1 No. OPGW cable each containing 48 Fibres (48F) to be installed & commissioned on one earth wire peak and conventional earth wire on other E/W peak.

The TSP shall install 48 F OPGW cables from gantry of **Edayarpalayam400 kV SS** to gantry of **Myvadi 400 kV PGCIL SS/ Pugalur 400 kV HVDC Station/ Kavathampalayam765 kV SS** with all associated hardware including Vibration Dampers, mid-way & gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at end Substations.

TSP shall supply, install & commission FODP with minimum 240 Fiber capacity along with panel and approach Cable (48F each except LILO portion of where 24Fx2 approach cable shall be required) with all associated hardware fittings from gantry tower to Control Room for all the incoming lines envisaged under the present scope.

C.3.0 Communication Equipment Requirement for Kavathampalayam765 kV/400 kV Substation

TSP shall supply, install & commission the following communication equipment for **Kavathampalayam765kV /400 kV Substation** end

1. 1 No. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 400kV lines
2. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 400kV lines.
3. 1 No. Self sustaining VOIP gate way with necessary interfaces, necessary cables and associated materials,VoIP phones (Minimum of 2 nos) and necessary analog telephones to implement the voice communication requirement for its voice communication with remote end substations and communication network.
4. 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 integration with the existing FOTE for onward 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).

5. Location of FODPs and FOTEs shall be as per engineering approval during project stage.

C.4.0 Communication Equipment Requirement for Pugalur 400kV Substation

TSP shall supply, install & commission the following communication equipment for **Pugalur 400kV** Substation end

1. 1 No. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 400kV lines
2. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 400kV lines.
3. 1 No. Self sustaining VOIP gate way with necessary interfaces, necessary cables and associated materials,VoIP phones (Minimum of 2 nos) and necessary analog telephones to implement the voice communication requirement for its voice communication with remote end substations and communication network.
4. 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 integration with the existing FOTE for onward 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.
5. Location of FODPs and FOTEs shall be as per engineering approval during project stage

C.5.0 Communication Equipment Requirement for Myvadi 400kV Substation

TSP shall supply, install & commission the following communication equipment for **Myvadi 400kV** Substation end

1. 1 No. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 400kV lines
2. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 400kV lines.
3. 1 No. Self sustaining VOIP gate way with necessary interfaces, necessary cables and associated materials,VoIP phones (Minimum of 2 nos) and necessary analog telephones to implement the voice communication requirement for its voice communication with remote end substations and communication network.
4. 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 integration with the existing FOTE for onward 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.

5. Location of FODPs and FOTEs shall be as per engineering approval during project stage.

C.6.0 400kV Edayarpalayam to 230 kV Othakalmandapam DCline , 230 kV Ponnarpuram, 230 kV Palladam, 230 kV Kalivelampatti

For **400kV Edayarpalayam to 230 kV Othakalmandapam I&II /Ponnarpuram ,Palladam, Kalivelampatti feeders in case of** D/C line, TSP shall supply, install & commission One (1) no. OPGW cable containing 48 Fibres (48F) on one E/W peak and conventional earth wire on other E/W peak.

The TSP shall install this OPGW from gantry of **400 kV Edayarpalayam**PS up to the gantry of **230 kV Othakalmandapam /Ponnarpuram,Palladam, Kalivelampatti feeder**

1. With all associated hardware including Vibration Dampers, midway & gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at end Substations.

2. TSP shall supply, install & commission FODP with minimum 240 Fiber capacity along with panel and approach Cable (48F each except LILO Portion where 24Fx2 approach cable shall be required) with all associated hardware fittings from gantry tower to Control Room for all the incoming lines envisaged under the present scope.

3. Maintenance of OPGW Cable and associated hardware shall be the responsibility of TSP.

C.7.0 **Communication Equipment Requirement for FOTE Requirement for Palladam, Kalivelampatty, Othakkalmandapam I & II, and Ponnapuram 230kV Substation**

TSP shall supply, install & commission the following communication equipment at each of the **Palladam, Kalivelampatty, Othakkalmandapam, Selvapuram and Ponnapuram 230kV** Substations end

1. 1 No. Hybrid FOTE with uplink having 4 directions and redundant for all modules for dedicated applications of 230kV lines at all the above SS end.
2. Stand alone Digital Tele Protection Coupler – 2 Nos per feeder/Line for each Substation end applicable for 230kV lines in all the above SS end.
3. 1 No. Self sustaining VOIP gate way with necessary interfaces, necessary cables and associated materials,VoIP phones (Minimum of 2 nos) and necessary analog telephones to implement the voice communication requirement for its voice communication with remote end substations and communication network. This is applicable for all the above SS end.

4. 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 integration with the existing FOTE for onward 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. This is applicable for all the above SS end.
5. Location of FODPs and FOTEs shall be as per engineering approval during project stage

6. 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).

~~7.~~ 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.

8. The maintenance of all the communication equipment and software thereof including FOTE, FODP, DTPC,approach cable, PMU, DCPS alongwith Battery Bank shall be the responsibility of TSP.

C.8.0 Specific Requirement for Phasor Measurement Units (PMUs)

TSP shall supply, install & commission required No. of Phasor Measurement Units (PMUs) as per the “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. The PMUs shall be provided with LAN switch and shall connect with LAN switch of control room of respective substations/ generating stations with Fiber 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 & 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.

Annexure-F.1

Next Generation Firewall (NGFW)

TSP shall provide 2 NGFW one in Main & another in Standby mode having electrical Ethernet interfaces/ports and placed between FOTE & 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 & 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**.

Annexure F.2

Specifications of Next Generation Firewall (NGFW)

1. NGFW shall have following features including but not limited to:

2. Encryption through IPSec VPN (Virtual Private Network), Deep Packet Inspection (DPI), Denial of service (DoS) & Distributed Denial of Service (DDoS) prevention, Port Block/ Allow, rules/ policies for block/allow, IP (Internet Protocol) & Media Access Control (MAC) spoofing protection, threat detection, Intrusion Prevention System (IPS), Anti-Virus, Anti-Spyware, Man InThe Middle (MITM) attack prevention.

3. The proposed firewall shall be able to handle (alert, block or allow) unknown /unidentified applications e.g. unknown TCP & UDP packets. It shall have the provision to define application control list based on application group and/or list.

4. 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

5. Firewall shall have Management Console port to configure remotely.

6. Firewall shall be EMI/EMC compliant in Substation environment as per IEC 61850-3.

7. Firewall shall be rack mounted in existing standard equipment cabinets.

8. 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.

9. Client based Encryption/ VPN must support different Operating System platforms e.g. Windows, Linux & Mac.

10. The solution must have content and comprehensive file detection policies, blocking the files as function of their types, protocols and directions.

11. 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.

12. 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.

13. Firewall shall have the capability to configure sufficient number of VLANs.

14. Firewall shall have the capability to support sufficient number of sessions.

15. 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 AES128, AES256 and hashing algorithms as MD5 and SHA1. IPSec VPN throughput shall support at least 300 Mbps

16. Firewall shall be capable of SNMP v3 for monitoring from Network Management system. It shall also have SNMPv3 encrypted authentication and access security

17. 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.

18. Firewall should have integrated traffic shaping (bandwidth, allocation, prioritisation, etc.) functionality

19. Shall support simultaneous operation with both IPv4 and IPv6 traffic

20. Firewall shall be compatible with SNTP/NTP or any other standards for clock synchronization

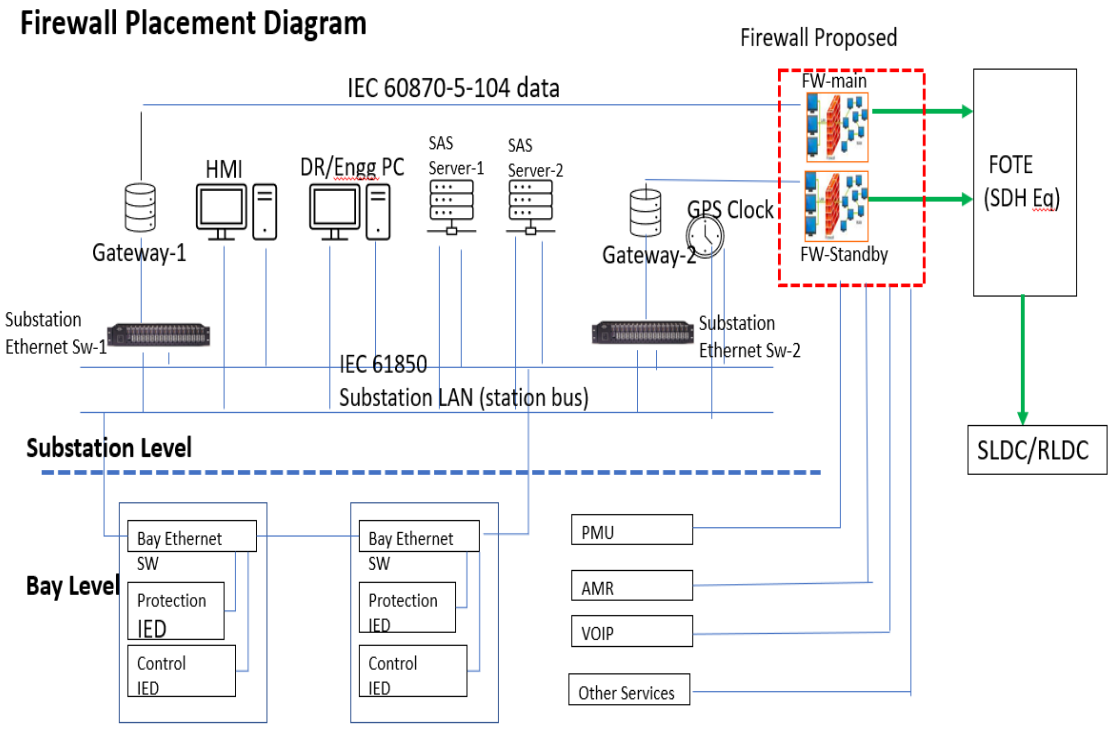
21. Firewall shall have the features of port as well as MAC based security

22. Firewall shall support exporting of logs to a centralized log management system (e.g. syslog) for security event and information management.

23. Firewall time shall be kept synchronised to official Indian Timekeeping agency, time.nplindia.org.

24. 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


Firewall Placement Diagram
Firewall Proposed
IEC 60870-5-104 data
FW-main
FW-Standby
FOTE
(SDH Eq)
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)
SLDC/RLDC
Substation Level
Bay Level
Bay Ethernet
SW
Protection
IED
Control
IED
Bay Ethernet
SW
Protection
IED
Control
IED
PMU
AMR
VOIP
Other Services

Annexure – G

Communication system integration in UNMS/CSMS

1. TSP is to ensure integration of communication system into UNMS/CSMS as per following:
"The new communication equipment/ system under the present scope shall be compatible for integration with existing regional level NMS system/ Centralized Supervision & Monitoring System (CSMS) i.e. Regional UNMS. The local configuration of the new communication equipment/ system at the station end shall be the responsibility of TSP as per followings. The configuration work in the existing centralized NMS/ UNMS at Control center end, for integration of new Communication equipment/ system shall be done by Regional ULDC Team/ NMT, however all the necessary support in this regard shall be ensured by TSP.

Requirement for integration of Communication Equipment/ system with Regional UNMS:

2, TSP shall ensure that NMS/EMS/NE supplied by them is life time license without time period limitation, NBI compliant and all FCAPS functionality is supported in the NBI such as NE Inventory, Hardware Inventory– Shelf/Slot/Card/SFP/Port, Topology, Protections, Alarms, Performance-real time & periodic, Performance KPI parameters (E-1, STM, Ethernet), Remote Configuration, Cross Connects, Trails & Circuits, Services Provisioning (NE), E-1, STM, Ethernet, TX & RX Trace, loop back and details are published in the NBI guide for the configuration parameters. The NMS

3. TSP shall be obliged to provide/share all necessary documentations such as NBI Guide/MIB/IDL/WSDL/API files etc. for onward integration of their NMS/EMS/NE with regional UNMS.

4. The following support shall be provided by TSP for integration of their supplied equipment with regional UNMS:

- Enabling & activating NBI license in their EMS/NMS and providing NBI login access along with User credentials
- Assist in verifying NBI Connectivity with UNMS vendor for the successful communication and retrieval of data.
- Assist in troubleshooting (if required) for NBI connectivity along with UNMS vendor for the communication and retrieval of data.

5. For standalone NE which is not integrated with any EMS/NMS, TSP shall provide modality of complete FCAPS data acquisition as above through industry standard programmatic methods and provide the CLI command manual."
Please note :

Where ever MPLS-TP links are implemented for subject project the suitable MPLS capacity is applicable.

Frequently Asked Queries:

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 & 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 & 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 the 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.

1.5 For transmission line, no special requirement is specified for type of Insulator and creepage in RFP document. Hence it is understood that bidder can decide the type of insulator along with creepage requirement based on general CEA regulations and relevant standards. Kindly confirm.

Reply: The minimum specific creepage distances shall be decided for the site pollution severity in the area of installation keeping in mind further increase in pollution during life of the line. It shall be as per CEA regulations and relevant standards. However, the tower shall be designed considering the porcelain insulators with creepage factor of 31 mm/kV irrespective of type of insulator used.

a. Substation:

b. 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.

c. 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 followCEA'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

d. 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.

e. 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. The Geo Technical Investigation report is enclosed for Edayarpalayam 400 / 230-110 KV SS.

f. 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.

g. We understand that VMS requirement is for unmanned stations only. For Manned stations VMS is not compulsory.

Reply: VMS shall be provided by TSP for manned and unmanned sub-stations.

h. 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.

i. 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)

j. 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/bays as per provision of RfP.

k. 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 in C&P panel subject to space availability, else, in separate metering panel (to be provided by TSP at its cost).

2.11 A draft copy of the Connection Agreement may be furnished.

Reply: Web page link https://www.ctuil.in/formats_gna_transition

2.12 Please clarify whether the spare 765 kV single phase Reactor unit for Bus reactor shall be provided with 1ph 765 kV CB.

Reply: As per RfP, the spare 1-Ph reactor unit shall be utilized for all the bus and switchable line reactor banks (including for future reactor banks). Hence, 1ph 765 kV CB shall also be provided with spare 1-Ph reactor for utilizing with bus reactor as well as switchable line reactor.

2.13 It is understood that existing busbar protection has provision for future bays and also PUs are available for future bays. BPC to confirm availability of CU and PU for bays under present scope of work at existing substations. BPC may kindly confirm availability of communication ports for integrating new PUs with the existing CUs at existing substations.

Reply: Bus Bar Protection with Central Unit (CU) is required for the new bus section as specified in RfP. Peripheral Units (PUs) shall be provided by the respective bay owner. Further, augmentation/replacement of existing CU, if required, to meet the system requirement shall also be provided for proper functioning of bus bar protection by TSP.

2.14 For SCADA, it is understood that necessary process I/O shall be available for future bays and accordingly license for same. BPC to confirm.

Reply: Necessary process I/O along with license shall be in the scope of the successful bidder (TSP) considering minimum 3 future bays at each voltage level.

2.15 No separate FF system is envisaged under the present scope of work for existing substation. BPC to confirm.

Reply: Existing fire-fighting systems shall be extended to meet the additional requirements under present scope.

2.16 BPC is requested to confirm the availability of space in the existing control rooms at existing substation for execution of extension work under current project.

Reply: Switchyard Panel Rooms are generally required for AIS type substation and relay room are required for GIS type substation. Further, if needed, the control room shall be augmented as per requirement.

3.0 Communication:

3.1 PLCC for 220 kV Lines are not under the scope of TSP. BPC to Confirm.It is requested to provide Type of Coupling for 220 kV Transmission Lines under present scope.

Reply: Unless specified in tender scope, PLCC equipment are not envisaged in the tender scope. However in respect of transmission lines designated for connection to M/s. PGCIL sub-stations or other transmission licensee Sub-stations where in PLCC equipment is used forbackup tele-protection, SCADA, telemetry, voice communication etc purposes Complete PLCC equipment (including indoor & Out door) compatible to remote end sub station PLCC equipment shall be provided and shall be considered under this tender scope. Essential spares for maintenance of PLCC equipment shall be provided.

Usually phase-phase coupling is preferred for PLCC applications. However, remote end compatibility shall be ensured

3.2 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 TANTRANSCO communication system.

Communication systems e.g. OPGW, FOTE etc. & PMU are required

speech communication, tele-protection and tele-metering and or grid monitoring from SLDC/RLDC

3.3 Is space for installation of communication panels are provided to TSP in existing Substations incase new bays are in the scope of TSP?

Reply:

TSP shall install as follows:

DTPC panels shall be installed in the respective switch yard panel room for kiosk type substation.

FOTE/FODP panels shall be installed in the new Bay Kiosk (Switchyard Panel Room (SPR)) / Bay Kisok/ Controlroom building/Relay Panel Room as per appropriate Engineering Design.

Further, TSP to connect and integrate the proposed FOTE with the existing TANTRANSCO communication network. TSP shall obtain TANTRANSCO approval of engineering drawings in respect of equipment/panels placed in existing TANTRANSCO substation.

In Case 132 kV Substation TSP shall accommodate the said panels either by extension of existing control room or other arrangements.

Where ever fibreopticline length exceeds the sufficient driving capacity of FOTE equipment at both ends of transmission line, necessary optical repeater station is to be provided at intermittent location ie at suitable sub-station of TANTRANSCO for which TSP shall provide necessary communication equipment, Auxiliary power supply system with associated materials. And these material are deemed to be under the tender scope. Necessary engineering drawing approval shall be obtained from TANTRANSCO for optical repeater station equipment proposed to be located in TANTRANSCO station.

3.4 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 2 × 48F OPGWshall be required to install by TSP on both earth wire peak on 400 kV & 765 kV lines where two E/W peaks are available. On 220 kV & 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

1 × 48 F OPGWshall be required to install by TSP on one earth wire peak and conventional earth wire on second earth wire peak, on both Line In and Line Out portion towers of 400 kV & 765 kV lines. On 220 kV & 132 kV lines where only one E/W peak is available TSP to install one No. 48 F OPGW in place of conventional earth wire.

3.5 How is the OPGW laying done in the case of 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. 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. 96F may be installed for common multi circuit portion.

3.6 How are PMUs integrated for new bays at existing Substations?

Reply: PMU data of new bays to be provided in the ethernet port of switch at control room and thereafter to be connected with existing FOTE of existing substation to send data to PDC of RLDC by TSP. These PMUs shall be provided with GPS/NavIC clock and LAN switch and shall connect with LAN switch of control room of respective substations with Fibre Optic cable. In this regard, the “Guidelines on Unified Philosophy for placement of PMUs in Indian Grid” issued vide letter No. CEA-PS-14-12/9/2024-PSETD Division dated 19.03.2025 shall be followed.

3.7 Is Spare direction available in existing FOTE for integration with new bay kiosk FOTE

Reply: The FOTE under present scope shall be integrated by TSP with the existing FOTE at control room of substation 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.

3.8 What is the distance from LILO point to proposed substation for feasibility of repeater station?

Reply: Tentative Location of LILO point shall be as per survey report of BPC however exact location to be ascertained after detailed survey by TSP.

3.9 What is the make and model of existing OPGW in case LILO of main line at new substation?

Reply: All OPGW (along with optical fibers) meet Central Electricity

Authority (Technical Standards for Communication System in Power System Operations) Regulations, 2020 and bidder shall install OPGW accordingly.

3.10 In case of LILO of existing line at new substation who shall provide PMUs at existing substation bays?

Reply: TSP shall provide the PMUs for the scope under the RfP and the same shall comply with the “Guidelines on Unified Philosophy for placement of PMUs in Indian Grid” issued vide letter No. CEA-PS-14-12/9/2024-PSETD Division dated 19.03.2025.

Schedule: 2

Scheduled COD

[Note: As referred to in the definition of "Element", "Scheduled COD", and in Articles 3.1.3 (c), 4 (b) and 4.3 (a) of this Agreement]

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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 Kavathampalayam 765/400 kV Substation:** a) Supply and Erection of 765 kV bus with 4 dia comprising of following: • 2 nos. of feeder bays for connecting Ariyalur 765 kV DC feeders with Switchable Line Reactors. (240 MVAr - 3×80 MVAr) • 2 nos. for the HV bay of ICTs. (765/400 kV, 500 MVA, Single PhaseICTs-7nos. Including 1 No. switchable Spare ICT) • 2 nos. bay for 240 MVAr (3×80MVAr) Bus Reactors with 1 No. bay arrangement for Single Phase Switchable Reactor spare unit • 2 nos. of feeder bays for connecting Virudunagar 765 kV DC feeders with	**30 months**	**21%**	Elements (S. No 1 & 2) of scheme are required to be commissioned simultaneously as their utilization is dependent on each other

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
	Switchable Line Reactors,240 MVAr (3×80 MVAr) • 1No.bay arrangement for Single Phase Switchable Line Reactor spare unit for all 765 kV line feeders. b) Supply and Erection of 400 kV Bus with 5 diacomprising of following: • 2 nos. of feeder bays for connecting Edayarpalayam 400 kV DC Feeders. • 2 nos. of feeder bays for connecting Rasipalayam 400 kV DC Feeders • 2 nos. of feeder bays for connecting Palavady 400 kV DC Feeders • 2 nos. for the LV side of ICTs. • 2 nos. of spare bays with equipment c) Supply and Erection of 765/400 kV, 500 MVA ICTs-7 Nos. (2×1500 MVA ICT Bank + 1No. Single Phase 500 MVA Spare ICT) with Nitrogen fire quenching			

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
	system and online gas and Tan Delta monitoring system. d) Supply and Erection of 765 kV, 3×80 MVAr single phase line Reactor with 1 no. spare- 13 Nos. with Nitrogen fire quenching system and online gas and Tan Delta monitoring system. e) Supply and Erection of 765 kV, 3 x 80 MVAr single phase bus Reactor with 1 no. spare - 7 Nos. with Nitrogen fire quenching system and online gas and Tan Delta monitoring system.			
2	a) 400kV Multi Circuit (MC) line with Quad Moose conductor for making LILO of *Rasipalayam to Palavadi feeder (Circuit 1 and 2)* at Kavathampalayam 765/400 kV SS. b) OPGW (Optical Ground Wire) cable with 48 optical fibers shall be used as the optical fiber communication ground wire, including all necessary accessories, for the erection of 400 kV Multi circuit (MC) transmission lines in one of the designated tower peaks.	30months	**3%**	Elements (S. No 1 & 2) of scheme are required to be commissioned simultaneously as their utilization is dependent on each other

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
	c) An earth wire shall be provided for the 400 kV Multi circuit (MC) transmission lines in the other designated tower peaks.			
3	**Establishment of Edayarpalayam 400/230-110 kV substation:** **A. Supply and Installation of 400kV Quad Moose ACSR Double Bus with 5 Nos Full Dia (2 Main + 1 Tie) comprising for the following Bays:** a) 2 Nos. of 400kV line bays to PGCIL, for terminating 400 kV DC Quad line from Pugalur PGCIL 400 kV HVDC station. b)1 No. of 400 kV Line bay to PGCIL, for terminating 400KV DC Quad line II from Myvadi PGCIL 400 kV SS. c) 2 Nos. 400 kV line bays for terminating the 400 kV DC Quad line from proposed Kavathampalayam 765 kV AIS to the proposed Edayarpalayam 400 kV AIS d) 2 Nos. ICT HV bay for 2 Nos 500 MVA, 400/230/33 kV 3 Phase ICTs.	30 Months	10%	Utilization of Elements (S. No 3) of scheme is Independent from other elements

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
	e) 2 Nos. of 400KV, 3 Phase 125 MVAR Bus reactor Bay. f) 1 No. ICT HV bay for 1 No 200 MVA, 400/110/33 kV 3 Phase ICTs. **B. Supply and Installation of 400kV Quad Moose ACSR Double Bus with 3 Nos half Dia (1 Main Bay + 1 Tie Bay) comprising the following Bays:** a) 1 No. of 400 kV Line bay to PGCIL, for terminating 400 kV DC Quad line I from Myvadi PGCIL 400 kV SS. b) 2 Nos. 400KV Spare feeder bays. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. c) 1 No. ICT HV bay for 1 No. 500 MVA, 400/230/33 kV future 3 Phase ICTs. d) 2 Nos. ICT HV bay for 2 Nos. 200 MVA, 400/110/33 kV 3 Phase ICTs. **C. Supply and Installation of 230kV Quad Moose ACSR**			

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
	Double Bus with Single Breaker scheme comprising the following Bays: a) 2 Nos. 230 kV ICT LV Bays for 2 Nos 500 MVA, 400/230/33KV 3 Phase ICTs. b) 1 No. 230KV ICT LV Bay for 1 No Future 500 MVA, 400/230/33 kV 3 Phase ICT. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. c) 5 Nos. 230 kV Line Bays with allied equipment for the following 230 kV Line Connectivity. • 230 kV Edayarpalayam –Selvapuram Feeder (Future 230 kV Edayparpalayam-Othakkalmandapam Feeder.I) • 230 kV Edayarpalayam –Othakkalmandapam Feeder.II			

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
	• 230 kV Edayarpalayam –Ponnapuram Feeder (Future Edayarpalayam – KongalNagaram Feeder). • 230 kV Edayarpalayam –Palladam Feeder. • 230 kV Edayarpalayam –Kalivelampatty Feeder d) 1 No 230 kV future Bay for Terminating the future 230 kV Line. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. e) 1 No 230 kV Bus Coupler Bay for an alternate feeding path for circuits and allows for Busbar switching without interrupting power supply to connected feeders. **D. Supply and Installation of 110kV Quad Moose ACSR Double Bus with Single Breaker scheme comprising the following Bays:**			

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
	a) 3 Nos. 110 kV ICT IV Bays for 3 Nos 200 MVA, 400/110/ 33 kV 3 Phase ICTs. b) 7 Nos.110 kV Line Bays with allied equipment for the following 110 kV Line Connectivity. • 110 kV Edayarpalayam – Othakkalmandapam Feeder • 110 kV Edayarpalayam – Podanur Feeder • 110 kV Edayarpalayam – Arasur Feeder • 110 kV Edayarpalayam – Irugur Feeder • 110 kV Edayarpalayam – Kethanur Feeder • 110 kV Edayarpalayam – Poolavadi Feeder • 110 kV Edayarpalayam – Edayarpalayam Feeder (Existing 110KV Edayarpalayam AIS) c) 1 No 110 KV future Bay for Terminating the future 110 kV Line. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also the Sub-Station Towers, Girders. Main Bus			

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
	and Jack Bus shall be Proposed and Installed. d) 1 No 110 kV Bus Coupler Bay for an alternate feeding path for circuits and allows for Busbar switching without interrupting power supply to connected feeders. e) Supply and Installation of 500 MVA, 400/230/33 kV3 Phase ICTs - 2 Nos, with Nitrogen Injection Fire Prevention and Extinguishing Systems (NIPES) Online DGA and Tan delta monitoring system. f) Supply and Installation of 200MVA, 400/110/33KV ICTs - 3 Nos with Nitrogen Injection Fire Prevention and Extinguishing System (NIFPES), Online DGA and Tan delta monitoring system. g) Supply and Installation of 400kV, 125MVAr Bus Reactor - 2 Nos. with Nitrogen Injection Fire Prevention and Extinguishing System (NIFPES) Online DGA and Tan delta monitoring system.			

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
4	a) 765kV Double Circuit (DC) line with Hexa zebra conductor from Kavathampalayam 765/400 kV SS to Ariyalur 765/400 kV SS. b) OPGW (Optical Ground Wire) cable with 48 optical fibers shall be used as the optical fiber communication ground wire, including all necessary accessories, for the erection of 765 kV double circuit (DC) transmission lines in one of the designated tower peaks. c) An earth wire shall be provided for the 765 kV double circuit (DC) transmission lines in the other designated tower peaks.	36 months	**50%**	Elements (S. No 4,5 & 6) of scheme are required to be commissioned simultaneously as their utilization is dependent on each other
5	a) 400kV Double Circuit (DC) line with Quad Moose conductor from Kavathampalayam 765/400kV SS to Edayarpalayam 400-230-110 kV SS. b) OPGW (Optical Ground Wire) cable with 48 optical fibers shall be used as the optical fiber communication ground wire, including all necessary accessories, for	36 months	**12%**	Elements (S. No 4,5 & 6) of scheme are required to be commissioned simultaneously as their utilization is dependent on each other

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date	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
	the erection of 400 kV double circuit (DC) transmission lines in one of the designated tower peaks. c) An earth wire shall be provided for the 400 kV double circuit (DC) transmission lines in the other designated tower peaks.			
6	**Bay Extension at Ariyalur 765 kV SS comprising of following:** Supply and Erection of 765 kV Bays as per Latest CEA guidelines: a) 765 kV Bay Extension for 2 nos. feeder bays in different Dias. b)765 kV, 240MVAr Switchable Line Reactors (3×80MVAr) - 2 sets. (6Nos.) with Nitrogen Fire Quenching System and online Gas and Tan delta monitoring system	36 months	**4%**	Elements (S. No 4,5 & 6) of scheme are required to be commissioned simultaneously as their utilization is dependent on each other

The payment of Transmission Charges for any Element, irrespective of its successful commissioning on or before its Scheduled COD, shall only be considered after successful commissioning of the Element(s), which are pre-required for declaring the commercial operation of such Element as mentioned in the above table.

Scheduled COD for overall Project is: 36 Months from effective date.

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 STU 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 provisions of this Agreement.

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
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

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

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

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

b. 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%)

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/ SLDC, 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

Provided, no Transmission Charges shall be paid during the period for which the RLDC/ SLDC 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/ SLDC Fee & Charges

The payment of RLDC/ SLDC fee & charges, in accordance with relevant regulations of Central Commission/ State Commission, shall be the responsibility of the TSP.

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.	Scope of the Transmission Scheme	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 Kavathampalayam 765/400 kV Substation:** a) Supply and Erection of 765 kV bus with 4 dia comprising of following: • 2 nos. of feeder bays for connecting Ariyalur 765 kV DC feeders with Switchable Line Reactors. (240 MVAr -3×80 MVAr) • 2 nos. for the HV bay of ICTs. (765/400 kV, 500 MVA, Single PhaseICTs-7nos. Including 1 No. switchable Spare ICT) • 2 nos. bay for 240 MVAr (3×80MVAr) Bus Reactors with 1 No. Bay arrangement for Single Phase Switchable Reactor spare unit • 2 nos. of feeder bays for connecting Virudunagar 765 kV DC feeders with Switchable	**21%**	Elements (S. No 1 & 2) of scheme are required to be commissioned simultaneously as their utilization is dependent on each other

Sl. No.	Scope of the Transmission Scheme	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
	Line Reactors,240 MVAr (3×80 MVAr) • 1No.bay arrangement for Single Phase Switchable Line Reactor spare unit for all 765 kV line feeders. b) Supply and Erection of 400 kV Bus with 5 dia comprising of following: • 2 nos. of feeder bays for connecting Edayarpalayam 400 kV DC Feeders. • 2 nos. of feeder bays for connecting Rasipalayam 400 kV DC Feeders • 2 nos. of feeder bays for connecting Palavady 400 kV DC Feeders • 2 nos. for the LV side of ICTs. • 2 nos. of spare bays with equipment c) Supply and Erection of 765/400 kV, 500 MVA ICTs-7 Nos. (2×1500 MVA ICT Bank + 1No. Single Phase 500 MVA Spare ICT) with Nitrogen fire quenching system and online gas and Tan Delta monitoring system. d) Supply and Erection of 765 kV, 3×80 MVAr single phase line Reactor with 1 no. spare-13 Nos. with Nitrogen fire quenching		

Sl. No.	Scope of the Transmission Scheme	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
	system and online gas and Tan Delta monitoring system. e) Supply and Erection of 765 kV, 3 x 80 MVAr single phase bus Reactor with 1 no. spare - 7 Nos. with Nitrogen fire quenching system and online gas and Tan Delta monitoring system.		
2	a) 400kV Multi Circuit (MC) line with Quad Moose conductor for making LILO of *Rasipalayam to Palavadi feeder (Circuit 1 and 2)* at Kavathampalayam 765/400 kV SS. b) OPGW (Optical Ground Wire) cable with 48 optical fibers shall be used as the optical fiber communication ground wire, including all necessary accessories, for the erection of 400 kV Multi circuit (MC) transmission lines in one of the designated tower peaks. c) An earth wire shall be provided for the 400 kV Multi circuit (MC) transmission lines in the other designated tower peaks.	**3%**	Elements (S. No 1 & 2) of scheme are required to be commissioned simultaneously as their utilization is dependent on each other
3	**Establishment of Edayarpalayam 400/230-110 kV substation:** **A. Supply and Installation of 400kV Quad Moose ACSR Double Bus with 5 Nos Full Dia (2 Main Bay + 1 Tie bay) comprising for the following Bays:**	**10%**	Utilization of Elements (S. No 3) of scheme is Independent from other elements

Sl. No.	Scope of the Transmission Scheme	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
	a) 2 Nos. of 400kV line bays to PGCIL, for terminating 400 kV DC Quad line from Pugalur PGCIL 400 kV HVDC station. b)1 No. of 400 kV Line Bay to PGCIL, for terminating 400KV DC Quad line II from Myvadi PGCIL 400 kV SS. c) 2 Nos. 400 kV line bays for terminating the 400 kV DC Quad line from proposed Kavathampalayam 765 kV AIS to the proposed Edayarpalayam 400 kV AIS d) 2 Nos. ICT HV Bay for 2 Nos 500 MVA, 400/230/33 kV 3 Phase ICTs. e) 2 Nos. of 400KV, 3 Phase 125 MVAR Bus reactor Bay. f) 1 No. ICT HV Bay for 1 No 200 MVA, 400/110/33 kV 3 Phase ICTs. **B. Supply and Installation of 400kV Quad Moose ACSR Double Bus with 3 Nos half Dia (1 Main Bay + 1 Tie Bay) comprising the following Bays:** a) 1 No. of 400 kV Line Bay to PGCIL, for terminating 400 kV DC Quad line I from Myvadi PGCIL 400 kV SS.		

Sl. No.	Scope of the Transmission Scheme	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
	b) 2 Nos. 400KV Spare feeder bays. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also, the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. c) 1 No. ICT HV Bay for 1 No. 500 MVA, 400/230/33 kV future 3 Phase ICTs. d) 2 Nos. ICT HV Bay for 2 Nos. 200 MVA, 400/110/33 kV 3 Phase ICTs. **C. Supply and Installation of 230kV Quad Moose ACSR Double Bus with Single Breaker scheme comprising the following Bays:** a) 2 Nos. 230 kV ICT IV Bays for 2 Nos 500 MVA, 400/230/33KV 3 Phase ICTs. b) 1 No. 230KV ICT IV Bay for 1 No Future 500 MVA, 400/230/33 kV 3 Phase ICT. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed.		

Sl. No.	Scope of the Transmission Scheme	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
	c) 5 Nos. 230 kV Line Bays with allied equipment for the following 230 kV Line Connectivity. • 230 kV Edayarpalayam – Selvapuram Feeder (Future 230 kV Edayparpalayam-Othakkalmandapam Feeder.I) • 230 kV Edayarpalayam – Othakkalmandapam Feeder.II • 230 kV Edayarpalayam – Ponnapuram Feeder (Future 230 kV Edayarpalayam – KongalNagaram Feeder). • 230 kV Edayarpalayam – Palladam Feeder. • 230 kV Edayarpalayam – Kalivelampatty Feeder. d) 1 No 230 kV future Bay for Terminating the future 230 kV Line. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky terrain. Also the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. e) 1 No 230 kV Bus Coupler Bay for an alternate feeding path for circuits and allows for Busbar switching without interrupting power supply to connected feeders.		

Sl. No.	Scope of the Transmission Scheme	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
	D. Supply and Installation of 110kV Quad Moose ACSR Double Bus with Single Breaker scheme comprising the following Bays: a) 3 Nos. 110 kV ICT IV Bays for 3 Nos 200 MVA, 400/110/ 33 kV 3 Phase ICTs. b) 7 Nos.110 kV Line Bays with allied equipment for the following 110 kV Line Connectivity. • 110 kV Edayarpalayam – Othakkalmandapam Feeder • 110 kV Edayarpalayam – Podanur Feeder • 110 kV Edayarpalayam – Arasur Feeder • 110 kV Edayarpalayam – Irugur Feeder • 110 kV Edayarpalayam – Kethanur Feeder • 110 kV Edayarpalayam – Poolavadi Feeder • 110 kV Edayarpalayam – Edayarpalayam Feeder (Existing 110KV Edayarpalayam AIS) c) 1 No 110 KV future Bay for Terminating the future 110 kV Line. The foundations for all equipment in these Bays shall be proposed without equipment due to rocky		

Sl. No.	Scope of the Transmission Scheme	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
	terrain. Also the Sub-Station Towers, Girders. Main Bus and Jack Bus shall be Proposed and Installed. d) 1 No 110 kV Bus Coupler Bay for an alternate feeding path for circuits and allows for Busbar switching without interrupting power supply to connected feeders. e) Supply and Installation of 500 MVA, 400/230/33 kV 3 Phase ICTs - 2 Nos, with Nitrogen Injection Fire Prevention and Extinguishing Systems (NIFPES) Online DGA and Tan delta monitoring system. f) Supply and Installation of 200MVA, 400/110/33KV ICTs - 3 Nos with Nitrogen Injection Fire Prevention and Extinguishing System (NIFPES), Online DGA and Tan delta monitoring system. g) Supply and Installation of 400kV, 3 phase 125MVAr Bus Reactor - 2 Nos. with Nitrogen Injection Fire Prevention and Extinguishing System (NIFPES) Online DGA and Tan delta monitoring system.		
4	a) 765kV Double Circuit (DC) line with Hexa zebra conductor from Kavathampalayam 765/400 kV SS to Ariyalur 765/400 kV SS.	**50%**	Elements (S. No 4,5 & 6) of scheme are required to be commissioned

Sl. No.	Scope of the Transmission Scheme	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
	b) OPGW (Optical Ground Wire) cable with 48 optical fibers shall be used as the optical fiber communication ground wire, including all necessary accessories, for the erection of 765 kV double circuit (DC) transmission lines in one of the designated tower peaks. c) An earth wire shall be provided for the 765 kV double circuit (DC) transmission lines in the other designated tower peaks.		simultaneously as their utilization is dependent on each other
5	a) 400kV Double Circuit (DC) line with Quad Moose conductor from Kavathampalayam 765/400kV SS to Edayarpalayam 400-230-110 kV SS. b) OPGW (Optical Ground Wire) cable with 48 optical fibers shall be used as the optical fiber communication ground wire, including all necessary accessories, for the erection of 400 kV double circuit (DC) transmission lines in one of the designated tower peaks. c) An earth wire shall be provided for the 400 kV double circuit (DC) transmission lines in the other designated tower peaks.	**12%**	Elements (S. No 4,5 & 6) of scheme are required to be commissioned simultaneously as their utilization is dependent on each other
6	**Bay Extension at Ariyalur 765 kV SS comprising of following:**	**4%**	Elements (S. No 4,5 & 6) of scheme are required to be

Sl. No.	Scope of the Transmission Scheme	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
	Supply and Erection of 765 kV Bays as per Latest CEA guidelines: a) 765 kV Bay Extension for 2 nos. feeder bays in different Dias. b)765 kV, 240 MVAr Switchable Line Reactors (3×80 MVAr) - 2 sets. (6Nos.) with Nitrogen Fire Quenching System and online Gas and Tan delta monitoring system		commissioned simultaneously as their utilization is dependent on each other

Schedule: 6

Methodology for Computing Transmission Availability – TBCB Project

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, got verified and certified by the concerned State Load Dispatch Centre (SLDC), separately for each AC transmission system.

2. Transmission system availability factor for nth calendar month ("TAFPn") shall be calculated by consider 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 transformer 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) **Static Synchronous Compensation ("STATCOM"):** Each STATCOM shall be considered as a separate element.

3. The Availability of the Transmission system shall be calculated 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
q1	=	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

4. The availability for each category of transmission elements shall be calculated based on the weightage factor, total hours under consideration and non-available hours for each element of that category. The formulae for calculation of 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 AC line – Number of sub-conductors in the line multiplied by ckt-km;
   (b) For each ICT bank – The rated MVA capacity;
   (c) For SVC- The rated MVAR capacity (inductive and capacitive);
   (d) For Bus Reactor/switchable line reactors – The rated MVAR capacity;
   (e) For STATCOM – Total rated MVAR Capacity.

5. The transmission elements under outage due to 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 existing system approved by the Commission. If the other transmission scheme belongs to the transmission licensee, SLDC may restrict the deemed availability period to that considered reasonable by it for the work involved. In case of dispute regarding deemed availability, the matter may be referred to TNERC 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 concerned SLDC.

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, GoTN, TNERC, SLDC 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 LTTCs.

Provided that such deemed availability shall be considered only for the period for which LTTCs 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 SLDC, shall be excluded from the total time of the element under 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 SLDC. A reasonable restoration time for the element shall be considered by SLDC 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. SLDC 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 substation or bays owned by other agency causing outage of the transmission licensee's elements, and tripping of lines, ICTs, etc. due to grid disturbance. However, if the element is not restored on receipt of direction from SLDC 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 SLDC'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 SLDC;
b. Beyond one month by TNERC 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 SLDC:

- Submission of outage data along with documentary proof (if any) and TAFPn Calculation by Transmission Licensees to SLDC
  - By 5th of the following month;

  Review of the outage data by SLDC and Issuance of availability certificate by SLDC – by 3rd of the next month.

Appendix-V

FORMULAE FOR CALCULATION OF AVAILABILITY OF EACH CATEGORY OF TRANSMISSION ELEMENTS

For AC transmission system

AVo(Availability of o no. of AC lines) = $\frac{\sum_{i=1}^{o} Wi(Ti - TNAi)/Ti}{\sum_{i=1}^{o} Wi}$

AVq(Availability of q no. of ICTs) = $\frac{\sum_{k=1}^{q} Wk(Tk - TNAk)/Tk}{\sum_{k=1}^{q} Wk}$

AVr(Availability of r no. of SVCs) = $\frac{\sum_{l=1}^{r=1} Wl(Tl - TNAl)/Tl}{\sum_{l=1}^{r} Wl}$

AVp(Availability of p no. of Switched Bus reactors) = $\frac{\sum_{m=1}^{p} Wm(Tm - TNAm)/Tm}{\sum_{m=1}^{p} Wm}$

AVu(Availability of u no. of STATCOMs) = $\frac{\sum_{n=1}^{u} Wn(Tn - TNAn)/Tn}{\sum_{n=1}^{u} Wn}$

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 ……..[Insert the name of the 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 …… (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 3.1.2 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 / 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 …… [Insert name of the SPV] or the Selected Bidder, as the case may be, to make any claim against or any demand on …… [Insert name of the SPV] or the Selected Bidder, as the case may be, or to give any notice to …… [Insert name of the SPV] 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 …… [Insert name of the SPV] 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 3.1.2of 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.

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

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.