

**TRANSMISSION SERVICE AGREEMENT**

**FOR**

**DEVELOPMENT AND OPERATION OF INTRA-  
STATE TRANSMISSION SYSTEM**

**FOR TRANSMISSION OF ELECTRICITY  
THROUGH TARIFF BASED COMPETITIVE  
BIDDING FOR**

**TRANSMISSION SYSTEM FOR ESTABLISHING  
400KV SUB-STATION AT HAMPAPURA  
ALONG WITH ASSOCIATED TRANSMISSION  
LINES (MANDYA DISTRICT)**

**BETWEEN THE**

**POWER COMPANY OF KARNATAKA LIMITED  
(PCKL)  
(Nodal Agency)**

**AND**

**[INSERT NAME OF SPV]**

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**THIS TRANSMISISON SERVICE AGREEMENT** (hereinafter referred to as “TSA” or “Agreement” or “the Agreement” or “this Agreement”) is made on the ..... [Insert day] of..... [Insert month] of Two Thousand and..... [Insert Year]

**BETWEEN:**

The .....[Insert name and registered address of “Nodal Agency” for the project] acting as a Nodal Agency (referred to as the “Nodal Agency”), which expression shall unless repugnant to the context or meaning thereof include its successors, and permitted assigns) as Party of the one part;

**AND**

..... [Insert Name of the Transmission Service Provider], incorporated under the Companies Act, 1956/ Companies Act, 2013 (as the case may be), having its registered office at ..... (herein after referred to as “Transmission Service Provider” or “TSP” or “InSTS Licensee”, which expression shall unless repugnant to the context or meaning thereof include its successors, and permitted assigns) as Party of the other part;

**(“Nodal Agency” and “TSP” are individually referred to as “Party” and collectively as the “Parties”)**

**AND WHEREAS:**

- A) In accordance with the Bidding Guidelines, the Bid Process Coordinator (hereinafter referred to as BPC) had initiated a competitive e-reverse bidding process through issue of RFP for selecting a Successful Bidder to build, own, operate and transfer the Project comprising of the Elements mentioned in Schedule 1 (hereinafter referred to as the Project)
- B) Pursuant to the said e-reverse bidding process, the BPC has identified the Successful Bidder, who will be responsible to set up the Project on build, own, operate and transfer basis to provide Transmission Service in accordance with the terms of this Agreement and the Transmission License.
- C) The Selected Bidder have submitted the Contract Performance Guarantee and acquired one hundred percent (100%) of the equity shareholding of

.....[Insert Name of the SPV], along with all its related assets and liabilities in terms of the provisions of the Share Purchase Agreement.

- D) The TSP has agreed to make an application for a Transmission License to the 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 Bid Evaluation Committee in accordance with the Bidding Guidelines issued by Ministry of Power, Government of India.
- F) The TSP agrees to the terms and conditions of this agreement, for making available the InSTS and charge the Transmission Charges in accordance with the terms and conditions of this agreement.
- G) The billing, collection and disbursement of the Transmission Charges by the PCKL 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

### 1 DEFINITIONS AND INTERPRETATIONS

#### 1.1 Definitions:

1.1.1 The words / expressions used in this Agreement, unless as defined below or repugnant to the context, shall have the same meaning as assigned to them by the Electricity Act, 2003 and the rules or regulations framed there under including those issued / framed by the 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 procedure contained in, Annexure V of Karnataka Electricity Regulatory Commission (Multi Year Transmission, Distribution and Retail Supply Tariff) Regulations, 2024 attached herewith in Schedule 6;

**“Bid”** shall mean technical bid and financial bid submitted by the Bidder, in response to the RFP, in accordance with the terms and conditions of the RFP;

**“Bid Deadline”** shall mean the last date and time for submission of the Bid in response to RFP, as specified in the RFP;

**“Bidding Company”** shall refer to such single company that has made a Response to RFP for the Project;

**“Bidding Consortium / Consortium”** shall refer to a group of companies that has collectively made a Response to RFP for the Project;

**“Bid Documents”** or **“Bidding Documents”** shall mean the RFP, along with all attachments thereto or clarifications thereof;

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

**“Bid Process Coordinator”** or **“BPC”** shall mean a person or its authorized representative as notified by the Government of Karnataka, responsible for carrying out the process for selection of Bidder who will acquire 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 in which the Nodal Agency’s registered office is located and the concerned TSP are located;

**“CEA”** shall mean the Central Electricity Authority constituted under Section -70 of the Electricity Act;

**“Change in law”** shall have the meaning ascribed thereto in Article 12;

**“Commercial Operation Date”** or **“COD”** shall mean the date as per Article 6.2;

**“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”** 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, submitted and to be submitted by the TSP or by the Selected Bidder on behalf of the TSP to the Nodal Agency from a bank mentioned in Annexure 17 of the RFP, in the form attached here to as Schedule 8, in accordance with Article 3 of this Agreement and which shall include the additional bank guarantee furnished by the TSP under this Agreement;

**“Contract Year”**, for the purpose of payment of Transmission Charges, shall mean the period beginning on the COD, and ending on the immediately succeeding March 31 and thereafter each period of 12

months beginning on April 1 and ending on March 31 provided that the last Contract Year shall end on the last day of the term of the TSA;

“**CTU**” or “**Central Transmission Utility**” shall have same meaning as defined in the Electricity Act, 2003;

“**Day**” shall mean a day starting at 0000 hours and ending at 2400 hours;

“**D/C**” shall mean Double Circuit;

“**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 thirtieth (30th) 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 2.1 of this Agreement;

“**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 InSTS, 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;

**“GOI”** shall mean Government of India;

**“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.

**“Indian Governmental Instrumentality”** shall mean Government of India, Government of any State in India or any ministry, department, board, authority, agency, corporation, commission under the direct or indirect control of Government of India or any State Government or both, any political sub-division of any of them including any court or CERC or KERC or tribunal or judicial or quasi-judicial body in India but excluding the CTU, TSP and the PCKL;

**“Insurances”** shall mean the insurance cover to be obtained and maintained by the TSP in accordance with Article 9 of this Agreement;

**“Inter connection 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 / InSTS Licensee's /

PCKL 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 Project, meets the technical requirement as specified in the RFP and so designated by other Member(s) in Bidding Consortium;

**“Lenders”** means the banks, financial institutions, multilateral funding agencies, non-banking financial companies registered with the Reserve Bank of India (RBI), insurance companies registered with the Insurance Regulatory & Development Authority (IRDA), pension funds regulated by the Pension Fund Regulatory & Development Authority (PFRDA), mutual funds registered with Securities & Exchange Board of India (SEBI), etc., including their successors and assigns, who have agreed on or before COD of the Project to provide the TSP with the debt financing described in the capital structure schedule, and any successor banks or financial institutions to whom their interests under the Financing Agreements may be transferred or assigned;

Provided that, such assignment or transfer shall not relieve the TSP of its obligations to the Nodal Agency under this Agreement in any manner and shall also does not lead to an increase in the liability of the Nodal Agency;

**“Lenders Representative”** shall mean the person notified by the Lender(s) in writing as being the representative of the Lender(s) or the Security Trustee and such person may from time to time be replaced by

the Lender(s) pursuant to the Financing Agreements by written notice to the TSP;

**“Letter of 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;

**“Letter of Intent”** or **“LOI”** shall have the same meaning as in the RFP;

**“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 **“Member in a Bidding Consortium / Member”** shall mean each company in the Bidding Consortium;

**“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;

**“State Load Despatch Centre”** shall mean the centre established as per sub-section (1) of Section 31 of the Electricity Act 2003;

**“Nodal Agency”** shall mean PCKL, which shall execute and implement the Transmission Service Agreement (TSA);

**“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 at least twenty six percent (26%) of the paid - up equity capital directly or indirectly in the Bidding Company or in the Member in a Bidding Consortium, as the case may be;

**“Preliminary Termination Notice”** shall mean a Nodal Agency’s Preliminary Termination Notice as defined in Article 13 of this Agreement;

**“Project”** shall mean **“Establishing 400kV Sub-station at Hampapura along with associated transmission lines (Mandya District)”**, as detailed in Schedule 1 of this Agreement;

**“Project Assets”** shall mean all physical and other assets relating to and forming part of the Project including:

- (a) rights over the Site for substations, ROW for transmission lines;
- (b) tangible & intangible assets such as civil works and equipment including foundations, embankments, pavements, electrical systems, communication systems, relief centres, administrative offices, Sub-stations, software, tower and sub-stations designs etc;
- (c) project facilities situated on the Site;
- (d) all rights of the TSP under the project agreements;
- (e) financial assets, such as receivables, security deposits etc;
- (f) insurance proceeds; and
- (g) Applicable Permits and authorisations relating to or in respect of the Transmission System;”

**“Project Execution Plan”** shall mean the plan referred to in Article 3.1.3 (c) hereof;

**“Prudent Utility Practices”** shall mean the practices, methods and standards that are generally accepted internationally from time to time by electric transmission utilities for the purpose of ensuring the safe, efficient and economic design, construction, commissioning, operation, repair and maintenance of the Project and which practices, methods and standards shall be adjusted as necessary, to take account of:

- (i) operation, repair and maintenance guidelines given by the manufacturers to be incorporated in the Project,

- (ii) the requirements of Law, and
- (iii) the physical conditions at the Site;
- (iv) the safety of operating personnel and human beings;

**“Rated Voltage”** shall mean voltage at which the Transmission System is designed to operate or such lower voltage at which the line is charged, for the time being, in consultation with the 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 30.04.2025 along with all schedules, annexures and RFP Project Documents attached thereto, issued by the BPC for tariff based competitive bidding process for selection of Bidder as TSP to execute the Project, including any modifications, amendments or alterations thereto;

**“RFP Project Documents”** shall mean the following documents to be entered into in respect of the Project, by the Parties to the respective agreements:

- a. Transmission Service Agreement,
- b. Share Purchase Agreement, 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 REC Power Development and Consultancy Limited, .....[Insert Name of the SPV] and the Successful Bidder for the purchase of one hundred (100%) per cent of the shareholding of the .....[Insert Name of the SPV] 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 “KERC”** shall mean the Karnataka 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 Karnataka;

**“STU” or “State Transmission Utility” of “Karnataka Power Transmission Corporation Limited (KPTCL)”** shall be the Board or the Government company, specified as such by the State Government under sub-section (1) of Section 39 of the Electricity Act 2003;

**“Successful Bidder” or “Selected Bidder”** shall mean the Bidder selected pursuant to the RFP and who has to acquire one hundred percent (100%) equity shares of .....[Insert Name of the SPV], along with all its related assets and liabilities, which will be responsible as the TSP to establish the Project on build, own, operate and transfer basis as per the terms of the TSA and other RFP Project Documents;

**“TSP’s Preliminary Notice”** shall mean a notice issued by the TSP in pursuant to the provisions of Article 13.3 of this Agreement;

**“Target Availability”** shall have the meaning as ascribed hereto in Article 0 of this Agreement;

**“Technically Evaluated Entity”** shall mean the company which has been evaluated for the satisfaction of the technical requirement set forth in RFP;

**“Termination Notice”** shall mean a Nodal Agency’s Termination Notice given by the Nodal Agency to the TSP pursuant to the provisions of Articles 3.3.2, 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 Nodal Agency as per the 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 at least twenty six percent (26%) equity in the Bidding Company or Member of a Consortium, (as the case may be) and in the Technically Evaluated Entity and / or Financially Evaluated Entity (as the case may be) and such Bidding Company or Member of a Consortium, (as the case may be) and the Technically Evaluated Entity and / or Financially Evaluated Entity (as the case may be) shall be under the direct control or indirectly under the common control of such entity;

## 1.2 Interpretation:

***Save where the contrary is indicated, any reference in this Agreement to:***

**“Agreement”** shall be construed as including a reference to its Schedules, Appendices and Annexures;

**“Rupee”, “Rupees” and “Rs.”** shall denote lawful currency of India;

**“crore”** shall mean a reference to ten million (10,000,000) and a **“lakh”** shall mean a reference to one tenth of a million (1,00,000);

**"encumbrance"** shall be construed as a reference to a mortgage, charge, pledge, lien or other encumbrance securing any obligation of any person or any other type of preferential arrangement (including, without limitation, title transfer and retention arrangements) having a similar effect;

**"holding company"** of a company or corporation shall be construed as a reference to any company or corporation of which the other company or corporation is a subsidiary;

**"indebtedness"** shall be construed so as to include any obligation (whether incurred as principal or surety) for the payment or repayment of money, whether present or future, actual or contingent;

**"person"** shall have the meaning as defined in Section 2(49) of the Act;

**"subsidiary"** of a company or corporation (the holding company) shall be construed as a reference to any company or corporation:

- (i) which is controlled, directly or indirectly, by the holding company, or
- (ii) more than half of the issued share capital of which is beneficially owned, directly or indirectly, by the holding company, or
- (iii) which is a subsidiary of another subsidiary of the holding company,

for these purposes, a company or corporation shall be treated as being controlled by another if that other company or corporation is able to direct its affairs and/or to control the composition of its board of directors or equivalent body;

**"winding-up", "dissolution", "insolvency", or "reorganization"** in the context of a company or corporation shall have the same meaning as defined in the Companies Act, 1956/ Companies Act, 2013 (as the case may be).

- 1.2.1** Words importing the singular shall include the plural and vice versa.
- 1.2.2** This Agreement itself or any other agreement or document shall be construed as a reference to this or to such other agreement or document as it may have been, or may from time to time be, amended, varied, novated, replaced or supplemented.
- 1.2.3** A Law shall be construed as a reference to such Law including its amendments or re-enactments from time to time.

- 1.2.4** A time of day shall, save as otherwise provided in any agreement or document be construed as a reference to Indian Standard Time.
- 1.2.5** Different parts of this Agreement are to be taken as mutually explanatory and supplementary to each other and if there is any inconsistency between or among the parts of this Agreement, they shall be interpreted in a harmonious manner so as to give effect to each part.
- 1.2.6** The tables of contents and any headings or sub-headings in this Agreement have been inserted for ease of reference only and shall not affect the interpretation of this Agreement.
- 1.2.7** All interest payable under this Agreement shall accrue from day to day and be calculated on the basis of a year of three hundred and sixty five (365) days.
- 1.2.8** The words “hereof” or “herein”, if and when used in this Agreement shall mean a reference to this Agreement.
- 1.2.9** The contents of Schedule 7 shall be referred to for ascertaining accuracy and correctness of the representations made by the Selected Bidder in Article 17.2.1 hereof.

**ARTICLE: 2**

**2 EFFECTIVENESS AND TERM OF AGREEMENT**

**2.1 Effective Date:**

This Agreement shall be effective from later of the dates of the following events:

- a. The Selected Bidder, on behalf of the TSP, has provided the Contract Performance Guarantee, as per terms of Article 3.1 of this Agreement; and
- b. The Selected Bidder has acquired for the Acquisition Price, one hundred percent (100%) of the equity shareholding of REC Power Development and Consultancy Limited in .....[Insert Name of the SPV] 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 KPTCL or its successors or an agency as decided by the Government of Karnataka 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 KPTCL or its successors or an agency as decided by the State Government 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 liquidated damages as per the terms of this Agreement, nor shall it effect the survival of any continuing obligations/ roles for which this Agreement provides, either expressly or by necessary implication, which are to survive after the Expiry Date or termination including those under Articles 3.3.3, 3.3.5, Article 9.3 (Application of Insurance Proceeds), Article 11 (Force Majeure), Article 13 (Events of Default and Termination), Article 14 (Liability & Indemnification), Article 16 (Governing Law & Dispute Resolution), Article 19 (Miscellaneous).

**2.5 Applicability of the provisions of this Agreement**

**2.5.1** For the purpose of Availability, Target Availability and the computation of Availability, Incentive, Penalty, the provisions provided in this Agreement shall apply and any future modifications in the relevant Rules and Regulations shall not be applicable for this Project.

**2.5.2** For the purposes of this Agreement for InSTS 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 ten (10) days from the date of issue of Letter of Intent, the Selected Bidder, shall:

- a. Provide the Contract Performance Guarantee, and
- b. Acquire, for the Acquisition Price, one hundred percent (100%) equity shareholding of .....[Insert Name of the SPV] from REC Power Development and Consultancy Limited, who shall sell to the Selected Bidder, the equity shareholding of .....[Insert Name of the SPV], 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.

The Selected Bidder, on behalf of the TSP, will provide to the Power Company of Karnataka Limited (being the Nodal Agency) the Contract Performance Guarantee for an amount of Rs 38.76 Crores (Rupees Thirty-Eight Crore Seventy-Six Lakh Only)

**3.1.2** The Contract Performance Guarantee shall be initially valid for a period up to three (3) months after the Scheduled COD of the Project and shall be extended from time to time to be valid for a period up to three (3) months after the COD of the Project. In case the validity of the Contract Performance Guarantee is expiring before the validity specified in this Article, the TSP shall, at least thirty (30) days before the expiry of the Contract Performance Guarantee, replace the Contract Performance Guarantee with another Contract Performance Guarantee or extend the validity of the existing Contract Performance Guarantee until the validity period specified in this Article.

**3.1.3** The TSP agrees and undertakes to duly perform and complete the following activities within six (6) months from the Effective Date (except for c) below), unless such completion is affected due to any Force Majeure Event, or if any of the activities is specifically waived in writing

by the Nodal Agency:

- a. To obtain the Transmission License for the Project from the 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) and maximum within one hundred and twenty (120) days from the Effective Date. Also, an approved copy each of Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) would be submitted to Independent Engineer & Nodal Agency in the same time period. The TSP's Project Execution Plan should be in conformity with the Scheduled COD as specified in Schedule 2 of this Agreement, and shall bring out clearly the organization structure, time plan and methodology for executing the Project, award of major contracts, designing, engineering, procurement, shipping, construction, testing and commissioning to commercial operation;
- d. To submit to the Nodal Agency, 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 even within three (3) Months after the time specified therein, then on and from the expiry of such period and until the TSP has satisfied all the conditions specified in Article 3.1.3, the TSP shall, on a monthly basis, be liable to furnish to Power Company of Karnataka Limited (being the nodal agency) additional Contract Performance Guarantee of Rupees Three Crore Eighty Eight Lakh Only (Rs 3.88 Crore) within two (2) Business Days of expiry of every such Month. Such additional Contract Performance Guarantee shall be provided to Power Company of Karnataka Limited (being the nodal agency) in the manner provided in Article 3.1.1 and shall become part of the Contract Performance Guarantee and all the provisions of this Agreement shall be construed accordingly Power Company of Karnataka Limited (being the nodal agency) shall be entitled to hold and / or invoke the Contract Performance Guarantee, including such additional Contract Performance Guarantee, in accordance with the provisions of this Agreement.

**3.3.2** Subject to Article 3.3.4, if:

- (i) the fulfilment of any of the conditions specified in Article 3.1.3 is delayed beyond nine (9) Months from the Effective Date and the TSP fails to furnish additional Contract Performance Guarantee to the Nodal Agency in accordance with Article 3.3.1 hereof; or
- (ii) the TSP furnishes additional Performance Guarantee to the Nodal Agency in accordance with Article 3.3.1 hereof but fails to fulfil the conditions specified in Article 3.1.3 within a period of twelve (12) months from the Effective Date,

the Nodal Agency shall have the right to terminate this Agreement, by giving a Termination Notice to the TSP, in writing, of at least seven (7) days, with a copy to Government of Karnataka, 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.

**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 of Rs 38.76 Crores (Rupees Thirty-Eight Crore Seventy-Six Lakh Only) as liquidated damages. The Nodal Agency shall

be entitled to recover this amount of damages by invoking the Contract Performance Guarantee to the extent of liquidated damages, which shall be required by the Nodal Agency, and the balance shall be returned to TSP, if any.

It is clarified for removal of doubt that this Article shall survive the termination of this Agreement.

- 3.3.4** In case of inability of the TSP to fulfil the conditions specified in Article 3.1.3 due to any Force Majeure Event, the time period for fulfilment of the condition subsequent as mentioned in Article 3.1.3, may be extended for a period of such Force Majeure Event. Alternatively, if deemed necessary, this Agreement may be terminated by the Nodal Agency giving a Termination Notice to the TSP, in writing, of at least seven (7) days, with a copy to Government of Karnataka, 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 thereof;
  - ii. the Grid Code;
  - iii. the CEA Regulations applicable, and as amended from time to time, for Transmission Lines and sub-stations:
    - the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007;
    - Central Electricity Authority (Technical Standards for construction of Electrical Plants and Electric Lines) Regulation, 2010;
    - Central Electricity Authority (Grid Standard) Regulations, 2010;
    - Central Electricity Authority (Safety requirements for construction, operation and maintenance of Electrical Plants and Electrical Lines) Regulation, 2011;
    - Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulation, 2010;
    - Central Electricity Authority (Technical Standards for Communication System in Power System Operation) Regulations, 2020.

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- 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 Inter connection 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 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 Guidelines issued by Govt. of India pertaining to this;
- i. to procure the products associated with the Transmission System as per provisions of Public Procurement (Preference to Make in India) orders issued by Ministry of Power vide orders No. 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 deemed to have included Selected Bidder and/ or TSP).

Also, to comply with Department of Expenditure, Ministry of Finance vide Order (Public Procurement No 1) bearing File

No. 6/18/2019-PPD dated 23.07.2020, 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;

- j. to submit to Nodal Agency information in the prescribed format [To be devised by Nodal Agency for ensuring compliance to Article 4.1 i) above.
- k. to comply with all its obligations undertaken in this Agreement.

#### **4.2 Roles of the Nodal Agency in implementation of the Project:**

**4.2.1** Subject to the terms and conditions of this Agreement, the Nodal Agency shall be the holder and administrator of this Agreement and shall inter alia:

- a. appoint an Independent Engineer within 90 days of the Effective Date
- b. provide letters of recommendation to the concerned Indian Governmental Instrumentality, as may be requested by the TSP from time to time, for obtaining the Consents, Clearances and Permits required for the Project;
- c. coordinate among TSP and upstream/downstream entities in respect of Interconnection Facilities; and
- d. monitor the implementation of the Agreement and take appropriate action for breach thereof including revocation of guarantees, cancellation of Agreement, blacklisting etc
- e. provide all assistance to the Arbitrators as required for the performance of their duties and responsibilities; and
- f. perform any other responsibility (ies) as specified in this Agreement.

#### **4.3 Time for Commencement and Completion:**

- a. The TSP shall take all necessary steps to commence work on the Project from the Effective Date of the Agreement and shall achieve Scheduled COD of the Project in accordance with the time schedule specified in Schedule 2 of this Agreement;

- b. The COD of each Element of the Project shall occur no later than the Scheduled COD or within such extended time to which the TSP shall be entitled under Article 4.4 hereto.

**4.4 Extension of time:**

**4.4.1** In the event that the TSP is unable to perform its obligations for the reasons solely attributable to the Nodal Agency, the Scheduled COD shall be extended, by a 'day to day' basis, subject to the provisions of Article 13.

**4.4.2** In the event that an Element or the Project cannot be commissioned by its Scheduled COD on account of any Force Majeure Event as per Article 11, the Scheduled COD shall be extended, by a 'day to day' basis for a period of such Force Majeure Event. Alternatively, if deemed necessary, the Nodal Agency may terminate the Agreement as per the provisions of Article 13.4 by giving a Termination Notice to the TSP, in writing, of at least seven (7) days, with a copy to Government of Karnataka, 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 4.1 of this Agreement.

**5.1.2** The TSP acknowledges and agrees that it shall not be relieved from any of its obligations under this Agreement or be entitled to any extension of time or any compensation whatsoever by reason of the unsuitability of the Site or Transmission Line route(s).

**5.1.3** The TSP shall be responsible for obtaining all Consents, Clearances and Permits related but not limited to road / rail / river / canal / power line / crossings, Power and Telecom Coordination Committee (PTCC), defence, civil aviation, right of way / way-leaves and environmental & forest clearances from relevant authorities required for developing, financing, constructing, maintaining/ renewing all such Consents, Clearances and Permits in order to carry out its obligations under this Agreement in general and shall furnish to the Nodal Agency such copy/ies of each Consents, Clearances and Permits, on demand. Nodal Agency shall provide letters of recommendation to the concerned Indian Governmental Instrumentality, as may be requested by the TSP from time to time for obtaining the Consents, Clearances and Permits required for the Project

**5.1.4** The TSP shall be responsible for:

- (a) acquisition of land for location specific substations, switching stations or HVDC terminal or inverter stations. Also, the actual location of Greenfield Substation (Switching Station HVDC Terminal or Inverter Station or in the Scope of TSA;
- For a Generation Pooling Substation shall not be beyond 3 Km radius of the location proposed by the BPC in their Survey Report.
  - For load Serving Substation within the scope of TSP shall not be beyond 5 Km radius of the location proposed by the BPC in their Survey Report

- For an intermediate Substation shall not be beyond 10 Km radius of the location proposed by the BPC in their Survey Report.

- (b) final selection of Site including its geo-technical investigation;
- (c) survey and geo-technical investigation of line route in order to determine the final route of the Transmission Lines;
- (d) seeking access to the Site and other places where the Project is being executed, at its own risk and costs, including payment of any crop, tree compensation or any other compensation as may be required.

**5.1.5** In case the Project involves any resettlement and rehabilitation, the resettlement and rehabilitation package will be implemented by the State Government authorities, for which the costs is to be borne by the TSP and no changes would be allowed in the Transmission Charges on account of any variation in the resettlement and rehabilitation cost. The TSP shall provide assistance on best endeavour basis, in implementation of the resettlement and rehabilitation package, if execution of such package is in the interest of expeditious implementation of the Project and is beneficial to the Project affected persons.

**5.2 Appointing Contractors:**

**5.2.1** The TSP shall conform to the requirements as provided in this Agreement while appointing Contractor(s) for procurement of goods & services.

**5.2.2** The appointment of such Contractor(s) shall neither relieve the TSP of any of its obligations under this Agreement nor make the Nodal Agency liable for the performance of such Contractor(s).

**5.3 Monthly Progress Reporting:**

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

**5.5 Progress Monitoring & Quality Assurance:**

**5.5.1** The Project Execution Plan submitted by the TSP in accordance with Article 3.1.3 c) shall comprise of detailed schedule of all the equipments / items /materials required for the Project, right from procurement of raw material till the dispatch from works and receipt at the site. Further, it should also include various stages of the construction schedule up to the commissioning of the Project.

**5.5.2** Nodal Agency, STU & Independent Engineer shall have access at all reasonable times to the Site and to the Manufacturer's works and to all such places where the Project is being executed.

**5.5.3** Independent Engineer shall ensure conformity of the conductor specifications with the functional specifications specified in RFP.

**5.5.4** The Independent Engineer shall monitor the following during construction of the Project:

- a) Quality of equipments, material, foundation, structures and workmanship etc. as laid down in Article 5.4 and 6.1.4 of the TSA. Specifically, quality

of Sub-station equipments, transmission line material and workmanship etc. would be checked in accordance with the Article 5.4.

- b) Progress in the activities specified in Condition Subsequent
- c) Verification of readiness of the elements including the statutory clearances & completion of civil works, fixing of all components and finalisation of punch points (if any) prior to charging of the elements
- d) Progress of construction of substation and Transmission Lines

5.5.5 The progress shall be reviewed by the Independent Engineer against the Project Execution Plan. The Independent Engineer shall prepare its report on monthly basis and submit the same to Nodal Agency highlighting the progress achieved till the end of respective month vis-à-vis milestone activities, areas of concern, if any, which may result in delay in the timely completion of the Project. Based on the progress, Nodal Agency and/ or 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 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 it. 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 Government of Karnataka, 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 Interconnection Facilities:**

- 6.1.1** The TSP shall give the RLDC(s), CTU, / STU, as the case may be, and any other agencies as required, at least sixty (60) days advance written notice of the date on which it intends to connect an Element of the Project, which date shall not be earlier than its Scheduled COD or Schedule COD extended as per Article 4.4.1 & 4.4.2 of this Agreement, unless mutually agreed to by Parties. Further, any preponing of COD of any element prior to Scheduled COD must be approved by the Nodal Agency,
- 6.1.2** The RLDC / SLDC (as the case may be) or the CTU / STU (as the case may be), for reasonable cause, including non-availability of Interconnection Facilities as per Article 4.2, can defer the connection for up to fifteen (15) days from the date notified by the TSP pursuant to Article 6.1.1, if it notifies to the TSP in writing, before the date of connection, of the reason for the deferral and when the connection is to be rescheduled. However, no such deferment on one or more occasions would be for more than an aggregate period of thirty (30) days. Further, the Scheduled COD would be extended as required, for all such deferments on “day to day” basis.
- 6.1.3** Subject to Articles 6.1.1 and 6.1.2, any Element of Project may be connected with the Interconnection Facilities when:
- a. it has been completed in accordance with this Agreement and the Connection Agreement;
  - b. it meets the Grid Code, Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 as amended from time to time and all other Indian legal requirements, and
  - c. The TSP has obtained the approval in writing of the Electrical Inspector certifying that the Element is ready from the point of view of safety of supply and can be connected with the Interconnection Facilities.
  - 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 Liquidated Damages for Delay in achieving COD of Project:**

- 6.4.1** If the TSP fails to achieve COD of any Element of the Project or the Project, by the Element's / Project's Scheduled COD or such Scheduled COD as extended under Articles 4.4.1 and 4.4.3, then the TSP shall pay to the Nodal Agency, a sum equivalent to 3.33% of Monthly

Transmission Charges applicable for the Element of the Project [in case where no Elements have been defined, to be on the Project as a whole] / Project, for each day of delay up to sixty (60) days of delay and beyond that time limit, at the rate of five percent (5%) of the Monthly Transmission Charges applicable to such Element / Project, as liquidated damages for such delay and not as penalty, without prejudice to any rights of the Nodal Agency under the Agreement.

- 6.4.2** The TSP's maximum liability under this Article 6.4 shall be limited to the amount of liquidated damages calculated in accordance with Article 6.4.1 for and up to six (6) months of delay for the Element or the Project.

Provided that, in case of failure of the TSP to achieve COD of the Element of the Project even after the expiry of six (6) months from its Scheduled COD, the provisions of Article 13 shall apply.

- 6.4.3** The TSP shall make payment to the Nodal Agency of the liquidated damages calculated pursuant to Article 6.4.1 within ten (10) days of the earlier of:

- a. the date on which the applicable Element achieves COD; or
- b. the date of termination of this Agreement.

The payment of such damages shall not relieve the TSP from its obligations to complete the Project or from any other obligation and liabilities under the Agreement.

- 6.4.4** If the TSP fails to pay the amount of liquidated damages to the Nodal Agency within the said period of ten (10) days, the Nodal Agency shall be entitled to recover the said amount of the liquidated damages by invoking the Contract Performance Guarantee. If the then existing Contract Performance Guarantee is for an amount which is less than the amount of the liquidated damages payable by the TSP to the Nodal Agency under this Article 6.3 and the TSP fails to make payment of the balance amount of the liquidated damages not covered by the Contract Performance Guarantee, then such balance amount shall be deducted from the Transmission Charges payable to the TSP. The right of the Nodal Agency to encash the Contract Performance Guarantee is without prejudice to the other rights of the Nodal Agency under this Agreement.

- 6.4.5** For avoidance of doubt, it is clarified that amount payable by TSP under this Article is over and above the penalty payable by TSP under Article 5.5.6 of this Agreement.

**6.5 Return of Contract Performance Guarantee**

- 6.5.1** The Contract Performance Guarantee as submitted by TSP in accordance with Article 3.1.1 shall be released by the Nodal Agency within three (3) months from the COD of the Project. In the event of delay in achieving Scheduled COD of any of the Elements by the TSP (otherwise than due to reasons as mentioned in Article 3.1.3 or Article 11) and consequent part invocation of the Contract Performance Guarantee by the Nodal Agency. Nodal Agency shall release the Contract Performance Guarantee, if any remaining unadjusted, after the satisfactory completion by the TSP of all the requirements regarding achieving the Scheduled COD of the remaining Elements of the Project. It is clarified that the Nodal Agency shall also return / release the Contract Performance Guarantee in the event of (i) applicability of Article 3.3.2 to the extent the Contract Performance Guarantee is valid for an amount in excess of Rs 38.76 Crores (Rupees Thirty-Eight Crore Seventy-Six Lakh Only), or (ii) termination of this Agreement by the Nodal Agency as mentioned under Article 3.3.4 of this Agreement.
- 6.5.2** The release of the Contract Performance Guarantee shall be without prejudice to other rights of the Nodal Agency under this Agreement.

**ARTICLE: 7**

**7 OPERATION AND MAINTENANCE OF THE PROJECT**

**7.1 Operation and Maintenance of the Project:**

The TSP shall be responsible for ensuring that the Project is operated and maintained in accordance with the regulations made by the 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, as applicable on the Bid Deadline and as appended in Schedule 6 of this Agreement.

**8.2 Target Availability:**

The Target Availability of each Element and the Project shall be 98%.

Payment of monthly Transmission charges based on actual availability will be calculated as per para 1.2 of Schedule 4 of this Agreement.

If the availability of any Element or the Project is below the Target Availability, for six consecutive months in a Contract Year, the 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 effect and maintain or cause to be effected and maintained during the Construction Period and the Operating Period, adequate Insurances against such risks, with such deductibles including but not limited to any third party liability and endorsements and co-beneficiary/insured, as may be necessary under

- a. any of the Financing Agreements,
- b. the Laws, and
- c. in accordance with Prudent Utility Practices.

The Insurances shall be taken effective from a date prior to the date of the Financial Closure till the Expiry Date.

### **9.2 Evidence of Insurance cover:**

**9.2.1** The TSP shall furnish to the Nodal Agency copies of certificates and policies of the Insurances, as and when the Nodal Agency may seek from the TSP as per the terms of Article 9.1

### **9.3 Application of Insurance Proceeds:**

**9.3.1** Save as expressly provided in this Agreement, the policies of Insurances and the Financing Agreements, the proceeds of any insurance claim made due to loss or damage to the Project or any part of the Project shall be first applied to reinstatement, replacement or renewal of such loss or damage.

**9.3.2** If a Natural Force Majeure Event renders the Project no longer economically and technically viable and the insurers under the Insurances make payment on a “total loss” or equivalent basis, the portion of the proceeds of such Insurance available to the TSP (after making admissible payments to the Lenders as per the Financing Agreements) shall be allocated only to the TSP. Nodal Agency and / or 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 the 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 the 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 Invoice as per provisions of this Agreement,

the two amounts, to the extent agreed to be set off by the TSP may, be set off against each other 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.

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 duly acknowledged by 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 all the Nodal Agency taken together under this Article in a Contract Year shall not exceed Rs. 12.92 Crores (Rupees Twelve Crore Ninety-Two Lakh 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 or 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 2% shall be allowed on the Monthly Transmission Charge

Invoice or Supplementary Bill for payments made in full within two Business Day of the receipt of the Invoice; or

- b. For payment of Invoices subsequently, but within the Due Date, a Rebate of 1% shall be allowed on the payments made in full.
- 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 for thirty (30) days after the Due Date, shall bear Late Payment Surcharge @ 1.25% per month on the unpaid amount. Such Late Payment Surcharge shall be calculated on simple rate basis 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.

#### **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 drawl 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 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
- radio active contamination or ionising radiation originating from a source in India or resulting from any other Indirect Non Natural Force Majeure Event mentioned above, excluding circumstances where the source or cause of contamination or radiation is brought or has been brought into or near the Site by the Affected Party or those employed or engaged by the Affected Party; or
- industry-wide strikes and labour disturbances, having a nationwide impact in India.

**11.4 Force Majeure Exclusions**

**11.4.1** Force Majeure shall not include (i) any event or circumstance which is within the reasonable control of the Parties and (ii) the following conditions, except to the extent that they are consequences of an event of Force Majeure:

(a) Unavailability, late delivery, or changes in cost of the machinery,

equipment, materials, spare parts etc. for the Project;

- (b) Delay in the performance of any Contractors or their agents;
- (c) Non-performance resulting from normal wear and tear typically experienced in transmission materials and equipment;
- (d) Strikes or labour disturbance at the facilities of the Affected Party;
- (e) Insufficiency of finances or funds or the Agreement becoming onerous to perform; and
- (f) Non-performance caused by, or connected with, the Affected Party's:
  - 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 as on Bid Deadline. 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 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

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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:

- 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.

**12.3 Notification of Change in Law:**

**12.3.1** If the TSP is affected by a Change in Law in accordance with Article 12.1 and wishes to claim relief for such Change in Law under this Article 12, it shall give notice to Nodal Agency of such Change in Law as soon as reasonably practicable after becoming aware of the same.

**12.3.2** The TSP shall also be obliged to serve a notice to the Nodal Agency even when it is beneficially affected by a Change in Law.

**12.3.3** Any notice served pursuant to Articles 12.3.1 and 12.3.2 shall provide, amongst other things, precise details of the Change in Law and its estimated impact on the TSP.

**12.4 Payment on account of Change in Law**

**12.4.1** The payment for Change in Law shall be through a separate Bill. However, in case of any change in Monthly Transmission Charges by reason of Change in Law, as determined in accordance with this Agreement, the Bills to be raised by the Nodal Agency after such change in Transmission Charges shall appropriately reflect the changed Monthly Transmission Charges.

## ARTICLE: 13

### 13 EVENTS OF DEFAULT AND TERMINATION

#### 13.1 TSP's Event of Default

The occurrence and continuation of any of the following events shall constitute a TSP Event of Default, unless any such TSP Event of Default occurs as a result of any non-fulfilment of its obligations as prescribed under this Agreement by the Nodal Agency or a Force Majeure Event:

- a. After having taken up the construction of the Project, the abandonment by the TSP or the TSP's Contractors of the construction of the Project for a continuous period of two (2) months and such default is not rectified within thirty (30) days from the receipt of notice from the Nodal Agency in this regard;
- b. The failure to commission any Element of the Project by the date falling six (6) months after its Scheduled COD unless extended by Nodal Agency as per provisions of this Agreement;
- c. If the TSP:
  - i. assigns, mortgages or charges or purports to assign, mortgage or charge any of its assets or rights related to the Project in contravention of the provisions of this Agreement; or
  - ii. transfers or novates any of its obligations pursuant to this Agreement, in a manner contrary to the provisions of this Agreement;

Except where such transfer is in pursuance of a Law and

- 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:

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- 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 Karnataka Electricity Regulatory Commission (Licensing) Regulations, 2004 or as amended from time to time; or

- e. Failure on the part of the TSP to comply with the provisions of Article 19.1 of this Agreement; or
- f. the TSP repudiates this Agreement and does not rectify such breach even within a period of thirty (30) days from a notice from the Nodal Agency in this regard; or
- g. after Commercial Operation Date of the Project, the TSP fails to achieve monthly Target Availability of 98%, for a period of six (6) consecutive months or within a non-consecutive period of six (6) months within any continuous aggregate period of eighteen(18) months except where the Availability is affected by Force Majeure Events as per Article 11; or
- h. any of the representations and warranties made by the TSP in Article 17 of this Agreement being found to be untrue or inaccurate. Further, in addition to the above, any of the undertakings submitted by the Selected Bidder at the time of submission of the Bid being found to be breached or inaccurate, including but not limited to undertakings from its Parent Company / Affiliates related to the minimum equity obligation; or
- i. the TSP fails to complete / fulfil all the activities / conditions within the specified period as per Article 3; or

- j. except for the reasons solely attributable to Nodal Agency, the TSP is in material breach of any of its obligations under this Agreement and such material breach is not rectified by the TSP within thirty (30) days of receipt of notice in this regard from the Nodal Agency; or
- k. the TSP fails to take the possession of the land required or HVDC terminal or inverter stations and/ or fails to pay the requisite price to the parties and/ or any State Government authority from whom the land is acquired, within twelve (12) months from the Effective Date.

**13.2 Termination Procedure for TSP Event of Default**

- a. Upon the occurrence and continuance of any TSP's Event of Default under Article 13.1 the Nodal Agency may serve notice on the TSP, with a copy to the Government of Karnataka, 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 Government of Karnataka, 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 BPCs for a period of 5 years.

**13.3 Procedure for Nodal Agency's non-fulfilment of Role**

- a. Upon the Nodal Agency not being able to fulfil its role under Article 4.2, the TSP may serve notice on the Nodal Agency, with a copy to Government of Karnataka, 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, 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 & TSP's Event of Default, the TSP shall be entitled for Termination Payment equivalent to valuation of Project Assets. Upon payment, the Nodal Agency shall take over the Project Assets.

**ARTICLE: 14**

**14 LIABILITY AND INDEMNIFICATION**

**14.1 Indemnity**

**14.1.1** The TSP shall indemnify, defend and hold the Nodal Agency harmless against:

(a) any and all third party claims, actions, suits or proceedings against the Nodal Agency for any loss of or damage to property of such third party, or death or injury to such third party, arising out of a breach by the TSP of any of its obligations under this Agreement, except to the extent that any such claim, action, suit or proceeding has arisen due to a negligent act or omission, breach of this Agreement or non-fulfilment of statutory duty on the part of Nodal Agency; and

(b) any and all losses, damages, costs and expenses including legal costs, fines, penalties and interest actually suffered or incurred by the Nodal Agency from third party claims arising by reason of:

i. a breach by the TSP of any of its obligations under this Agreement, (provided that this Article 14 shall not apply to such breaches by the TSP, for which specific remedies have been provided for under this Agreement) except to the extent that any such losses, damages, costs and expenses including legal costs, fines, penalties and interest (together to constitute "Indemnifiable Losses") has arisen due to a negligent act or omission, breach of this Agreement or non-fulfilment of statutory duty on the part of the Nodal Agency, or

ii. any of the representations and warranties of the TSP under this Agreement being found to be inaccurate or untrue.

**14.1.2** The Nodal Agency shall, in accordance with the Regulations framed by KERC in this regard, indemnify, defend and hold the TSP harmless against:

(a) any and all third party claims, actions, suits or proceedings against the TSP, for any loss of or damage to property of such third party, or death or injury to such third party, arising out of any material breach by the Nodal Agency of any of their roles under this Agreement, except to the extent that any such claim, action, suit or proceeding has arisen due to a negligent act or omission, breach of

this Agreement or breach of statutory duty on the part of the TSP, its Contractors, servants or agents; and

- (b) any and all losses, damages, costs and expenses including legal costs, fines, penalties and interest ('Indemnifiable Losses') actually suffered or incurred by the TSP from third party claims arising by reason of:
  - i. any material breach by the Nodal Agency of any of its roles under this Agreement (provided that, this Article 14 shall not apply to such breaches by the Nodal Agency, for which specific remedies have been provided for under this Agreement), except to the extent that any such Indemnifiable Losses have arisen due to a negligent act or omission, breach of this Agreement or breach of statutory duty on the part of the TSP, its Contractors, servants or agents or
  - ii. any of the representations and warranties of the Nodal Agency under this Agreement being found to be inaccurate or untrue.

## **14.2 Patent Indemnity:**

### **14.2.1**

- (a) The TSP shall, subject to the Nodal Agency's compliance with Article 14.2.1 (b), indemnify and hold harmless the Nodal Agency and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Nodal Agency may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Agreement by reason of the setting up of the Project by the TSP.

Such indemnity shall not cover any use of the Project or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Agreement, any infringement resulting from the misuse of the Project or any part thereof, or any products produced in association or combination with any other equipment, plant or materials not supplied by the TSP, pursuant to the Agreement.

- (b) If any proceedings are brought or any claim is made against the Nodal Agency arising out of the matters referred to in Article

14.2.1(a), the Nodal Agency shall promptly give the TSP a notice thereof, and the TSP shall at its own expense take necessary steps and attend such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. The TSP shall promptly notify the Nodal Agency of all actions taken in such proceedings or claims.

- (c) If the TSP fails to notify the Nodal Agency within twenty-eight (28) days after receipt of such notice from the Nodal Agency under Article 14.2.1(b) above, that it intends to attend any such proceedings or claim, then the Nodal Agency shall be free to attend the same on their own behalf at the cost of the TSP. Unless the TSP has so failed to notify the Nodal Agency within the twenty eight (28) days period, the Nodal Agency shall make no admission that may be prejudicial to the defence 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 KERC in this regard, subject to the TSP's compliance with Article 14.2.2(b) shall indemnify and hold harmless the TSP and its employees, officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs and expenses of whatsoever nature, including attorney's fees and expenses, which the TSP may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Agreement by reason of the setting up of the Project by the TSP.
- (b) If any proceedings are brought or any claim is made against the TSP arising out of the matters referred to in Article 14.2.2 (a) the TSP shall promptly give the Nodal Agency a notice thereof, and the Nodal Agency shall at its own expense take necessary steps and attend such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. The Nodal Agency shall promptly notify the TSP of all actions taken in such proceedings or claims.

- (c) If the Nodal Agency fails to notify the TSP within twenty-eight (28) days after receipt of such notice from the TSP under Article 14.2.2(b) above, that it intends to attend any such proceedings or claim, then the TSP shall be free to attend the same on its own behalf at the cost of the Nodal Agency. Unless the Nodal Agency has so failed to notify the TSP within the twenty (28) days period, the TSP shall make no admission that may be prejudicial to the defence of any such proceedings or claim.
- (d) The TSP shall, at the Nodal Agency request, afford all available assistance to the Nodal Agency in attending to such proceedings or claim, and shall be reimbursed by the Nodal Agency for all reasonable expenses incurred in so doing.

### **14.3 Monetary Limitation of liability**

- 14.3.1** A Party ("Indemnifying Party") shall be liable to indemnify the other Party ("Indemnified Party") under this Article 14 for any indemnity claims made in a Contract Year only up to an amount of Rupees Two Crore Fifty-Eight Lakh Only (Rs 2.58 Crore).

### **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

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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 agrees unconditionally with the TSP to release from such encumbrances upon payment by the TSP to the Lenders of all amounts due under the Financing Agreements.

**15.2.3** Article 15.2.1 does not apply to:

- a. liens arising by operation of law (or by an agreement evidencing the same) in the ordinary course of the TSP developing and operating the Project;
- b. pledges of goods, the related documents of title and / or other related documents, arising or created in the ordinary course of the TSP developing and operating the Project; or

- c. security arising out of retention of title provisions in relation to goods acquired in the ordinary course of the TSP developing and operating the Project.

**15.3 Substitution Rights of the Lenders**

**15.3.1** The TSP would need to operate and maintain the Project under the provisions of this Agreement and cannot assign the Transmission License or transfer the Project or part thereof to any person by sale, lease, exchange or otherwise, without the prior approval of the Nodal Agency.

**15.3.2** However, in the case of default by the TSP in debt repayments or in the case of default by the TSP as per Article 13 of this Agreement during the debt repayments, the Commission may, on an application from the Lenders, assign the Transmission License to the nominee of the Lenders subject to the fulfilment of the qualification requirements and provisions of the Karnataka Electricity Regulatory Commission (Licensing) Regulations, 2004 and as amended from time to time.

## **ARTICLE: 16**

### **16 GOVERNING LAW AND DISPUTE RESOLUTION**

#### **16.1 Governing Law:**

This Agreement shall be governed by and construed in accordance with the Laws of India. Any legal proceedings in respect of any matters, claims or disputes under this Agreement shall be under the jurisdiction of appropriate courts in Delhi.

#### **16.2 Amicable Settlement:**

**16.2.1** Either Party is entitled to raise any claim, dispute or difference of whatever nature arising under, out of or in connection with this Agreement, including its existence or validity or termination or whether during the execution of the Project or after its completion and whether prior to or after the abandonment of the Project or termination or breach of the Agreement by giving a written notice to the other Party, which shall contain:

- (i) a description of the Dispute;
- (ii) the grounds for such Dispute; and
- (iii) all written material in support of its claim.

**16.2.2** The other Party shall, within thirty (30) days of issue of notice issued under Article 16.2.1, furnish:

- (i) counter-claim and defences, if any, regarding the Dispute; and
- (ii) all written material in support of its defences and counter-claim.

**16.2.3** Within thirty (30) days of issue of notice by the Party pursuant to Article 16.2.1, if the other Party does not furnish any counter claim or defense under Article 16.2.2, or thirty (30) days from the date of furnishing counter claims or defence by the other Party, both the Parties to the Dispute shall meet to settle such Dispute amicably. If the Parties fail to resolve the Dispute amicably within thirty (30) days from the later of the dates mentioned in this Article 16.2.3, the Dispute shall be referred for dispute resolution in accordance with Article 16.3.

#### **16.3 Dispute Resolution:**

All Disputes shall be adjudicated by the 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.

#### **18.2 Roles and functions of Independent Engineer**

The role and functions of the Independent Engineer shall include the following:

- a. Progress Monitoring as required under this Agreement;
- b. Ensuring Quality as required under this Agreement;
- c. determining, as required under the Agreement, the costs of any works or services and/or their reasonableness during construction phase;
- d. determining, as required under the Agreement, the period or any extension thereof, for performing any duty or obligation during construction phase;
- e. determining, as required under the Agreement, the valuation of the Project Assets.
- f. Assisting the Parties in resolution of Disputes and
- g. Undertaking all other duties and functions in accordance with the Agreement.

#### **18.3 Remuneration of Independent Engineer**

The fee and charges of the Independent Engineer shall be paid by the Nodal Agency as per terms & conditions of appointment.

#### **18.4 Termination of appointment**

18.4.1 The Nodal Agency may, in its discretion, terminate the appointment of the Independent Engineer at any time, but only after appointment of another Independent Engineer.

18.4.2 If the TSP has reason to believe that the Independent Engineer is not discharging its duties and functions in a fair, efficient and diligent manner, it may make a written representation to the Nodal Agency and seek termination of the appointment of the Independent Engineer. Upon receipt of such representation, the Nodal Agency shall hold a tripartite meeting with the TSP and Independent Engineer for an amicable 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 .....[Insert Name of the SPV] shall not be less than Fifty one percent (51%) up to a period of one (1) year after COD of the Project.

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

Provided further, that in case the Selected Bidder is a Bidding Consortium, the Lead Member shall continue to hold equity of at least twenty six percent (26%) upto a period of one (1) year after COD of the Project and any Member of such Bidding Consortium shall be allowed to divest its equity as long as the other remaining Members (which shall always include the Lead Member) hold the minimum equity specified above.

**19.1.2** If equity is held by the Affiliates, Parent Company or Ultimate Parent Company of the Selected Bidder, then, subject to the second proviso to Article 19.1.1, such Affiliate, Parent Company or Ultimate Parent Company shall be eligible to transfer its shareholding in .....[Insert Name of the SPV] to another Affiliate or to the Parent Company / Ultimate Parent Company of the Selected Bidder. If any such shareholding entity, qualifying as an Affiliate / Parent Company / Ultimate Parent Company, is likely to cease to meet the criteria to qualify as an Affiliate / Parent Company / Ultimate Parent Company, the shares held by such entity shall be transferred to another Affiliate / Parent Company / Ultimate Parent Company of the Selected Bidder.

**19.1.3** Subject to Article 19.1.1, all transfer(s) of shareholding of .....[Insert Name of the SPV] by any of the entities referred to in Article 19.1.1 and 19.1.2 above, shall be after prior written intimation to the Nodal Agency.

**19.1.4** For computation of effective Equity holding, the Equity holding of the Selected Bidder or its Ultimate Parent Company in such Affiliate(s) or Parent Company and the equity holding of such Affiliate(s) or Ultimate Parent Company in .....[Insert Name of the SPV] shall be computed in accordance with the example given below:

If the Parent Company or the Ultimate Parent Company of the Selected Bidder A directly holds thirty percent (30%) of the equity in .....[Insert Name of the SPV] then holding of Selected Bidder A in .....[Insert Name of the SPV] shall be thirty percent (30%);

If Selected Bidder A holds thirty percent (30%) equity of the Affiliate and the Affiliate holds fifty percent (50%) equity in .....[Insert Name of the SPV], then, for the purposes of ascertaining the minimum equity/equity lock-in requirements specified above, the effective holding of Bidder A in .....[Insert Name of the SPV] shall be fifteen percent (15%), (i.e., 30% x 50%)

**19.1.5** The provisions as contained in this Article 19.1 shall override the terms of the consortium agreement submitted as part of the Bid.

**19.1.6** The TSP shall be responsible to report to Nodal Agency, within thirty (30) days from the occurrence of any event that would result in any change in its equity holding structure from that which existed as on the date of signing of the Share Purchase Agreement. In such cases, the Nodal Agency would reserve the right to ascertain the equity holding structure and to call for all such required documents / information / clarifications as may be required.

**19.2 Commitment of maintaining Qualification Requirement**

**19.2.1** The Selected Bidder will be required to continue to maintain compliance with the Qualification Requirements, as stipulated in RFP Document, till the COD of the Project. Where the Technically Evaluated Entity and/or the Financially Evaluated Entity is not the Bidding Company or a Member in a Bidding Consortium, as the case may be, the Bidding Company or Member shall continue to be an Affiliate of the Technically Evaluated Entity and/or Financially Evaluated Entity till the COD of the Project.

**19.2.2** Failure to comply with the aforesaid provisions shall be dealt in the same manner as TSP's Event of Default as under Article 13 of this Agreement.

**19.3 Language:**

**19.3.1** All agreements, correspondence and communications between the Parties relating to this Agreement and all other documentation to be prepared and supplied under the Agreement shall be written in English, and the Agreement shall be construed and interpreted in accordance with English language.

**19.3.2** If any of the agreements, correspondence, communications or documents are prepared in any language other than English, the English translation of such agreements, correspondence, communications or documents shall prevail in matters of interpretation.

**19.4 Affirmation**

The TSP and the Nodal Agency, each affirm that:

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 liquidated damages or the method of calculating the liquidated damages specified in this Agreement is a genuine and reasonable pre-estimate of the damages that may be suffered by the non-defaulting Party in each case specified under this Agreement.

**19.8 Restriction of Shareholders / Owners Liability**

**19.8.1** Parties expressly agree and acknowledge that none of the shareholders of the Parties hereto shall be liable to the other Parties for any of the contractual obligations of the concerned Party under this Agreement.

**19.8.2** Further, the financial liabilities of the shareholder(s) of each Party to this Agreement shall be restricted to the extent provided in the Indian Companies Act, 1956 / Companies Act, 2013 (as the case may be).

**19.9 Taxes and Duties:**

**19.9.1** The TSP shall bear and promptly pay all statutory taxes, duties, levies and cess, assessed/levied on the TSP, its Contractors or their employees that are required to be paid by the TSP as per the Law in relation to the execution of the Project and for 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 Lol), the Nodal Agency may terminate the Agreement without being liable in any manner whatsoever to the TSP. Further, the TSP & its Affiliates shall not be eligible to participate in any tender or RFP issued by any BPC for an indefinite period from the date such TSP is found by the Nodal Agency to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practices, as the case may be.

**19.20.3** For the purposes of this Clause 19.20, the following terms shall have the meaning hereinafter respectively assigned to them:

(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 Lol 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 Lol 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 Lol 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  
: Nodal Agency

.....  
[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.	<p>Establishing 2x500 MVA, 400/220/33 kV GIS sub-station at Hampapura in Mandya Taluk &amp; District.</p> <ul style="list-style-type: none"> <li>• 500 MVA, 400/220/33 kV ICTs: 2 Nos.</li> <li>• 400 kV ICT Bay: 2 Nos.</li> <li>• 420 kV, 125 MVAR bus reactors: 2 Nos.</li> <li>• 400 kV Line Bays: 4 Nos. (for termination of LILO of 400kV DC Quad moose line from Jagalur-Kadakola to 400/220 kV Hampapura sub-station)</li> <li>• 220 kV ICT Bay: 2 Nos.</li> <li>• 220 kV Line bays: 8 Nos.</li> <li>• 220 kV Bus-Sectionalizer Bay – 1 Set</li> <li>• 220 kV Bus- coupler Bay - 2 Nos</li> <li>• 400 kV Bus Reactor Bay – 2 NOS</li> <li>• 400Kv Bus PT bay – 2 Nos</li> <li>• 220 KV Bus PT bay 4 nos</li> </ul> <p><b>Space For Future Provision</b></p> <ul style="list-style-type: none"> <li>• 500 MVA, 400/220/33 kV ICTs: 4 Nos.</li> <li>• 400 kV ICT Bay: 4 Nos.</li> <li>• 420 kV, 125 MVAR bus reactors: 2 Nos.</li> <li>• 400 kV Line Bays: 4 Nos.</li> <li>• 220 kV ICT Bay: 4 Nos.</li> <li>• 220 kV Line bays: 8 Nos.</li> <li>• 400 kV Bus Reactor Bay – 2 Nos.</li> </ul>	24 Months
2.	400kV DC Quad moose line from Jagalur- Kadakola with LILO to 400/220 kV Hampapura sub-station	
3.	<p>LILO of 400kV DC Quad moose line from Jagalur-Kadakola to proposed 765/400kV CN'Halli Station (under ISTS scheme)</p> <ul style="list-style-type: none"> <li>• 400 kV Line bays at proposed 765/400kV CN'Halli Station: 4 Nos.</li> </ul>	

Sl. No.	Scope of the Transmission Scheme	Scheduled COD in months from Effective Date
4.	<p>220 kV DC line with Twin Zebra conductor from proposed Hampapura to 220/66kV Huygonahalli sub-station along with 2 nos of 220kV TB's at Huygonahalli</p> <ul style="list-style-type: none"> <li>220 kV Line bays at 220/66kV Huygonahalli sub-station: 2 Nos. (for termination of Hampapura to 220/66kV Huygonahalli 220 kV DC line)</li> </ul>	
5.	<p>220 kV DC line with Twin Zebra conductor from proposed Hampapura to 220/66kV Tubinakere sub-station along with 2 nos of 220kV TB's at Tubinakere</p> <ul style="list-style-type: none"> <li>220 kV Line bays at 220/66kV Tubinakere sub-station: 2 Nos. (for termination of Hampapura to 220/66kV Tubinakere 220 kV DC line)</li> </ul>	
6.	<p>220 kV DC line with Twin Zebra conductor from proposed Hampapura to proposed 220/66kV Maddur sub-station along with 2 nos of 220kV TB's at proposed Maddur</p> <ul style="list-style-type: none"> <li>220 kV Line bays at proposed 220/66kV Maddur sub-station: 2 Nos. (for termination of Hampapura to proposed 220/66kV Maddur 220 kV DC line)*</li> </ul>	
7.	<p>220 kV DC line with Twin Zebra conductor from proposed Hampapura to 220/66kV Nagamangala sub-station along with 2 nos of 220kV TB's at Nagamangala</p> <ul style="list-style-type: none"> <li>220 kV Line bays at 220/66kV Nagamangala: 2 Nos. (for termination of Hampapura to 220/66kV Nagamangala 220 kV DC line)</li> </ul>	

**Note:**

1. KPTCL to provide land for the construction of 2x500 MVA, 400/220 kV GIS sub-station at Hampapura in Mandya District and shall be handed over to TSP as is where basis.
2. Existing 400 kV Line Bays of Kptcl at Jagalur & Kadakola Substation can be utilized for termination of 400 kV Jagalur-Kadakola DC Line.

**Project Description**

In view of providing reliable power supply to downstream 220kV sub-stations (Huygonahalli, Tubinakere, Kothipura) and planned 220kV substations of Maddur & Channapattana and to overcome the loading constraints of 220kV lines along with having further loading & operational flexibility, 400/220kV sub-station is proposed at Hampapura in Mandya Taluk, Mandya district.

**SPECIFIC TECHNICAL REQUIREMENTS FOR TRANSMISSION LINE**

1. The design, routing and construction of transmission lines shall be in accordance with Chapter V, Part-A of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time. Other CEA Regulations and MoP guidelines, as applicable, shall also be followed.
2. 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:
  - 2.1 Steel section of grade E 250 and/or grade E 350 as per IS 2062, only are permitted for use in towers, extensions, gantry structures and stub setting templates. For towers in snowbound areas, steel sections shall conform to Grade-C of IS-2062. The minimum size of sections shall be 50 x 50 x 5 for cross arm lower and upper member and 45 x 45 x5 for all other stress carrying members. Use of unequal sections is not permitted. The minimum thickness of angle sections used in the design of towers shall be kept not less than:
 

6mm: For Main corner leg members including the ground wire peak (including inner & outer members and cross arm).

5mm: For all other members.
  - 2.2 Towers shall be designed as per IS-802:2015, however the drag coefficient of the tower shall be as follows:

Solidity Ratio	Drag Coefficient
Up to 0.05	3.6
0.1	3.4
0.2	2.9
0.3	2.5
0.4	2.2
0.5 and above	2.0

As per Clause 12.1.2.1 b) 2) of IS 802:2015, Under security condition for tension and dead end towers, the transverse loads due to line deviation shall be the component of 100 percent mechanical tension of conductor and ground wire/ OPGW corresponding to 100% of design wind pressure at everyday temperature or 36% design wind pressure at minimum temperature after accounting for drag coefficient and gust response factor. The above loading shall also be considered for design of suspension tower.

Transmission Service Provider (TSP) shall adopt any additional loading/ design criteria for ensuring reliability of the line, if so desired and/ or deemed necessary in accordance with CEA “Technical Standard for Construction of

Electrical Plants and Electric Lines” Regulation 2022, as amended from time to time.

3. Type testing of newly designed fully galvanized towers shall be carried out in CPRI/any other NABL accredited tower testing station in India. The Towers shall be erected in vertical position in the test bed and testing shall be carried out in accordance with IS 802 (part-III) with +6M body extensions. All standard tests, including quality control tests in accordance with relevant IS shall be carried out.
4. For power line crossing of 400 kV or above voltage level, large angle & dead end towers (i.e. D/DD/QD) shall be used on either side of power line crossing (i.e. D/DD/QD- D/DD/QD arrangement).

For overhead crossing of existing power line of 110/132kV and 220kV voltage level, only (D/DD/QD) angle towers shall be used on either side of power line crossing.

For power line crossing of 66kV 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.

For crossing of Railways, National highways and state highways, the rules/regulations of appropriate authorities shall be followed.

5. The conductor configuration shall be as follows:

**For transmission lines with ACSR/AAAC/AL59/HPC conductor:**

Transmission line	ACSR Conductor specified	Equivalent AAAC conductor based on 53% conductivity of Al Alloy	Equivalent minimum size of AL59 conductor based on 59% conductivity of AL Alloy*	Sub-conductor Spacing
400kV D/C (Quad Moose) transmission lines	<b>Moose: Stranding</b> 54/3.53 mm-Al + 7/3.53 mm-Steel, 31.77 mm diameter 528.5 mm <sup>2</sup> , Aluminium area, Maximum DC Resistance at 20°C (Ω/km): 0.05552 Minimum UTS:	<b>Stranding details:</b> 61/3.55 mm 31.95 mm diameter; 604 mm <sup>2</sup> Aluminium alloy area Maximum DC Resistance at	<b>Stranding details:</b> 61/3.31 mm 29.79 mm diameter; 525 mm <sup>2</sup> Aluminium alloy area Maximum DC Resistance at	457 mm

Transmission line	ACSR Conductor specified	Equivalent AAAC conductor based on 53% conductivity of Al Alloy	Equivalent minimum size of AL59 conductor based on 59% conductivity of AL Alloy*	Sub-conductor Spacing
	161.20 kN	20°C (Ω/km): 0.05506 Minimum UTS: 159.80 kN	20°C (Ω/km): 0.0566 Minimum UTS: 124.70 kN	
220 kV D/C (Zebra) transmission lines	Zebra: Stranding 54/3.18 mm-Al + 7/3.18 mm-Steel, 428 Sq mm, Aluminium area, 28.62 mm diameter	<b>Stranding Details:</b> 61/3.19 mm 28.71 mm diameter; 487.5 sq.mm Aluminum alloy area	<b>Stranding Details:</b> 61/3.08 mm 27.7 mm diameter; 454 sq.mm Aluminium alloy area	NA
132 kV D/C (Panther) transmission lines	Panther: Stranding 30/3.0 mm-Al + 7/3.0 mm-Steel, 261.5 Sq mm, Aluminium area, 21.05 mm diameter	<b>Stranding Details:</b> 37/3.15 mm 5 mm 22.05mm Diameter; 288.3 Sq.mm Aluminum alloy area	<b>Stranding Details:</b> 37/3.08 mm 21.56mm Diameter; 275.66 Sq.mm Aluminum alloy area	NA

**Note:**

i. \*To select any size above the minimum, the sizes mentioned in the Indian standard IS-398(part-6) shall be followed.

ii. The transmission lines shall have to be designed for a maximum operating conductor temperature of 85 deg C for ACSR, 95deg C for AAAC & Al-59.

6. The High Performance Conductors (HPC) shall be as per the standard technical specification issued by CEA.
7. The required phase to phase spacing and horizontal spacing for 400kV, 220kV, and 132kV line shall be governed by the tower design as well as minimum live metal clearances for each voltage level respectively under different insulator swing angles. All electrical clearances including minimum live metal clearance, ground clearance and minimum mid span separation between earth wire and

conductor shall be as per Central Electricity Authority (Measures Relating to Safety & Electric Supply) Regulations as amended from time to time and IS: 5613.

**For 400kV transmission lines:**

The minimum live metal clearances for 400 kV D/C transmission lines shall be considered as follows:

- i Under stationary conditions : From tower body: 3.05m
- ii Under swing conditions:

Wind pressure Condition	Minimum electrical clearance
a) Swing angle (22°)	3.05 mtrs
b) Swing angle (44°)	1.86 mtrs

However, the phase to phase spacing for 400kV D/C Line shall not be less than 8m.

**For 220kV Transmission Lines:**

The minimum live metal clearances for 220kV D/C transmission lines shall be considered as follows:

- i Under stationary conditions : From tower body: 2.13m
- ii Under swing conditions:

Wind pressure Condition	Minimum electrical clearance
a) Swing angle (15°)	1.98 mtrs
b) Swing angle (30°)	1.83 mtrs
c) Swing angle (45°)	1.675 mtrs

However, the phase to phase spacing for 220kV D/C Line shall not be less than 5m.

**For 132kV Transmission Lines:**

The minimum live metal clearances for 132kV D/C transmission lines shall be considered as follows:

- i Under stationary conditions: From tower body: 1.53 m
- ii Under swing conditions:

Wind pressure Condition	Minimum electrical clearance
a) Swing angle (15°)	1.53 mtrs
b) Swing angle (30°)	1.37mtrs

c) Swing angle (45°)	1.22 mtrs
d) Swing angle (60°)	1.07 mtrs

However, the phase to phase spacing for 132 kV D/C Line shall not be less than 4m.

8. The minimum ground clearance for 400kV D/C transmission lines shall be 8.84m, for 220 kV D/C line shall be 7.015 m and for 132 kV D/C line shall be 6.10 m so that maximum electric field does not exceed 10kV/m within the ROW and does not exceed 5kV/m at the edge of the ROW as per international guidelines.

An allowance of 4% of max sag shall be provided to account for errors in stringing.

Conductor creep shall be compensated by over tensioning the conductor at a temperature of 26° C lower than the stringing temperature.

9. The minimum mid span separation between earth wire and conductor shall be 9.0 m for 400 kV D/C transmission lines, 8.5 m for 220 kV D/C transmission lines & 6.1 m for 132 kV D/C transmission lines. Shielding angle shall not exceed 20 deg for 400 kV D/C & 30 deg for 220 kV D/C lines and 132 kV D/C lines.
10. Transposition is to be done for all transmission lines whose length is greater than 100km. Transposition should be carried out at 1/3 and 2/3 of line length tower positions.
11. The switching impulse withstand voltage (wet) for 400kV line shall be 1050kVp. Lightning impulse withstand voltage (dry) for 400kV line shall be 1550kVp, for 220 kV line shall be 1050kVp & for 132kV line shall be 650kVp.
12. The Fault current for design of line shall be 63 kA for 1 sec for 400 kV, 50 kA for 1 sec for 220 kV and 40 kA for 1 sec for 132 kV.
13. Porcelain / Glass / Polymer insulators shall be used in the line as per requirement and site conditions. However, porcelain /glass disc insulators string shall be required to be used for Pilot string irrespective of type of insulators used for suspension/tension location.
14. Each tower shall be earthed such that tower footing resistance 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 at tension tower for direct earthing of both shield wires. If site condition demands, multiple earthing or use of earthing enhancement compound shall be used. The line surge arrester, if required, may be used in lightning prone areas.
15. 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 & 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.

16. 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 or mandated, shall be provided on the line. In order to optimize the route use of GATISHAKTI platform shall also be made.
17. Wherever, transmission lines are passing through cyclone prone areas (i.e. areas up to 60 km from coast)/ creek regions/ aggressive soil areas following shall also be applicable:
  - a. The fabricated tower parts and stubs shall have a minimum overall zinc coating of 900 g/m<sup>2</sup> of surface area except for plates and sections below 5mm which shall have a minimum overall zinc coating of 610g/m<sup>2</sup> of surface area. The average zinc coating for all sections and plates 5mm and above shall be maintained as 127 microns and that for plates and sections below 5mm 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<sup>3</sup>.
  - 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<sup>2</sup> 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.
18. In case of 400kV 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 standard steel (GSS) or AACSR or any other suitable conductor type depending upon span length and other technical consideration.

19. The raised chimney foundation is to be provided in areas prone to flooding/water stagnation like paddy field /agricultural field & undulated areas to avoid direct contact of water with steel part of tower. The top of the chimney of foundation should be at least above HFL (High Flood Level) or the historical water stagnation/ logging level (based on locally available data) or above High Tide Level or 500 mm above Natural Ground level (whichever is higher).
20. Transmission line shall be designed considering wind zones as specified in wind map given in National Building Code 2016, Vol.1 and IS:802-2015. The developer shall also make his own assessment of local wind conditions and frequent occurrences of high intensity winds (HIW) due to thunderstorms, dust-storms, downburst etc. along the line route and wherever required, higher wind zone than that given in wind map shall be considered for tower design for ensuring reliability of line. Further, for transmission line sections passing within a distance of 50 km from the boundary of two wind zones, higher of the two wind zones shall be considered for design of towers located in such sections. The other design parameters such as Reliability level, Terrain category etc, are as per IS:802-2015 and CBIP-2014.
21. Routing of transmission line through protected areas of India shall be avoided to the extent possible. In case, it is not possible to avoid protected areas, the towers of the transmission line up to 400 kV levels 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 Nodal Agency and BPC by the TSP.
22. The TSP shall abide by the Guidelines of CEA w.r.t. shifting of transmission lines for NHAI projects and other projects.
23. Safety precautions in regards to gas/oil pipelines in vicinity of Transmission lines shall be taken in coordination with gas/ petroleum authorities.
24. The last span from dead end tower to existing KPTCL substation gantry should be less than 90mtr.
25. In case the LILO of existing line is to be done, and any modification in the existing line is required for the above LILO work the same should be done by the TSP after obtaining necessary approval of KPTCL. Further, the span on either side of LILO points shall be maintained by the TSP.
26. The stringing of the transmission line in forest area shall be carried out through drone.

27. 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

### TECHNICAL SPECIFICATION FOR SF6 GAS INSULATED METAL ENCLOSED SWITCHGEAR (GIS)

#### 1.0 GENERAL CHARACTERISTICS

The SF6 gas insulated metal enclosed switchgear shall be totally safe against inadvertent touch of any of its live constituent parts. It should be designed for indoor/outdoor (as specified) application with meteorological conditions at site as per Section Project. All parts of the switchgear should be single phase enclosed for 400 kV and single phase/three phase enclosed for 220 kV.

The arrangement of gas sections or compartments shall be such as to facilitate future extension of any make on either end without any drilling, cutting or welding on the existing equipment. To add an equipment, it shall not be necessary to move or dislocate the existing switchgear bays. As the 400/220kV GIS is likely to be extended in future on either side, the contractor shall make available during detailed engineering stage, all details such as cross section, gas pressure, extension conductor piece to extend existing bus bar and all required material etc. for design of adopter in future for extension of GIS. GIS must be complete in all respects for future extension and there should be no requirement of any component/material of GIS from the present supplier at the time of future extension by another GIS manufacturer. The design should be such that all parts subjected to wear and tear are easily accessible for maintenance purposes. The equipment offered shall be protected against all types of voltage surges and any equipment necessary to satisfy this requirement shall be deemed to be included. The required overall parameters of GIS are as follows :-

<b>S N</b>	<b>Technical particulars</b>	<b>400 kV System</b>	<b>220 kV System</b>
a	Rated Voltage	420 kV (rms)	245 kV (rms)
b	Rated frequency	50 HZ	50 HZ
c	Grounding	Effectively earthed	Effectively earthed
d	Rated power frequency withstand Voltage (1min) line to earth	650 kV (rms)	460 kV (rms)
e	Impulse withstand BIL (1.2/50/mic. Sec) Line to earth	±1425 kVp	±1050 kVp

<b>S N</b>	<b>Technical particulars</b>	<b>400 kV System</b>	<b>220 kV System</b>
f	Switching impulse voltage (250/2500 mic.-sec)	1050 kVp	-
g	Rated short time withstand current (1 sec)	63/50/ 40 kA (rms) (As applicable)	50/ 40 kA (rms) (As applicable)
h	Rated peak withstand current	157.5/125/100 kA (peak) (as applicable)	125/100 kA (peak) (as applicable)
i	Guaranteed maximum gas losses for complete installation as well as for all individual sections in %	As per IEC- 62271- 203	As per IEC- 62271-203
j	Rated current normal/ at site (at 50 degree C design ambient temperature)	As per schedule of requirement	As per schedule of requirement
k	Seismic level	Zone – II as per IS- 1893, Year-2002	Zone – II as per IS-1893, Year- 2002

The metal-enclosed gas insulated switchgear, including the operating devices, accessories and auxiliary equipment forming integral part thereof, shall be designed, manufactured, assembled and tested in accordance with the IEC-62271-203 publications including their parts and supplements as amended or revised to date.

## **2.0 REFERENCE STANDARDS**

The metal-enclosed gas-insulated switchgear, including the operating devices, accessories and auxiliary equipment forming integral part thereof, shall be designed, manufactured, assembled and tested in accordance with the following International Electro-technical Commission (IEC)

Publications including their parts and supplements as amended or revised to date:

**IEC 62271-203** Gas Insulated metal-enclosed switchgear for rated voltages above 52KV

**IEC 60376** New sulphur hexafluoride

**IEC 62271- 100** High voltage alternating current Circuit breakers

**IEC 62271-1** High voltage Switchgear and control-gear standards – common specifications

**IEC 62271-102** Alternating current disconnectors(isolators) and earthing switches

**IEC 61128** Alternating current disconnectors. Bus-transfer current switching by disconnectors.

**IEC 61129** Alternating current earthing switches. Induced current switching

**IEC 61869-2/1** Current transformers

**IEC 61869-3/1** Voltage transformers

**IEC 60137** Bushings for alternating voltages above 1000 V

**IEC 62271-209** Cable connections for gas-insulated metal enclosed switchgear for rated voltage above 52kV

**IEC 60480** Guide to checking of sulphur hexafluoride taken from electrical equipment

**IEC 60099 -1/4** Non-linear resistor type arresters for AC systems

**IEC 60439** Factory-built assemblies of low-voltage switchgear and control Gear.

**IEC 62271-101** High-voltage Switchgear & control gear – synthetic test.

**IEEE 80 (2000)** IEEE Guide for Safety in AC Substation grounding.

**CIGRE-44** Earthing of GIS- an application guide. (Electra no.151,Dec'93).

**IEC 61639** Direct connection between Power Transformers and gas insulated metal enclosed switchgear for rated voltage 72.5 kV and above.

The components and devices which are not covered by the above standards shall conform to, and comply with, the latest applicable standards, rules, codes and regulations of the internationally recognized standardizing bodies and professional societies as may be approved by the Employer. The manufacturer shall list all applicable standards, codes etc. and provide copies thereof for necessary approval.

In case the requirements laid down herein differ from those given in above standard in any aspect the switchgear shall comply with the requirements indicated herein in regard thereto.

### **3.0 DEFINITIONS**

#### **3.1 Assembly**

Assembly refers to the entire completed GIS equipment furnished under contract.

#### **3.2 Bay**

Bay refers to the area occupied by one Circuit Breaker and associated equipments used to protect one line/transformer/Reactor/bus coupler in double bus scheme/one and half breaker scheme and which comprises of atleast one circuit breaker, two disconnectors & 3 Nos. of single phase CT's/bushing CT's.

#### **3.3 Compartment**

When used in conjunction with GIS equipment, compartment refers to a gas tight volume bounded by enclosure walls and gas tight isolating barriers.

#### **3.4 Enclosure**

When used in conjunction with GIS equipment, enclosure refers to the grounded metal housing or shell which contains and protects internal Power system equipment (breaker, disconnecting switch, grounding switch, voltage transformer, current transformer surge arresters, interconnecting bus etc.)

#### **3.5 Manual Operations**

Manual operation means operation by hand without using any other source of Power.

#### **3.6 Module**

When used in conjunction with GIS equipment, module refers to a portion of that equipment. Each module includes its own enclosure. A module can contain more than one piece of equipment, for example, a module can contain a disconnecting switch and a grounding switch.

#### **3.7 Reservoir**

When used in conjunction with GIS equipment reservoir refers to a larger gastight volume.

### **4.0 GENERAL DESIGN AND SAFETY REQUIREMENT**

4.1. The GIS assembly shall consist of separate modular compartments e.g Circuit Breaker compartment, Bus bar compartment filled with SF6 Gas and separated by gas tight partitions so as to minimize risk to human life, allow ease of maintenance and limit the effects of gas leaks failures & internal arcs etc. These compartments shall be such that maintenance on one feeder may be performed without de-energising the adjacent feeders. These compartments shall be designed to minimize the risk of damage to adjacent sections and protection of personnel in the event of a failure occurring within the compartments. Rupture diaphragms with suitable deflectors shall be provided to prevent uncontrolled bursting pressures developing within the enclosures under worst operating conditions ,thus providing controlled pressure relief in the affected compartment.

4.2. The workmanship shall be of the highest quality and shall conform to the latest modern practices for the manufacture of high technology machinery and electrical switchgear.

4.3. The switchgear, which shall be of modular design, shall have complete phase isolation. The conductors and the live parts shall be mounted on high graded epoxy resin insulators. These insulators shall be designed to have high structural strength and electrical dielectric properties and shall be free of any voids and free of partial discharge at a voltage which is atleast 5 % greater than the rated voltage .They should be designed to have high structural and dielectric strength properties and shall be shaped so as to provide uniform field distribution and to minimize the effects of particle deposition either from migration of foreign particles within the enclosures or from the by-products of SF6 breakdown under arcing conditions.

4.4. Gas barrier insulators and support insulators shall have the same basis of design. The support insulators shall have holes on both sides for proper flow of gas.

4.5. Gas barrier insulators shall be provided so as to divide the GIS into separate compartments. They shall be suitably located in order to minimize disturbance in case of leakage or dismantling. They shall be designed to withstand any internal fault thereby keeping an internal arc inside the faulty compartment. Due to safety requirement for working on this pressurized equipment, whenever the pressure of the adjacent gas compartment is reduced, it should be ensured by the bidder that adjacent compartment would remain in service and also isolate/earth the gas compartments which is not at minimum operating pressure. The gas tight barriers shall be clearly marked on the outside of the enclosures. The service continuity of GIS shall confirm to Annexure-F of IEC :62271-203.

4.6. The material and thickness of the enclosures shall be such as to withstand an internal flash over without burn through for a period as specified in IEC at rated short time withstand current. The material shall be such that it has no effect of environment as well as from the by-products of SF6 breakdown under arcing condition.

4.7. Each section shall have plug- in or easily removable connection pieces to allow for easy replacement of any component with the minimum of disturbance to the remainder of the equipment. Inspection windows shall be provided for disconnectors and earth switches.

4.8. The material used for manufacturing the switchgear equipment shall be of the type, composition and have physical properties best suited to their particular purposes and in accordance with the latest engineering practices. All the conductors shall be fabricated of aluminum/ copper tubes of cross sectional area suitable to meet the normal and short circuit current rating requirements. The finish of the conductors shall be smooth so as to prevent any electrical discharge. The conductor ends shall be silver plated and fitted into finger contacts or tulip contacts. The contacts shall be of sliding type to allow the conductors to expand or contract axially due to temperature variation without imposing any mechanical stress on supporting insulators.

4.9. Each pressure filled enclosure shall be designed and fabricated to comply with the requirements of the applicable pressure vessel codes and based on the design temperature and design pressures as defined in IEC-62271-203.

4.10. The manufacturer shall guarantee that the pressure loss within each individual gas-filled compartment shall not be more than half percent (0.5%) per year.

4.11. Each gas-filled compartment shall be equipped with static filters, density switches, filling valve and safety diaphragm. The filters shall be capable of absorbing any water vapour which may penetrate into the enclosures as well as the by-products of SF6 during interruption. Each gas compartment shall be fitted with separate non-return valve connectors for evacuating & filling the gas and checking the gas pressure etc.

4.12. The switchgear line-up when installed and operating under the ambient conditions shall perform satisfactorily and safely under all normal and fault conditions. Even repeated operations up to the permissible servicing intervals under 100% rated and fault conditions shall not diminish the performance or significantly shorten the useful life of the switchgear. Any fault caused by external reasons shall be positively confined to the originating compartment and shall not spread to other parts of the switchgear.

4.13. The thermal rating of all current carrying parts shall be minimum for one sec. for the rated symmetrical short-circuit current.

4.14. The switchgear shall be of the free standing, self-supporting with easy accessibility to all the parts during installation & maintenance with all high-voltage equipment installed inside gas-insulated metallic and earthed enclosures, suitably sub-divided into individual arc and gas-proof compartments preferably for:

- a) Bus bars
- b) Intermediate compartment
- c) Circuit breakers
- d) Line disconnectors
- e) Voltage Transformers
- f) Gas Insulated bus duct section between GIS and XLPE cable/Overhead Conductor.
- g) Gas Insulated bus section between GIS & Oil filled Transformer/ Reactor

The bus enclosure should be sectionalized in a manner that maintenance work on any bus disconnector (when bus and bus disconnector are enclosed in a single enclosure ) can be carried out by isolating and evacuating the small effected section and not the entire bus. The design of GIS shall be such that in case a circuit breaker module of a feeder is removed for maintenance, both busbars shall remain in service. For achieving the above requirements, adequate number of intermediate compartments, if required, shall be provided to ensure equipment and operating personnel's safety. The service continuity of GIS shall conform to Annexure-F of IEC :62271-203.

4.15. The arrangement of the individual switchgear bays shall be such so as to achieve optimum space-saving, neat and logical arrangement and adequate accessibility to all external components.

4.16. The layout of the substation equipment ,busbars and switchgear bays shall preferably be based on the principle of \_ phase grouping \_ . Switchgear layout based on the \_ mixed phases \_ principle shall not be accepted without mutual agreement between supplier and owner. The arrangement of the equipment offered must provide adequate access for operation, testing and maintenance.

#### **4.17. LOCAL CONTROL CUBICLE (LCC)**

##### **14.17.1. Functions**

14.17.1.1 Each circuit-breaker bay shall be provided with a local control cubicle containing local control switches and a mimic diagram for the operation and semaphore/indicating lamp for status indication of the circuit-breaker and all associated isolators and earth switches together with selector switches to prevent local and remote and supervisory controls being in operation simultaneously.

14.17.1.2. Status indications in the LCC shall be semaphore type or LED type.

14.17.1.3. Closing of the circuit- breaker from the local control unit shall only be available when the breaker is isolated for maintenance purposes. Circuit-breaker control position selector, operating control switch and electrical emergency trip push button shall be installed in the Local Control Cubicle. Circuit-breaker control from this position will be used under

Technical Specification Gas Insulated Switchgear Page 37 of 80 Rev 05 (April 2018) maintenance and emergency conditions only. The emergency trip push buttons shall be properly shrouded.

14.17.1.4. If Disconnecter or earth switch is not in the fully open or closed position a "Control Circuit Faulty" alarm shall be initiated, and electrical operation shall be blocked.

14.17.1.5. 20% spare terminals shall be provided in each LCC apart from terminals provided for the termination and interconnection of all cabling associated with remote and supervisory control, alarms, indications, protection and main power supply etc .

14.17.1.6.. Where plugs and sockets connect control cabling between the local control cubicle and the switchgear these shall not be interchanged. In plug in connector type cable arrangement, min 2 cores of the cable with connected condition on both side up to the TB to be left unused as spare.

14.17.1.7. Hydraulic/pneumatic and SF6 auxiliary equipment necessary for the correct functioning of the circuit breaker, isolators and earth switches shall be located in a separate cubicle compartment.

14.17.1.8. LCC shall be suitable for remote operation from substation automation system (SAS). Each gas tight compartment shall be monitored individually per phase basis through SAS

### 14.17.2. **Constructional features**

14.17.2.1. Local Control cubicle shall be either mounted on the GIS with front access or free standing, floor mounting type. It shall comprise structural frames completely enclosed with specially selected smooth finished, cold rolled sheet steel of thickness not less than 3 mm for weight bearing members of the panels such as base frame, front sheet and door frames, and 2.0mm for sides, door, top and bottom portions. There shall be sufficient reinforcement to provide level transportation and installation. Alternatively folded sheet panels of adequate thickness and strength is also acceptable.

14.17.2.2. Access to all compartments shall be provided by doors. All fastenings shall be integral with the panel or door and provision made for locking. Cubicles shall be well ventilated through vermin-proof louvers (if required) having anti insect screen. All doors shall be gasketed all around with suitably profiled Neoprene/EPDM/PU gaskets conforming to the provision of IS 11149. However, XLPE gaskets can also be used for fixing protective glass doors.

14.17.2.3. For LCC panel of each feeder bay (i.e. line, transformer, and reactor etc.), Bus Coupler bay and Bus Sectionalizer bay, separate AC/DC supply for power circuit of GIS switchgear shall be provided, fed directly from ACDB/DCDB. The control DC supply (for control, interlocking, signaling) shall be tapped from respective relay & protection panel. For LCC panel illumination and heating purpose Loop in Loop out AC Supply can be provided.

14.17.2.4. Each panel shall be provided with necessary arrangements for receiving, distributing and isolating of DC and AC supplies for various control, signaling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with Fuses/MCBs. All fuses shall be HRC cartridge type conforming to IS: 13703 mounted on plug-in type fuse  
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bases. The short time fuse rating of Fuses shall be not less than 9 KA. Fuse carrier base shall have imprints of the fuse 'rating' and 'voltage'.

14.17.2.5. Each LCC Panel shall be provided with the following

1. **Plug Point:** 240V, Single phase 50Hz, AC socket with switch suitable to accept 5/15 Amps pin round standard Indian plug, shall be provided in the interior of each cubicle with ON-OFF switch.

2. **Interior Lighting:** Each panel shall be provided with a door-operated LED lighting fixture rated for 240 Volts, single phase, 50 Hz supply for the interior illumination of the panel controlled by the respective panel door switch.

3. **Space Heater:** Each panel shall be provided with a thermostatically connected space heater rated for 240V, single phase, 50 Hz AC supply for the internal heating of the panel to prevent condensation of moisture. The fittings shall be complete with switch unit.

14.17.2.6. Operating mechanisms, auxiliary switches and associated relays, control switches, control cable terminations, and other ancillary equipment shall be accommodated in sheet steel vermin proof cubicles.

14.17.2.7. The arrangement of equipment within cubicles shall be such that access for maintenance or removal of any item shall be possible with the minimum disturbance of associated apparatus. All the control switches shall be internal i.e. installed behind a lockable glass door, that allows a complete view of the annunciator and mimic diagram when the LCC door is closed. Necessary protection shall be provided to avoid inadvertent operation of control switches.

14.17.2.8. An interlocking scheme shall be provided that takes into account the following basic requirements.

To safeguard maintenance personnel who may be working on one section of the

equipment with other sections live.

prevent incorrect switching sequences that could lead to a hazardous situation to plant, equipment and personnel.

14.17.2.9. Electrical bolt interlocks shall be energized only when the operating handle of the mechanism is brought to the working position. Visible indication shall be provided to show whether the mechanism is locked or free. Means, normally padlocked/handle lock, shall be provided whereby the bolt can be operated in the emergency of a failure of interlock supplies.

14.17.2.10. Where key interlocking is employed tripping of the circuit breaker shall not occur if any attempt is made to remove the trapped key from the mechanism. Any local emergency tripping device shall be kept separate and distinct from the key interlocking.

14.17.2.11. Disconnecting switches shall be so interlocked that they cannot be operated unless the associated circuit-breaker is open except that where

double bus bar arrangements are specified, on-load transfer of feeder circuits from one bus bar to another shall be made Technical Specification Gas Insulated Switchgear Page 39 of 80 Rev 05 (April 2018) possible by interlocks which ensure that the associated bus coupler and its isolators are closed.

14.17.2.12. Bus coupler circuit breaker shall be interlocked so that it shall not be possible to open a bus coupler circuit breaker while on load change over on that side of the breaker is in progress.-

14.17.2.13. All isolating devices shall be interlocked with associated circuit-breakers and isolators in the same station so that it shall not be possible to make or break current on an isolating device unless a parallel circuit in that station is already closed.

### **14.17.3. Cabling between LCC Panel and GIS equipment**

14.17.3.1. The unarmored screen cable shall be of 1.1kV grade, multi core, annealed copper conductor, Tinned copper braided screen (approx. 85% coverage).

14.17.3.2. The core insulation and outer sheath of cable shall be of halogen-free special polymer.

14.17.3.3. The cable shall be flame-retardant, flexible, abrasion-and wear-resistant.

14.17.3.4. The size of core shall not be less than 2.5 sq. mm for instrument transformers and 1.5 sq.mm for other control cable.

14.17.3.5. Prefabricated cables with heavy duty multi-point plug-in connections on GIS end shall be provided.

14.17.3.6. All instrument transformer connections shall be hard wired to terminal block via ring type connection.

The LCC panel as a separate item may be considered if the bidder desires to supply from the manufacturer other than GIS supplier. The make of LCC panel shall be KPTCL approved C&R panel vendors make only. Also, the interfacing of LCC panel with original GIS module in respect of schemes, TB nos, Ferrule nos etc., is in the scope of Bidder

The supply of power and control cables and cabling from GIS module up to Local Control Panels shall be in GIS module supplier/BIDDER's scope.

4.18. All the elements shall be accessible without removing support structures for routine inspections and possible repairs. The removal of individual

enclosure parts, or entire breaker bays shall be possible without disturbing the enclosures of neighboring bays.

4.19. It should be impossible to unwillingly touch live parts of the switchgear or to perform operations that lead to arcing faults without the use of tools or brute force.

4.20. In case of any repair or maintenance on one busbar disconnectors, the other busbar should be live and in service.

4.21. All interlocks that prevent potentially dangerous mal-operations, shall be constructed such that they can not be operated easily, i.e. the operator must use tools or brute force to over-ride them.

4.22. In general the contours of energized metal parts of the GIS and any other accessory shall be such, so as to eliminate areas or points of high electrostatic flux concentrations. The surfaces shall be smooth with no projection or irregularities which may cause visible corona. No corona shall be visible in complete darkness which the equipment is subjected to specified test voltage. There shall be no radio interference from the energized switchgear at rated voltage.

4.23. The enclosure shall be of continuous design and shall meet the requirement as specified in clause no. 10 ( special considerations for GIS) of IEEE- 80, Year- 2000 . The enclosure shall be sized for carrying induced current equal to the rated current of the Bus. The conductor and the enclosure shall form the concentric pair with effective shielding of the field internal to the enclosure.

4.24. The fabricated metal enclosures shall be of Aluminium alloy having high resistance to corrosion, low electrical losses and negligible magnetic losses. All joint surfaces shall be machined and all castings shall be spot faced for all bolt heads or nuts and washers. All screws, bolts, studs and nuts shall conform to metric system.

4.25. The breaker enclosure shall have provision for easy withdrawal of the interrupter assemblies. The removed interrupter assembly must be easily and safely accessible for inspection and possible repairs.

4.26. The enclosure shall be designed to practically eliminate the external electromagnetic field and thereby electrodynamic stresses even under short circuit conditions.

4.27. The elbows, bends, cross and T-sections of interconnections shall include the insulators bearing the conductor when the direction changes take

place in order to ensure that live parts remain perfectly centered and the electrical field is not increased at such points.

4.28. The Average Intensity of electromagnetic field shall not be more than 50 micro –Tesla on the surface of the enclosure. The contractor shall furnish all calculations and documents in support of the above during detailed engineering.

4.29. The Bidder shall furnish the following information regarding the loosely distributed metallic particles within the GIS encapsulation.

a) Calculations of critical field strength for specific particles of defined mass and geometry.

b) The methodology and all the equipment for electrical partial discharge (PD) detection including that mentioned in the specification else-where.

4.30. The switchgear shall have provision for connection with ground mat risers. This provision shall consist of grounding pads to be connected to the ground mat riser in the vicinity of the equipment.

4.31. The ladders and walkways shall be provided wherever necessary for access to the equipment. A portable ladder with adjustable height may also be supplied to access to the equipment.

4.32. Wherever required, the heaters shall be provided for the equipment in order to ensure the proper functioning of the switchgear at specified ambient temperatures. The heaters shall be rated for 240V AC supply and shall be complete with thermostat, control switches and fuses, connected as a balanced 3-phase. 4-wire load. The possibility of using heaters without thermostats in order to achieve the higher reliability may be examined by the bidder and accordingly included in the offer but it shall be ensured by the bidder that the temperature rise of different enclosures where heating is provided should be within safe limits as per relevant standards. One copy of the relevant extract of standard to which the above arrangement conforms along with cost reduction in offer. If any, shall also be furnished along with the offer. The heaters shall be so arranged and protected as to create no hazard to adjacent equipment from the heat produced.

4.33. The enclosure & support structure shall be designed that a mechanic 1780 mm in height and 80 Kg in weight is able to climb on the equipment for maintenance.

4.34. The sealing provided between flanges of two modules / enclosures shall be such that long term tightness is achieved.

4.35. Alarm circuit shall not respond to faults for momentary conditions. The following indications including those required elsewhere in the specifications shall be generally provided in the alarm and indication circuits.

4.35.1. Gas Insulating System:

- a) Loss of Gas Density.
- b) Loss of Heater power(if required)
- c) Any other alarm necessary to indicate deterioration of the gas insulating system.

4.35.2. Operating System:

- a) Low operating pressure.
- b) Loss of Heater power.
- c) Loss of operating power.
- d) Loss of control.
- e) Pole Disordance.

4.36. The equipment will be operated under the following ambient conditions:

- a) The ambient temperature varies between 0 degree-C and 50 degree-C. However, for design purposes, ambient temperature should be considered as 50 degree-C.
- b) The humidity will be about 95% (indoors)
- c) The elevation is less than 1000 metres.

4.37. Temperature rise of current carrying parts shall be limited to the values stipulated in IEC-62271-1, under rated current and the climatic conditions at site. The temperature rise for accessible enclosure shall not exceed 20 degree C above the ambient temperature of 50 degree C. In the case of enclosures, which are accessible but need not be touched during normal operation, the temperature rise limit may be permitted upto 30 degree C above the ambient of 50 C.

These conditions shall be taken into account by the supplier in the design of the equipment.

**5.**

**5.1 Type tests** The offered 400/220kV GIS equipments shall conform to the type tests as per IEC-62271-203.

The type tests certificates should not be older than Ten (10) years as on the last date of submission of bid.

a) For equipments manufactured in India:

i. Type tests on indigenous equipment for which testing facility is available in India, should have been conducted in any independent laboratories approved by Government or accredited by National accreditation body of the country like Central Power Research Institute (CPRI), Electrical Research and Development Association (ERDA), etc.

ii. Type tests on indigenous equipment, for which testing facility is not available in India, should have been conducted in a laboratory of foreign country accredited by National accreditation body of that country.

iii. The type tests conducted in-house by manufacturers shall also be acceptable provided the lab (manufacturer's) is accredited by National accreditation body of the country and the tests have been witnessed by a representative of NABL accredited Independent laboratory/Power utility.

**b) For equipments manufactured Abroad:**

iii. Type tests on imported equipment should have been conducted in an Indian Laboratory or foreign laboratory accredited by National accreditation body of respective country.

ii. Type tests conducted in-house by manufacturers shall also be acceptable provided the laboratory is accredited by National accreditation body of the country and the tests have been witnessed by a representative of accreditation body / Power utility.

Contractor shall submit type test reports for the following type tests & additional type tests.

Sl. No.	Description of the Type Test for 400kV and 220kV GIS
1	Tests to verify the insulation level of the equipment and dielectric test on auxiliary circuits

2	Tests to prove the temperature rise of any part of the equipment and measurement of the resistance of the main circuit
3	Tests to prove the ability of the main and Earthing circuits to carry the rated peak and rated short time withstand current.
4	Tests to verify the making and breaking capacity of the included switching devices.
5	Tests to prove the satisfactory operation of the included switching devices
6	Tests to prove the strength of the enclosures
7	Gas tightness tests
8	Tests on partitions
9	Tests to prove the satisfactory operation at limit temperatures
10	Tests to assess the effects of arcing due to internal fault
11	Verification of the degree of protection of the enclosure
12	Tests to prove performance under thermal cycling and gas tightness tests on insulators
13	Additional tests on auxiliary and control circuits
14	Tests to prove the radio interference voltage (RIV) level (if applicable)
15	Electromagnetic Compatibility Test (EMC)
16	Reactor current switching test.
17	Test to demonstrate the Power frequency withstand capability of breaker in open condition at lock out pressure [ref clause No. 11.4(vi)]

The test reports of the above type tests for GIS as well as all type tests on 400kV SF6/ Air bushing as per IEC 60137 shall be submitted for approval as per section-GTR of Technical specification.

5.2: Routine Tests:

- a) Routine tests shall be made either in the course of component assembly and / or on the complete shipping unit assembly.

The following routine tests shall be performed as per IEC 62271-203 at the factory on every unit following its manufacture:

- i. Dielectric test on the main circuit.
- ii. Tests on auxiliary and control circuits
- iii. Measurement of the resistance of the main circuit.
- iv. Tightness test.
- v. Design and visual checks.
- vi. Pressure tests of enclosures.
  - i. Mechanical operation tests.
  - ii. Tests on auxiliary circuits, equipment and interlocks in the control mechanism.
  - iii. Pressure test on partitions.

Note: Tests on transport units.

GIS modules or components shall be assembled in the factory to transport units. The size of the transport units shall be defined by engineering and shall be as large as practical for shipment to the site and handling during installation. On assembly units without support or barrier insulator dielectric tests are not necessary.

5.3 KPTCL may insist for conducting all or some of the routine tests at the factory premises during inspection of the GIS module by KPTCL Engineers.

5.4 Tests after installation on site:

After the switchgear has been completely installed on site & filled with SF6 gas, the complete assembly shall be subjected to the following site test as per IEC: 62271-203.

- a) Dielectric tests on the main circuit.
- b) Dielectric tests on auxiliary circuit.
- c) Measurement of the resistance of the main circuit.
- d) Gas tightness tests.
- e) Checks and verifications.
- f) Gas quality verifications.
- g) ON SITE HV TESTINGS.

## 6. **Bellows or Compensating Units :-**

Adequate provision shall be made to allow for the thermal expansion of the conductors and of differential thermal expansion between the conductors and the enclosures. The bellows shall be metallic (preferably of stainless steel) of following types or other suitable equivalent arrangement shall be provided wherever necessary.

- 1 Lateral / Vertical mounting units: These shall be inserted, as required, between sections of busbars, on transformer, shunt reactor and XLPE cable etc. Lateral mounting shall be made possible by a sliding section of enclosure and tubular conductors.
- 2 Axial compensators : These shall be provided to accommodate changes in length of busbars due to temperature variations.
- 3 Parallel compensators: These shall be provided to accommodate large linear expansions and angle tolerances.
- 4 Tolerance compensators: These shall be provided for taking up manufacturing, site assembly and foundation tolerances.
- 5 Vibration compensators: These bellow compensators shall be provided for absorbing vibrations caused by the transformers and shunt reactors when connected to SF6 switchgear by oil- SF6 bushings.
6. The electrical connections across the bellows or compensating units shall be made by means of suitable connectors.

**7. INDICATION AND VERIFICATION OF SWITCH POSITIONS**

Indicators shall be provided on all circuit breakers, isolators and earth-switches, which shall clearly show whether the switches are open or closed. The indicators shall be mechanically coupled directly to the main contact operating drive rod or linkages and shall be mounted in a position where they are clearly visible from the floor or the platform in the vicinity of the equipment. Windows shall also be provided with all isolators and earthswitches so that the switch contact positions can be verified by direct visual inspection.

**8. PRESSURE RELIEF:-**

Pressure relief devices shall be provided in the gas sections to protect the main gas enclosures from damage or distortion during the occurrence of abnormal pressure increase or shock waves generated by internal electrical fault arcs (preferably in downward direction). Pressure relief shall be achieved either by means of diaphragms or plugs venting directly into the atmosphere in a controlled direction. If the pressure relief devices vent directly into the atmosphere, suitable guards and deflectors shall be provided. Contractor shall submit to the owner the detailed criteria/ design regarding location of pressure relief devices/rupture diaphragms.

**9. PRESSURE VESSEL REQUIREMENTS**

The enclosure shall be designed for the mechanical and thermal loads to which it is subjected in service. The enclosure shall be manufactured and

tested according to the pressure vessel code ( ASME/CENELEC code for pressure Vessel.) Each enclosure has to be tested as a routine test at 1.5 time the design pressure for one minute. The bursting strength of Aluminium castings has to be at least 5 times the design pressure. A bursting pressure test shall be carried out at 5 times the design pressure as a type test on each type of enclosure.

**10. EARTHING:**

- 10.1 The MANUFACTURER shall provide a “Main Ground Bus Earth mat”, rated 63kA/50kA for 3 sec (as required)., to which all intentionally earthed parts of the assembly must be connected.
- 10.2 It shall be the responsibility of the VENDOR to provide a sufficient number of earth points so that dangerous voltages are not induced in the enclosure by the fault currents circulating in the inner conductor.
- 10.3 Earthing pads shall be provided for at-least two paths to earth from the “Main Earth Bus” or each metallic enclosure and auxiliary equipment designated for connection to the station earth grid. The VENDOR shall provide data to assure that the connections from the “Main Earth Bus” to the station earth will not interfere with required enclosure current paths or any operational feature of the assembly. A copper earth bar, located near the control cable entrances of all main and auxiliary equipment, shall be provided for the purpose of terminating the shield of each control cable.
- 10.4 Provision shall be made for future extension and/or connection to earth buses of other interconnecting switchgear.
- 10.5 The BIDDER shall be responsible for supplying all earthing materials required for bonding all the equipment and steel work included in this contract to the main station earth mat also to be provided by the BIDDER.
- 10.6 The design of the earth system and connection to the switchgear equipment shall also be compatible with the circulating currents that are present in the switchgear metal cladding. On the design of the earth mat mesh, the VENDOR shall provide full details of the circulating currents expected to flow in the earth mat system.
- 10.7 Every section of the SF6 switchgear equipment including all panels, cubicles, kiosks and boxes shall be solidly bonded to the earthing system.
- 10.8 Earth switches, voltage transformers, panels and kiosks, shall be bonded to the earthing system as specified in the relevant previous clauses.
- 10.9 All steelwork, access decking and gangways, handrails, etc., shall also be effectively bonded to the earthing system.

10.10 The design of the earthing system along with the station earth mat shall be such as to ensure the safety and protection of all operating and maintenance personnel under all normal and fault conditions. Detailed earthing drawings shall be prepared for the complete installation which shall be provided under this contract and submitted to the PURCHASER for approval.

10.11 The enclosure of the equipment and support structure of GIS shall be earthed in such a way that the following conditions are obtained:

- a) The touch potential at any part of the enclosure is less than 65 V.
- b) The induced current during normal operation is prevented from entering the earthing grid.

10.12 GIS Module earth mat has to be provided by the bidder for which detailed calculation and drawings to be furnished.

### **10.13 GROUNDING**

The grounding system shall be designed and provided as per IEEE-80-2000 and CIGRE-44 to protect operating staff against any hazardous touch voltages and electro-magnetic interferences. The GIS supplier shall define clearly what constitutes the main grounding bus of the GIS. The GIS supplier must supply the entire material for grounding bus of GIS viz conductor, clamps, joints, operating and safety platforms etc. The GIS supplier is also required to supply all the earthing conductors and associated hardware material for the following:

- 1) Connecting all GIS equipment, bus ducts, enclosures, control cabinets, supporting structure etc. to the ground bus of GIS.
- 2).

The enclosure of the GIS may be grounded at several points so that there shall be grounded cage around all the live parts. A minimum of two nos. of grounding connections should be provided for each of circuit breaker, transformer terminals, cable terminals, surge arrestors, earth switches and at each end of the bus bars. The grounding continuity between each enclosure shall be effectively interconnected with Cu/ Al bonds of suitable size to bridge the flanges. In case the bidder does not offer external bonding, the bidder shall demonstrate that the connectivity offered by them between each enclosure is effective and does not require external bonding. Further similar design should have been in service. Subassembly to subassembly bonding shall be provided to provide gap & safe voltage gradients between all intentionally grounded parts of the GIS assembly & between those parts and the main grounding bus of the GIS.

Each marshalling box, local control panel, power and control cable sheaths and other non current carrying metallic structures shall be connected to the grounding system of GIS via connections that are separated from GIS enclosures. The grounding connector shall be of sufficient mechanical strength to withstand electromagnetic forces as well as capable of carrying the anticipated maximum fault current without overheating. At least two grounding paths shall be provided to connect each point to the main grounding bus. Necessary precautions should be under taken to prevent excessive currents from being induced into adjacent frames, structures of reinforcing steel and to avoid establishment of current loops via other station equipment.

All flexible bonding leads shall be tinned copper. All connectors, for attaching flexible bonding leads to grounding conductors and grounding conductors to support structures shall be tinned bronze with stainless steel or tinned bronze hardware.

The contractor shall provide suitable measure to mitigate transient enclosure voltage caused by high frequency currents caused by lightning strikes, operation of surge arrestor, ph./ earth fault and discharges between contacts during switching operation. The grounding system shall ensure safe touch & step voltages in all the enclosures. The contractor shall provide suitable barrier of non-linear resistor/ counter discontinued SF6/ Air termination, SF6/ Transformer or Reactor termination, SF6/ HV cable bushing etc. to mitigate transient enclosure voltage.

## **11. CIRCUIT BREAKERS**

### **11.1 General**

SF6 gas insulated metal enclosed circuit breakers shall comply with the latest revisions of IEC- 62271-100 & relevant IEC except to the extent explicitly modified in the specification and shall meet with requirements specified.

Circuit breakers shall be equipped with the operating mechanism. Circuit breakers shall be of single pressure type. Complete circuit breaker with all necessary items for successful operation shall be supplied. The circuit breakers shall be designed for high speed single and three phase reclosing with an operating sequence and timing as specified.

### **11.2. Duty Requirements**

Circuit breaker shall be C2 - M2 class as per IEC 62271-100.

Circuit breaker shall meet the duty requirements for any type of fault or fault location also for line charging and dropping when used on 400/220 kV effectively grounded system, with transmission lines of lengths and

characteristics as indicated in Section Project and perform make and break operations as per the stipulated duty cycles satisfactorily.

### 11.3 PRE INSERTION RESISTER

400 kV circuit breakers for line bay shall be provided with single step pre insertion closing resistors ( wherever the requirement of PIR is explicitly specified so ) to limit the switching surges to a value of less than 2.3 p.u. The value of the pre-insertion resistor and the duration of pre-insertion time shall be as given in clause 10.7.3 of this chapter. The resistor shall have thermal rating for the following duties :

i) TERMINAL FAULT

Close .... 1 Min ..... Open ..... Close open 2 min ..... close ..... 1 Min ..... open close open.

ii) RECLOSING AGAINST TRAPPED CHARGES

Duty same as under (i) above. The first, third and fourth closures are to be on de-energised line while second closing is to be made with lines against trapped charge of 1.2 p.u. (Based on 1 pu = 653kV) of opposite polarity.

iii) OUT OF PHASE CLOSING

One closing operation under phase opposition that is with twice the voltage across the terminals.

iv) No allowance shall be made for heat dissipation of resistor during time interval between successive closing operations. The resistors and resistor supports shall perform all these duties without deterioration. Calculations and test reports of resistors proving thermal rating for duties specified above shall be furnished alongwith the bid. The calculations shall take care of adverse tolerances on resistance values and time settings.

### 11.4. The circuit breaker shall be capable of:

i) Interrupting the steady and transient magnetizing current corresponding to 400 kV/220 kV class transformers of 500MVA ratings on both 400 kV & 220 kV side.

ii) Interrupting line/cable charging current as per IEC without re-strikes and without use of opening resistors.

iii) Clearing short line fault (Kilometric faults) with source impedance behind the bus equivalent to symmetrical fault current specified.

iv) Breaking 25% the rated fault current at twice the rated voltage under phase opposition condition.

v) The breaker shall satisfactorily withstand the high stresses imposed on them during fault clearing, load rejection and re-energisation of lines with trapped charges.

vi) Withstanding all dielectric stresses imposed on it in open condition at lock out pressure continuously (ie., 2 p.u. across the breaker continuously, for validation of which a power frequency dielectric withstand test conducted for a duration of at least 15 minutes is acceptable).

vii) 400 kV breakers shall be able to switch in and out the 400 kV shunt reactor for any value from 50 MVAR up to 80 MVAR without giving rise to overvoltage more than 2.3 p.u. Laboratory test and or field test reports in support of the same shall be furnished along with the bid.

### **11.5 Controlled Switching Requirements:**

The circuit Breaker shall be equipped with controlled switching with consequent optimization of switching behavior when used in switching of 400kV Bus reactor & switchable Line reactor. The controller shall be provided in Main & Tie circuit breakers of Bus reactors.

The controlling relay shall also record and monitor the switching operations and make adjustments to the switching instants to optimize the switching behavior as necessary. It shall provide self diagnostic facilities, signaling of alarms and enable downloading of data captured from the switching events.

#### **11.5.1 Technical Requirement for controlled switching device:**

1. The controller shall be designed to operate at the correctly and satisfactorily with the excursion of auxiliary A/C & DC voltages and frequency as specified in section – GTR.

2. The controller shall meet the requirements of IEC-60255-4 Appendix 'E' class III regarding HF disturbance test and fast transient test shall be as per IEC-61000-4 level III and insulation test as per 60255-5.

3. The controller shall have functions for switching ON & OFF the circuit breakers.

4. The controller shall get command to operate the breakers manually or through auto reclose relay at random. The controller shall be able to analyze the current and voltage waves available through the signals from secondaries of CTs & CVTs for the purpose of calculation of optimum moment of the switching the circuit breaker and issue command to circuit breaker to operate.

5. The controller shall also have an adaptive control feature to consider the next operating time of the breaker in calculation of optimum time of issuing the

switching command. In calculation of next operating time of the breaker the controller must consider all factors that may affect the operating time of the breaker such as, but not limited to, ambient temperature, hydraulic/pneumatic pressure of the operating mechanism, control voltage variation, SF6 gas density variations etc. Schematic drawing for this purpose shall be provided by the contractor. The accuracy of the operating time estimation by the controller shall be better than + 0.5ms.

6. The controller should have display facility at the front for the settings and measured values.

7. The controller should be PC compatible for the setting of various parameters and down loading of the settings and measured values date time of witching etc. Window based software for this purpose shall be supplied by the contractor to be used on the owner's PC.

8. The controller shall have self-monitoring facility.

9. The controller shall be suitable for current input of 1 amp from the secondary of the CTs and 110V (ph to ph) from the CVTs. The controller shall also take care of transient and dynamic state values of the current from the secondary of the CTs and CVTs.

10. The controller shall have time setting resolution of 0.1ms or better

11. The controller shall have sufficient number of output/input potential free contacts for connecting the monitoring equipment and annunciation system available in the control room. Necessary details shall be worked out during engineering the scheme.

### **11.6 Total Break Time**

The total break time shall not be exceeded under any of the following duties :

i) Test duties T10,T30,T60,T100 (with TRV as per IEC- 62271-100 )

ii) Short line fault L90, L75 (with TRV as per IEC-62271-100 )

iii) The Bidder may please note that total break time of the breaker shall not be exceeded under any duty conditions specified such as with the combined variation of the trip coil voltage (70-110%), pneumatic/hydraulic pressure and SF6 gas pressure etc. While furnishing the proof for the total break time of complete circuit breaker, the bidder may specifically bring out the effect of non simultaneity between poles and show how it is covered in the total break time. The values guaranteed shall be supported with the type test reports.

### **11.7. CONSTRUCTIONAL FEATURES**

The features and constructional details of breakers shall be in accordance with requirements stated hereunder:

### **11.7.1. Contacts**

All making and breaking contacts' shall be sealed and free from atmospheric effects. Contacts shall be designed to have adequate thermal and current carrying capacity for the duty specified and to have a life expectancy so that frequent replacement due to excessive burning will not be necessary. Provision shall be made for rapid dissipation of heat generated by the arc on opening.

11.7.2. Any device provided for voltage grading to damp oscillations or, to prevent re-strike prior to the complete interruption of the circuit or to limit over voltage on closing, shall have a life expectancy comparable of that of the breaker as a whole.

11.7.3. Breakers shall be so designed that when operated within their specified rating, the temperature of each part will be limited to values consistent with a long life for the material used. The temperature rise shall not exceed that indicated in IEC-62271-100 under specified ambient conditions.

11.7.4. The gap between the open contacts shall be such that it can withstand atleast the rated phase to ground voltage for eight hours at zero pressure above atmospheric level of SF<sub>6</sub> gas due to its leakage. The breaker should be able to withstand all dielectric stresses imposed on it in open condition at lockout pres-sure continuously (i.e. 2 pu. power frequency voltage across the breaker continuously)

11.7.5. In the interrupter assembly there shall be an adsorbing product box to minimize the effect of SF<sub>6</sub> decomposition products and moisture. The material used in the construction of the circuit breakers shall be such as to be fully compatible with SF<sub>6</sub> gas decomposition products.

11.7.6. Provisions shall be made for attaching an operational analyzer to record travel, speed and making measurement of operating timings etc. after installation at site.

## **11.8. OPERATING MECHANISM**

### **11.8.1. General Requirements:**

a) Circuit breaker shall be operated by spring charged mechanism or electro hydraulic mechanism or a combination of these. The mechanism shall be housed in a dust proof cabinet and shall have IP : 42 degree of protection.

- b) The operating mechanism shall be strong, rigid, not subject to rebound or to critical adjustments at site and shall be readily accessible for maintenance.
- c) The operating mechanism shall be suitable for high speed reclosing and other duties specified. During reclosing the breaker contacts shall close fully and then open. The mechanism shall be antipumping and trip free (as per IEC definition) under every method of closing.
- d) The mechanism shall be such that the failure of any auxiliary spring will not prevent tripping and will not cause trip or closing operation of the power operating devices.
- e) A mechanical indicator shall be provided to show open and close position of the breaker. It shall be located in a position where it will be visible to a man standing on the ground level with the mechanism housing closed. An operation counter shall also be provided in the central control cabinet/operating Mechanism.
- f) Working parts of the mechanism shall be of corrosion resisting material, bearings which require grease shall be equipped with pressure type grease fittings. Bearing pin, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or changing adjustment with repeated operation of the breaker.
- g) The bidder shall furnish detailed operation and maintenance manual of the mechanism alongwith the operation manual for the circuit breaker.

#### **11.8.2. Control**

- a) The close and trip circuits shall be designed to permit use of momentary-contact switches and push buttons.
- b) Each breaker pole shall be provided with two (2) independent tripping circuits, valves, pressure switches, and coils each connected to a different set of protective relays.
- c) The breaker shall normally be operated by remote electrical control. Electrical tripping shall be performed by shunt trip coils. However, provisions shall be made for local electrical control. For this purpose a local/remote selector switch and close and trip control switch/push buttons shall be provided in the breaker central control cabinet.
- d) The trip coil shall be suitable for trip circuit supervision during both open and close position of breaker.
- e) Closing coil and associated circuits shall operate correctly at all values of voltage between 85% and 110% of the rated voltage. Shunt trip and

associated circuits shall operate correctly under all operating conditions of the circuit breaker upto the rated breaking capacity of the circuit breaker and at all values of supply voltage between 70% and 110% of rated voltage. If additional elements are introduced in the trip coil circuit their successful operation and reliability for similar applications on circuit breakers shall be clearly brought out in the additional information schedules. In the absence of adequate details the offer is likely to be rejected.

f) Densimeter contacts and pressure switch contacts shall be suitable for direct use as permissives in closing and tripping circuits. Separate contacts have to be used for each of tripping and closing circuits. If contacts are not suitably rated and multiplying relays are used then fail safe logic/schemes are to be employed. DC supplies for all auxiliary circuit shall be monitored and for remote annunciations and operation lockout in case of dc failures.

g) The auxiliary switch of the breaker shall be positively driven by the breaker operating rod.

### **11.8.3. Spring operated Mechanism**

a) Spring operated mechanism shall be complete with motor in accordance with Section GTR. Opening spring and closing spring with limit switch for automatic charging and other necessary accessories to make the mechanism a complete operating unit shall also be provided.

b) As long as power is available to the motor, a continuous sequence of the closing and opening operations shall be possible. The motor shall have adequate thermal rating for this duty.

c) After failure of power supply to the motor one close open operation shall be possible with the energy contained in the operating mechanism.

d) Breaker operation shall be independent of the motor which shall be used solely for compressing the closing spring. Facility for manual charging of the closing spring shall also be provided. The motor rating shall be such that it required preferably not more than 60 seconds for full charging of the closing spring.

e) Closing action of circuit breaker shall compress the opening spring ready for tripping.

f) When closing springs are discharged after closing a breaker, closing springs shall automatically be charged for the next operation and an indication of this shall be provided in the local and remote control cabinet.

g) Provisions shall be made to prevent a closing operation of the breaker when the spring is in the partial charged condition.

- h) Mechanical interlocks shall be provided in the operating mechanism to prevent discharging of closing springs when the breaker is in the closed position.
- i) The spring operating mechanism shall have adequate energy stored in the operating spring to close and latch the circuit breaker against the rated making current and also to provide the required energy for the tripping mechanism in case the tripping energy is derived from the operating mechanism.

**11.8.4. Hydraulically Operated Mechanism :**

- a) Hydraulically operated mechanism shall comprise of operating unit with power cylinder, control valves, high and low pressure reservoir, motor etc.
- b) The hydraulic oil used shall be fully compatible for the temperature range to be encountered during operation.
- c) The oil pressure switch controlling the oil pump and pressure in the high pressure reservoir shall have adequate no. of spare contacts, for continuous monitoring of low pressure, high pressure etc. at switchyard control room.
- d) The mechanism shall be suitable for at-least two close open operations after failure of AC supply to the motor starting at pressure equal to the lowest pressure of auto reclose duty plus pressure drop for one close open operation.
- e) The mechanism shall be capable of operating the circuit breaker correctly and performing the duty cycle specified under all conditions with the pressure of hydraulic operated fluid in the operating mechanism at the lowest permissible pressure before make up.
- f) Trip lockout shall be provided to prevent operations of the circuit breaker below the minimum specified hydraulic pressure. Alarm contacts for lost of Nitrogen shall also be provided.
- g) All hydraulic joints shall have no oil leakage under the site conditions and joints shall be tested at factory against oil leakage.

**11.9. ADDITIONAL DATA TO BE FURNISHED ALONGWITH THE OFFER :**

- a) Drawing showing contacts in close, arc initiation, full arcing, arc extinction and open position.
- b) Data on capabilities of circuit breakers in terms of time and number of operations at duties ranging from 100 fault currents to load currents of the lowest possible value without requiring any maintenance or checks.

- c) Curves supported by test data indicating the opening time under close open operation with combined variation of trip coil voltage and hydraulic pressure.

### 11.10. TESTS

11.10.1. In accordance with the requirements stipulated under Section GTR the circuit breaker alongwith its operating mechanism shall conform to the type tests as per IEC-62271-100.

#### 11.10.2. Routine Tests

Routine tests as per IEC : 62271-100 shall be performed on all circuit breakers. In addition to the mechanical and electrical tests specified by IEC, the following shall also be performed. Speed curves for each breaker shall be obtained with the help of a suitable operation analyzer to determine the breaker contact movement during opening, closing, auto-reclosing and trip free operation under normal as well as limiting operating conditions (control voltage, pneumatic pressure etc.). The tests shall show the speed of contacts directly at various stages of operation, travel of contacts, opening time, closing time, shortest time between separation and meeting of contacts at break make operation etc. This test shall also be performed at site for which the necessary operation analyzer alongwith necessary transducers, cables, console etc. shall be furnished as mandatory maintenance equipment.

#### 11.10.3 TECHNICAL PARAMETERS

##### 400 kV CIRCUIT BREAKER:

a)	Rated voltage kV (rms)	420
b)	Rated frequency (Hz)	50
c)	No. of poles	3
d)	Type of circuit breaker	
e)	Rated continuous current (A) at an ambient temperature of 500C	3150/4000 A (for line, transformer & Reactor, bus coupler bay breaker)
f)	Rated short circuit capacity	63kA/50kA with percentage of DC component as per IEC-62271-100 corresponding to minimum opening conditions as specified
g)	Symmetrical interrupting capability kA (rms)	63kA/50kA
h)	Rated short circuit making current kAp	157.5kA/125kA
i)	Short time current carrying capability for	63kA/50kA

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	Three second kA (rms)	
j)	Rated line charging interrupting current at 90 degree leading power factor angle (A rms)	As per IEC
	(The breaker shall be able to interrupt the rated line charging current with test voltage immediately before opening equal to the product of $U/\sqrt{3}$ and 1.4 as per IEC-62271-100	
k)	First pole to clear factor	1.3
l)	Rated break time as IEC (ms)	40
m)	Total break time (ms)	45
n)	Total closing time (ms)	Not more than 150
o)	Rated operating duty cycle	O-0.3s –CO-3 min-CO
p)	Reclosing	Single phase & Three phase auto reclosing.
q)	Pre-insertion resistor requirement (If required) 1). Rating (ohms) 2). Minimum pre-insertion Times (ms)  3). Opening of PIR contacts	400 8 a) PIR contacts should open immediately after closing of main contacts. b) At least 5 ms before opening of main contacts at rated air/gas pressure, where the PIR contact remain closed.
r)	Rated insulation levels Full wave impulse withstand (1.2x50micro sec.)	
	Between lines terminals and ground:	±1425 kVp
	Between terminals with circuit breaker open:	±1425 kVp impulse on one terminal & 240kVp of opposite polarity on the other terminal.
s)	Rated switching impulse withstand voltage (250/2500 micro-sec) Dry & wet. Between terminals with circuit breaker open:	1050kVp  ±900 kVp impulse on one terminal & 345kVp of opposite polarity on the other terminal.

t)	One minute power frequency withstand voltage. <ul style="list-style-type: none"> <li>• Between line</li> <li>• terminals and ground</li> <li>• Between terminals with circuit breaker open.</li> </ul>	650kV rms.  815kV rms.
u)	Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz at 266kV(Micro volts)	1000
v)	Max. difference in the instants of closing/opening of contacts (ms) between poles.	As per IEC
w)	Trip coil and closing coil voltage	220V DC with variation as specified in Sec GTR
x)	Auxiliary contacts Auxiliary switch shall also comply with requirements as given. Independent single pole reversible contacts (from NO to NC & vice versa.	Each circuit breaker pole shall be provided with an auxiliary switch with 20% of spare – NO & 20% spare NC contacts for use in future.
y)	Rating of auxiliary contacts Breaking capacity of auxiliary contacts less than 20 ms. System neutral earthing	10A at 220V DC 2A DC with the circuit time constant of not less than 20ms. Effectively earthed.
z)	Mechanical & Electrical endurance class	M2-C2

**245 kV CIRCUIT BREAKER:**

a)	Rated voltage kV (rms)	245
b)	Rated frequency (Hz)	50
c)	No. of poles	3
d)	Type of circuit breaker	
e)	Rated continuous current (A) at an ambient temperature of 400C	1600/3000 A (3000 for bus coupler breaker)
f)	Rated short circuit capacity	50/40kA (As applicable) with percentage of DC component as per IEC-62271-100 corresponding to minimum opening conditions as specified
g)	Symmetrical  interrupting capability kA (rms)	50/40 kA(As applicable)

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h)	Rated short circuit making current kAp	125/100kA(As applicable)
i)	Short time current carrying capability for Three second kA (rms)	50/40 kA(As applicable)
j)	Rated line charging interrupting current at 90 degree leading power factor angle (A rms)	As per IEC
	(The breaker shall be able to interrupt the rated line charging current with test voltage immediately before opening equal to the product of $U/\sqrt{3}$ and 1.4 as per IEC-62271-100	
k)	First pole to clear factor	1.3
l)	Rated break time as IEC (ms)	60
m)	Total break time (ms)	65
n)	Total closing time (ms)	Not more than 200
o)	Rated operating duty cycle	O-0.3s –CO-3 min-CO
p)	Reclosing auto reclosing	Single phase / Three phase auto reclosing.
q)	Rated insulation levels	
	ull wave impulse withstand voltage (1.2x50micro sec.)	
	Between lines terminals and ground:	±1050 kVp
	Between terminals with circuit breaker open:	±1050 kVp
	One minute power frequency withstand voltage.	
	Between line terminals and ground	460kV rms.
	• Between terminals with circuit breaker open.	530kV rms.
r)	Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz at 156kV(Micro volts)	1000
s)	Max. difference in the instants of closing/opening of contacts	As per IEC

	(ms) between poles.	
t)	Trip coil and closing coil voltage	220V DC with variation as specified in Sec GTR
u)	Auxiliary contacts Auxiliary switch shall also comply with requirements as given. Independent single pole reversible contacts (from NO to NC & vice versa.	Each circuit breaker pole shall be provided with an auxiliary switch with 20% of spare – NO & 20% spare NC contacts for use in future.
	Rating of auxiliary contacts	10A at 220V DC
	Breaking capacity of auxiliary contacts less than 20 ms.	2A DC with the circuit time constant of not less than 20ms.
v)	System neutral earthing	Effectively earthed.
w)	Mechanical & Electrical endurance class	M2-C2

## 12. DISCONNECTORS (ISOLATORS)

### 12.1. General

Disconnectors shall be of the single-pole, group operated type, installed in the switchgear to provide electrical isolation of the circuit breakers, the transformers, shunt reactor, double bus and transmission lines. The disconnectors shall conform to IEC- 62271-102 and shall have the following ratings as specified.

#### Technical Parameter

Sl. No.	Particulars	400kV	220kV
a)	Rated voltage (rms) Un	420kV	245kV
b)	Rated frequency	50Hz	5-Hz
c)	System earthing	Effectively earthed	Effectively earthed
d)	Type	SF6 insulated	SF6 insulated
e)	Rated continuous current (A) at an ambient temperature of 400C	3150/4000A (for line, Transformer & reactor / bus coupler / bay)	1600/3000 A (for line / bus coupler )
f)	Rated short time withstand current of isolator and earth switch	50/40kA for 1 sec. (As applicable)	50/40kA for 1 sec. (As applicable)
g)	Rated dynamic short circuit withstand current of isolator & earth switch	125/100kAp (as applicable)	125/100kAp (as applicable)

Sl. No.	Particulars	400kV	220kV
h)	Rated insulation level: One minute power frequency withstand voltage		
	To earth:	650kV rms	460kV rms
	Across isolating distance	815kV rms	530kV rms
	Rated insulation level: 1.2/50micro sec. lighting impulse withstand voltage (+ve or -ve polarity)		
	To earth:	1425kVp	1050kVp
	Across isolating distance	±1425 ±240kVp	±1200kVp
	Rated switching impulse withstand voltage (250/2500 micro. Sec.) dry & wet		
	Between line terminals & ground	±1050kVp	NA
	Between terminals with isolator open	±900kVp impulse on one terminal & 345kVp of opposite polarity on the other terminal	NA
i)	Rated mechanical terminal load	As per IEC	As per IEC
j)	No. of spare auxiliary contacts on each isolator	4 NO & 4NC	4 NO & 4NC
k)	No. of spare auxiliary contacts on each earthing switch	4 NO & 4NC	4 NO & 4NC
l)	A. Mechanical endurance class of disconnecter.  B. Electrical endurance class of earthing switches.  i. High speed earthing switch with short circuit making capability.  ii. Maintenance earthing switch	M2 (10,000)  E1/E2  E0	M2 (10,000)  E1/E2  E0

## 12.2. Construction & Design.

12.2.1. The single pole group operated disconnectors shall be operated by electric motor suitable for use on 220 v DC system and shall be equipped with a

manual operating mechanism for emergency use. The motor shall be protected against over current and short circuit.

- 12.2.2. Disconnectors shall be suitable to switch the bus charging currents during their opening and closing and shall conform to all test duties as per Annexure –F of IEC: 62271-102. They shall also be able to make and break rated bus transfer current at rated bus transfer voltage which appears during transfer between busbars in accordance with Annexure-B of IEC: 62271-102. The contact shielding shall also be designed to prevent restrikes and high local stresses caused by transient recovery voltages when these currents are interrupted.
- 12.2.3. The disconnecting switches shall be arranged in such a way that all the three phases operate simultaneously. All the parts of the operating mechanism shall be able to withstand starting torque of the motor mechanism without damage until the motor overload protection operates.
- 12.2.4. It shall be possible to operate the disconnecting switches manually by cranks or handwheels. The contacts shall be both mechanically and electrically disconnected during the manual operation.
- 12.2.5. The operating mechanisms shall be complete with all necessary linkages, clamps, couplings, operating rods, support brackets and grounding devices. All the bearings shall be permanently lubricated or shall be of such a type that no lubrication or maintenance is required.
- 12.2.6. The opening and closing of the disconnectors shall be achieved by either local or remote control. The local operation shall be by means of a two-position control switch located in the bay module control cabinet.
- 12.2.7. Remote control of the disconnectors from the control room shall be made by means of remote/ local transfer switch.
- 12.2.8. The disconnector operations shall be inter-locked electrically with the associated circuit breakers in such a way that the disconnector control is inoperative if the circuit breaker is closed.
- 12.2.9. Each disconnector shall be supplied with auxiliary switch having four normally open and four normally closed contacts for future use over and above those required for switchgear interlocking and automation purposes. The auxiliary switch contacts are to be continuously adjustable such that, when required, they can be adjusted to make contact before the main switch contacts.
- 12.2.10. The signaling of the closed position of the disconnector shall not take place unless it is certain that the movable contacts will reach a position in

which the rated normal current, peak withstand current and short-time withstand current can be carried safely.

- 12.2.11. The signaling of the open position of the disconnecter shall not take place unless the movable contacts have reached such a position that the clearance between the contacts is at least 80 percent of the rated isolating distance.
- 12.2.12. All auxiliary switches and auxiliary circuits shall be capable of carrying a current of at least 10 A DC continuously.
- 12.2.13. The auxiliary switches shall be capable of breaking at least 2 A in a 220 V DC circuit with a time constant of not less than 20 milliseconds.
- 12.2.14. The disconnectors and safety grounding switches shall have a mechanical key (pad locking key) and electrical inter-locks to prevent closing of the grounding switches when isolator switches are in the closed position and to prevent closing of the disconnectors when the grounding switch is in the close position.
- 12.2.15. The local control of the Isolator and high-speed grounding switches from the bay module control panel should be achieved from the individual control switches with the remote/local transfer switch set to local.
- 12.2.16. All electrical sequence interlocks will apply in both remote and local control modes.
- 12.2.17. Each disconnector shall have a clearly identifiable local, positively driven mechanical position indicator, together with position indicator on the bay module control cabinet and provisions for taking the signals to the control room. The details of the inscriptions and colouring for the indicator are given as under :

	<b>SIGN</b>	<b>COLOUR</b>
Open position	Open	Green
Closed position	Closed	Red

- 12.2.18. All the disconnecting switches shall have arrangement allowing easy visual inspection of the travel of the switch contacts in both open and close positions, from the outside of the enclosure.

12.2.19. The disconnecting switches shall be provided with rating plates and shall be accessible for inspection.

12.2.20. The disconnecting switches shall be capable of being padlocked in both the open and closed positions with the operating motor automatically disengaged. The padlocking device shall be suitable for a standard size lock with a 10 mm shank. The padlock must be visible and directly lock the final output shaft of the operating mechanism. Integrally mounted lock when provided shall be equipped with a unique key for such three phase group. Master key is not permitted.

12.2.21. Tests: The disconnectors & earth switch shall confirm to type tests and shall be subjected to routine test in accordance with IEC – 62271-100/102

**13. SAFETY GROUNDING SWITCHES**

13.1. Three-pole, group operated, safety grounding switches shall be operated by electric motor for use on 220 V DC ungrounded system and shall be equipped with a manual operating mechanism for emergency use. The motor shall be protected against over-current and short circuit.

13.2. Each safety grounding switch shall be electrically interlocked with its associated disconnecter and circuit breaker such that it can only be closed if both the current breaker and disconnecter are in open position. Safety grounding switch shall also be mechanically key interlocked with its associated disconnecter.

13.3. Each safety grounding switch shall have clearly identifiable local positive driven mechanical indicator together with position indicator on the bay module control cabinet and provision for taking the signal to Control room.

13.4. The details of the inscription and colouring for the indicator are given as under :

	<b>SIGN</b>	<b>COLOUR</b>
<b>Open position</b>	<b>Open</b>	<b>Green</b>
<b>Closed position</b>	<b>Closed</b>	<b>Red</b>

13.5. Interlocks shall be provided so that manual operation of the switches or insertion of the manual operating device will disable the electrical control circuits.

13.6. Each ground switch shall be fitted with auxiliary switches having four normally open and four normally closed contacts for use by others over and above those required for local interlocking and position indication purposes.

- 13.7. Provision shall be made for padlocking the ground switches in either the open or closed position.
- 13.8. All portions of the grounding switch and operating mechanism required for grounding shall be connected together utilizing flexible copper conductors having a minimum cross-sectional area of 100 sq. mm.
- 13.9. The main grounding connections on each grounding switch shall be rated to carry the full short circuit rating of the switch for 1 sec. and shall be equipped with a silver- plated terminal connector suitable for steel strap of adequate rating for connection to the grounding grid.
- 13.10. The safety grounding switches shall conform to the requirements of IEC-62271- 102
- 13.11. Mechanical position indication shall be provided locally at each switch and remotely at each bay module control cabinet/ substation automation system.

#### **14. HIGH SPEED MAKE PROOF GROUNDING SWITCHES:**

Grounding switches located at the beginning of the line feeder bay modules shall be of the high speed, make proof type and will be used to discharge the respective charging currents, in addition to their safety grounding function. These grounding switches shall be capable of interrupting the inductive currents and to withstand the associated TRV.

Single phase switches shall be provided with operating mechanism suitable for operation from a 220V DC.

The switches shall be fitted with a stored energy closing system to provide fault making capacity.

The short circuit making current rating of each ground switch shall be at least equal to its peak withstand current rating of 125/100 kA ( As applicable ). The switches shall have inductive/ capacitive current switching capacity as per IEC-62271-102.

Each high speed make proof grounding switch shall have clearly identifiable local positive driven mechanical indicator together with position indicator on the bay module control cabinet and provision for taking the signal Control Room.

The details of the inscription and colouring for the indicator shall be as under:-

	SIGN	COLOUR
OPEN POSITION	Open	Green
CLOSED POSITION	Closed	Red

High speed ground switch operation should be possible locally from the bay module control cabinet, or remotely from the control room in conjunction with opening of the associated disconnecter.

These high speed grounding switches shall be electrically interlocked with their associated circuit breakers and disconnectors so that the grounding switches can not be closed if the circuit breakers and disconnectors are closed.

Interlocks shall be provided so that the insertion of the manual operating devices will disable the electrical control circuits.

Each high speed ground switch shall be fitted with auxiliary switches having four NO & four NC auxiliary contacts for use by others, over and above these required for local interlocking and position indication. All contacts shall be wired to terminal blocks in the local bay control cabinet. Provision shall be made for padlocking the ground switches in their open or closed position.

All portion of the grounding switches and operating mechanism required for connection to ground shall be connected together utilizing copper conductor having minimum cross-sectional area of 100 sq. mm.

The main grounding connection on each grounding switch shall be rated to carry the peak withstand current rating of the switch for 1 sec. and shall be equipped with a silver plated terminal connector suitable for steel strap of adequate design for connection to the grounding grid.

The high speed make proof grounding switches shall conform to the requirements of IEC-62271-102.

## **15. INSTRUMENT TRANSFORMERS**

### **15.1. Instrument Transformers**

#### **15.1.1. Current Transformers**

##### **A) General :**

- i) The current transformers and accessories shall conform to IEC : 61869-2/1 and other relevant standards except to the extent explicitly modified in the specification.

- ii) The particulars of the various cores may change within reasonable limits as per the requirements of protection relay supplier. The manufacturer is required to have these values confirmed from the purchaser before proceeding with design of the cores. The other characteristics of CTs shall be as given in TECHNICAL PARAMETER of Current Transformer.

**B) Ratios and Characteristics**

The number, rating, ratios, accuracy class, etc. for the individual current transformers secondary cores shall be in accordance with Table-IA & 1B Where multi-ratio current transformers are required the various ratios shall be obtained by changing the effective number of turns on the secondary winding.

**C) Rating and Diagram Plates**

Rating and diagram plates shall be as specified in the IEC specification incorporating the year of manufacture. The rated extended current rating voltage and rated thermal current shall also be marked on the name plate.

The diagram plates shall show the terminal markings and the relative physical arrangement of the current transformer cores with respect to the primary terminals (P1 & P2).

The position of each primary terminal in the current transformer SF6 gas section shall be clearly marked by two plates fixed to the enclosure at each end of the current transformer.

**D) Constructional Details:**

- a) The current transformers incorporated into the GIS will be used for protective relaying and metering and shall be of metal- enclosed type. All the current transformers shall have effective electromagnetic shields to protect against high frequency transients.
- b) Each current transformer shall be equipped with a marshalling box with terminals for the secondary circuits, which are connected to the local control cubicle. The star/ delta configuration and the inter connection to the line protection panels will be done at the CT terminal block located in the local control cubicle.
- c) Current transformers guaranteed burdens and accuracy class are to be intended as simultaneous for all cores.

- d) The rated extended primary current shall be 150% at highest ratio and 200% at ratios other than highest ratios.
- e) The instrument security factor at all ratios shall be less than five (5) for metering core. If any auxiliary CTs/reactor are used in the current transformers then all parameters specified shall have to be met treating auxiliary CTs as an integral part of the current transformer. The auxiliary CTs/reactor shall preferably built in construction of the CTs.
- f) The wiring diagram, for the interconnections of the three single phase CTs shall be provided inside the marshalling box.
- g) The current transformers shall be suitable for high speed auto-reclosing.
- i) Provisions shall be made for primary injection testing either within CT or outside.
- ii) Electromagnetic shields to be provided against high frequency transients typically 1-30 Hz.

#### **15.1.2. VOLTAGE TRANSFORMERS**

##### **A) General**

The voltage transformers shall conform to IEC- 61869-3/1 and other relevant standards except to the extent explicitly modified in the specification. Voltage transformers shall be of the electromagnetic type with SF6 gas insulation. The earth end of the high voltage winding and the ends of the secondary winding shall be brought out in the terminal box. However, for 400 kV on the lines outdoor type Capacitive Voltage Transformers suitable for carrier coupling shall be provided.

##### **B) Ratios and Characteristics**

The rating, ratio, accuracy class, connection etc. for the voltage transformers shall be in accordance with Table II-A and Table II-B.

##### **C) Rating and diagram plates**

Rating and diagram plate shall be provided complying with the requirements of the IEC specification incorporating the year of manufacture and including turns ratio, voltage ratio, burden, connection diagram etc.

##### **D) Secondary Terminals, Earthing and Fuses**

The beginning and end of each secondary winding shall be wired to suitable terminals accommodated in a terminal box mounted directly on

the voltage transformer section of the SF6 switchgear. All terminals shall be stamped or otherwise marked to correspond with the marking on the diagram plate. Provision shall be made for earthing of the secondary windings inside the terminal box.

- E) The transformer shall be able to sustain full line to line voltage without saturation of transformer.

The accuracy class will be at maximum tap.

**F) Constructional Details of Voltage Transformers :**

- a) The voltage transformers shall be located in a separate bay module on the bus and will be connected phase- to ground and shall be used for protection, metering and synchronization.
- b) The voltage transformers shall be of inductive type, nonresistant and shall be contained in their own-SF6 compartment, separated from other parts of installation. The voltage transformers shall be effectively shielded against high frequency electromagnetic transients. The voltage transformers shall have three secondary windings
- c) Voltage transformers secondaries shall be protected by HRC cartridge type fuses/MCB for all the windings. In addition fuses shall be provided for the protection and metering windings for fuse monitoring scheme. The secondary terminals of the VT's shall be terminated to the stud type non-disconnecting terminal blocks in the secondary boxes via the fuse/MCB.
- d) The voltage transformer should be thermally and dielectrically safe when the secondary terminals are loaded with the guaranteed thermal burdens.
- e) The accuracy of 0.2 on secondary III should be maintained through out the entire burden range upto 100 VA on all the three windings without any adjustments during operation.
- f) The diagram for the interconnection of the VTs shall be provided inside the marshalling box.

**15.1.3. TESTS:**

Current and voltage transformers shall conform to type tests and shall be subjected to routine test in accordance with IEC.

**15.1.4 TECHNICAL PARAMETERS**

**15.1.4.1 Current Transformers**

<b>S N</b>	<b>Particulars</b>	<b>400kV</b>	<b>220kV</b>
a	Rated Voltage Un	420 kV (rms)	245 kV (rms)
b	Rated frequency	50hZ	50hZ
c	System neutral earthing	Effectively earthed	Effectively earthed
d	Rated short time thermal current	50kAp. for 1 second.	50/40 kAp. (as applicable) for 1 second.
e	Rated dynamic current	125 kAp. for 1 second	125/100 kAp. (As applicable) for 1 second
f	Rated insulation levels 1.2/50 micro second impulse voltage 1 minute power frequency withstand voltage 250/2500micro second switching impulse voltage (Dry & wet)	± 1425 kVp 650 kV (ram) 1050kVp	± 1050 kVp 460kv (rms)
g	Maximum temperature rise over an ambient temperature of 400C	As per IEC 61869-2/1	As per IEC 61869-2/1
h	Radio interference voltage at $1.1U_n/\sqrt{3}$ and frequency range 0.5 to 2 MHz	1000 microvolts	1000 microvolts
i	One minute power frequency withstand voltage between secondary terminal and earth	3kV (rms)	3kV (rms)
j	Partial discharge level	10 pico coulombs	10 pico coulombs

**15.1.4.2 Voltage Transformers**

<b>Sl. No.</b>	<b>Particulars</b>	<b>400kV</b>	<b>220kV</b>
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a	Rated System Voltage Un	420 kV (rms)	245 kV (rms)
b	Rated frequency	50hZ	50hZ
c	System neutral earthing	Effectively earthed	Effectively earthed
d	System fault level	50 kAp. for 1 second.	50/40 kAp. (as applicable) for 1 second.
e	Rated insulation levels 1.2/50 micro second impulse voltage 1 minute power frequency withstand voltage 250/2500micro second switching impulse voltage (Dry & wet)	± 1425 kVp 650 kV (ram) 1050kVp for 400kV system	± 1050 kVp 460kv (rms)
f	One minute power frequency withstand voltage for secondary winding	3KV(rms)	3kV (rms)
g	Radio interference voltage at $1.1U_n/\sqrt{3}$ and frequency range 0.5 to 2 MHz	1000 microvolts	1000 microvolts
h	Rated total thermal burden	400VA	400VA
i	Partial discharge level	10 pico couloms	10 pico couloms

## 16 OUTDOOR BUSHINGS :

### A) General

Outdoor bushings, for the connection of conventional external conductors to the SF6 metal enclosed switchgear, shall be provided where specified and shall conform to the requirements given in GTR. The dimensional and clearance requirements for the metal enclosure will be the responsibility of the manufacturer and their dimensions must be coordinated with the switchgear. Bushings shall generally be in accordance with the requirements of IEC publication 60137 as applicable.

### B) Insulation levels and creepage distances

All bushings shall have an impulse and power frequency withstand level that is greater than or equal to the levels specified for GIS. The creepage distance over the external surface of outdoor bushings shall not be less than 25 mm/kV.

### C) Bushing types and fitting

Condenser type bushings will be preferred but alternative types can also be considered. Liquid filled bushings shall be provided with liquid level gauges clearly visible from ground level, preferably of the direct reading prismatic type or the magnetic type. Other types of liquid level gauges will only be accepted if specifically approved.

### D) Mechanical forces on bushing terminals

Outdoor bushings must be capable of withstanding cantilever forces due to weight of busduct and short circuit forces. Design calculations in support of the cantilever strength chosen shall be submitted for owners review and approval.

### E) The major parameters of the bushings shall be as follows:-

i	Rated Voltage (kv)	420 kV	245 kV
ii	Rated current (Amp)	3150/2000 (as applicable)	1600
iii	Lightning impulse withstand voltage (kVp)	1425	1050
iv	Switching impulse withstand voltage (kVp)	1050	-
v	One minute power frequency withstand voltage kV (rms)	650	460
vi	Minimum total creepage distances (mm)	10500	6125

## 17 Surge Arrestors

The surge arrestors shall conform in general to latest IEC –60099-4.

## 17.1 INSULATION CO-ORDINATION AND SELECTION OF SURGE ARRESTOR

The contractor shall be fully responsible for complete insulation co-ordination of switchyard including GIS. Contractor shall carry out detailed studies and design calculations to evolve the required parameters locations, energy capability etc. of surge arrestors such that adequate protective margin is available between peak impulse, surge and power frequency discharge voltages and BIL of the protected requirement. The locations of surge arrestors shown in single line diagram is indicative only. If the bidders feels that at some more locations the surge arrestors are required to be provided the same should also be included in the offer.

The contractor shall perform all necessary studies. The report shall detail the limits of all equipment parameters which could affect the insulation co-ordination. The report shall also detail the characteristics of the surge arrester and shall demonstrate that the selected arrester's protective and withstand levels, discharge and coordinating currents, and arrester ratings and comply with the requirement of this specification.

The contractor shall also consider in the studies the open circuit breaker condition, fast transients generated by slow operation of disconnecting switches. The study report and design calculations shall be submitted for Owner's approval.

### 17.2 Duty requirements

- a) The surge arrester shall be of heavy duty station class and gapless (Metal oxide) type without any series or shunt gaps.
- b) The surge arresters shall be capable of discharging over-voltages occurring during switching of unloaded transformers, reactors and long lines.
- c) 420 kV class Surge arresters shall be capable of discharging of severe re-energisation switching surges on a 400 kV, 450 Km long line with surge impedance of 300 ohms and capacitance of 12 nF/Km and over voltage factor of 2.3 p.u
- d) 420 kV class arrester shall be capable of discharging energy equivalent to class 4 of IEC for a 420 kV system on two successive operation followed immediately by 50 HZ energisation with a sequential voltage profile as specified below:

705 kVp for 3 peaks

580 kVp for 0.1 Sec.

565 kVp for 1 Sec.

550 kVp for 10 Secs.

- e) 245 kV class arrester shall be capable of discharging energy equivalent to class 3 of IEC for 245 kV system on two successive operations.
- f) The reference current of the arresters shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage.
- g) The surge arresters are being provided to protect the followings whose insulation levels are indicated in the table given below:-

<b>Equipment to be protected</b>	<b>Lightning impulse (kVp) for 420kV system</b>	<b>Switching surge (kVp) for 420kV system</b>	<b>Lightning impulse (kVp) for 245kV system</b>
Power transformer	± 1300	± 1050	± 950
Instrument transformer	± 1425	± 1050	± 1050
Reactor	± 1300	± 1050	-
CB/Isolator phase to ground	± 1425	± 1050	± 1050
Across open contacts	± 1425 (±240)	± 900 (± 345)	± 1200

### 17.3 Constructional Features

The nonlinear blocks shall be of inferred metal oxide material. These shall be provided in such a way as to obtain robust construction, with excellent mechanical and electrical properties even after repeated operations. The arrester enclosure shall be vertically or horizontally mounted to suit the layout of the switchgear as suggested by the manufacturer and shall be fitted with a discharge counter located in an easily accessible position. The main

grounding connection from the surge arrestor to the earth shall be provided by the bidder. The size of the connecting conductor shall be such that all the energy is dissipated to the ground without getting overheated.

**17.4 Tests**

In accordance with the requirements stipulated the surge arrestors shall conform to type tests and shall be subjected to routine and acceptance tests in accordance with IEC document. Each metaloxide block shall be tested for the guaranteed specific energy capability in addition to the routine/acceptance test as per IEC-60099.

**17.5 Test on Surge Monitors :**

The Surge monitors shall also be connected in series with the test specimens during residual voltage and current impulse withstand tests to verify efficacy of the same. Additional routine/functional tests with one 100A and 10 kA current impulse, (8/20 micro sec.) shall also be performed on the surge monitor.

**17.6 Parameters**

Following are the parameters for 400kV and 220 kV system generally adopted by Owner for their installations. These parameters are indicative and not binding. The actual parameters required for the installation shall be evolved by contractor.

**420KV & 220KV CLASS SURGE ARRESTOR**

Sl. No.	Particulars	400kV	220kV
a)	Rated System Voltage	420 kV	245 kV
b)	System neutral earthing	Effectively earthed	Effectively earthed
c)	Rated arrester voltage	390kV	216kV
d)	Nominal discharge current	10kA of 8/20 micro second wave	10kA of 8/20 micro second wave
e)	Rated frequency	50Hz	50Hz
f)	Minimum discharge capability voltage corresponding to minimum discharge characteristics	8 KJ/kV or corresponding to Cl. 3.4.1 (d) to rated arrester voltage and at minimum discharge	5KJ/kV (referred to rated arrester)

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		characteristics whichever is higher.	
<b>g)</b>	Continuous operating voltage at 500C	303kV	168kV
<b>h)</b>	Min. switching surge residual voltage (1kA) Max. switching surge residual voltage (1kA)	730kVp 780kVp	- 500kVp
<b>i)</b>	Max. residual voltage at (i). 5kA 10kA nominal discharge current 20kA nominal discharge current	- 900kVp 975kVp	560kVp 600kVp -
<b>j)</b>	Long duration discharge class	4	3
<b>k)</b>	High current short duration test value (4/10 micro sec. wave)	100kAp	100kAp
<b>l)</b>	Current for pressure relief test	40kA rms	40kA rms
<b>m)</b>	Prospective symmetrical fault current	40kA rms for 0.2 Sec.	40kA rms for 0.2 Sec.
<b>n)</b>	Pressure relief class	A	A
<b>o)</b>	RIV at $1.1U_n/\sqrt{3}$ kV rms (micro volts)	Less than 500	Less than 500
<b>p)</b>	Partial discharge at 1.05 COV	Not more than 50	Not more than 50
<b>q)</b>	Reference ambient temp.	500C	500C

**18 400 kV & 220 kV GIS BUILDING (If applicable):**

- a) The buildings shall house 400 KV and 220 KV Gas Insulated Switchgear (GIS) separately and other associated equipments inside in each of the GIS building.
- b) The bidder shall submit the design & construction proposal of the building along with necessary information, data, and drawings in the techno- commercial bid according to the complete requirements.
- c) The dimensions for 400 KV & 220 KV GIS building is indicated in the enclosed layout plan. The dimension given is for reference only and may vary according to requirement of the equipment to be installed inside. The bidder shall finalize

the dimensions according to the equipment offered by them providing enough space & access for erection, operation and maintenance. The dimensions indicated in the tender drawing is only indicative and minimum required. (Refer Annexure V of projects).

#### **19.0 Seismic Design Criteria:**

The equipment shall be designed for operation in seismic zone for earthquake resistance. The seismic loads are due to the horizontal and vertical acceleration which may be assumed to act non concurrently. Seismic level Zone- II as per new IS- 1893, latest edition has to be considered for the design of equipment. The seismic loads shall be equal to static loads corresponding to the weight of the parts multiplied by the acceleration. The equipments along with its parts shall be strong enough and sufficiently well connected to resist total operating stresses resulting from the forces in normal operation but in case of abnormal condition shall also resist with forces superimposed due to earthquakes. The copies of type test reports for similar rated equipment, if tested earlier, should be furnished along with the tender. If the equipment has not been type tested earlier, design calculations of simulated parameters should be furnished along with the offer.

To prevent the movement of GIS sub assemblies i.e. various bay modules during the earthquake, suitable devices shall be provided for fixing the sub assemblies to the foundation. The contractor shall supply necessary bolts for embedding in the concrete foundation. The fixing of GIS sub assemblies to the foundation shall be designed to with-stand the seismic events. It will also be ensured that the special devices as well as bolts shall not be over stressed. The details of the devices used and the calculations for establishing the adequacy shall be furnished by the supplier and shall be subject to the purchaser's approval.

#### **20.0 PARTIAL DISCHARGE MONITORING SYSTEM & DEW POINT METER**

Online P.D meter, Online SF6 & O2 monitoring & alarm system and Dew point meter shall be offered as per relevant schedule of BPS and shall be considered for evaluation of bid. The specifications are enclosed at Annex-A1. Contractor shall provide adequate number of UHF sensors in the offered GIS for connection to the Online PD meter & the number & location of these sensors shall be subject to approval of the purchaser.

#### **21.0 QUALITY OF SF6 GAS**

- a) The SF6 gas insulated metal-clad switchgear shall be designed for use with SF6 gas complying with the recommendations of IEC 60376, 60376A &

60376B, at the time of the first charging with gas. All SF6 gas supplied as part of the contract shall comply with the requirements of IEC as above as a minimum & should be suitable in all respects for use in the switchgear under all operating conditions.

- b) The high pressure cylinders in which SF6 gas is supplied & stored at site shall comply with the requirements of following standards & regulations :

**IS : 4379 Identification of the contents of industrial gas cylinders.**

**IS : 7311 Seamless high carbon steel cylinders for permanent & high pressure** liquefiable gases. The cylinders shall also meet Indian Boilers Regulations. (Mandatory)

**c) Test**

SF6 gas shall be tested for purity, dew point, air, hydrolysable fluorides and water contents as per IEC:60376, 60376A & 60376B and test certificates shall be furnished to the owner indicating all test results as per IEC standards for each lot of SF6 gas. Further site tests for moisture, air content, flash point and dielectric strength to be done during commissioning of GIS. Gas bottles should be tested for leakage during receipt at site.

- d) The bidder shall indicate diagnostic test methods for checking the quality of gas in the various sections during service. The method proposed shall, as a minimum check the moisture content & the percentage of purity of the gas on annual basis.
- e) The bidder shall also indicate clearly the precise procedure to be adopted by maintenance personnel for handling equipment that are exposed to the products of arcing in SF6 Gas so as to ensure that they are not affected by possible irritants of the skin and respiratory system. Recommendations shall be submitted for suitable protective clothing, method of disposal of cleaning utensils and other relevant matters.
- f) The bidder shall also indicate the details and type of filters used in various gas sections, and should also submit the operating experience with such filters.

**22 SF6 GAS MONITORING DEVICES AND ALARM CIRCUITS:-**

**22.1** Dial type temperature compensated gas density or density monitoring devices with associated pressure gauge will be provided. The devices shall provide continuous & automatic monitoring of the state of the gas & a separate device shall be provided for each gas compartment so that each compartment can be monitored simultaneously as follows:-

**1) Compartments except circuit breaker**

**a) Gas Refill level**

This will be used to annunciate the need for the gas refilling. The contractor shall provide a contact for remote indication.

**b) 'Zone Trip' level**

This is the minimum level at which the manufacturer will guarantee the insulation rating of the assembly. Contacts shall be in accordance with requirement.

**2) Circuit Breaker**

**a) 'Gas Refill' level**

This will be used to annunciate the need for gas refilling. The contractor shall provide contact for remote indication.

**b) 'Breaker Block' level**

This is the minimum gas density at which the manufacturer will guarantee the rated fault interrupting capability of the breaker. At this level the breaker block contact shall operate & the trip-ping & closing circuit shall be blocked.

**c) 'Zone Trip' level**

This is the minimum level at which the manufacturer will guarantee the insulation rating of the assembly. Contacts shall be in accordance with requirement. The bidder should furnish temperature v/s pressure curves for each setting of density monitor along with details of the monitoring device. It shall be possible to test all gas monitoring relays/devices without de-energizing the primary equipment & without reducing pressure in the main section. Plugs & sockets shall be used for test purposes. It shall also damp the pressure pulsation while filling the gas in service, so that flickering of the pressure switch contacts does not take place.

**3)**

a. The gas density and pressure sensitive devices, together with all relays supplied by the manufacturer for use in protection, shall be approved by the PURCHASER. It shall be possible to test all gas monitoring relays without de-energizing the primary equipment and without reducing pressure in the main section. Disconnecting type plugs and sockets shall be used for test purposes; the pressure/density device shall be suitable for connecting to the male portion of the plug.

b. Two potential free electrical contacts shall be provided with each and every alarm condition. These are to be grouped together and wired to the cable termination blocks in the local control panels to give remote alarm

indications/annunciation's the remote panels. The BIDDER will be advised of the grouping required after the contract has been placed. Provision shall be made for display of gas pressure of all individual gas compartment in the remote panel/HMI. The density monitor shall be provided with necessary signal Transmitter (mA) for display of actual gas pressure in the remote HMI.

- c. BIDDER shall advise if the breakers are suitable for breaking the load current even if SF-6 gas pressure has reduced to atmospheric pressure.

## **22.2**

### **a) Gas Leakage**

The maximum gas leakage shall not exceed 0.5% (half percent) per year for the whole equipment and for any individual gas compartment separately.

### **b) Gas Supply**

The contractor shall include the supply of all SF6 gas necessary for filing & putting into operation the complete switchgear installation being supplied. In addition 20% of total gas requirement shall be supplied in separate cylinders as spare requirement, over & above the requirement of gas for successful commissioning. Pl. refer list of mandatory spares in this connection.

## **23 GAS FILLING AND EVACUATING PLANT:-**

All the plant necessary for filling and evacuating the SF6 gas in the switchgear shall be supplied with the contract to enable any maintenance work to be carried out. This shall include all the necessary gas cylinders for temporarily storing the evacuated SF6 gas. The capacity of the temporary storage facilities shall at least be sufficient for storing the maximum quantity of gas that could be removed when carrying out maintenance or repair work on the switchgear and associate equipment of at least one complete bay. Where any item of the filling and evacuating plant is of such a weight that it cannot easily be carried by maintenance personnel, it shall be provided with lifting hooks for lifting and moving with the overhead cranes. The capacity of evacuation plant will be as under :

Vacuum Pump: 40 M<sup>3</sup>/Hour(Nominal suction pressure)

Compressor: 15 M<sup>3</sup>/Hour(Delivery)

The evacuation equipment shall be provided with all the necessary pipes, couplings, flexible tubes and valves for coupling up to the switchgear for filling or evacuating all the gases. The gas compartments shall preferably be fitted with permanent non-return valves through which the gas is pumped into or evacuated form the compartments. Details of the filling and evacuating plant

that will be supplied, as well as the description of the filling and evacuating procedures shall be provided along with the bid.

**24 SF6 GIS to XLPE Cable Termination (If Applicable):**

The 220 kV underground cables are to be connected to 220 kV GIS by the interfacing of XLPE cable sealing end to GIS Cable termination enclosure for making connection 1C x 1000 sq mm ( As applicable ) XLPE cable. Cable termination kit shall be supplied by cable supplier. The ducts and the casing shall be suitable for the requirements for which it is designed. This interface section shall be designed in a manner which will allow ease of operation and maintenance.

The SF6 GIS to XLPE cable termination shall conform to IEC-62271-209(latest edition).

The provision shall be made for a removable link. The gap created when the link is removed should have sufficient electric strength to withstand the switchgear high voltage site tests. The bidder may suggest alternative arrangements to meet these requirements. The corona rings/stress shields for the control of electrical field in the vicinity of the isolation gap shall be provided by the GIS manufacturer.

All supporting structures for the SF6 bus-duct connections between the XLPE cable sealing ends and the GIS shall be supplied by the supplier. The supplier may specify alternative connecting & supporting arrangements for approval of the purchaser.

The opening for access shall be provided in each phase terminal enclosures as necessary to permit removal of connectors to isolate the XLPE cables to allow carrying out the insulation tests. The typical arrangement drawing of interconnecting bus-duct from GIS bay module to XLPE cable termination end shall be submitted along with offer.

**25 Electric Overhead Crane (If applicable):**

**One EOT Crane each for 400kV & 220kV GIS hall of suitable capacity shall be provided for erection & maintenance of largest GIS component/assembly.** The crane shall consist of all special requirements for erection & maintenance of GIS equipments.

The crane shall be possible to be operated through the cable & through the pendant control or through remote control device, which shall be easily accessible from the floor of GIS building.

- 26** The crane for 400kV GIS hall shall have capacity of minimum 6T safe working load & minimum height of crane shall be 9.0 meters or as per actual requirement whichever is higher.

The crane for 220kV GIS hall shall have capacity of minimum 5T safe working load & minimum height of crane shall be 8.0 meters or as per actual requirement whichever is higher.

EOT Crane shall be provided with Double Girder type.

**27 TRANSFORMER / REACTOR TERMINATION MODULE (If applicable):-**

The transformer/reactor termination module enables a direct transition from the SF6 gas insulation to the bushing of an oil-insulated transformer/reactor. For this purpose, the transformer/reactor bushing must be oil-tight, gas-tight and pressure resistant. Any temperature related movement and irregular setting of the switchgear's or transformer's/reactor's foundations are absorbed by the expansion fittings.

**OR**

The oil filled transformers and reactors are as shown in the sub-station SLD. The oil to air bushings of the 400/220/33kV autotransformers and 400kV reactors shall be supplied by the respective supplier's and the same shall be connected to the SF6 ducts through air to SF6 bushings to be provided under present scope.

**28 PAINTING OF ENCLOSURE:-**

All enclosures shall be painted externally as per manufacturer's painting procedure. The painting procedures as followed shall be enclosed with the bid.

**29 HEATERS**

Wherever required, heaters shall be provided to prevent moisture condensation. Heaters are not allowed in side the main circuit.

**30 IDENTIFICATION & RATING PLATE**

- i) Each bay shall have a nameplate showing
  - a) A listing of the basic equipment from air entrance bushing to air entrance bushing such as a breaker, disconnectors grounding switches, current transformers, voltage transformers, and bushings).
  - b) A schematic diagram indicating their relative locations.
  - c) KPTCL Contract Number.

- ii) Each module will have its own Identification & rating plate.

The rating plate marking for each individual equipments like circuit breaker, disconnectors grounding switches, current transformer, voltage transformers, surge arrester etc shall be as per their relevant IEC.

**31. TRANSPORTATION OF EQUIPMENT TO SITE.**

The contractor shall be responsible for the loading, transport, handling and offloading of all equipment and materials from the place of manufacture or supply to site. The contractor shall be responsible to select and verify the route, mode of transportation and make all necessary arrangement with the appropriate authorities as well as determining any transport restrictions and regulations imposed by the government and other local authorities .All transport packages containing critical units viz Circuit breakers, disconnectors, earth switches, surge arrestors and bus sections exceeding 3 metres length shall be provided with sufficient number of electronic impact recorders ( on returnable basis ) during transportation to measure the magnitude and duration of the impact in all three directions. The acceptance criteria and limits of impact in all three directions which can be withstood by the equipment during transportation and handling shall be submitted by the contractor during detailed engineering. The recording shall commence in the factory and must continue till the units reach site. The data of electronic impact recorders shall be downloaded at site and a soft copy of it shall be handed over to Engineer – in –charge. Further, within three weeks the contractor shall communicate the interpretation of the data.

**32. PACKING, STORAGE AND UNPACKING.**

All the equipment shall be carefully packed for transport by sea, rail and road in such a manner that it is protected against the climatic conditions and the variations in such conditions that will be encountered enroute from the manufacturer's works to the site.

The SF6 metalclad equipment shall be shipped in the largest factory assembled units that the transport and loading limitations and handling facilities on site will allow to reduce the erection and installation work on site to a minimum. Where possible all items of equipment or factory assembled units shall be boxed in substantial crates or containers to facilitate handling in a safe and secure manner. Should the units be considered too large for packing in crates, they shall be suitably lagged and protected to prevent damage to any part, particularly small projections, during transport and handling. Special lugs or protective supports shall be provided for lifting to prevent slings and other lifting equipment from causing damage. Each crate, container or shipping unit

shall be marked clearly on the outside to show where the weight is bearing and the correct position for the slings.

Each individual piece to be shipped, whether crate, container or large unit, shall be marked with a notation of the part or parts contained therein.

Special precautions shall be taken to protect any parts containing electrical insulation against the ingress of moisture. This applies particularly to the metalclad equipment of which each gas section shall be sealed and pressurized prior to shipping. Either dry nitrogen/air or dry SF6 gas shall be used and the pressure shall be such as to ensure that, allowing for reasonable leakage, it will always be greater than the atmospheric pressure for all variations in ambient temperature and the atmospheric pressure encountered during shipment to site and calculating the pressure to which the sections shall be filled to ensure positive pressure at all times during shipment. The type of gas, the maximum pressure to which sections will be filled prior to shipment and the minimum allowable pressure during shipment shall be advised prior to dispatch.

All blanking plates, caps, seals, etc., necessary for sealing the gas sections during shipment to site shall be provided as part of the contract and shall remain the property of KPTCL. If considered necessary, blanking plates or other sealing devices shall be provided with facilities for measuring the gas pressure and recharging at any time during the transport period. Any seals, gaskets, 'O' rings, etc. that may be used as part of the arrangement for sealing off gas sections for shipment of site, shall not be used in the final installation of the equipment at site. Identification serial numbers shall be stamped into the blanking plates, etc., and on the switchgear equipment to which they are fitted so that they can easily be identified and refitted should it ever be necessary to ship sections of the switchgear back to the manufacturer's works for repair.

Valves and other gas couplings associated with the switchgear gas systems shall be adequately protected against damage from any bumps or physical blows. They shall also be capped to prevent ingress of dirt or moisture or damage to any coupling, pipes, threads or special fittings. Any explosion vents and other pressure relief devices, shall be suitably sealed and protected to prevent accidental exposure of the sealed sections during shipment to site.

For bus ducts involving male and female joints of the current carrying conductor, the same shall be transported in disassembled condition to avoid any damage during transit. All bright parts liable to rust shall receive a coat of anti rusting composition and shall be suitably protected.

The contractor will be able to use the available storage areas at site.

## Transmission Service Agreement

The contractor shall ensure that during the period between arrival at site and erection, all materials and parts of the contract works are suitably stored in such approved manner as to prevent damage by weather, corrosion, insects, vermin or fungoral growth. The scope of providing the necessary protection, storing off the ground, as required etc. is included in the works to be performed by the contractor.

The equipment shall only be unpacked or removed from the containers immediately prior to being installed. They shall not be left lying unnecessarily in open crates or containers. Special precautions shall be taken when gas sections which have been sealed and pressurized for shipping are opened up to reduce the ingress of dirt and atmospheric moisture to a minimum. Whenever possible this shall only be done immediately prior to installation and if any section is to be left outside for any length of time after being opened, it shall be resealed and pressurized with either dry nitrogen/air or SF<sub>6</sub> gas until required.

**TABLE-IA-I**  
**Requirements for 420kV Current Transformer**  
**(For Line and Bus coupler feeder)**

No. of cores	Core no.	Application	Current ratio	Output Burden(V A)	Accuracy class	Min. knee point voltage Vk	Max. CT sec. wdg. Resistance(ohm)	Max. excitation current at Vk(in mA)	Remarks
5	1	BUS DIFF	3000-2000-1000/1	-	PS	3000/2000/1000	15/10/5	20 on 3000/1 tap 30 on 2000/1 tap 60 on 1000/1 tap	
	2	BUS DIFF	3000-2000-1000/1	-	PS	2000/2000/1000	15/10/5	20 on 3000/1 tap 30 on 2000/1 tap 60 on 1000/1 tap	
	3	METERING	3000-2000-1000/1	20 20 20	0.2S 0.2S 0.2S	-	-	-	
	4	BACKUP/ LINE PRTN	3000-2000-1000/1	-	PS	3000 2000 1000	15/10/5	20 on 3000/1 tap 30 on 2000/1 tap 60 on 1000/1 tap	
	5	LINE PRTN	3000-2000-1000/1	-	PS	3000 2000 1000	15/10/5	20 on 3000/1 tap 30 on 2000/1 tap 60 on 1000/1 tap	

All relaying CTs shall be of accuracy class PS as per IS: 2705/IEC-61869-2/1

**TABLE-IA-II**  
**Requirements for 420kV Current Transformer**  
 (For Transformer and Reactor feeder)

No. of cores	Core no.	Application	Current ratio	Output Burden (VA)	Accuracy class	Min. knee point voltage V <sub>k</sub>	Max. CT sec. wdg. Resistance(ohm)	Max. excitation current at V <sub>k</sub> (in mA)	Remarks
5	1	BUS DIFF	2000-1000/1	-	-	2000/1000	10/5	30 on 2000/1 tap 60 on 1000/1 tap	
	2	BUS DIFF	2000-1000/1	-	-	2000/1000	10/5	30 on 2000/1 tap 60 on 1000/1 tap	
	3	METERING	2000-1000-500/-	20 20 20	0.2S 0.2S 0.2S	-	-	-	
	4	TRANS/Reactor BACKUP	2000-1000-500/1	-	-	2000 1000 500	10/5/2.5	30 on 2000/1 tap 60 on 1000/1 tap 120 on 500/1 tap	
	5	TRANS/Reactor DIFF	2000-1000-500/1	-	-	2000 1000 500	10/5/2.5	30 on 2000/1 tap 60 on 1000/1 tap 120 on 500/1 tap	

All-relaying CTs shall be of accuracy class PS as per IS: 2705/IEC 61869-2/1

**TABLE-IB**  
**Requirements for 245kV Current Transformer**

No. of cores	Core no.	Application	Current ratio	Output Burden(V A)	Accuracy class	Min. knee point voltage Vk	Max. CT sec. wdg. Resistance(ohm)	Max. excitation current at Vk(in mA)	Remarks
5	1	BUS DIFF CHECK	1600-800/1	-	-	1600/800	8/4	25 on 1600/1 tap 50 on 800/1 tap	
	2	BUS DIFF MAIN	1600-800/1	-	-	1600/800	8/4	25 on 1600/1 tap 50 on 800/1 tap	
	3	METERING	1600-800/1	20	0.2S	-	-	-	
	4	TRANS BACKUP/ LINE PRTN	1600-800/1	-	-	1600/800	8/4	25 on 1600/1 tap 50 on 800/1 tap	
	5	TRANS DIFF /LINE PRTN	1600-800/1	-	-	1600/800	8/4	25 on 1600/1 tap 50 on 800/1 tap	

All relaying CTs shall be of accuracy class PS as per IS: 2705/IEC 61869-2/1

**TABLE-IIA**  
**Requirements of Voltage Transformer**

Sl. No.	Particulars	400kV			220kV		
		1	Rated primary voltage	420/ $\sqrt{3}$ kV			245/ $\sqrt{3}$ kV
2	Type	Electro magnetic, or single phase capacitor VT			Electro magnetic		
3	No. of secondaries	3			3		
4	Rated voltage factor	1.2 continuous 1.5 – 30 seconds			1.2 continuous 1.5 – 30 seconds		
5	Phase angle error	$\pm$ 20 minutes			$\pm$ 20 minutes		
		Sec I	Sec II	Sec III	Sec I	Sec II	Sec III
6	Rated voltage (V)	110/ $\sqrt{3}$	110/ $\sqrt{3}$	110/ $\sqrt{3}$	110/ $\sqrt{3}$	110/ $\sqrt{3}$	110/ $\sqrt{3}$
7	Application	Protection	Protection	Metering	Protection	Protection	Metering
8	Accuracy	3P	3P	0.2	3P	3P	0.2
9	Output burden (VA) (Minimum)	50	50	50	50	50	50

### Annexure-A1

#### TESTING & MAINTENACE EQUIPMENT

Testing & Maintenance equipment shall be offered, as per relevant schedule of BPS.

##### 1. SF6 Gas leakage detector.

The detector shall be portable, battery operated, hand held type and having a minimum SF6 gas leakage sensitivity of 5gm/year. The sensor shall be connected through a flexible wand for easy accessibility to joints, seals and couplings in GIS equipment and provided with a protection filter. The equipment shall have on/off switch & suitable indicating lamps/LEDs, variable pitch audible signal for leakage indication. The equipment shall have automatic zeroing of background signals suitable for detecting SF6

gas leakage in charged switchyard. The test kit shall be compatible for EMI/EMC environment as per IEC 1000.

**2. Gas filling and evacuating plant: (Gas Processing unit)**

- The plant necessary for filling and evacuating the SF6 gas in the switchgear shall be supplied to enable any maintenance work to be carried out. This shall include all the necessary gas cylinders for temporarily storing the evacuated SF6 gas. The capacity of the temporary storage facilities shall at least be sufficient for storing the maximum quantity of gas that could be removed from at least one phase of one complete bay (switchgear and associated equipment).
- Where any item of the filling and evacuating plant is of such a weight that it cannot easily be carried by maintenance personnel, it shall be provided with lifting hooks for lifting and moving with the overhead cranes.
- The minimum capacity parameters of evacuation plant will be as under:
  - Oil Free Suction (Recovery) Pump: 30 M3/Hour
  - Compressor (Two Stages): 15 M3/Hour
  - Oil Free Vacuum Pump: 100 M3/Hour
- The evacuation equipment shall be provided with all the necessary pipes, couplings, flexible tubes and valves for coupling up to the switchgear for filling or evacuating all the gases. Details of the filling and evacuating plant that will be supplied, as well as the description of the filling and evacuating procedures shall be furnished.

**Online Partial Discharge Monitoring System (Applicable for 400kV GIS substation –Both on 400kV side & 220kV side)**

□□GIS equipment shall be designed so as to minimize partial discharge or other electrical discharge. A state-of-the art Partial Discharge Monitoring system shall be provided to monitor the entire GIS installation.

□□An on-line continuous Partial Discharge Monitoring (PDM) system shall be designed to provide an automatic facility for the simultaneous collection of PD data at multiple points on the GIS & its associated GIB ducts and Voltage Transformers adopting UHF technique. The data stored shall provide a historical record of the progress of PD sources and shall identify the areas of maximum activity.

□□On-line continuous Partial Discharge Monitoring (PDM) system shall be capable for measuring PD in charged GIS environment as EHV which shall have bandwidth in order of 100 MHz–2GHz with possibility to select a wide range of intermediate bandwidths for best measurement results. The principle of operation shall be based on UHF principle of detection.

□□The scope shall cover Engineering, supply, installation, testing and commissioning of partial discharge continuous monitoring system, with all necessary auxiliaries and accessories to make a complete system as per technical specification, including site demonstration of successful operation. Any items/accessories necessary to make the system fully functional for the trouble free online PD monitoring of complete GIS installation shall be considered as included in the scope.

The PDM system shall be provided with all its hardware and software, with readily interfacing to the UHF PD couplers installed in the GIS of present bays and future bays as shown in SLD plus 20% additional as extra. Details of this shall be submitted during engineering stage for approval.

The integration of UHF PD coupler in future GIS bays shall be done in respective package. The number of UHF PD coupler for future bays shall be decided based on GIS layout finalized under present scope (considering present GIS equipment with future provision).

The PD Monitoring PC Work Station shall be housed in a lockable cabinet with duplicate keys and shall be located in the control room of the GIS substation. Workstation PCs shall be pre-loaded with all necessary Hardware & Software. The PCs shall have each Combo drive & Retrievable disk drive (1 TB), Ethernet port 100Mbps, printer. The workstation PC shall be powered by suitable dedicated UPS and same is included in the present scope.

□□Design of on-line PDM System

1. The technical proposal for PDM system along with detailed design documentation shall be submitted for EMPLOYER'S approval during engineering stage.
2. To guarantee that sufficient coverage is available for complete GIS installation to monitor PD activity all design details shall be submitted as part of the above for review.
3. The sensitivity of the offered system shall be in accordance with CIGRE Document No. 654 that will be verified as part of site sensitivity tests.
4. UHF attenuation data of GIS shall be submitted for the switching devices, spacers, bends etc.
5. The signal attenuation level of co-axial cable per meter length and justification for the length of cable connection between the couplers and detector units shall be furnished.
6. The overall sensitivity of PD detection system shall take into account the spacing between couplers and the associated cabling, filters, amplifiers, etc.
7. The Sub-station GIS layout as a separate drawing indicating position of spacers, spread over of PD sensors with distance, sensor identification, the detector unit identification etc. shall be submitted during engineering stage for approval.
8. The PD sensors shall be identified / coordinated with the corresponding detector unit etc. with proper identification labeling and indicated in the substation PDM SLD.
9. Internal arrangement/wiring diagram is to be submitted for detector units/control cabinet etc. All internal items are to be identified / labeled to facilitate troubleshooting.
10. Supply requirement (AC & DC) to be specified for the complete monitoring system.
11. Power supply to PDM PC shall have protection against surges, overload and short circuit. A dedicated on-line UPS system shall also be provided as a backup during supply interruption, to ensure trouble-free & reliable running of the PDM System for a minimum of 15 minutes duration. Ratings of UPS shall be proposed for the approval of EMPLOYER'S. The UPS shall have enough capacity to initiate a 'safe' shut down of the PDM PC and the peripherals after this 15-minute period if normal supply fails to resume. The PDM PCs shall restart automatically on resumption of normal supply. The UPS shall not generate spikes during changeover of supply.

UPS shall automatically give indication / alarm when it requires battery replacement.

Potential Free Contacts shall be generated to signal these events. These contacts shall be wired out to Annunciation / Monitoring systems. Alternately, inverter of suitable capacity is also acceptable. Critical Process and Status alarms of the PDM system shall be displayed.

12. PDM System shall be provided with a user security for accessing the system with a log-on and password entry procedure. The user levels shall be defined as a Master User and other users for the modification of system, update, and entry of parameters or manual operation. System shall be able to generate 3D point on wave pattern whenever any PD activity detected by the system. System shall be able to give online 3D point on wave pattern, online PRPD (phase resolved PD) and online short time trend etc. System shall be able to generate the all the logs related to system fault, system access, PD event, and any changes in system setting etc.
13. Method of electrical isolation/protection provided between PD sensor and detector circuitry in case of flashover/high potential stress inside GIS should be furnished.
14. The selected mode of propagation of PD signal (electromagnetic wave) inside GIS for the design of sensors shall be furnished.
15. The protection available for electronics against transient over voltages caused by switching operations shall be furnished.
16. The capacity of each detector unit to be specified to accommodate as many numbers of PD sensors signal.
17. The applicable standards to meet IEC & IEEE requirements for electromagnetic compatibility shall be specified. The offered system should have been tested for the same for working in a 400kV & above substation environment. The necessary documentation has to be submitted in this regard.
18. Guaranteed technical particulars & data sheet for various components used in the system shall be submitted.

**Calibration:** The UHF Couplers have to be first calibrated as per CIGRE procedure TF 15/330305 as part of factory acceptance tests to guarantee detection sensitivity of 5pC or better. The GIS of same design shall be used as test specimen during the coupler

calibration. The pulse injection level determined through above factory calibration tests shall only be used as reference for site sensitivity checks during commissioning of PDM system. The data sheet/frequency response characteristics shall be submitted for reference.

□□**Every Day Use & Maintenance:** The system shall be designed suitable for an unmanned s/s and operate automatically. The system shall generate alarms if suspected partial discharge activity is noticed or the system itself is in failure, thereby eliminating the necessity of periodic system access by the user and one such alarm shall be connected to Substation automation system (SAS). The alarms shall be configured coupler wise.

□□**Computers and Peripherals:** The PC operating system shall be the latest version of MS Windows. It should be suitable for continuous process application and should have been tested for the same. The hardware configuration of PC should be the latest available in the market of industrial type subject to EMPLOYER'S / Engineer approval. For storing the historical PD database, sufficient storage facility in the form of hard disc and retrievable hard disk drive of 1TB as specified shall be available in the substation. The PC monitor shall be 21" LCD type of reputed make.

□□**Filtering Facility:** The filtering facility has to be provided in order to distinguish real PD from internal/external noise such as switching operations, self-test signal, radio, communication signal etc. The PDM system itself shall be able to discriminate the noise

from real PD. The exposed gas barriers of the GIS shall be shielded effectively against noise interference & tested. The gas barrier shields/belts shall be suitable for outdoor use also & able to withstand high ambient temperature. Site measurements have to be performed after installation of the PDM system in order to identify the various sources of external noise to incorporate the same in the filtering facility. This filtering will preferably be through software by band pass, which can be manually activated (as an option) to filter out noise signals in the trend plot display. If hardware filtering is employed then adequate measures have to be taken to avoid masking of other signals, which may lie in the same frequency range. The method adopted for the above shall be specified taking into account the sensitivity requirement of PDM system as per CIGRE document. The noise filters shall be selectable individually coupler-wise.

□□**Self-Test (Diagnostic) Facility:** Built-in self-checking facility shall be incorporated in the control system which will continuously verify the correct operation of the whole monitoring system with the simulated PD signal viz. checking of the sensitivity of individual detector units, response of PD sensors in addition to the checking of the system functioning. The periodicity of such

self-check operation shall be specified. In case of system failure this shall trigger an alarm for communication to SAS. External check facility: Propose the arrangement/device available for externally checking the healthiness of PD sensors by pulse injection in addition to built-in monitoring facility.

**Detector Units:** The sensitivity of each detector unit shall be furnished. The sensitivity level of individual detector units shall be selectable depending on the site background noise level.

**Trend Plot:** The trend plot facility shall be available with the update period of hourly/daily/weekly/monthly/yearly. It shall be possible to view the historical trends for the complete archived data accumulated over several years.

**PD Monitoring modes:** There shall be two different modes of system operation viz. a dedicated Continuous PD Monitoring mode for the normal day today operation of the system & a dedicated HV commissioning test mode which is exclusively for PD monitoring during HV commissioning test. The HV commissioning mode shall also operate as an independent feature.

In the HV Commissioning mode the real time display shall be possible for a minimum of two complete bays with associated bus bars and at with one second update period. The HV test software shall automatically record the HV voltage information along with PD so as to check PD inception & extinction voltages precisely. The complete HV & PD data recorded during HV test shall be possible to be reviewed in replay mode after the HV test.

**Alarm Facility:** The PDM system shall generate alarm when action is required; viz. a) PD alarm (abnormal PD activity indicating a risk of failure) & b) PD system fail alarm to be connected to SAS.

**Real Time Display:** The PDM system should have the facility of Real Time display, which will give an instant indication of PD activity coupler wise, with one-second-update period. The PDM system shall be able to capture the PD data triggered by associated switching operations of CBs & isolators.

**Schematics:** The PDM system should have GIS schemes bay-wise incorporating PD sensor identification and location along with spacer location. The sectional view of typical bay arrangement of GIS showing active parts shall also be included as part of the PDM software.

**Print Option/Facility:** PDM system should have the option/facility of printing all trend plots/reports/POW patterns/displays, etc. Laser Colour printer shall be provided for this purpose at substation.

**Data Archives:** This is to provide access to historical data and file storage with date and time stamp. Sufficient storage facility shall be available to review historical data updated for the lifetime of switchgear. The substation &

headquarters PCs shall have a backup device in the form of a retrievable disk drive of 1TB capacity for this purpose.

**□□PD Fault Identification & Location/Pattern Recognition/Predictive Maintenance**

Diagnostic Software: In order to interpret various types of PD defects, intelligent diagnostics software (expert system) shall be built- in as part of the PDM software capability. This is mainly to reduce the dependence on PD specialist. The bidder shall also make available typical point-on-wave patterns as library pictures to train the user.

Software Updates: It shall be possible to upgrade / update the system software throughout the lifetime of the system with the ongoing development / refinement in PD technology.

□□Fault investigation : In case of any indication of suspected PD activity by the on line system, further investigation has to be carried out by the contractor for the PD defect identification and location during the warranty period

□□Special Tools / equipment, Spare Parts, software packages Special Tools: Special tools for cutting and crimping of coaxial cable with 'N Connectors' shall be supplied.

Spare parts: The contractor has to supply critical spares with replacement procedure for the trouble free operation of the system during its expected lifetime as part of the contract. A detailed list shall be included in the tender and also submitted for EMPLOYER'S approval during the detailed engineering stage.

Software Packages: The complete software package shall be supplied as part of a back-up facility in the form of DVD/CDs viz. Windows operating system with end user license, PDM Software including HV Test, Drivers for modems etc., software for remote access, printer etc. The list shall be submitted for reference.

Pulse generator for UHF sensor sensitivity test shall also be supplied as a standard accessory.

□□Operation & Maintenance Manual :A complete O&M manual covering all aspects of trouble shooting of PDM system in six sets in original shall be provided & also in CD's. For diagram references colour pictures shall be provided. A step-by-step procedure for spare parts replacement shall also be included.

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**Factory / Site Test Formats:** The factory & site tests format to be submitted for approval. The format shall cover all possible tests to confirm healthiness of the system and to record the test values.

**List of References:** The bidder shall provide a reference list of PD monitoring system,

**TECHNICAL SPECIFICATIONS FOR ONLINE SF6 and O2 MONITORING  
& ALARM SYSTEM**

**1.0 General**

The online SF6 & O2 gas monitoring and alarm system shall be used for detecting hazardous SF6 gas built-up in enclosed areas such as GIS switchgear rooms, cable trenches and other rooms used to store SF6.

The gas build up in enclosed spaces can be as a result of slow gas leakage from switchgear caused by damage or corrosion of switchgear seals or pressure housings, in service, or during maintenance, leakage of gas filling valves or due to emergency venting of gas due to internal pressure rise in the equipment during a fault.

It shall be suitable for indoor EHV switchgear rooms.

Pure SF6 gas is colourless, odourless, non-flammable, inert gas. At room temperature the density is more than five times that of air.

In switchgear, SF6 acts as both insulation and an arcing media. During arcing and partial discharge events, under the influence of high temperature and other factors, SF6 gas will be decomposed. Decomposition can produce highly toxic products, such as SF4, S2F2, SOF2, HF, SO2, etc. if these are inhaled, they can cause pulmonary oedema and dizziness, coma and even death.

In the relatively closed interior of a switch room, due to poor air circulation, SF6 decomposition and deposition in the room can reach harmful level during emergency conditions.

When leaking SF6 gas accumulates at lower levels in a switch room or adjoining cable trenches (due to its density) caused by a major accident, it can displaced enough O2 to result in local hypoxia, asphyxiation.

The principle of operation shall be based on infrared laser absorption spectroscopy detector principle.

The system components are as follows:

(1). Host computer: Real time display of various parameter and integrated analyzer for calculation of all monitored parameters and alarms thresholds.

SCADA alarm and data transmission and control of forced ventilation fans, local alarms, lights etc.

(2). SF6 gas laser detector: Four Gas Laser Detector Unit containing the laser absorption spectroscopy module that analyses the sampled gas for analysis from up to four (4) Collector Units. The obtained data is uploaded to the host through an RS 485 connection.

(3).Collector: Collector for sampling and associated gas particle filtration pre-treatment. These are to be installed at the LOWEST place in the monitored area. (SF6 gas sinks to low spot).

(4). Infrared proximity switch: Entry of persons into the GIS area automatically starts the fan and voice prompts.

(5). The Box (Cabinet) is located in the control or relay room to control the fan start and stop and provide power to each device.

(6). Sound and light alarm devices: If SF6 or O2 set value is exceeded, an alarm sounds to alert staff.

#### System Installation:

##### Site survey

1. If possible a site survey must be carried out and any special considerations identified and marked up on user-supplied drawings. Based on this, it should be possible to select the installation locations for sensors and the other parts.
2. The collector must be placed in sets of four (4) units so that they can connect to their allocated Four Gas Laser Detector Unit.
3. The Host Controller should be placed in an area where there is access to input power, output telecommunication lines, fan control and alarm lines.

##### System features:

1. Real-time display functions of various parameters.
2. Environmental SF6 gas content detection.
3. Environmental O2 content detection.
4. Environmental temperature and humidity detection.
5. Alarm when SF6 gas content exceeded allowable threshold.
6. Hypoxia alarm (i.e. Low O2 level).
7. Temperature exceeded alarm and start conditioning function.
8. Excessive humidity alarm and control of the dehumidifier function.

9. Excessive levels of hypoxial or SF6,
10. Control of exhaust air ventilation function.
11. Log query capabilities.
12. Voice prompts.
13. Sound and light alarm.
14. Last exhaust display.
15. Intelligent screen saver function.
16. Remote data transmission capabilities.

Technical Parameters:

- SF6 gas concentration alarm:  $0 \sim 2000 \times 10^{-6} (v/v)$
- SF6 gas detection sensitivity:  $\pm 2\%$  (laser type)
- $\pm 5\%$  set value (electrochemical transmitters)
- Detect oxygen concentration:  $0 \sim 25U\%$  (with digital display)
- Oxygen concentration alarm threshold: Adjustable
- Oxygen measurement accuracy:  $< 0.5\%$  ( $0.4\%$ , O<sub>2</sub> when 21%)
- Temperature display range :  $-25 \sim 99^\circ \text{C}$
- Temperature measurement accuracy :  $< 0.5\%$
- Temperature alarm thresholds: Adjustable
- Humidity display range :  $0 \sim 99\% \text{ RH}$
- Humidity measurement accuracy:  $< 3\%$
- Input Voltage  $176 \sim 265\text{V AC}$
- Alarm output points: 5A
- Fan output points: 5A
- Fan output contacts Power :  $380\text{V AC } 40\text{A}$
- Fan ventilation time setting : 15Min / second (adjustable)
- Data recording time : 2 years, the PC mass storage
- Communication: RS-485 standard protocol

Environmental operational requirements:

- Temperature: Operating temperature – 25° C -+85° C
- Humidity: less than 95% RH

## **GENERAL FACILITIES**

Following facilities shall be provided:

- Substation Gantry/Towers are envisaged for present scope of bays only. However, for adjacent future bay, gantry/towers shall be designed for extension (considering Quad conductor for 400kV future lines, Single/Double conductor for 220kV future lines) wherever required.
- The sub-station shall be conforming to the requirement of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.
- In addition, the scope for development of communication system at the Substations & Transmissions lines is in the scope of TSP. The communication equipment at both ends of the transmission line terminating at KPTCL's substation, along with its O&M, shall be in the scope of the TSP. For all the new substations, PLCC, Substation Automation System (SAS) & Time synchronization equipment, shall be provided by the TSP as per guidelines & amendments thereof.
- 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.
- TSP has to arrange for construction power and water on its own.
- Space for storage of O&M spares shall be arranged by TSP on its own.
- 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 the complete substation area including future switchyard area to prevent encroachment and unauthorized access. The minimum height of the boundary wall shall be of 1.8 m from finished ground level (FGL).
- All electrical equipment shall be installed above the Highest Flood Level (HFL) and where such equipment is not possible to be installed above Highest Flood Level, it shall be ensured that there is no seepage or leakage or logging of water.

**EXTENSION OF EXISTING 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.
<b>A. Jagalur Substation</b>			
1.0	Single Line Diagram	KPTCL/TECH/SS-400/HML-1-R3	
2.0	Layout Plan & Cross Section	KPTCL/TECH/SS-400/HML-2-R4	
3.0	Earthmat	SEE/R&D/EEE/KCO-126/F-100(7)	
<b>B. 400/220kV SS at Kadakola</b>			
1.0	Single Line Diagram	KPTCL/TECH/SS-220/KDKL-1	
2.0	Layout Plan	KPTCL/TECH/SS-220/KDKL-4	
3.0	Cross Section	KPTCL/TECH/SS-220/KDKL-5	
<b>C. 220/66kV Huygonahalli sub-station</b>			
1.0	Single Line Diagram	KPTCL/TECH/SS-400/KRP-1-R4	
2.0	Layout Plan	KPTCL/TECH/SS-220/KRP-4-R4	
3.0	Cross Section	KPTCL/TECH/SS-220/KRP-5-R1	
<b>D. 220/66kV Tubinakere Substation</b>			
1.0	Layout Plan and Section	SHREEM/ELEC/KPTCL/ ELEC/LAYOUT/TUBINAKERE/SS	
2.0	Earthmat	Enclosed	
<b>E. 220/66kV Maddur sub-station</b>			
1.0	Single Line Diagram	KPTCL/TECH/SS-220/MDDR-1-R3	
2.0	Layout Plan	KPTCL/TECH/SS-220/MDDR-4-R3	
3.0	Cross Section	KPTCL/TECH/SS-220/MDDR-5-R3	
<b>F. 220/66kV Nagamangala sub-station</b>			
1.0	Single Line Diagram	KPTCL/TECH/SS-220/NGML-1-R3	
2.0	Layout Plan	KPTCL/TECH/SS-220/NGML-4-R2	
3.0	Cross Section	KPTCL/TECH/SS-220/NGML-5-R3	
4.0	Earthmat	SEE/R&D/EEE/KCO-126/F-149(12)	

**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,

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layout, topography, infrastructure such as the requirement of roads, cable trench, drainage, boundary etc. and also the design philosophy.

Details of existing Substation								
S.no	From	To	Capacity available in LT transformer	Spare feeder in ACDB	Spare feeder in DCDB	Battery capacity	Availability of Busbar protection	Availability of fire hydrant system
1	Prop.400/220 kV Hampapura GIS S/s	Prop. 400/220kV Kadakola S/s	Available	Available	Available	Available	Busbar bay units has to be provided and same has to be interfaced to existing Busbar relay	NA
2		400/220kV Jagalur S/s	Available	Available	Available	Available	Busbar bay units has to be provided and same has to be interfaced to existing Busbar relay	NA
3		220kV K R Pet S/s	Available	ACDB with 1 I/C and 5 feeders required	DCDB with 2 I/C and 6 feeders required	Available	Available	NA
		220 kV Tubinkere S/s	Available	Available	Available	Available	Available	NA
		Proposed 220kV Maddur S/s	Available	Available	Available	Available	Available	NA
		220 kV Nagamangala S/s	Available	Available	Available	Available	Available	NA

## **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, and CERC Guidelines on "Interface Requirements" 2024, all above documents as amended from time to time.

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.

The communication services viz. SCADA, VoIP, PMU, AGC & AMR (wherever applicable) have been identified as critical services and therefore shall be provisioned with 2+2 redundancy i.e. 2 channels for Main Control Centre (SLDC) and 2 channels for Backup Control Centre (SLDC). 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 SLDC.

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

### **1.0 400kV DC Quad moose line from Jagalur- proposed Kadakola (Quad ACSR/ AAAC/ AL59 Moose equivalent).**

In 400kV Jagalur- proposed Kadakola 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.

The TSP shall install this OPGW from gantry of Jagalur up to the gantry of Kadakola 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. The transmission line length is 260 kms (approx.).

Maintenance of OPGW Cable, OPGW Hardware & shall be the responsibility of TSP.

## **2.0 LILO of Jagalur- proposed Kadakola 400kV DC Quad moose line at 400/220 kV Hampapura sub-station**

On LILO of both ckt of Jagalur- proposed Kadakola 400kV line at Hampapura sub-station, TSP shall supply, install and commission OPGW and earthwire as per Tower Configurations:

- (I) Loop-In and Loop out Ckt on Single Towers: Two (2) no. OPGW cable containing 48 Fibres (48F) to be installed and commissioned by the TSP on both the Earthwire peaks
- (II) Loop-In and Loop out Ckt on Two separate Towers: One (1) no. OPGW cable containing 48 Fibres (48F) on one earthwire peak and conventional earthwire on other E/W peak for both Loop In and Loop Out Lines.

The TSP shall install OPGW cables from gantry of Hampapura sub-station up to the LILO tower with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at Hampapura sub-station. The transmission line length is 6 kms (approx.).

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of Jagalur and Kadakola S/s as per link budget requirement after change of fiber length due to LILO at Hampapura sub-station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

## **3.0 LILO of Jagalur- proposed Kadakola 400kV DC Quad moose line at to proposed 765/400kV CN'Halli Station**

On LILO of both ckt of Jagalur- proposed Kadakola 400kV line at to proposed 765/400kV CN'Halli Station, TSP shall supply, install and commission OPGW and earthwire as per Tower Configurations:

- (I) Loop-In and Loop out Ckt on Single Towers: Two (2) no. OPGW cable containing 48 Fibres (48F) to be installed and commissioned by the TSP on both the Earthwire peaks

- (II) Loop-In and Loop out Ckt on Two separate Towers: One (1) no. OPGW cable containing 48 Fibres (48F) on one earthwire peak and conventional earthwire on other E/W peak for both Loop In and Loop Out Lines.

The TSP shall install OPGW cables from gantry of to proposed 765/400kV CN'Halli Station up to the LILO tower with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at to proposed 765/400kV CN'Halli Station.

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of Jagalur and Kadakola S/s as per link budget requirement after change of fiber length due to LILO at to proposed 765/400kV CN'Halli Station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

**4.0 220kV DC line with Twin Zebra conductor from proposed 400/220kV Hampapura to 220/66kV Huygonahalli Sub-station along with 2Nos of 220kV TB's at Huygonaalli.**

On 220kV DC line with Twin Zebra conductor from proposed 400/220kV Hampapura to 220/66kV Huygonahalli Sub-station, TSP shall supply, install and commission OPGW as per Tower Configurations:

- (I)DC line on Single Towers: One (1) no. OPGW cable containing 48 Fibres (48F) to be installed and commissioned by the TSP

The TSP shall install OPGW cables from gantry of Hampapura sub-station up to gantry of Huygonahalli with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at Hampapura sub-station and 220kV Huygonahalli(K.R.Pet) sub-station. The transmission line length is 37 kms (approx.).

Further TSP shall comply to the requirements mentioned as per **Appendix-F.1-VOID**

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of 220kV Huygonahalli as per link budget due to new 220kV line at 220kV Huygonahalli sub-station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

**5.0 220kV DC line with Twin Zebra conductor from proposed 400/220kV Hampapura to 220/66kV Tubinakere Sub-station along with 2Nos of 220kV TB's at Tubinakere.**

On 220kV DC line with Twin Zebra conductor from proposed 400/220kV Hampapura to 220/66kV Tubinakere Sub-station, TSP shall supply, install and commission OPGW as per Tower Configurations:

- (I)DC line on Single Towers: One (1) no. OPGW cable containing 48 Fibres (48F) to be installed and commissioned by the TSP

The TSP shall install OPGW cables from gantry of Hampapura sub-station up to gantry of Tubinakere with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at Hampapura sub-station and 220kV Tubinakere sub-station. The transmission line length is 16 kms (approx.).

Further TSP shall comply to the requirements mentioned as per **Appendix-F.1-VOID**

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of 220kV Tubinakere as per link budget due to new 220kV line at 220kV Tubinakere sub-station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

**6.0 220kV DC line with Twin Zebra conductor from proposed 400/220kV Hampapura to proposed 220/66kV Maddur Sub-station along with 2Nos of 220kV TB's at Maddur.**

On 220kV DC line with Twin Zebra conductor from proposed 400/220kV Hampapura to 220/66kV Maddur Sub-station, TSP shall supply, install and commission OPGW as per Tower Configurations:

- (I)DC line on Single Towers: One (1) no. OPGW cable containing 48 Fibres (48F) to be installed and commissioned by the TSP

The TSP shall install OPGW cables from gantry of Hampapura sub-station up to gantry of proposed Maddur with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware

hereafter) and finally terminate in Joint Boxes at Hampapura sub-station and 220kV proposed Maddur sub-station. The transmission line length is 22 kms (approx.).

Further TSP shall comply to the requirements mentioned as per **Appendix-F.1-VOID**

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of proposed 220kV Maddur as per link budget due to new 220kV line at 220kV proposed Maddur sub-station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

**7.0 220kV DC line with Twin Zebra conductor from proposed 400/220kV Hampapura to proposed 220/66kV Nagamangala Sub-station along with 2Nos of 220kV TB's at Nagamanagala.**

On 220kV DC line with Twin Zebra conductor from proposed 400/220kV Hampapura to 220/66kV Nagamangala Sub-station, TSP shall supply, install and commission OPGW as per Tower Configurations:

- (I)DC line on Single Towers: One (1) no. OPGW cable containing 48 Fibres (48F) to be installed and commissioned by the TSP

The TSP shall install OPGW cables from gantry of Hampapura sub-station up to gantry of proposed Nagamanagala with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at Hampapura sub-station and 220kV Nagamangala sub-station. The transmission line length is 14 kms (approx.).

Further TSP shall comply to the requirements mentioned as per **Appendix-F.1-VOI**

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of 220kV Nagamangala as per link budget due to new 220kV line at 220kV Nagamangala sub-station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

**8.0 4Nos. of 400 kV line bays at 400/220kV Hampapura for termination of proposed C.N.Halli and proposed Kdakaola 400 kV DC lines.**

- I. TSP shall supply, install & commission one or more no. FODP (336F or higher) along with panel and required Approach Cables (48F/24F) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room.
- II. TSP shall supply, install & commission One or more STM-16 (FOTE) equipment along with panel/s supporting minimum **Nine (9)** directions with Multiplex Section Protection – 1+1 (MSP )with necessary interfaces to meet the voice and data communication requirement among proposed 400kV C.N.Halli, proposed 400kV Kadakola. These directions shall exclude protected (1+1) local patching among equipment (if any). The suitable DC Power Supply and backup to be provided for communication equipment. The 8command Digital Tele Protection Coupler (DTPC) with 220V DC source on E1 for each 400kV line at both ends to be provided.
- III. FOTE/FODP panel shall be installed in the new Bay Kiosk/ Switchyard Panel Room (SPR). The FOTE under present scope shall be integrated by TSP with the existing FOTE at remote end Sub-stations ie., 400kV Jagalur and 400kV Kadakola 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 for integration with the existing FOTE for onwards data transmission.

In case spare optical direction is not available in the existing FOTE 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 KPTCL NMS of OPGW. 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

KPTCL Team, however all the necessary support in this regard shall be ensured by TSP.

The maintenance of all the communication equipment and software there of including FOTE, PMU, FODP, approach cable, DCPS along with Battery Bank shall be the responsibility of TSP.

**9.0 4Nos. of 220kV line bays at 400/220kV Hampapura for termination of proposed 220 kV DC lines.**

I. TSP shall supply, install & commission one or more no. FODP (432F or higher) along with panel and required Approach Cables (48F/24F) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room.

II. TSP shall supply, install & commission One or more STM-16 (FOTE) equipment along with panel/s supporting minimum **Nine (9)** directions with Multiplex Section Protection – 1+1 (MSP )with necessary interfaces to meet the voice and data communication requirement among 220kV Huygonahalli, 220kV Tubinakere, proposed 220kV Maddur and 220kV Nagamangala S/s. These directions shall exclude protected (1+1) local patching among equipment (if any). The suitable DC Power Supply and backup to be provided for communication equipment. The 8command Digital Tele Protection Coupler (DTPC) with 220V DC source on E1 for each 400kV line at both ends to be provided.

III.FOTE/FODP panel shall be installed in the new Bay Kiosk/ Switchyard Panel Room (SPR). The FOTE under present scope shall be integrated by TSP with the existing FOTE at remote end Sub-stations ie., 220kV Huygonahalli, 220kV Tubinakere, 220kV Nagamangala and proposed 220kV Maddur 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 for integration with the existing FOTE for onwards data transmission.

In case spare optical direction is not available in the existing FOTE 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 KPTCL NMS of OPGW. 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 KPTCL Team, however all the necessary support in this regard shall be ensured by TSP.

The maintenance of all the communication equipment and software there of including FOTE, PMU, FODP, approach cable, DCPS along with Battery Bank shall be the responsibility of TSP.

#### **10.0 Specific Requirement for Phasor Measurement Units (PMUs)**

TSP shall supply, install & commission required No. of Phasor Measurement Units (PMUs) PMUs at all the locations under the scope of TSP under this RFP as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 (along with all amendments if any), and all the applicable Regulations, Standards, Guidelines issued time to time. The signal list shall be as per the Annexure-I Part-B of CERC Guidelines on "Interface Requirements" 2024. These PMUs shall be provided with GPS clock and LAN switch and shall connect with LAN switch of control room of respective substations/ generating stations with Fibre Optic cable. These PMUs shall be connected with the FOTE at Substation/ generating stations for onwards data transmission to the PDC (Phasor Data Concentrator) located at respective SLDC& RLDC. Configuration work in existing PDC at SLDC/RLDC for new PMU integration shall be done by respective TSP in co-ordination with SLDC/RLDC. 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.

**Repeater Requirements -VOID**

- If the repeater location is finalized in the Control Room of a nearby substation, TSP shall provide 1 No. OPGW (96F/48F) as per OPGW in main line to accommodate all OPGW fibers of main line, on a single Earthwire peak with OPGW Hardware & mid-way Joint Boxes etc. of the line crossing the main line and 1 no. Approach Cable (96F/48F) as per OPGW laid to accommodate all OPGW fibers of main line, with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the repeater equipment in substation control room.  
TSP shall co-ordinate for Space and DC power supply sharing for repeater equipment.

TSP shall provide required FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link.

OR

- If the repeater location is finalized in the nearby substation premises, the TSP shall identify the Space for repeater shelter in consultation with station owner. Further TSP shall provide 1 No. OPGW (96F/48F) as per OPGW in main line to accommodate all OPGW fibers of main line, on a single Earthwire peak with OPGW Hardware & mid-way Joint Boxes etc. of the line crossing the main line and 1 No. Approach Cable (96F/48F) as per OPGW laid to accommodate all OPGW fibers of main line, with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the substation where the repeater shelter is to be housed.

TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems.

OR

- If the repeater location is finalized on land near the transmission tower. TSP shall make the provisions for Land at nearby tower for repeater shelter. Further TSP shall provide required. Approach Cable (96F/48F) as per OPGW laid in main line to accommodate all OPGW fibers of main line, with all

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associated hardware fittings to establish connectivity up to the location of repeater shelter.

TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems

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

**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:  
Encryption through IPSec VPN (Virtual Private Network), Deep Packet Inspection (DPI), Denial of service (DoS) and Distributed Denial of Service (DDoS) prevention, Port Block/ Allow, rules/ policies for block/allow, IP (Internet Protocol) & 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

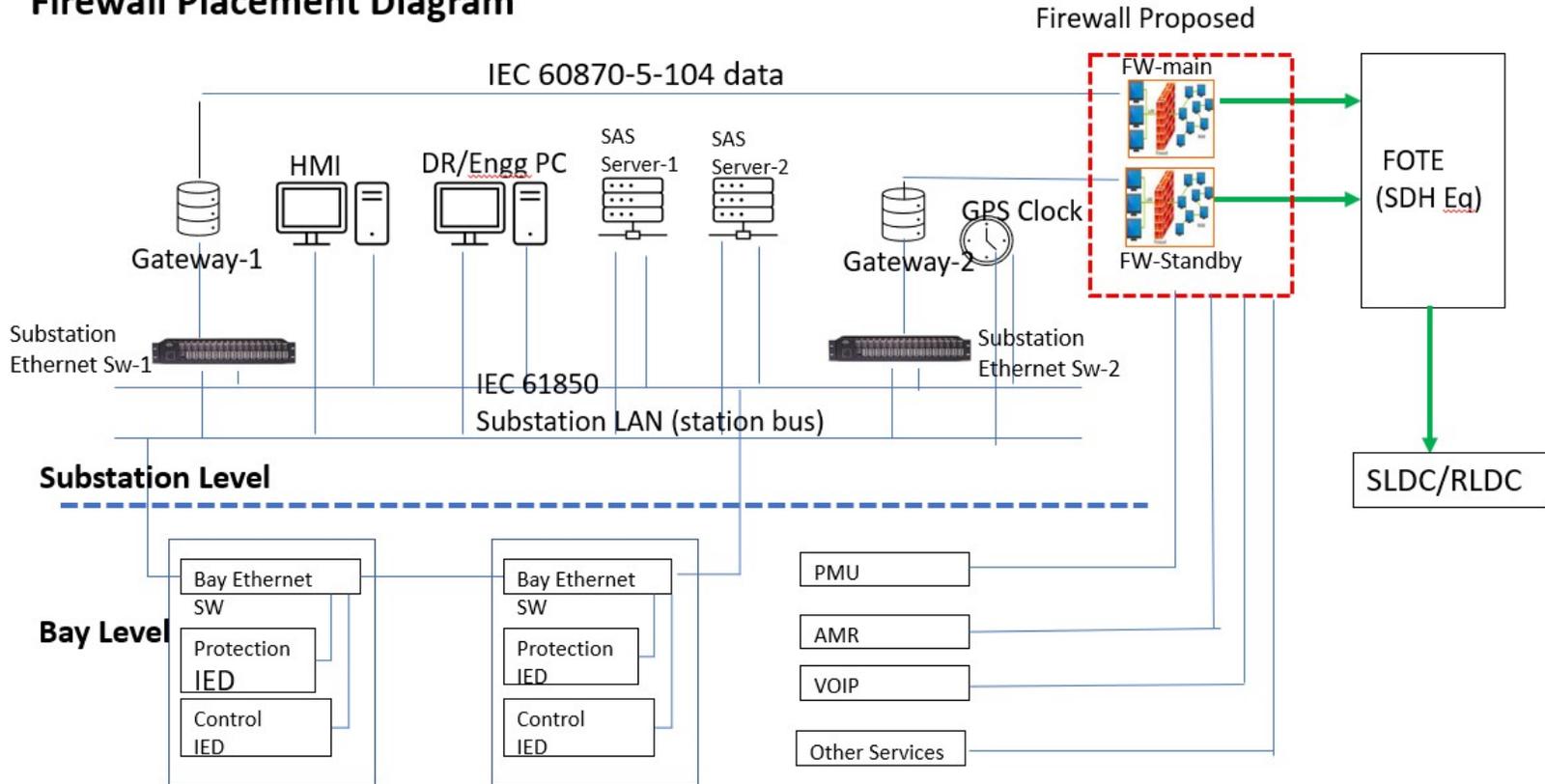


Figure F.2

**C.15.0 PLCC and PABX:**

Power line carrier communication (PLCC) equipment complete for speech, tele-protection commands and data channels shall be provided on each transmission line. The PLCC equipment shall in brief include the following: -

- Coupling device, Coupling filters line traps, carrier terminals, protection couplers, HF cables, PABX (if applicable) and maintenance and testing instruments.
- At new substation, a telephone exchange (PABX) of 24 lines shall be provided at as means of effective communication among various buildings of the substation, remote end substations and with control centres (RLDC/ SLDC) etc.
- Coupling devices shall be suitable for 400kV and 220kV voltage class. The pass band of coupling devices shall have sufficient margin for adding communication channel in future if required. Necessary protection devices for safety of personnel and low voltage part against power frequency voltages and transient over voltage shall also be provided.
- The line traps shall be broad band tuned suitable for blocking the complete range of carrier frequencies. Line Trap shall have necessary protective devices such as lightning arresters for the protection of tuning device.
- The carrier terminals shall be of single side-band (SSB) amplitude modulation (AM) type and shall have 4 kHz band width. PLCC Carrier terminals and Protection couplers shall be considered for both ends of the line.
- PLCC equipment for all the transmission lines covered under the scheme shall be provided by TSP. PLCC to be provided for following lines are under present scope:

<b>Sl. No</b>	<b>Line name</b>	<b>PLCC configuration</b>
1	400kV Hampapura-C.N.Halli-1	Phase-Phase Coupling
2	400kV Hampapura-C.N.Halli-2	Phase-Phase Coupling
3	400kV Hampapura-Kadakola-1	Phase-Phase Coupling
4	400kV Hampapura-Kadakola-1	Phase-Phase Coupling
5	220kV Hampapura-Huygonahalli-1	Phase-Phase Coupling
6	220kV Hampapura-Huygonahalli-2	Phase-Phase Coupling
7	220kV Hampapura-Tubinakere-1	Phase-Phase Coupling
8	220kV Hampapura-Tubinakere-2	Phase-Phase Coupling
9	220kV Hampapura-Maddur-1	Phase-Phase Coupling

Sl. No	Line name	PLCC configuration
10	220kV Hampapura-Maddur-1	Phase-Phase Coupling
11	220kV Hampapura-Nagamangala-1	Phase-Phase Coupling
12	220kV Hampapura-Nagamangala-2	Phase-Phase Coupling

- Further, CVT and Wave trap for all 400 kV and 220 kV line bays under present scope shall be provided by TSP.
- All other associated equipment like cabling, coupling device and HF cable shall also be provided by the TSP.
- The PLCC Equipment to be provided at both ends of Sub-station for 400kV and 220kV lines.
- Two (2) sets of 48 V battery banks for PLCC and communication equipment shall be provided at each new Substation with at least 10-hour battery backup and extended backup, if required.

#### **C.16.0: Communication through VSAT:**

KPTCL is having captive VSAT communication network for all Sub-stations. The VSAT equipment will be provided by KPTCL and the estimated cost of equipment will be intimated.

In addition, License fee, Annual bandwidth charges, AMC cost and other statutory charges pertaining to VSAT on quarterly basis needs to be paid. The demand note will be issued from KPTCL to pay the charges. An undertaking agreement on a stamp paper towards payment of VSAT charges has to be submitted to KPTCL (as a back-up communication)

#### **SPECIFIC TECHNICAL REQUIREMENTS FOR INTEGRATION OF COMMUNICATION EQUIPMENT WITH STATE LEVEL NMS & REGIONAL UNMS:**

The new communication equipment/ system for all the substations under the present scope shall be compatible for integration with existing regional level NMS system/ Centralized Supervision and Monitoring System (CSMS) i.e. Regional UNMS. The local configuration of the new communication equipment at the station end shall be the responsibility of TSP as per **Annexure E.1**. The configuration work in the existing centralized NMS/ CSMS 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.

#### **Annexure E.1**

**Requirement for integration of Communication Equipment 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 and periodic, Performance KPI parameters ( E-1, STM, Ethernet) , Remote Configuration, Cross Connects, Trails and Circuits, Services Provisioning (NE), E-1 , STM, Ethernet , TX and RS 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 and 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.

**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 and conditions. As far as shutdown of ISTS lines are concerned the same can be availed by approaching respective Regional Power Committee.

- 1.2 We understand that the suggested swing angle criteria are applicable for Suspension Insulator in Suspension Tower. Further, you are requested to provide similar swing angle and clearance criteria for Pilot Insulator with Jumper and Jumper.

**Reply:** It is clarified that the swing angle criteria (as mentioned in RFP) for transmission lines is applicable for Suspension Insulator in Suspension Tower. Further, as per Clause 2.2 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 pollution condition in the area of installation. It shall be as per CEA regulations and relevant standards.

**Substation**

- 2.1 We understand that space for storage of O&M spare shall be provided by the existing owner within the station boundary without any cost. Kindly confirm.

**Reply:** Space for storage of O&M spares shall be arranged by TSP on its own.

- 2.2 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 be 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 adjacent to Main cable trench only under present scope of work.
- (d) Levelled area being provided by developer for bay extension.

**Reply:** Regarding requirement of internal road, drainage, cable trench, leveling of the bay extension area, bidder is advised to visit site and acquaint themselves with the provisions/facilities available at substation.

- 2.3 Kindly provide the soil investigation report of soil parameters of existing substation.

**Reply:** Bidder is advised to visit the substation site and ascertain the requisite parameters.

- 2.4 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 a chargeable basis.

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

**Reply:** VMS shall be provided in line with requirements of RfP document.

2.6 It is understood that Construction water and power shall be provided free of cost to TSP by the respective substation owner for construction of new bays.

**Reply:** Arrangement of construction power and water is in the scope of TSP.

2.7 It is understood that the existing fire hydrant system shall be extended by the TSP for bay extension.

**Reply:** Existing fire hydrant system shall be extended from existing system (if required)

2.8 We understood that no any dedicated metering CT and CVT is 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 matches with metering requirement. Requisite Special Energy Meters shall be provided and installed by CTU at the cost of TSP in C&P panel subject to space availability, else, in separate metering panel (to be provided by TSP at its cost).

2.9 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.

2.10 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.

- 2.11 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.

- 2.12 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.

- 2.13 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:** PLCC for 220 kV line is in the scope of developer of the line.

Inter circuit coupling for 220 kV D/C and phase to phase coupling for 220 kV S/C shall be applicable for PLCC.

- 2.14 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.

### **Communication**

- 3.1 What are the usage of OPGW, FOTE, PMU etc. under communication requirement of RFP?

**Reply:** User shall be responsible for providing compatible equipment along with appropriate interface for uninterrupted communication with the concerned control center and shall be responsible for successful integration with the communication system provided by STU.

Communication systems e.g. OPGW, FOTE etc. and PMU are required for grid operation through RLDC/SLDC, speech communication, tele-protection

and tele-metering.

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

**Reply:** The space related issues are deliberated in the RFP itself. TSP to install FOTE/FODP panels in the new Bay Kiosk (Switchyard Panel Room (SPR)) / Bay Kisok/ Relay Panel Room (in case of GIS S/s). Further, TSP to connect and integrate the proposed FOTE with the existing FOTE in the control room to complete the communication path upto RLDC.

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

3.3 How is the OPGW laying done in case of LILO lines?

**Reply:** In case LILO lines are on same towers (e.g. both Line In and Line Out portion are on same towers, generally done LILO of S/C lines). Then 2x24F OPGW shall be required to install by TSP on both earthwire peak on 400 kV and 765 kV lines where two E/W peaks are available. On 220 kV and 132 kV lines where only one E/W peak is available TSP to install one No. 48F OPGW.

Incase LILO lines are on different towers (e.g. both Line In and Line Out portion are on different towers, generally done LILO of D/C lines). Then 1x24F OPGW shall be required to install by TSP on one earthwire peak and conventional earthwire on second earthwire peak, on both Line In and Line Out portion towers of 400 kV and 765 kV lines. On 220 kV and 132 kV lines where only one E/W peak is available TSP to install one No. 24F OPGW in place of conventional earthwire.

3.4 How is the OPGW laying done in 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. 24F OPGW to be installed on both E/W peaks for common M/C portion of 765 kV and 400 kV lines.

Incase 220/132 kV lines using multi circuit portion where single E/W peak is available one No. 48F may be installed for common multi circuit portion.

3.5 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 clock and LAN switch and shall connect with LAN switch of control room of respective substations with Fibre Optic cable.

**3.6** 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.

**3.7** 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 (alongwith 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 to provide PMUs for all bays under their scope of RFP.

**Schedule: 2**  
**Scheduled COD**

[Note: As referred to in the definition of “Element”, “Scheduled COD”, and in Articles 3.1.3 (c), 4.1 (b) and 4.3 (a) of this Agreement]

Sl. No.	Name of the Transmission Element	Scheduled COD	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
1.	Establishing 2x500 MVA, 400/220/33 kV GIS sub-station at Hampapura in Mandya Taluk & District.	24 months from SPV transfer	100%	All elements of scheme are required to be commissioned simultaneously as their utilization is dependent on each other.
2.	400kV DC Quad moose line from Jagalur- proposed Kadakola with LILO to 400/220 kV Hampapura sub-station			
3.	LILO of 400kV DC Quad moose line from Jagalur-proposed Kadakola to proposed 765/400kV CN'Halli Station (under ISTS scheme)			
4.	220 kV DC line with Twin Zebra conductor from proposed Hampapura to 220/66kV Huygonahalli sub-station along with 2 nos of 220kV TB's at Huygonahalli			
5.	220 kV DC line with Twin Zebra conductor from proposed Hampapura to 220/66kV Tubinakere sub-station along with 2 nos of 220kV TB's at Tubinakere			
6.	220 kV DC line with Twin Zebra conductor from			

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Sl. No.	Name of the Transmission Element	Scheduled COD	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
	proposed Hampapura to proposed 220/66kV Maddur sub-station along with 2 nos of 220kV TB's at proposed Maddur			
7.	220 kV DC line with Twin Zebra conductor from proposed Hampapura to 220/66kV Nagamangala sub-station along with 2 nos of 220kV TB's at Nagamangala			

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 the Project is: 24 months from the date of SPV Transfer.

### **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 provision 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	$140 \times 25\% \times ((28+31)/365)$	5.65		--	0.00
1-Apr-18 to 30-Nov-18	$140 \times 25\% \times (244/365)$	23.39		--	0.00
1-Dec-18 to 31-Mar-19	$140 \times 100\% \times (121/365)$				46.41
2	$140 \times 100\% \times 1$				140
3	$140 \times 100\% \times 1$				140
4	$140 \times 100\% \times 1$				140
5	$140 \times 100\% \times 1$				140
.....					
.....					
36 (1-Apr to 30-Nov)	$140 \times 100\% \times (244/365)$				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 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	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	$140 \times 25\% \times (153/365)$	14.67		--	0.00
1-Dec-18 to 31-Mar-19	$140 \times 100\% \times (121/365)$				46.41
2	$140 \times 100\% \times 1$				140
3	$140 \times 100\% \times 1$				140
4	$140 \times 100\% \times 1$				140
5	$140 \times 100\% \times 1$				140
.....					
.....					
36 (1-Apr to 30-Nov)	$140 \times 100\% \times (244/365)$				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%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * 1$$

- a. If Actual Transmission System Availability for the month m of contract year n exceeds 98.5% and less than or equal to 99.75%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * (AA/ 98.5\%)$$

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- c. If Actual Transmission System Availability for the month m of contract year n is greater than 99.75%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * (99.75\% / 98.5\%)$$

- 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%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * (AA / 98\%)$$

- e. If Actual Transmission System Availability for the month m of contract year falls below 95%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * (AA / 98\%) - 0.02 * (T_{mn} * (AA / 95\%))$$

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%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * 1$$

- b. If Actual Transmission System Availability for the month m of contract year n exceeds 96% and less than or equal to 99.75%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * (AA / 96\%)$$

- c. If Actual Transmission System Availability for the month m of contract year n is greater than 99.75%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * (99.75\% / 96\%)$$

- 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%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * (AA / 95\%)$$

- e. If Actual Transmission System Availability for the month m of contract year falls below 92%;

$$\text{Monthly Transmission Charges MTC}(m) = T_{mn} * (AA / 95\%) - 0.02 * (T_{mn} * (AA / 92\%))$$

where:

- AA is the actual Availability, as certified by RPC, as per procedure provided in Schedule 6.
- m is the month in Contract Year 'n'

- $T_{mn}$  = 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:**

<b>Sl. No.</b>	<b>Name of the Transmission Element</b>	<b>Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project</b>	<b>Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element</b>
1.	Establishing 2x500 MVA, 400/220/33 kV GIS sub-station at Hampapura in Mandya Taluk & District.	100%	All elements of scheme are required to be commissioned simultaneously as their utilization is dependent on each other.
2.	400kV DC Quad moose line from Jagalur- proposed Kadakola with LILO to 400/220 kV Hampapura sub-station		
3.	LILO of 400kV DC Quad moose line from Jagalur- proposed Kadakola to proposed 765/400kV CN'Halli Station (under ISTS scheme)		
4.	220 kV DC line with Twin Zebra conductor from proposed Hampapura to 220/66kV Huygonahalli sub-station along with 2 nos of 220kV TB's at Huygonahalli		
5.	220 kV DC line with Twin Zebra conductor from proposed Hampapura to 220/66kV Tubinakere sub-		

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Sl. No.	Name of the Transmission Element	Percentage of Quoted Transmission Charges recoverable on Scheduled COD of the Element of the Project	Element(s) which are pre-required for declaring the commercial operation (COD) of the respective Element
	station along with 2 nos of 220kV TB's at Tubinakere		
6.	220 kV DC line with Twin Zebra conductor from proposed Hampapura to proposed 220/66kV Maddur sub-station along with 2 nos of 220kV TB's at proposed Maddur		
7.	220 kV DC line with Twin Zebra conductor from proposed Hampapura to 220/66kV Nagamangala sub-station along with 2 nos of 220kV TB's at Nagamangala		

**Schedule: 6**

**ANNEXURE-V**

**Procedure for calculation of Transmission System Availability**

- i) Availability shall be calculated and declared separately for each voltage level.

The transmission system availability shall be declared as per the formula mentioned below. The transmission elements shall be grouped into following categories for the purpose of calculation of availability of transmission systems:

- (a) AC transmission lines: Each circuit of AC transmission line shall be considered as one element.
- (b) Inter-Connecting Transformers (ICTs): Each ICT bank (three single phase transformer together) shall form one element.
- (c) Static VAR Compensator (SVC): SVC along with SVC transformer shall form one element. However, 50% credit to inductive and 50% to capacitive rating shall be given.
- (d) Switched Bus Reactor: Each switched Bus Reactor shall be considered as one element.

- ii) The Availability of Transmission system shall be calculated as under:

% System Availability for the system

$$= \frac{o \times AV_o + p \times AV_p + q \times AV_q + r \times AV_r}{o + p + q + r} \times 100$$

Where

o is Total number of AC lines.

AV<sub>o</sub> is Availability of o number of AC lines.

p is Total number of switched bus reactors.

AV<sub>p</sub> is Availability of p number of switched bus reactors.

q is Total number of ICTs.

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AVq is Availability of q number of ICTs.

r is Total number of SVCs.

AVr is Availability of r number of SVCs.

- iii) The weightage factor for each category of transmission elements shall be as under:
  - (a) For each circuit of AC line – Surge Impedance Loading for Uncompensated line (SIL) multiplied by Circuit Km. (SIL rating for various voltage level and conductor configuration shall be as per the procedure adopted for power system analysis)
  - (b) For each ICT bank – The rated MVA capacity.
  - (c) For SVC – The rated MVAR capacity (inductive & capacitive).
  - (d) For switched Bus reactor – The rated MVAR capacity.
  
- iv) 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 Enclosure-I.
  
- v) The transmission elements under outage due to following reasons not attributable to the Transmission Licensee shall be deemed to be available:
  - (a) Shut down to transmission elements availed by other agency/agencies for maintenance or construction of their transmission system.
  - (b) Manual tripping of line due to over voltage and manual tripping of switched bus reactor as per the directions of RLDC / SLDC.
  
- vi) Outage time of transmission elements for the following contingencies shall be excluded from the total time of the element under period of consideration.
  - (a) Outage of elements due to acts of God and force majeure events beyond the control of the Transmission Licensee.

(b) 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, tripping of lines, ICTs, etc. due to grid disturbance. However, if the elements is not restored on receipt of direction from SLDC while normalising the system following grid incident/disturbance within reasonable time, the element will be considered not available for whole period of outage and outage time shall be attributable to the Transmission Licensee.

**Enclosure-1**

AVo (Availability of o no. of AC lines) =

$$\frac{\sum_{i=1}^o (W_i(T_i - TNA_i) / T_i)}{\sum_{i=1}^o W_i}$$

AVq (Availability of q no. of ICTs)=

$$\frac{\sum_{k=1}^q (W_k(T_k - TNA_k) / T_k)}{\sum_{k=1}^q W_k}$$

**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.

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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 3.1.2 of 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,

$\Delta T$  = 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 KEREC, applicable on the Bid Deadline, in case KEREC notification is not available, then Discount rate shall be as per CEREC.

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.