



NIT No.: TPCODL/P&S/ 1000000099 /21-22

**Procedure to Participate in Tender**

**Tender Enquiry No- TPCODL/P&S/1000000099 /20-21**

<b>Tender Enquiry No.</b>	<b>Work Description</b>	<b>EMD (Rs.)</b>	<b>Tender Fee (Rs.)</b>	<b>Last Date and Time for payment of Tender Fee</b>
TPCODL/P&S/ 1000000099 /21-22	Rate Contract for RTU based Automation for Conventional Substations	30,00,000/-	5000	25.08.2021; 17:00 Hours

**Please note that corresponding details mentioned in this document will supersede any other details mentioned anywhere else in the Tender Document.**

**Procedure to Participate in Tender.**

Following steps to be done before “Last date and time for Payment of Tender Fee” as mentioned above:

1. Eligible and Interested Bidders to submit duly signed and stamped letter on Bidder's letter head indicating
  - a. Tender Enquiry number
  - b. Name of authorized person
  - c. Contact number
  - d. E-mail id
  - e. Details of submission of Tender Fee
  - f. GST Registration No
2. Non-Refundable Tender Fee, as indicated in table above, to be submitted in the form of Direct Deposit in the following bank account and submit the receipt along with a covering letter clearly indicating the Tender Reference/ Enquiry Number –

Beneficiary Name – TP Central Odisha Distribution Ltd.

Bank Name – STATE BANK OF INDIA

Branch Name – IDCO Towers, Bhubaneswar

Address – PO- Saheed Nagar, Janapath, Bhubaneswar.

Branch Code – 7891

Account No – 10835304915

IFSC Code – SBIN0007891

E-mail with necessary attachment of 1 and 2 above to be sent to imran.ahmad@tpcentralodisha.com with copy to sudhakar.behera@tpcentralodisha.com before last date and time for payment of Tender Fee.



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Interested bidders to submit Tender Fee and Authorization Letter before Last date and time as indicated above, after which link from TPCODL E-Tender system (Ariba) will be shared for further communication and bid submission.

Please note all future correspondence regarding the tender, bid submission, bid submission date extension, Pre-bid query etc will happen through TPCODL E-Tender system (Ariba). User manual to guide the bidders to submit the bid through E-Tender system (Ariba) is enclosed.

All communication will be done strictly with the bidders who have done the above step to participate in the Tender.

Also it may be strictly noted that once date of “Last date and time for Payment of Tender Participation Fee” is lapsed no Bidder will be sent link from TPCODL E-Tender System (Ariba). Without this link vendor will not be able to participate in the tender. Any last moment request to participate in tender will not be entertained.

Also all future corrigendums to the said tender will be informed on Tender section on website <https://www.tpcentralodisha.com>.

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## **OPEN TENDER NOTIFICATION**

**FOR**

### **Rate Contract for RTU based Automation for Conventional Substations**

**Tender Enquiry No.: TPCODL/P&S/ 1000000099 /21-22**

**Due Date for Bid Submission: [20.09.2021; 17:00 Hours]**

**TP Central Odisha Distribution Limited  
2<sup>nd</sup> Floor, IDCO Towers, Janpath, Bhubaneswar – 751022**



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## 1.0 Event Information

### 1.1. Scope of work

**Open Tenders** are invited from interested Bidders entering into a firm contract for the following:

S. No.	Description	EMD Amount (Rs.)	Tender Fee (Rs.)
1.	Rate Contract for RTU based Automation for Conventional Substations	30,00,000/-	5,000/-

Note: Tender Fee is inclusive of GST

### 1.2. Availability of Tender Documents

Please refer "Procedure to participate in the e-tender".

### 1.3. Calendar of Events

(a)	Date of sale/ availability of tender documents from TPCODL Website	From 12.08.2021 onwards
(b)	Date by which Interested and Eligible Bidder to pay Tender Fee and confirm participation as mentioned in "Procedure to Participate in Tender"	25.08.2021; 17:00 Hours
(c)	Last Date of receipt of pre-bid queries, if any	30.08.2021; 17:00 Hours
(c)	Date & Time of Pre-Bid Meeting (if any)	Shall be shared later
(d)	Location of Pre-Bid Meeting	Shall be shared later
(e)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	06.09.2021;
(f)	Last date and time of receipt of Bids	20.09.2021; 17:00 Hours

**Note :-** In the event of last date specified for submission of bids and date of opening of bids is declared as a closed holiday for TPCODL's office, the last date of submission of bids and date of opening of bids will be the day following working day at appointed times.

### 1.4 Mandatory documents required along with the Bid

- 1.4.1 EMD of requisite value and validity
- 1.4.2 Tender Fee of requisite amount
- 1.4.3 Requisite Documents for compliance to Qualification Criteria mentioned in Clause 1.7.
- 1.4.4 Drawing, Type Test details along with a sample of each item as specified at Annexure I (as applicable)
- 1.4.5 Duly signed and stamped 'Schedule of Deviations' as per Annexure III on bidder's letter head.

- 1.4.6 Duly signed and stamped 'Schedule of Commercial Specifications' as per Annexure IV on bidder's letter head.
- 1.4.7 Proper authorization letter/ Power of Attorney to sign the tender on the behalf of bidder.
- 1.4.8 Copy of PAN, GST, PF and ESI Registration (In case any of these documents is not available with the bidder, same to be explicitly mentioned in the 'Schedule of Deviations')

***Please note that in absence of any of the above documents, the bid submitted by a bidder shall be liable for rejection.***

## **1.5. Deviation from Tender**

Normally, the deviations to tender terms are not admissible and the bids with deviation are liable for rejection. Hence, the bidders are advised to refrain from taking any deviations on this Tender. Still in case of any deviations, all such deviations shall be set out by the Bidders, clause by clause in the 'Annexure III - Schedule of Deviations' and same shall be submitted as a part of the Technical Bid.

## **1.6. Right of Acceptance/Rejection**

Bids are liable for rejection in absence of following documents:-

- i. EMD of requisite value and validity
- ii. Tender fee of requisite value
- iii. Price Bid as per the Price Schedule mentioned in Annexure I (BOQ)
- iv. Necessary documents against compliance to Qualification Requirements mentioned at Clause 1.7 of this Tender Document
- v. Filled in Schedule of Deviations as per Annexure III
- vi. Filled in Schedule of Commercial Specifications as per Annexure IV
- vii. Receipt of Bid within the due date and time

TPCODL reserves the right to accept/reject any or all the bids without assigning any reason thereof.

## **1.7 Qualification Requirement / Eligibility Criteria**

1. The Bidder must have a presence in India for last 5 years, meeting requirement as specified below:
  - 1.1. Registered in India under the Companies Act of India 1956, as on Bid submission date for supply of the Sub-Station Automation System.
  - 1.2. Having experience and infrastructure to carry-out in-house Design, Engineering, Supply, Erection, Commissioning, Routine & Acceptance Tests, Service Support during Warranty and Post Warranty, Training facility of Sub-Station Automation System in India as Bidder.
  - 1.3. The Bidder shall be the Original Equipment Manufacturer for Hardware and Software of the proposed Sub-Station Automation System.
2. Bidder must have executed at least 100 Nos. of RTUs at 33/22/11 kV Substations commissioned and Integrated with SCADA & ADMS system at Metro / District / Regional level for Power Utility during the last five (5) years. In addition, the Bidder must have executed at least 50 Nos. of RTU in one project.
3. Bidder to submit performance certificate of Two projects (one with 50 Nos. of RTUs and other with minimum 25 Nos. of RTUs which is running in satisfactory condition for last two (2) years. In case the bidder has a previous association with TPCODL for similar products and services, the performance feedback for that bidder by TPCODL's

- User Group shall only be considered irrespective of performance certificates issued by any third organization. Copy of performance certificates to be submitted in this regard.
4. In case bidder uses experience of parent organization based out-side India to meet the QR, then bidder shall submit concurrence from the parent organization to support the supply and experience criteria.
  5. The bidder shall submit Type test reports obtained from CPRI / ERDA / KEMA / International Accredited Lab for the offered solution. The type tests should have been conducted on the equipment / material of the same design.  
In case the type test reports furnished are not for the offered equipment / material but for the equipment / material with and/or different capacity, then type test shall be carried out for the offered equipment / material from CPRI / ERDA / KEMA / International Accredited Lab without any cost implication to the Purchaser and the Type Test reports shall be submitted before dispatch of the equipment / material.  
(Bidder needs to submit an undertaking that type test shall be carried out for the offered equipment / material from CPRI / ERDA / KEMA / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before dispatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with and/or different capacity, (if applicable)).
  6. The bidder should have average annual turnover of Rs. 20 Crores in the last three years. (*Copy of Audited balance sheet and Profit and Loss Statement to be submitted*).

Bidders need to submit the details as per the attached format with RFP and ensure that the documents submitted are clearly marked/bundled in support of above-mentioned qualification criteria. In absence of these reference documents, the bid will not be further evaluated by the Purchaser and/or the Purchaser may not subsequently be made responsive by the Bidder for any correction of the non-conformity.

## 1.8. Marketing Integrity

We have a fair and competitive marketplace. The rules for bidders are outlined in the General Condition of Contracts. Bidders must agree to these rules prior to participating. In addition to other remedies available, TPCODL reserves the right to exclude a bidder from participating in future markets due to the bidder's violation of any of the rules or obligations contained in the General Condition of Contracts. A bidder who violates the market place rules or engages in behavior that disrupts the fair execution of the marketplace, may result in restriction of a bidder from further participation in the marketplace for a length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

- Failure to honor prices submitted to the marketplace
- Breach of terms as published in TENDER/NIT

## 1.9. Supplier Confidentiality

All information contained in this tender is confidential and shall not be disclosed, published or advertised in any manner without written authorization from TPCODL. This includes all bidding information submitted to TPCODL. All tender documents remain the property of TPCODL and all suppliers are required to return these documents to TPCODL upon request. Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

## 2.0 Evaluation Criteria

- The bids will be evaluated technically on the compliance to tender terms and conditions



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- Bidders meeting Qualification Requirement as mentioned in 1.7, shall be evaluated technically. The technical evaluation criteria is outlined in 8.3 – Bid Evaluation Criteria of section on “Project Specifications (Section A)”. Bidders meeting minimum Technical Score shall be considered for further evaluation.
- The bids will be evaluated commercially on the overall all-inclusive lowest cost for complete tender BoQ as calculated in Schedule of Items [Annexure I]. TPCODL however, reserves right to split the order line item wise and/or quantity wise among more than one Bidder. Hence, all bidders are advised to quote their most competitive rates against each line item.
- Bidder has to mandatorily quote against each item of Schedule of Items [Annexure I]. Failing to do so, TPCODL may reject the bids.

**NOTE:** In case a new bidder is not registered with TPCODL, factory inspection and evaluation shall be carried out to ascertain bidder’s manufacturing capability and quality procedures. However TPCODL reserves the right to carry out factory inspection and evaluation for any bidder prior to technical qualification.

In case a bidder is found as Disqualified in the factory evaluation, their bid shall not be evaluated any further and shall be summarily rejected. The decision of TPCODL shall be final and binding on the bidder in this regard.

**2.1 Price Variation Clause:** The prices shall remain FIRM during the entire contract period.

### **3.0 Submission of Bid Documents**

#### **3.1 Bid Submission**

Bidders are requested to submit their offer in line with this Tender document. TPCODL shall respond to the clarification raised by various bidders and the replies will be sent to all participating bidders through TPCODL e-tender system (Ariba).

Bids shall be submitted in 3 (three) parts:

**FIRST PART: “EMD”** as applicable shall be submitted. The EMD shall be valid for 210 days from the due date of bid submission in the form of BG / Bank Draft / Bankers Pay Order (issued from a Scheduled Bank) online NEFT/ RTGS transfer favoring ‘TP Central Odisha Distribution Limited’ payable at Bhubaneswar. The EMD has to be strictly in the format as mentioned in General Condition of Contract, failing which it shall not be accepted by TPCODL and the bid as submitted shall be liable for rejection. A separate non-refundable tender fee of stipulated amount also needs to be transferred online through NEFT/ RTGS in case the tender document is downloaded from our website.

TPCODL Bank Details for transferring Tender Fee and EMD is as below:

**Account Name:** TP CENTRAL ODISHA DISTRIBUTION LIMITED

**Bank Name:** SBI, IDCO Towers, Bhubaneswar

**Bank Account No. :** 10835304915

**IFSC Code:** SBIN007891

For Tender Fee and EMD submitted via online transfer, bidder to ensure that the same are carried out through separate transactions.

The EMD in the form of Bank Draft / BG /Bankers Pay Order shall be delivered at the following address in sealed envelope clearly indicating the tender reference / enquiry number, name of tender and bidder name:

**Chief (Procurement & Stores)**

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2<sup>nd</sup> Floor, IDCO Towers, Janpath, Bhubaneswar-751022

**SECOND PART: “TECHNICAL BID”** shall contain the following documents:

- a) Documentary evidence in support of qualifying criteria
- b) Technical literature/GTP/Type test report etc. (if applicable)
- c) Qualified manpower (if available)
- d) Testing facilities (if applicable)
- e) No Deviation Certificate as per the Annexure III – Schedule of Deviations
- f) Acceptance to Commercial Terms and Conditions viz. Delivery schedule/period, payment terms etc. as per the Annexure IV – Schedule of Commercial Specifications.
- g) Quality Assurance Plan/Inspection Test Plan for supply items (if applicable)
- h) Project Implementation Plan including Level 2 Schedule for the project
- i) Unpriced mentioning “Quoted/Not Quoted” against all line items (Prices should not be mentioned)

**The technical bid shall be properly indexed and is to be submitted through TPCODL E-tender platform (Ariba) only. Hard copy of Technical Bids need not be submitted.**

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the TPCODL, shall be written in the English Language. Any printed literature furnished by the Bidder may be written in another Language, provided that this literature is accompanied by an English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

THIRD PART: “PRICE BID” shall contain only the price details and strictly in format as mentioned in Annexure I along with explicit break up of basic prices, Taxes & duties, Freight etc. In case any discrepancy is observed between the item description stated in Schedule of Items mentioned in the tender and the price bid submitted by the bidder, the item description as mentioned in the tender document (to the extent modified through Corrigendum issued if any) shall prevail. Price Bid is to be submitted in soft copy through TPCODL E-Tendering system (Ariba) only. Hard copy of Price Bid not be submitted.

#### **SIGNING OF BID DOCUMENTS:**

The bid must contain the name, residence and place of business of the person or persons making the bid and must be signed and sealed by the Bidder with his usual signature. The names of all persons signing should also be typed or printed below the signature.

The Bid being submitted must be signed by a person holding a Power of Attorney authorizing him to do so, certified copies of which shall be enclosed.

The Bid submitted on behalf of companies registered with the Indian Companies Act, for the time being in force, shall be signed by persons duly authorized to submit the Bid on behalf of the Company and shall be accompanied by certified true copies of the resolutions, extracts of Articles of Association, special or general Power of Attorney etc. to show clearly the title, authority and designation of persons signing the Bid on behalf of the Company. Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished with bid.

A bid by a person who affixes to his signature the word ‘President’, ‘Managing Director’, ‘Secretary’, ‘Agent’ or other designation without disclosing his principal will be rejected.

The Bidder’s name stated on the Proposal shall be the exact legal name of the firm.

#### **3.2 Contact Information**





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Please note all correspondence regarding the tender, bid submission, bid submission date extension, Pre-bid query etc will happen through TPCODL E-Tender system (Ariba).

All communication will be done strictly with the bidder who have done the above step to participate in the Tender.

**Communication Details:**

**Package Owner**

Name: Mosam Saxena  
Designation: Procurement  
Contact No.: 9867983908  
E-Mail ID: [mosam.saxena@tpcentralodisha.com](mailto:mosam.saxena@tpcentralodisha.com)

**Technical Department**

Name: Amok Agarwala  
Designation: Head – Automation & Technology, Contact No: 9223220845  
E-Mail ID : [amok.agarwala@tpcentralodisha.com](mailto:amok.agarwala@tpcentralodisha.com)

**Escalation Matrix**

Name: Mr. Samarendra Patnaik,  
Designation: GM-Procurement  
Contact No: 7008289603  
E-Mail ID: [samarendra.patnaik@tpcentralodisha.com](mailto:samarendra.patnaik@tpcentralodisha.com)

Name: Mr. Pravin Kumar Jain  
Designation: Chief (Procurement & Stores)  
E-Mail ID: [pravin.jain@tpcentralodisha.com](mailto:pravin.jain@tpcentralodisha.com)

Bidders are strictly advised to communicate with Package Owner through TPCODL E-tender System (Ariba) only. They need to pay Tender Participation Fee to receive the Ariba log-in.

**3.3 Bid Prices**

Bidders shall quote for the entire Scope of Supply/ work with a break up of prices for individual items and Taxes & duties. The bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total price with taxes, duties & freight up to destination at various sites of TPCODL. The all-inclusive prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during the execution of the supply work, breakup of price constituents.

**Applicable GST to be specified clearly.**

The quantity break up shown else-where other than Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any items not indicated in the price schedule but which are required to complete the job as per the Technical Specifications/ Scope of Work/ SLA mentioned in the tender, shall be deemed to be included in prices quoted.

**3.4 Bid Currencies**

Prices shall be quoted in Indian Rupees Only.



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### 3.5 Period of Validity of Bids

Bids shall remain valid for 180 days from the due date of submission of the bid.

Notwithstanding clause above, the TPCODL may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and responses thereto shall be made in writing.

### 3.6 Alternative Bids

Bidders shall submit Bids, which comply with the Bidding documents. Alternative bids will not be considered. The attention of Bidders is drawn to the provisions regarding the rejection of Bids in the terms and conditions, which are not substantially responsive to the requirements of the bidding documents.

### 3.7 Modifications and Withdrawal of Bids

The bidder is not allowed to modify or withdraw its bid after the Bid's submission. The EMD as submitted along with the bid shall be liable for forfeiture in such event.

### 3.8 Earnest Money Deposit (EMD)

The bidder shall furnish, as part of its bid, an EMD amounting as specified in the tender. The EMD is required to protect TPCODL against the risk of bidder's conduct which would warrant forfeiture.

The EMD shall be denominated in any of the following form:

- Banker's Cheque/ Demand Draft/ Pay order drawn in favor of TP Central Odisha Distribution Limited payable at Bhubaneswar.
- Online transfer of requisite amount through NEFT/ RTGS.
- Bank Guarantee valid for 210 days after due date of submission.

#### ***The EMD shall be forfeited in case:***

a) The bidder withdraws its bid during the period of specified bid validity.

**Or**

b) The successful Bidder does not

a) accept the Purchase Order, or

b) furnish the required Performance Security Bank Guarantee

## 4 Bid Opening & Evaluation process

### 4.1. Process to be confidential

Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process. Any effort by a Bidder to influence the TPCODL's processing of Bids or award decisions may result in rejection of the Bidder's Bid.

### 4.2. Technical Bid Opening

Bids will be opened at TPCODL Office, Bhubaneswar. All tender bids shall be opened internally by TPCODL. Presence of any bidder will not be allowed during bid opening process. Technical bid must not contain any cost information whatsoever.

First the envelope marked "EMD" will be opened. Bids without EMD/cost of tender (if applicable) of required amount/ validity in prescribed format, shall be rejected.

Next, the technical bid of the bidders who have furnished the requisite EMD will be opened, one by one.



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#### **4.3. Preliminary Examination of Bids/Responsiveness**

TPCODL will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order. TPCODL may ask for submission of original documents in order to verify the documents submitted in support of qualification criteria.

Arithmetical errors will be rectified on the following basis: If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected. If there is a discrepancy between the Total Amount and the sum of the total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.

Prior to the detailed evaluation, TPCODL will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.

Bid determined as not substantially responsive will be rejected by the TPCODL and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

#### **4.4. Techno Commercial Clarifications**

Bidders need to ensure that the bids submitted by them are complete in all respects. To assist in the examination, evaluation and comparison of Bids, TPCODL may, at its discretion, ask the Bidder for a clarification on its Bid with respect to the TPCODL specifications and attempt will be made to bring all bids on a common footing. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted owing to any clarifications sought by TPCODL.

#### **4.5. Price Bid Opening**

Price bids will be opened internally without the presence of any bidder representative. The EMD of the bidder withdrawing or substantially altering his offer at any stage after the technical bid opening will be forfeited at the sole discretion of TPCODL without any further correspondence in this regard.

#### **4.6. Reverse Auctions**

TPCODL reserves the right to conduct the reverse auction (instead of public opening of price bids) for the products/ services being asked for in the tender. The terms and conditions for such reverse auction events shall be as per the Acceptance Form attached as Annexure VI of this document. The bidders along with the tender document shall mandatorily submit a duly signed copy of the Acceptance Form attached as Annexure VI as a token of acceptance for the same.

### **5 Award Decision**

TPCODL will award the contract to the successful bidder whose bid has been determined to be the lowest-evaluated responsive bid as per the Evaluation Criterion mentioned at Clause 2.0. The Cost for the said calculation shall be taken as the all-inclusive cost quoted by bidder in Annexure I (Schedule of Items) subject to any corrections required in line with Clause 4.3 above. The decision to place purchase order/LOI solely depends on TPCODL on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that TPCODL may deem relevant.





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TPCODL reserves the rights to award contract to one or more bidders so as to meet the delivery requirement or nullify award decision without assigning any reason thereof.

In case any supplier is found unsatisfactory during delivery process, the award will be cancelled and TPCODL reserves right to award contract to other suppliers who are found fit.

## **6 Order of Preference/Contradiction**

In case of contradiction in any part of various documents in tender, following shall prevail in order of preference:

1. Schedule of Items (Annexure I)
2. Post Award Contract Administration (Clause 7.0)
3. Submission of Bid Documents (Clause 3.0)
4. Scope of Work and SLA (Annexure VII)
5. Technical Specifications (Annexure II)
6. Acceptance Form for Participation in Reverse Auction (Annexure VI)
7. General Conditions of Contract (Annexure VIII)

## **7 Post Award Contract Administration**

### **7.1. Special Conditions of Contract**

- After finalization of tender, TPCODL shall place a Rate Contract for a period of Two (02) years to the successful bidder.
- Business Associate (BA) shall submit applicable Performance Bank Guarantee as per GCC within 15 days of issuance of order. PBG applicable shall be 5% of Order Value. PBG submitted, shall be released after completion of applicable guarantee period plus one month.
- Guarantee applicable shall be as per technical specifications.
- Completion Schedule / Delivery period shall be as per timelines defined in Annexure VII.
- Any change in statutory taxes, duties and levies during the contract period shall be borne by TPCODL.
- All the terms and conditions of TPCODL General Conditions of Contract for Service Orders shall be applicable.

### **7.2 Drawing Submission and Approval**

Refer Annexure II.

### **7.3 Delivery Timelines**

Refer Annexure VII

### **7.4 Warranty Period**

Refer Annexure VII

### **7.5 Payment Terms**

Refer Annexure VII

### **7.6 Climate Change**

Significant quantities of waste are generated during the execution of project and an integrated approach for effective handling, storage, transportation and disposal of the same shall be adopted. This would ensure the minimization of environmental and social impact in order to



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combat the climate change. Please refer attached Environment Policy and Sustainability Policy, Annexure-XI for more details.

### **7.7 Ethics**

TPCODL is an ethical organization and as a policy TPCODL lays emphasis on ethical practices across its entire domain. Bidder should ensure that they should abide by all the ethical norms and in no form either directly or indirectly be involved in unethical practice.

TPCODL work practices are governed by the Tata Code of Conduct which emphasizes on the following:

- We shall select our suppliers and service providers fairly and transparently.
- We seek to work with suppliers and service providers who can demonstrate that they share similar values. We expect them to adopt ethical standards comparable to our own.
- Our suppliers and service providers shall represent our company only with duly authorized written permission from our company. They are expected to abide by the Code in their interactions with, and on behalf of us, including respecting the confidentiality of information shared with them.
- We shall ensure that any gifts or hospitality received from, or given to, our suppliers or service providers comply with our company's gifts and hospitality policy.
- We respect our obligations on the use of third party intellectual property and data.

Bidder is advised to refer Tata Code of Conduct (TCOC) attached at Annexure X for more information.

Any ethical concerns with respect to this tender can be reported to the following e-mail IDs:

- 1) Chief Ethics Counselor – Ravindra.singh@tpcentralodisha.com

### **8 Specification and standards**

As per Annexure.

### **9 General Condition of Contract**

Any condition not mentioned above shall be applicable as per GCC attached along with this tender.

### **10 Safety**

All jobs are this tender have to be executed strictly in compliance to the Safety terms and Conditions of TP Central Odisha Distribution Limited. Please refer attached Safety terms and conditions, Annexure-IX, for details. Violation of Safety norms will result in Penalty as mentioned in the above document.



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**ANNEXURE I**  
**Schedule for Items**

Attached

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NIT No.: TPCODL/P&S/ 100000099 /21-22

**ANNEXURE II**  
**Technical Specifications**

Attached

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**ANNEXURE III**

**Schedule of Deviations**

*Bidders are advised to refrain from taking any deviations on this TENDER. Still in case of any deviations, all such deviations from this tender document shall be set out by the Bidders, Clause by Clause in this schedule and submit the same as a part of the **Technical Bid**.*

*Unless **specifically** mentioned in this schedule, the tender shall be deemed to confirm the TPCODL's specifications:*

<b>S. No.</b>	<b>Clause No.</b>	<b>Tender Clause Details</b>	<b>Details of deviation with justifications</b>

*By signing this document we hereby withdraw all the deviations whatsoever taken anywhere in this bid document and comply to all the terms and conditions, technical specifications, scope of work etc. as mentioned in the standard document except those as mentioned above.*

**Seal of the Bidder:**

**Signature:**

**Name:**

## ANNEXURE IV

### Schedule of Commercial Specifications

***(The bidders shall mandatorily fill in this schedule and enclose it with the offer Part I: Technical Bid. In the absence of all these details, the offer may not be acceptable.)***

<b>S. No.</b>	<b>Particulars</b>	<b>Remarks</b>
1.	Prices firm or subject to variation (If variable indicate the price variation clause with the ceiling if applicable)	Firm / Variable
1a.	If variable price variation on clause given	Yes / No
1b.	Ceiling	----- %
1c.	Inclusive of GST	Yes / No (If Yes, indicate % rate)
1d.	Inclusive of transit insurance	Yes / No
2.	Delivery	Weeks / months
3.	Guarantee clause acceptable	Yes / No
4.	Terms of payment acceptable	Yes / No
5.	Performance Bank Guarantee acceptable	Yes / No
6.	Liquidated damages clause acceptable	Yes / No
7.	Validity (180 days) (From the date of opening of bid)	Yes / No
8.	Inspection during stage of manufacture	Yes / No
9.	Rebate for increased quantity	Yes / No (If Yes, indicate value)
10.	Change in price for reduced quantity	Yes / No (If Yes, indicate value)
11.	Covered under Small Scale and Ancillary Industrial Undertaking Act 1992	Yes / No (If Yes, indicate, SSI Reg'n No.)

**Seal of the Bidder:**

**Signature:**

**Name:**

**ANNEXURE V**

**Checklist of all the documents to be submitted with the Bid**

Bidder has to mandatorily fill in the checklist mentioned below:-

S. No.	Documents attached	Yes / No / Not Applicable
1	EMD of required value	
2	Tender Fee as mentioned in this tender	
3	Signed copy of this tender as an unconditional acceptance	
5	Duly filled schedule of commercial specifications (Annexure IV)	
6	Sheet of commercial/technical deviation if any (Annexure III)	
7	Balance sheet for the last completed three financial years; mandatorily enclosing Profit & loss account statement	
8	Acknowledgement for Testing facilities if available (duly mentioned on bidder letter head)	
9	List of Machine/tools with updated calibration certificates if applicable	
10	Details of order copy (duly mentioned on bidder letter head)	
11	Order copies as a proof of quantity executed	
12	Details of Type Tests if applicable (duly mentioned on bidder letter head)	
13	All the relevant Type test certificates as per relevant IS/IEC (CPRI/ERDA/other certified agency) if applicable	
14	Project/supply Completion certificates	
15	Performance certificates	
16	Client Testimonial/Performance Certificates	
17	Credit rating/solvency certificate	
18	Undertaking regarding non blacklisting (On company letter head)	
19	List of trained/untrained Manpower	

**Seal of the Bidder:**

**Signature:**

**Name**



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## **ANNEXURE VI**

### **ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT**

*(To be signed and stamped by the bidder)*

In a bid to make our entire procurement process more fair and transparent, TPCODL intends to use the reverse auctions as an integral part of the entire tendering process. All the bidders who are found as technically qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

**The following terms and conditions are deemed as accepted by the bidder on participation in the bid event:**

1. TPCODL shall provide the user id and password to the authorized representative of the bidder. *(Authorization Letter in lieu of the same shall be submitted along with the signed and stamped Acceptance Form).*
2. TPCODL will make every effort to make the bid process transparent. However, the award decision by TPCODL would be final and binding on the supplier.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of TPCODL, bid process, bid technology, bid documentation and bid details.
4. The bidder is advised to understand the auto bid process to safeguard themselves against any possibility of non-participation in the auction event.
5. In case of bidding through Internet medium, bidders are further advised to ensure availability of the entire infrastructure as required at their end to participate in the auction event. Inability to bid due to telephone line glitch, internet response issues, software or hardware hangs, power failure or any other reason shall not be the responsibility of TPCODL.
6. In case of intranet medium, TPCODL shall provide the infrastructure to bidders. Further, TPCODL has sole discretion to extend or restart the auction event in case of any glitches in infrastructure observed which has restricted the bidders to submit the bids to ensure fair & transparent competitive bidding. In case of an auction event is restarted, the best bid as already available in the system shall become the start price for the new auction.
7. In case the bidder fails to participate in the auction event due any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid as submitted by the bidder as a part of the tender shall be considered as the bidder's final no regret offer. Any offline price bids received from a bidder in lieu of non-participation in the auction event shall be out-rightly rejected by TPCODL.
8. The bidder shall be prepared with competitive price quotes on the day of the bidding event.
9. The prices as quoted by the bidder during the auction event shall be inclusive of all the applicable taxes, duties and levies and shall be FOR at TPCODL site.
10. The prices submitted by a bidder during the auction event shall be binding on the bidder.
11. No requests for time extension of auction event shall be considered by TPCODL.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all-inclusive prices offered during conclusion of the auction event for arriving at Contract amount.

**Signature & Seal of the Bidder**





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**ANNEXURE VII**  
**Scope of Work & SLA**

Attached

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**ANNEXURE VIII**  
**GENERAL CONDITIONS OF CONTRACT**

**Attached:** General Conditions of Contract (GCC) for Composite Orders

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## ANNEXURE IX

### SAFETY POLICY AND SAFETY TERMS AND CONDITIONS

#### 1. Objective

The Tata Power engages contractor workforce to execute, run and maintain various operating sites and facilities across locations for various business verticals including Generation, Transmission, Distribution and Renewable. The activities range from project execution, operation, maintenance to facilities management.

The management of contractor safety represents a significant challenge for management. Tata Power has a responsibility to ensure that contractors are provided with enough information and support to enable them to conduct their roles safely and without endangering health and safety of their own workforce or that of our staff.

To ensure reduction in reportable injuries and achieve goal of zero accidents, first edition of contractor safety code of conduct was launched successfully in the year 2014. Since last four years after the launch of CSCC, Tata Power could achieve the objective of reduction in reportable injuries and fatalities.

Over the period, as the system was being matured, a need was felt to make second revision of the CSCC process. Objective of second revision is improve existing CSCC system and make it user friendly.

2. **Scope:** This procedure applies to all operating and project sites of The Tata Power Company Ltd and Group companies including new businesses like EV charging, Home Automation etc.

#### 3. Definitions

- 3.1. **Order Manager:** Order Manager is the Tata Power representative, who has the ownership of the given job.
- 3.2. **Site Safety Management Plan:** It is the safety plan agreed between Contractor and Tata Power. It will contain the entire job specific safety requirement and will be signed by the contractor.
- 3.3. **Contractor:** An individual or a company that provides services to Tata Power under a signed contract.
- 3.4. **Emergency:** a serious, unexpected or dangerous situation requiring immediate action, which may result in loss of revenue/property, business discontinuity. In case of Emergency\*, services may be procured by selecting the qualified vendor based on the vendor category without the safety bid evaluation. It must be approved by MB level and above.
- 3.5. **Expert Service jobs:** Jobs which needs expert services of contractor which does not involve direct exposure to the potential risk or work which involves only supervisory work such as expert for turbine overhaul, expert for boiler overhaul, expert for pump and motor, expert for compressor overhaul.



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- 3.6. **Head of the Division:** Business in charge of the division who is overall custodian of the generating station or transmission division or distribution division.
- 3.7. **Category A Vendor:** Vendor eligible to carry out Very High & High risk (as per Tata Power Hazard Identification and Risk Analysis Procedure) and /or Long-Term Contract related to operation and maintenance (O&M) of plant. Vendors must fulfil the requirement specified for Category A in Appendix 12-CSMF-5 of this document.
- 3.8. **Category B Vendor:** Vendors eligible to carry out technical jobs, that are classified under Medium /low risk. Vendors must fulfil the requirement specified for Category B in Appendix 12-CSMF-5 of this document.
- 3.9. **Category C Vendor:** Vendors eligible for to carry out low or very low risk administrative and office jobs. For this he must fulfil the requirement specified for Category C in Appendix 12-CSMF-5 of this document.
- 3.10. **Category D Vendor:** All Consultants, Medical Practitioners or vendors taking job from Tata Power and working from their own premises (e.g. motor rewinding at vendor's shop floor, equipment sent for repair to vendor's works etc.) are classified as Category D Vendor
- 3.11. **High Risk Jobs:** A Job or its activities are considered as Very High or High Risk when Order manager apply the "Tata Power Hazard Identification and Risk Analysis" procedure and found safety risk associated with are under Very High or High category. Indicative lists of jobs are given in appendix 15 of this document.
- 3.12. **Medium Risk Jobs:** Jobs or its activities are considered as medium risk when Order manager apply "Tata Power Hazard Identification and Risk Analysis" procedure and found the same as Medium Risk.
- 3.13. **Low Risk Jobs:** Any job or its activities are considered as Low or Very low risk while Order manager, calculate it by applying "Tata Power Hazard Identification and Risk Analysis" procedure and found it under Low or Very Low category.
- 3.14. **Long Duration Jobs:** When the duration of job is 12 months or more, it is considered as Long duration job
- 3.15. **High Value Jobs:** When the value of the job contract is Rs. One Crore or more it will be considered as High value job.

## 4. Responsibilities

**4.1 Order Manager:** Order Manager is the Tata Power representative, who is responsible for:

- 4.1.1 Finalizing the Site Safety Management Plan along with Contractor, Safety Concurrences Group, Divisional Safety Head and Expert (External or Internal) if required.
- 4.1.2 Supervise and ensure work is carried out as per the Site Safety Management Plan including agreed Risk Assessment (HIRA/JSA) and Method Statement.
- 4.1.3 Conduct audit and evaluate Safety Performance of contractor.
- 4.1.4 Ensure contractors adhere to all statutory provisions.
- 4.1.5 In case any deviation is needed in agreed safety management plan or in CSCC process for execution of job, Management of Change procedure will be applicable, and approval may be obtained from divisional head /Cluster head.

**4.2 Contractor:** The person, entity or organisation who is executing the job for Tata Power under a contractual agreement and will be responsible for the following

- 4.2.1 To follow all Tata Power Critical Safety Procedure, Rules and guidelines given in Safety Terms and Conditions
- 4.2.2 Undertake job as per Site Safety Management Plan CSM-F10 and method statements agreed with Tata Power.
- 4.2.3 Raise any concerns with regard to their work and its safety with the Tata Power Order Manager.
- 4.2.4 Report all injuries, near misses, unsafe acts/conditions, and occurrences to the Tata Power Order Manager immediately.
- 4.2.5 Ensure that all sub-contractors follow the Tata Power Safety Procedure and agreed Site Safety Management Plan CSM-F10.
- 4.2.6 To follow all statutory requirements as per the laws of the land.
- 4.2.7 All vendors applying for A category jobs or submitting quote for high risk jobs shall obtain certificates of ISO 9001, ISO14001 and ISO45001 before submitting quote for high risk Jobs.

**4.3 Safety Concurrence Group:** It is Cross Functional Team constituted by Corporate Safety Team, which will have representatives from Execution department, Divisional safety and Corporate / Divisional contracts. SCG will be responsible for the following

- 4.3.1 Assessment of Safety Potential of new vendor before registration as per CSM-F1-Safety Category Qualification Form.
- 4.3.2 Safety Evaluation of the bids as per evaluation format CSM-F-9 Safety Bid Evaluation Criteria
- 4.3.3 Finalization of the Site Safety Management Plan CSM-F-10 submitted by the contractor.
- 4.3.4 Corporate Safety Team / Cluster Safety Head will be part of SCG during Safety Bid Evaluation for following types of jobs
  - 4.3.4.1 High-Risk jobs to be carried out in Annual Overhaul / Major Shutdowns and Outages.
  - 4.3.4.2 Capex jobs of High-Risk Category



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### **5.1 Vendor Registration**

For Vendor Registration, Corporate Contract will issue following documents for evaluation of contractor's safety capability

- 1) [CSM-F1 –Safety Category Qualification Form](#)
- 2) [Safety Terms and Conditions](#)

The document [Safety Terms and Conditions](#) provides the information about Tata Power safety System to the contractor. Contractor will submit the [CSM-F1- Safety Category Qualification Form](#) with all relevant details and documents to Vendor Registration Initiator, which will in turn forward it to Safety Concurrence Group (SCG) for evaluation. The SCG will evaluate the details submitted by the contractor based on a predetermined criteria [CSM-F-5 Safety Potential Evaluation Criteria](#) for Vendor Registration and will determine the category (Category A/B/C/D) for which the contractor will be registered. As mentioned in the above criteria, a site visit may also be organized by SCG prior to registration under Category A and B. In case, the contractor does not qualify the safety criteria, the contractor will not be registered. However, he may apply afresh for registration after 6 months. Please refer [Appendix 1: Process Flow Chart for Vendor Registration](#).

### **5.2 Bid evaluation**

At the time of placing the Purchase Requisition (PR), Order Manager is required to declare the risk involved in the of the job (i.e. High Risk / Medium Risk / Low Risk jobs, based on the RPN in HIRA. If the Job is “High Risk” or “Long Duration”, then RFQ will be attached with following documents:

- 1) [CSM-F7- Blank Safety Competency Form](#)
- 2) [CSM-F8 PPE requirements](#)
- 3) [Safety Terms and Conditions](#)
- 4) [Job Specific Safety Requirement \(Educational and Professional Qualification, Skill & Experience Manpower, Tools and Tackles \(e.g. man lifter, use of drone, use & availability of rescue kit\), Work Methodology etc.\)](#)

Otherwise the RFQ will be attached only with [Safety Terms and Conditions](#). Long term and low value jobs (see definition) are exempted from the CSCC process.

Corporate Contracts will collect duly filled [CSM-F7 Safety Competency Form](#) along with the bid. All other stakeholders will also put their efforts to get all relevant safety data during meeting / discussions with the vendor. SCG will evaluate the document as per the [CSM-F9 Safety bid evaluation criteria](#). If any specific condition related to Contract is required to convey to contractor, Site safety team will attach the same as Annexure for specific conditions of job and submit it to contract team along with safety bid evaluation form. Commercial bid of contractor will be considered for evaluation by contract team only if contractor is qualified in safety bid. Site Safety Management Plan, defining the complete procedure of executing the job at site will be signed by the contractor and SCG after mutual agreement. CC will attach a copy of site safety Management Plan and any specific condition of contract along with PO to the successful bidder. Please refer [Appendix 6: Process Flow Chart for issuing RFQ and PO significant health and safety risk associated with it](#).



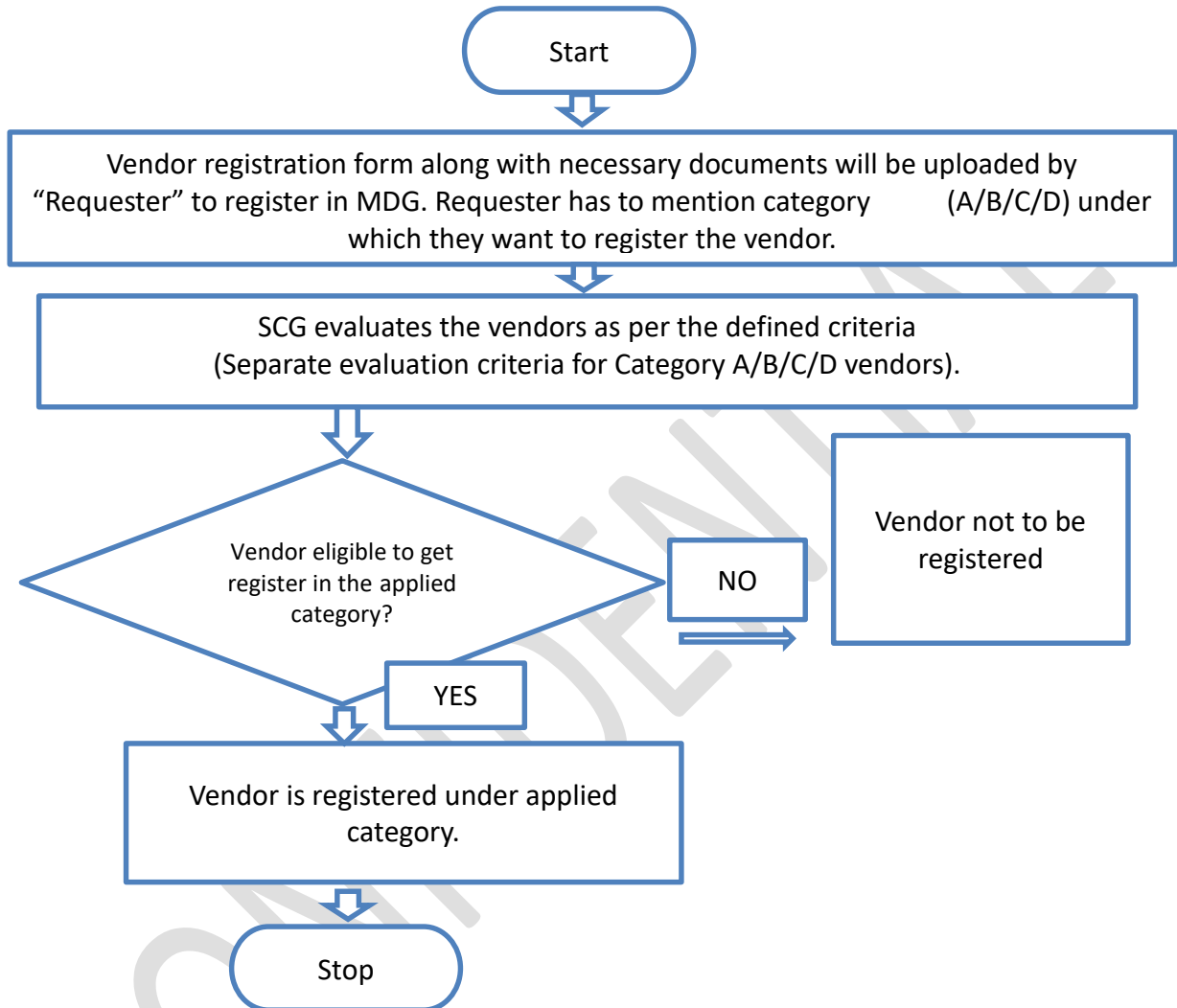
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### **5.3 Safety Performance Evaluation**

During the time of job execution, regular site inspection will be carried out by the Tata Power officials and violations will be dealt as per [CSM-F4 Safety Violation Penalty Criteria](#). Apart from this, monthly safety performance of the contractor will be evaluated based on the predetermined criteria as per [CSM-F11 safety Performance Score](#) and monthly score will be maintained by the Order Manager. Certain percentage of each running bill will be retained as Safety Retention amount and will be released on the basis of Safety Performance Score at certain intervals as defined in [CSM- F-3- Safety Performance Evaluation Criteria](#). Please refer [Appendix 10: Process Flow Chart for Safety Performance Evaluation](#). Percentage of retention amount is mentioned in safety terms and conditions.

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## Appendix 1: Process Flow Chart for Vendor Registration







## Appendix 2: CSM-F-1 Safety Category Qualification form

1. "Safety Category Qualification Form" is part of vendor registration form. It needs to be filled by the contractor at the time of Registration and should be submitted to Requester / order manager with all relevant documents.
2. The same will be evaluated by Safety Concurrence Group of the Division (SCG) as per the criteria given in CSM-F-5.
3. Information provided by contractor will be verified during site visit.

### Safety Category Qualification Form

**Please consider my application for**

**Category A Vendor: Vendor eligible to carry out Very High- and High-risk O&M jobs**

**Category B Vendor: Vendors eligible to carry out technical jobs, classified as Medium / low risk**

**Category C Vendor: Vendors eligible for to carry out low or very low risk administrative and office jobs**

**Category D vendor: All Consultants, Medical Practitioners or vendors taking job from Tata Power and working from their own premises.**

Name of the Vendor:						
Sr. No	Safety Information	Remarks	Attachment			
1	Certified for i. OHSAS 18001/ ISO 45001, ii. ISO: 14001 iii. ISO: 9001 (ISO certificates to be issued from reputed accreditation agencies specified by Tata Power)	i. Y/ N ii. Y/ N iii. Y/ N	Attach copy of the certification			
2	Safety Statistics for Last Three (3) Years - LTIFR - LTISR	Yes/No		Year 1 (Last FY)	Year 2	Year 3
			LTIFR			
			LTISR			
3	Do you have Safety Policy?	Yes/No	Attach copy of the safety policy.			
4	Do you have Safety training process?	Yes/No	Attach safety training process.			
5	Do you have Safety organization structure e.g. Safety Officers and Safety Committees?	Yes/No	Attach copy of the safety organization structure.			
6	Name and address of sites where work is in progress or worked earlier	Yes/No	Site details to be attached for inspection by Officials.			

Signature :

Name and Designation :

Stamp of Organization :

### Appendix 3: Safety Terms and Conditions

Please refer the attached document [Safety Terms and Conditions](#).

### Appendix 4: CSM- F-3- Safety Performance Evaluation Criteria

1. A certain percentage of the bill value will be retained against every running bill as safety performance retention. The amount will be released with the last invoice or every six-month based on Safety Performance Score of contractors. The retention amount will be calculated based on contract value as below.

Contract Value	Retention Amount (%)
Up to 10 Lakhs	2.5
10 – 50 lakhs	2
0.5 to 10 Cr	1.5
>10 Cr	1

2. The evaluation criteria include Lead Indicators such as CFSA (Contractor Field safety Audit) score, percentage of workers trained in TPSDI, inspection of critical equipment. Lag indicators such as Fatalities, LWDC and man days lost.
3. The retention amount saved will go to a separate Safety Improvement Fund.
4. For the contract value of more than Rs 1 Cr or contract duration more than 12 months, the retention amount shall be released half yearly based on safety performance. For all remaining contracts, the retention amount will be released with the final bill.
5. Long term jobs with low value (Less than Rs. 1 Cr.) are exempted from the safety retention. Invoice of these type of jobs can be cleared without safety retention.
6. In case of job stoppage due to safety violations / unsafe observations at the site, no time extension shall be given to the contractor, if such delays are attributable to contractor.
7. In case of fatality, limb loss or loss of property, vendor must pay for liability, legal, statutory and additional mutually agreed settlement charges imposed by the appointed committee. This charge is over and above the retention amount.
8. The committee will finalize an amount between 5 -50 lakhs based on factors such as advise by statutory authorities, contract value and impact of accident etc.
9. Safety performance bonus 1% (limiting to 50 lakhs) of the invoice value will be considered at the end of the job if the contractual safety performance score 100%.
10. During the progress of the work, concerned Supervisor/Engineer will visit and inspect the work site regularly and evaluate the safety performance of the contractor based on matrix attached herewith and apply the Consequence management policy as applicable.
11. Order Manager, divisional chief and SBU head have the authority to terminate the contract in case of three consecutive serious violations.

**Safety Performance Evaluation report- CSM-F-3**

	<b><u>Lead Indicators</u></b>	<b>Unit Of measurement</b>	<b>Target</b>	<b>weight age</b>
1	% of Employee certified in TPSDI/Authorized agency	%	50%	10
2	CFSA score (Annexure 6.1)	Average Severity of Violations	1.49	20
3	Monthly inspection completed by contractor for Critical Equipment, lifting Tools & Tackles and hand tools used at site as per Tata Power Checklist	%	80	5
4	Revalidation of Condition of tools, tackles and equipment by Order Manger.	%	100	15
	<b><u>Lag Indicators</u></b>			
1	Number of Fatalities	No.	0	30
2	Number of Lost workday case (LWDC)	No.	0	10
3	Man-days Lost	No.	0	10

### Appendix 5: CSM- F-4 Safety Violation Penalty Criteria

Penalty shall be imposed on the contractors under the following circumstances for breaching the contractual agreements:

S No	Description of violation	Severit	Penalty
1.	Working without Permit	5	5000/-
2.	Untrained (TPSDI) worker on high-risk jobs.	5	5000/-
3.	Unhygienic/Bad condition of PPE	2	250/-
4.	Not following Tata Power Procedure & Standard	4	2000/-
5.	Unsafe Act/Condition of Severity 4	4	2000/-
6.	Unsafe Act/Condition of Severity 5	5	5000/-
7.	No Earthling of Electrical equipment	5	5000/-
8.	Damaged welding cable	5	5000/
9.	Violation of Positive Isolation Procedure (LOTO Not followed)	5	5000/
10.	ELCB of more than 30 mA/ELCB not working	5	5000/
11.	On/Off switch of welding m/c not working	5	5000/
12.	Electric cable tied with metal wire	5	5000/
13.	Leakage found DA hose / cylinder	5	5000/
14.	Use of LPG	5	5000/
15.	Use of IC engine based Three-wheeler at the work site.	5	5000/
16.	Starting the job without Toolbox Talk	5	5000/
17.	Spatter falling on DA hose / Gas-line/ pathways / Equipment	5	5000/
18.	No safety latch in crane hook	5	5000/
19.	Load raised or swung over people or occupied areas of buildings	5	5000/
20.	Persons standing in swing area of construction equipment.	5	5000/
21.	Using damaged slings.	5	5000/
22.	Unstable scaffolding/nonstandard Scaffolding in use	5	5000/
23.	Handrails and mid-rails are missing	5	5000/
24.	Safety Harness not anchored with lifeline/fixed structure	5	5000/
25.	Fall arrestor not provided/ Not being used.	5	5000/
26.	Double lifeline not used for working at height	5	5000/
27.	No rubber mat in Electrical Distribution (DB) room	4	2000/-
28.	Water found accumulated in Electrical Distribution room/near welding machine.	4	2000/
29.	Inserting electric cables into socket, without using plug.	4	2000/
30.	Use of damaged electrical cable/two core cables.	4	2000/
31.	Inflammable material found in Distribution Room / welding areas.	4	2000/
32.	Loose material falling into excavated pit	4	2000/
33.	Water logging into excavated pit /trenches	4	2000/
34.	No / inadequate Barricade	4	2000/
35.	Undercut / cave-in found on sides of excavated pits	4	2000/

36.	Grinding wheel/ Coupling/ Piling winch/other rotating parts without guard	4	2000/
37.	The HMV/Mobile Crane operator does not have a valid HMV driving license.	4	2000/
38.	The loading area is not leveled properly.	4	2000/
39.	Ladder not anchored at top	4	2000/
40.	Opening found in working platform of scaffolding/floor	4	2000/
41.	Inadequate illumination at the working area	4	2000/
42.	Loose material lying on Gantry, platform	4	2000/
43.	Cleaning with Compressed Air.	3	500/-
44.	Gas Cylinders using without cap.	3	500/
45.	Gas Cylinders stored without securing	3	500/
46.	Bringing inside any other chemicals, apart from approved by Safety dept.	3	500/
47.	Using drum for sitting or accessing height.	3	500/
48.	Misusing emergency facilities like fire hydrant line/ hose box/ spray system/ eye wash etc.	3	500/
49.	No provision of Safety net where falling materials or tools may occurs	3	500/
50.	Taking electrical supply from non-designated outlet (other than socket).	3	500/
51.	Restricted gangways due to unwanted materials.	3	500/
52.	Not reporting incident.	3	500/
53.	Entering into restricted area like switch yard/ hazardous storage	3	500/
54.	Work without supervision	3	500/
55.	Parking of vehicle without applying wheel choke at right front-front and left rear-rear wheels other than passenger cars.	3	500/
56.	Heavy Vehicle without helper or co-driver.	3	500/
57.	Not wearing florescent safety jacket at site.	3	500/
58.	People travelling in load body of vehicle.	3	500/
59.	Parking of vehicles at non designated area.	3	500/
60.	Shifting heavy materials without guide ropes.	3	500/
61.	Using other than 24V lamp inside the confined space/Use of other than 24V lamps.	3	500/
62.	Angular loading/ lifting with Crane or hoist.	3	500/
63.	By passing the limit switch/ Safety Interlock.	3	500/
64.	Housekeeping activities on road without proper barricade.	3	500/
65.	Trying to board or alit from running vehicle.	3	500/
66.	Cylinder Valves of Gas cylinders not closed when not in use.	3	500/
67.	Flash-back arrester not used.	3	500/
68.	Hand Trolley wheel found damaged.	3	500/

69.	Guy ropes of required length on both sides of object are not used during movement with load.	3	5/ 00/
70.	Scotch block/wedge not provided, when the vehicle is parked.	3	500/
71.	Suitable Trolley not provided to hold the cylinders.	3	500/
72.	Locked First Aid box	3	500/
73.	Caution boards, danger signs (luminescent /red) along with emergency contact number are not found displayed.	3	500/
74.	Person found jumping barricading tape	3	500/
75.	Stacking of pipes, pile casing, drums without chock blocks/wedges	3	500/
76.	The terrain on which Heavy Equipment/Machinery moves is not reasonably hard.	3	500/
77.	Without Safety Helmet at working sites	4	250/-
78.	Without Crash Helmet (on bikes)	4	500/-
79.	Without Full body double lanyard Safety Harness (for work at height)	5	5000/-
80.	Without Hand gloves - Material Handling, Welding, Cutting,	4	100/-
81.	Without Safety goggles/ face shield - Welding/Cutting /Grinding	5	5000/-
82.	Handling Chemical without PVC Apron	5	5000/-
83.	Smoking in prohibited area (Closed Go-downs, Storage of flammable material, Storage of Gas cylinders)	5	1000/-
84.	Sleeping at Workplace	3	100/-
85.	Driving beyond speed limit	3	1000/-
86.	Seat Belt While Driving (for front seat passengers and driver)	3	500/-
87.	Driving without license	4	1000/-
88.	Heavy Commercial vehicles without reverse horn	3	500/-
89.	Nonfunctional Head light/ taillight and side indicators	3	100/-
90.	Using Mobile Phone During Driving	5	5000/-
91.	Poor visibility of registration number/ without registration number	3	100/-
92.	Broken/ without Side view mirror	3	100/-
93.	Over speeding above specified limit	3	500/-
94.	Broken/ Without Pressure gauge on Oxygen/ LPG / Acetylene cylinder.	3	500/-
95.	Without Flash back arrestor on Industrial Acetylene & Oxygen cylinders.	5	5000/-
96.	Spillage of hazardous material/chemicals during transportation	4	2000/-
97.	Electrical equipment without Earthing/ ELCB/ Double Insulation Cable.	5	5000/-
98.	Lifting Tools & Tackles used without/ expired Test Certificates.	5	5000/-
99.	Housekeeping repeatedly not maintained		



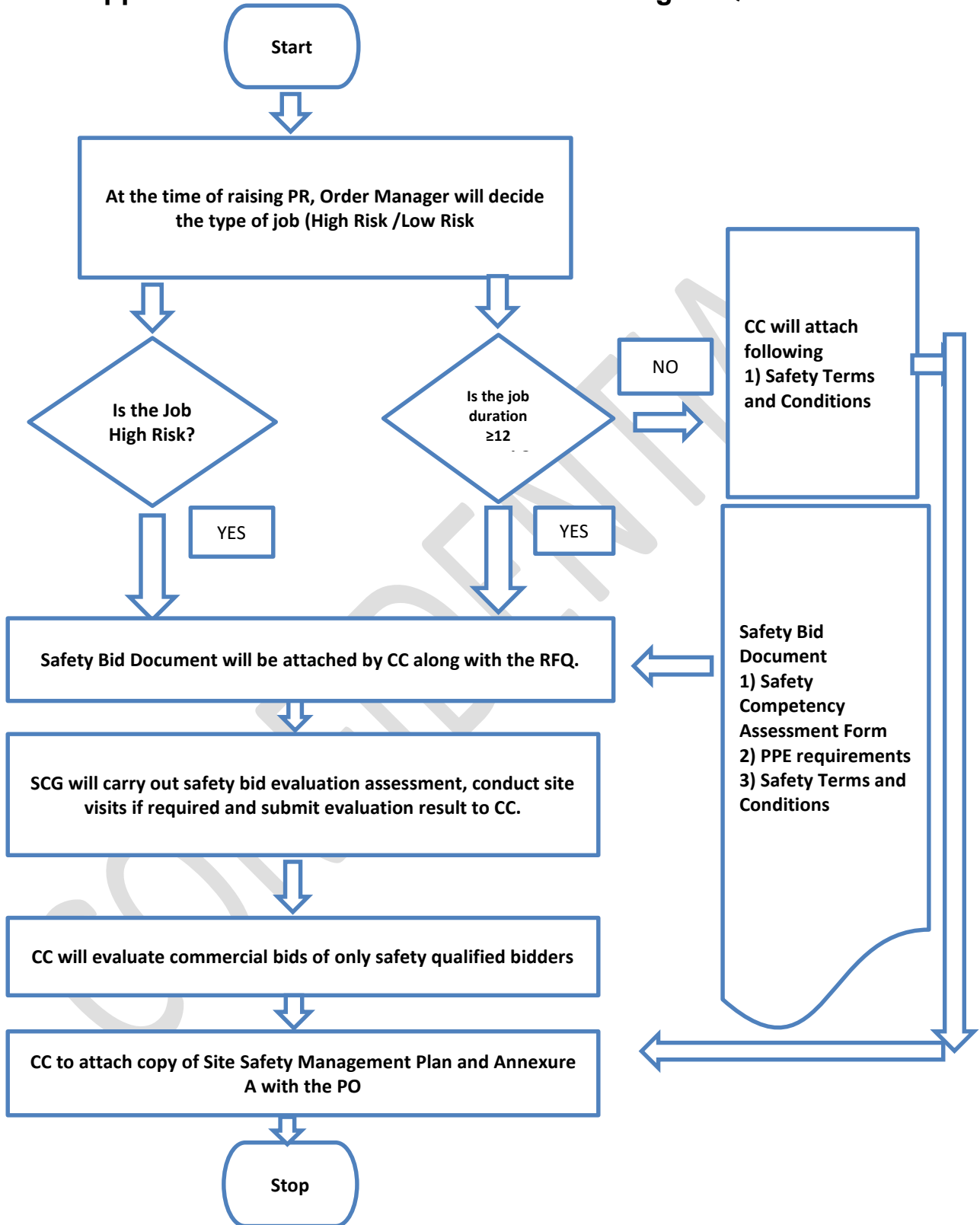
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100.	<ul style="list-style-type: none"><li>• First Time</li></ul>	3	Warning
101.	<ul style="list-style-type: none"><li>• Second Time</li></ul>	4	1000/-
102.	<ul style="list-style-type: none"><li>• Third Time</li></ul>	5	5000/-
103.	Serious Violation of House Keeping (after 1st or 2nd warning to be decided by Project Manager depending on the severity)	5	Rs.10000/- and above
104.	Repeat Violation of same nature	5	5 X Penalty for Violation
105.	Appointment of subcontractor without his Safety Bid Evaluation and/or without the permission of engineer in charge or Order manager.	5	5% of Contract Value

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## Appendix 6: Process Flow Chart for issuing RFQ and PO







## Appendix 7: CSM-F-7 Safety Competency Form (Template)

Name of the Vendor/Bidder : -

Name of the Sub Vendor (If job is given to Sub Vendor) : -

Description of the Job : -

Request for Quotation (RFQ) No. :-

Vendor/Bidder to mandatorily provide the below safety competency related information.

### 1. Proposed Manpower Deployment Schedule: -

Category of Manpower Deployed	Minimum Qualification & Experience	Proposed Numbers against each category month-wise			
		Month 1	Month 2	...	Month n
Project Manager					
Site-In-Charge (Site Manager)					
Shift-in-Charge					
Safety Officers					
Supervisors					
Technicians					
a.....					
b.....					
Highly Skilled Workmen					
a.....					
b.....					
Skilled Workmen					
Semi-Skilled Workmen					
Unskilled Workmen					
<b>Total Manpower</b>					

#### Instructions to Bidder to fill:

- Bidder to provide the overall site manpower deployment schedule as above.
- Bidder to indicate (through colour code mentioned below ) their direct and sub-contracted employees

Direct bidder employee

Partly Direct / Partly sub-contracted

Sub-Contracted

- Against each of the category, bidder to indicate the minimum qualification and experience of the proposed manpower.
- Rows can be added to also identify other specialised manpower e.g. specific details to be included for high risk activities operators
- Columns can be extended to the actual duration of Site activities.
- Bidder to note that if operations is in shifts, then Shift-in-charge / safety officers are required for each shift of operation.

### 2. List of Tools, Tackles, Machines and Equipment: -

Bidder/ Vendor to provide the list of tools, tackles, equipment **to be used during the job / project execution**. Bidder/Vendor to ensure that all the lifting tools and tackles, pressure

vessels are duly certified by the competent person authorised by the Chief Inspector of Factories of the respective state prior to start of the job

Sr. No.	Description of Tools / Tackles	Capacity / Rating	Quantity	Make	Remarks
1					
2					
3					
4					
5					
6					
7					
...					

**3. Safety Records:**

Bidder to provide the details of fatalities and lost workday cases (LWDC), occurred in last three years (data to be provided for the last completed FY and preceding 2 years).

Description	Safety Data for Last 3 Years		
	Year 1 (Last FY)	Year 2	Year 3
	20__ - __	20__ - __	20__ - __
Fatalities (Nos.)			
Lost Workday Cases (Nos.)			

In case of no fatalities, LWDC during any year, the form may be filled stating NIL against the respective year. Bidders are encouraged to also submit the RCA / incident investigation reports and the learning's implemented out of the above reported incidents

**4. Job Safety Plan/ Method Statement:**

Bidder to provide / enclose a detailed Site/Job Safety Plan along with a Method statement detailing the execution philosophy (how the bidder intends to execute the Job/Project), identifying all key activities which are required to be performed by the contractor at Site. Bidder to also list down all high-risk activities and provide the Hazard Identification and Risk Assessment (HIRA) for all such high-risk activities involved in the site work.

(Use Method Statement template attached as annexure A and sample as attachment B)

**5. Management System Certification: -**

Sr.	Certification	Yes / No	If Yes, Year of Certification	If No, Next date for Certification
	ISO 9001			
	ISO 14001			
	OSHAS 18001 / ISO 45001			
	Any other (please specify.....)			

Note: Please attach certificates to support above. In case not accredited for above but applied for, application letters may be attached.

**Appendix 8: CSM-F-8 PPE requirements**

The Contractor shall ensure that the following PPE of Approved standards shall be available at all time and shall be used by his employees with no exception whatsoever.

1	All contractor's employees at site	Safety Florescent Jacket (orange color), Safety helmet & safety shoes with Composite or steel toe cap
2	Workers mixing asphalt, cement, lime / concrete	Safety goggle & protective Hand gloves and footwear, Nose mask.
3	Welders / Grinders	Welding screen/goggles, safety shoes, leather hand gloves, aprons, leg guard
4	Stone breaker	Protective goggle, hearing protection, anti-vibration hand gloves and Protective clothing.
5	Electricians	Rubber hand gloves & Electrical resistant shoes.
6	Workers engaged in insulation using glass wool etc.	Respiratory mask & leather Hand gloves, goggles.
	Workers engaged in coal handling plant, ash handling plant and working in high dust area.	Dust mask, Hand gloves, protective goggles.
7	Workers working at a height of 1.8 Meter or above.	Double lanyard full body harness, fall arrestor and safety net made of reinforced nylon fiber ropes firmly supported with steel structures

- PPE shall be conforming to BIS/DGMS/DIN specifications, in good condition and shall be comfortable to his employees, when used.



## Appendix 9: CSM- F-10 Site Safety Management Plan / Method Statement

### Site Safety Plan / Method Statement (Template)

This Method Statement describes the specific safe working methods which will be used to carry out the described work. It gives details of work procedure with control measures to counter health and safety issues related to this work. The listed content of this Method Statement can be changed/modified subjected to job scope / specifications, but task specific method statement once finalized & approved, that should not be modified during work execution without permission from the approving authority.

Project/Job Name		
<b>Scope of work: -</b>		
Drawing References: -		
Detail of Sub contractors involved: -		
Method Statement Prepared By: - Designation: - (e.g. Site Manager)	<u>Signature</u>	<u>Date</u>

**1.0 Introduction** (*Describe purpose of the work, give details of type and scope of work being carried out*);

--

**2.0 Location of Work** (*Give site address and precise location on site where work is to be carried out.* )

--

**3.0 Safety Document /Specific Approval Required** (*Details of any safety documents or specific approval i.e. Client specific approval required to undertake the work*)

**5.0 Role & Responsibilities of Personnel/Parties Involved in activities:** -Clearly define role and responsibilities of all personnel involved in activity i.e. Site management staff including subcontractors' parties- Main contractor Project/Site Manager, Sub Contractor Site Manager, Project Engineer, Safety officer, Competent Supervisory Staff)

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**6.0 Working/Activity Description:** - *It is important that all operatives should have clear idea of those operational sequences and responsible supervisor must verify their competency prior to their engagement in operation.*

### 6.1 Pre-Working Checks

**6.2 Resources (Equipment, tools including manpower) Details** *i.e. Equipment and Tools, specific operational equipment, test kits, lifting resources, Details of materials to be used in operation, including any reference to COSHH assessments in case of use of any chemicals, Details of the manpower allocated to the task, e.g. titles, qualifications, competences, direct manpower, contractors. Details of plant, tools and equipment to be used for the work, including the availability of relevant statutory documents, checks or inspections etc. Details of fencing, barriers, cones, chains, dangers notices, warning signs etc.*

**Tools required for work:**

Sr.No	Tools /Equipment /Machine	UOM	Required Qty.	Remark
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

**6.4 Operational Sequence of work:** - *Full description of the work, setting out the methodology in a sequential manner, including any reference to any identified operational restraints. Also refer here sec. 5.0 responsibilities part for every step of work sequence).*

Sr.No	Activity	Details of job sequence	Risk Involved	Control Checks








1.				
2.				
3				
4				
5.				

**6.7 Final Checks & restoration of work area after completion of work :-** *Those checks to be carried out by responsible supervisor in witness of his line hierarchy by use of specific checklist of certain operational checks and once those completed satisfactory, PTW (if applicable) to be closed and isolation arrangements to be restored by removing barricades/cautionary tags.*

**7.0 Task Specific Hazards:** - *Refer to Task Specific Risk Assessment and attach in appendix*

**Attachment: - Specific Risk Assessment**

In addition, please provide below control measures in risk assessment *(as applicable)*.

<b>Fall Protection Measures: (Where Work at height cannot be avoided)</b>							
<b>Control Measures for Electrical Hazards</b>							
<b>Others Hazard if any (please provide details)</b>							
<b>Hazardous Substances to be used in job : (Attach MSDS if required)</b>	 Acute Toxic	 Health Hazard	 Corrosive	 Dangerous For the environment	 Oxidising	 Highly flammable	 Explosives
	Yes /No	Yes /No	Yes /No	Yes /No	Yes /No	Yes /No	Yes /No




**7.0 Emergency Provisions:** -*Relevant operational possibility of a programme in the case of emergency situation i.e. electrical supply restoration. In addition emergency response provisions i.e. first aiders, fire fighting, and first aid arrangements, nearest onsite/offsite emergency response also to be considered during emergency planning.*

**8.0 "5S issues" / Waste Disposal/ Housekeeping and Environmental issues:** -*Details waste disposal processes and or housekeeping activities, Details of environmental impacts and control measures.*

**9.0 Personal Protective Equipment (PPE):-** (*Tick on PPE requirements for the task/Job*)

Required Personnel Protective Equipment:	 Safety Boots	 Hard Hats	 Safety Gloves	 Hearing Protection	 Eye Protection	 Respiratory Protection	Other: 1. Hi-Viz 2. Coveralls 3.
--	---	--	--	--	---	---	---

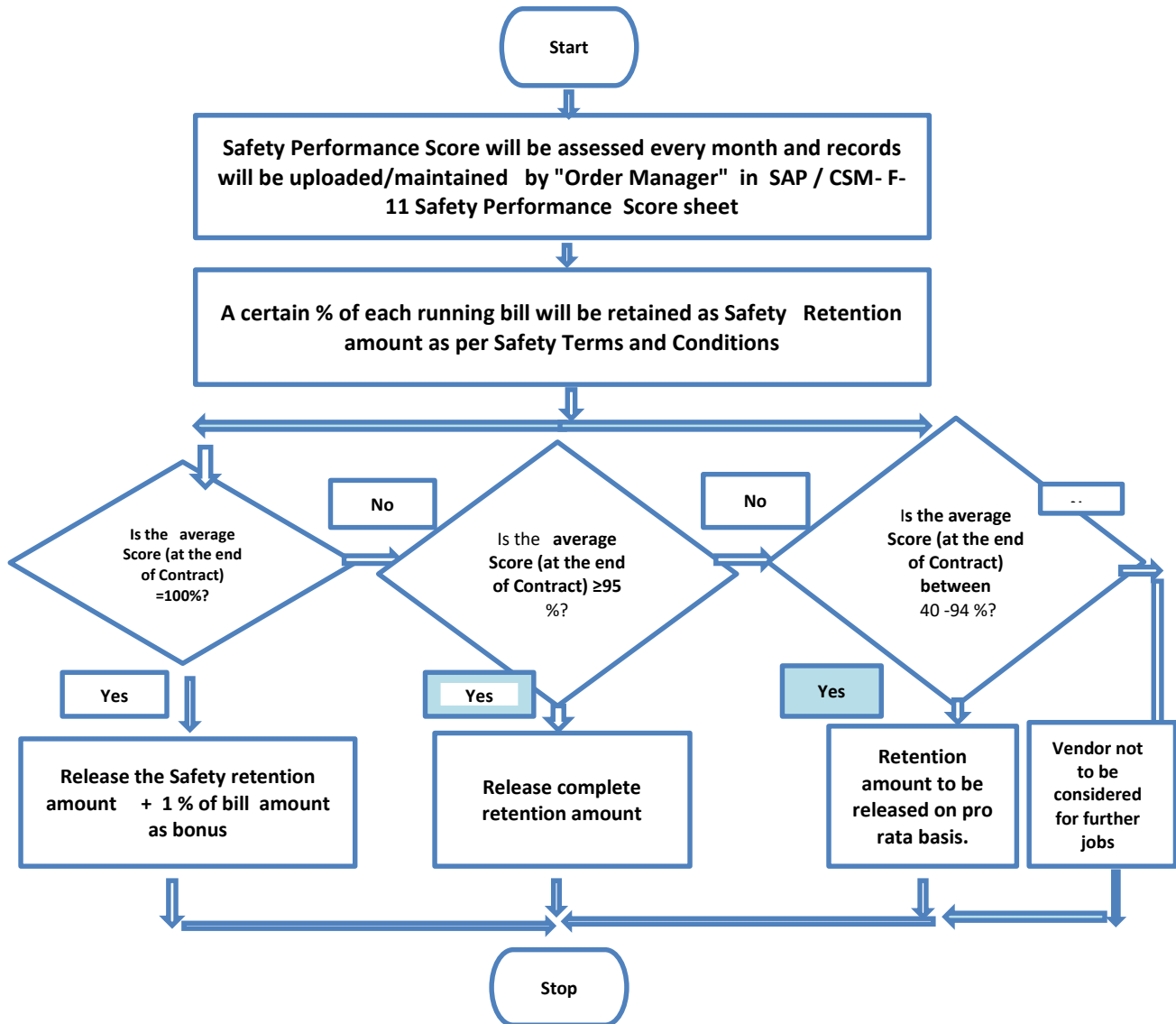
## 10.0 First Aid facilities and Nearby Hospitals Details

	Name of On-Site First Aider:	
	First Aid Box Location:	
	Location of Nearest Hospital:	

## 11.0 Occupational Health, Fitness and COVID-19 related Preparedness:

1. Please give a brief writeup / methodology of your organization planned to avoid impact of the COVID-19 pandemic at Tata Power working site.
2. Please give brief details of occupational health and hygiene related interventions planned by your organisation to ensure good health and fitness of workforce at Tata Power site.

## Appendix 10: Process Flow Chart for Safety Performance Evaluation





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### Appendix 11: CSM- F-11 Safety Performance Score

S. No	Parameter	Unit of Measurement	Target	Weight age	Actual Performance	Actual Score
<b>Lead Indicator</b>						
1	% of Employee certified in TPSDI/Authorized agency	Number	50%	10		
2	CFSA score (Annexure 6.1)	Average Severity of Violations	1.49	20		
3	Monthly inspection completed for Critical Equipment, lifting Tools & Tackles and hand tools used at site	Number	80%	10		
4	Condition of critical tools, tackles and equipment	Number	100%	10		
<b>Lag Indicator</b>						
1	Number of Fatalities	No	0	30		
2	Number of Lost workday case (LWDC) (reportable)	No	0	10		
3	Man-days Lost	Man-days	0	10		
					<b>Final Score</b>	
					<b>Invoice Value</b>	
					<b>Amount to be released</b>	



## Safety Performance Evaluation Criteria

### Lead Indicators

	<b>Target</b>			
% of Employee certified in TPSDI/Authorized agency	50%	100%	Less than 100%	
Score		10	5	
	<b>Target</b>			
CFSA score	<=1.49	1.5 to 2.5	2.51 to 3.5	>=3.51
Score	20	15	10	0
	<b>Target</b>			
Monthly inspection completed for Critical Equipment, lifting Tools & Tackles and hand tools used at site	>=80%	79 to 50%	<50%	
Score	10	7	0	
	<b>Target</b>			
Condition of critical tools, tackles and equipment	100%	<100%		
Score	10	0		

### Lag Indicators

Number of Fatalities	0	>0	
Score	30		0
Number of LWDC (reportable)	0	>0	
Score	10		0
Number of man days lost	0	1 to 5	>5
Score	10	5	0

## Appendix 12: CSM-F-5 Safety Potential Evaluation Criteria for Vendor Registration

At the time of vendor registration, vendor will be registered under 3 categories

- 1) **Category A-** Vendors eligible to carry out High risk Jobs
- 2) **Category B-** Vendors eligible to carry out technical jobs that are low risk
- 3) **Category C-** Vendors eligible to carry out administrative and office jobs
- 4) **Category D-** Outsourced Jobs / Consultants /Medical Practitioners / Suppliers etc

For vendors to be registered under **Category A**, a safety potential evaluation will be carried out based on following parameters.

Sr. No	Description	Weight	Actual	Remarks
		age (%)	Score	
1	Does the contractor have a valid ISO 45001/ OHSAS 18001/ Certification?	30		
2	During site visit check for safety adequacy at site	30		Annexure - 12.1
3	Check the Safety statistics of Contractor	10		Annexure - 12.2
4	Check the Safety orientation & training process of Contractor	15		Annexure 12.3
5	Check the organizational structure for safety professionals & engineers / supervisors.	10		Annexure - 12.4
6	Certified/skilled workers as a percentage of overall workforce	5		
	Total	100		

### Evaluation Criteria for Category B

Sr. No	Description	Weight	Actual	Remarks
		age (%)	Score	
1	Does the contractor have a valid ISO 9001 certification?	30		
2	During site visit check for safety adequacy at site	30		Annexure -12.1
3	Check the Safety statistics of Contractor	10		Annexure -12.2

4	Check the Safety orientation & training process of Contractor	15		Annexure -12.3
5	Check the organizational structure for safety professionals & engineers / supervisors.	10		Annexure -12.4
6	Certified/skilled workers as a percentage of overall workforce	5		
	<b>Total</b>	100		

**Evaluation Criteria for Category C**

Sr. No	Description	Weight age (%)	Actual Score	Remarks
2	Check the Safety statistics of Contractor	40		Annexure - 12.2
3	Check the Safety orientation & training process of Contractor	20		Annexure - 12.3
	<b>Total</b>	100		

**Annexure 12.1: Evaluation Criteria for Category D:**

Category D does not require any evaluation as it is for outsourced job outside the Tata Power company premise.

**Annexure 12.2**



Check List – Adequacy of Safety Statistics of Service Provider			Actual Marks obtained	Remarks
1	Check the safety statistics for last 3 years (LTIFR and LTISR)	Statistics available	Marks 5	
		Statistics not available	0	
2	Check the trend LTIFR for last 3 years	LTIFR value	Marks	
		0 to 0.2	5	
		0.21 to 0.3	2.5	
3	Check the trend of LTISR last 3 years	LTISR value	Marks	
		0 to 2	5	
		2 to 3	2.5	
4	Has there been any Prosecution/Conviction for any contravention with regard to Safety & Health provisions under the Factories Act /Electricity Act/ BOCW Act and Rules framed there under?	No Prosecution	Marks 10	
		Prosecution	0	
		To be provided in written on letter head		
<b>Total</b>			<b>25</b>	

### Annexure 12.3

Check List – Adequacy of Safety orientation & training process of Service provider			Actual Marks obtained
1	Records of safety trainings provided to safety officer/supervisor/workmen during last 1 year as percentage(%) of total employed by service provider	Safety Officer	Marks
		≥80% of employees	5
		50 to 79 % of employee	2.5
		<50%	0
		Safety Supervisor	Marks
		≥80% of employees	10
		50 to 79 % of employee	6
		<50%	0
		Workmen	Marks
		≥80% of employees	10
		50 to 79 % of employee	6
		<50%	0
<b>Total</b>			<b>25</b>

### Annexure 12.4



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Check List – Adequacy of organizational structure for safety professionals & engineers / supervisors.			Actual Marks obtained	
1	Check availability of number of safety officers from government recognized institute as per workforce strength.	Marks		
		1 in 50 employees		10
		1 in 100 employee		6
		Any other		0
3	Check availability of qualified workforce from government recognized institute/TPSDI.	Marks		
		100% of safety officers qualified		5
		50 – 99% of safety officers qualified		3
		<50		0
<b>Total</b>		<b>15</b>		

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### Appendix 13: CSM-F-9 Safety Bid Evaluation Criteria

The User has to select whether the job is high risk/ long duration at time of raising the PR.

- 1) The decision whether job is “**high risk**” or not has to be made by order manager on the basis of Risk involved (Risk Priority Number in HIRA) of the Jobs. An indicative list of high-risk jobs is attached as annexure
- 2) If a technical job is of low risk with estimated duration of the contract is 1 year or more the job should be treated as “**long duration**”.
- 3) All Safety bids will be evaluated by Safety Concurrence Group. Structure of SCG will be declared by Corporate safety. Corporate safety team will audit bid evaluation process of a few selected jobs and Quality of evaluated safety Bids.
- 4) Records of jobs sent by for Safety Bid evaluation shall be maintained by Corporate Contract team in existing tracing sheet along with other jobs.
- 5) For Safety Bid Evaluation will be based on following parameters.

		Minimum Requirement	Weight age (%)	Score Obtained
<b>Manpower</b>	<b>Safety Officer (1 per 500 workers)</b>	<b>Qualification-</b> Officer shall possess Advance Diploma In Industrial Safety by state technical board. <b>Experience-</b> Minimum 1-year experience in relevant field as mentioned in the job in PR.	5	
	<b>Safety Supervisor (1 per work site up to max. 50 workers)</b>	<b>Qualification-</b> Supervisor shall possess ITI/ Diploma in relevant field. <b>Experience-</b> Minimum 2-year experience in relevant field as mentioned in the job in PR. <b>Training</b> – Trained and certified by TPSDI or equivalent institute in relevant safety procedures. <b>Note:</b> On request of the contractor/Users -TPDSI should vet & certify the skilled & experienced Technician if Technical Qualification is not adequate.	5	
	<b>Technician (Skilled workers as electrician, rigger, fitter, welder, cable jointer, line men etc)</b>	<b>Experience-</b> Minimum 2 year experience in relevant field as mentioned in the job in PR. <b>Training</b> – Trained and certified by TPSDI or equivalent institute in relevant safety procedures.	5	

<b>Tools &amp; Tackles</b>	Equipment / Machines/ Tools & Tackles(lifting and shifting tools)	The list of Equipment /Machines / Tools and tackles to be used for job to be submitted by the contractor. Evaluation of the list will be carried out based on 1) Suitability as per the relevant job 2) Make and age of the tools from authorized agencies defined by the user. 3) Certification by the competent authority of respective state.	30	
<b>Safety Records</b>	Safety Records	Safety Records for last 3 years (as per vendor or as per our knowledge) – Recommendation?	15	
<b>Safety Plan</b>	HIRA/Contract Job Safety Plan	Adequacy of HIRA and Job Safety Plan with respect to relevant job. More weight age will be given to vendor for using mechanized work and advanced tools and equipment	20	
<b>Accredited Bodies certificate</b>	ISO-9001	ISO-9001	2	
	ISO-14001	ISO-14001	3	
	OHSAS 18001 ISO 45000	OHSAS 18001/ISO 45000	15	
		<b>Total Score</b>		

- 6) Vendor entitled to carry out the job only when qualified for the safety evaluation as follows:  
Contractor is qualified in safety bid only if his total score is more than 70% in all category 1 jobs such as high risk/long duration.
- 7) The Corporate Contract has to ensure that the vendor provides the filled “Safety Competency Form” along with the quotation.
- 8) Corporate Contract will forward the Safety Competency Form received from the contractor to the Safety Concurrence Group for evaluation.
- 9) In case SCG wants to visit the site, the Safety Competency will be based on evaluation at the time of site visit Annexure 13.1

**Annexure -13.1:**

<b>Checklist to be used:</b> During site visit to check the adequacy Safety systems.			
		Observation	Score* (1-5)
1	Check the adequacy of safety policy and Safety Management system of the contractor.		
2	Does the contractor have written down safety procedures?		



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3	Check the records of Near miss, unsafe act, unsafe conditions and incidents.		
4	Check the organization setup to implement the safety systems at site (safety officer, safety supervisor)		
5	Check whether safety meeting and toolbox talk carried out regularly and records maintained or not.		
6	Is the process of incident investigation adequate or not?		
7	Verify incident reporting and recording system		
8	Check the usage of equipment/tools and tackles.		
9	Check for housekeeping at site		
10	Check the use of PPEs and general behavior of workforce towards safety		
<b>Total Score</b>			
<b>Site Visit Score</b>			

Score\* - rating on the scale of 1-5 to be given based on the observations on site. Score of 1 is the lowest and score of 5 is the highest.

### Appendix 14: CSM-F-11.1 CFSA Format

CONTRACTOR FIELD SAFETY AUDIT						
<b>Project Name :</b>						
<b>Date:</b>						
<b>Description of Severity rating:</b>			<b>Audit Team:</b>			
	1 = Untidy area, minor issues, sets poor example					
	2 = Restricted access, unacceptable trash, disorderly					
	3 = Rule or procedure violation, potential injury					
	4 = Unsafe condition, serious injury potential					
	5 = Immediate serious injury potential, stop activity immediately and correct		<b>Audit Time:</b>		10:00hrs -11:30 hrs	
			<b>Weather:</b>		cloudy	
	<b>Description</b>	<b>Responsible</b>	<b>Number Personnel Observed</b>	<b>Violations</b>	<b>Remarks</b>	<b>Leading Indicators</b>



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		Engineer	Contractors	Good Citizens	Violators	Number of Violations	Severity	Violations x Severity		4 & 5	PPE	Unsafe Act	Unsafe Condition
Are													
a													
1													
	Sub Totals			0	0	0	0	0		0	0	0	0
	% of Observed People Working Safely												
	Number of Violations												
	Average Severity of Violations												
	Number of Severity 4 & 5 Violations												
	% of 4 & 5 Violations												
	Approximate Number of Workers Observed												
	Number of People on Site												
	% of Workers Observed												

## Appendix 15: Indicative List of High-Risk Jobs

To access the exhaustive list of High-risk jobs, please refer the following documents

- 1) [High Risk Jobs- Generation](#)
- 2) [High Risk Jobs- T&D](#)
- 3) [High Risk Jobs- Renewable](#)

Indicative List of High-Risk Jobs -Generation Cluster				
Sl. No.	Jobs			
1	Demolition / Painting of Chimney			
2	Survey Sounding Jobs in Sea			
3	Dredging at Coal Birth Jetty			
4	Maintenance / Testing and Replacement of Extra High Voltage (132 KV etc.) Switchyard equipment			
5	Maintenance of EOT Cranes			
6	Deep excavation (5 feet or more) near existing buildings /Structure s			
7	Working inside confined spaces (entry through manhole)			
8	Operation Maintenance of elevators			
9	Working on Live control Circuits for identification of faults			
10	Cable laying and termination Jobs			

Indicative List of High-Risk Jobs - T&D Cluster				
Sl. No.	Jobs			
1	Transmission Line Tower Erection on columns, near live lines, In congested areas, In creeks, In the Sea			
2	Conductor Stringing on Tower Using Tensioner & Puller in the area such as Line Crossing, Near Live lines, Congested Areas, Road Crossing, Bridge Crossing, Railway line Crossing, In creeks ,In the Sea			
3	Cable Pulling by Using winch Machine in City and Rural Areas			
4	Hot Washing of HT and Extra HT lines, Towers and switchyards equipment			
5	Installation of Lifts			
6	Installation of EOT Cranes			
7	Tower Dismantling			
8	Working on H Frame /Pole mounted Transformers			
9	Excavation in operational Area heaving power cables in receiving station			
10	Identification and spiking of cable / disconnection of cables from poles			





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## Indicative List of High-Risk Jobs - Renewable Cluster

Sl. No.	Jobs				
1	Working on Electrical Panels				
2	Hi Potting of Equipment				
3	Battery commissioning and maintenance				
4	Working on the nasal of Wind Turbine				
5	Working on live electrical switchyard, material Handling and Equipment installation				
6	Roof Top Solar Panels Installation and maintenance				
7	Working in live Electrical Switchyard, Material Handling, equipment installation				
8	All maintenance activities that requires climbing on Towers /Structures / Transformer/ GODs				
9	Loading and Unloading of Solar Panels on trucks				
10	Structural Repair /Dismantling work at height.				



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**ANNEXURE X**  
**TATA CODE OF CONDUCT**

The Owner abides by the Tata Code of Conduct in all its dealing with stake holders and the same shall be binding on the Owner and the Contractor for dealings under this Order/ Contract. A copy of the Tata Code of Conduct is available a tour website:

**<https://www.tatapower.com/pdf/aboutus/Tata-Code-of-Conduct.pdf>**

The Contractor is requested to bring any concerns regarding this to the notice of our Chief Procurement & Stores e-mail ID: [pkjain@tatapower.com](mailto:pkjain@tatapower.com).

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**ANNEXURE XI**  
**ENVIRONMENT & SUSTAINABILITY POLICY**



**CORPORATE ENVIRONMENT POLICY**

**Tata Power is committed to a clean, safe and healthy environment, and we shall operate our facilities in an environmentally sensitive and responsible manner. Our commitment to environmental protection and stewardship will be achieved by:**

- Complying with the requirements and spirit of applicable environmental laws and striving to exceed required levels of compliance wherever feasible
- Ensuring that our employees are trained to acquire the necessary skills to meet environmental standards
- Conserving natural resources by improving efficiency and reducing wastage
- Making business decisions that aim towards sustainable development
- Engaging with stakeholders to create awareness on sustainability

A handwritten signature in blue ink, appearing to read 'Praveer Sinha', with a horizontal line underneath.

(Praveer Sinha)  
CEO & Managing Director

Date: 15<sup>th</sup> June, 2018

**TATA POWER**  
Lighting up Lives!





## CORPORATE SUSTAINABILITY POLICY

At Tata Power, our Sustainability Policy integrates economic progress, social responsibility and environmental concerns with the objective of improving quality of life. We believe in integrating our business values and operations to meet the expectations of our customers, employees, partners, investors, communities and public at large

- We will uphold the values of honesty, partnership and fairness in our relationship with stakeholders
- We shall provide and maintain a clean, healthy and safe working environment for employees, customers, partners and the community
- We will strive to consistently enhance our value proposition to the customers and adhere to our promised standards of service delivery
- We will respect the universal declaration of human rights, International Labour Organization's fundamental conventions on core labour standards and operate as an equal opportunities employer
- We shall encourage and support our partners to adopt responsible business policies, Business Ethics and our Code of Conduct Standards
- We will continue to serve our communities:
  - By implementing sustainable Community Development Programmes including through public/private partnerships in and around our area of operations
  - By constantly protecting ecology, maintaining and renewing bio-diversity and wherever necessary conserving and protecting wild life, particularly endangered species
  - By encouraging our employees to serve communities by volunteering and by sharing their skills and expertise
  - By striving to deploy sustainable technologies and processes in all our operations and use scarce natural resources efficiently in our facilities
  - We will also help communities that are affected by natural calamities or untoward incidence, or that are physically challenged in line with the Tata Group's efforts

The management will commit all the necessary resources required to meet the goals of Corporate Sustainability.

(Praveer Sinha)  
CEO & Managing Director

Date: 15<sup>th</sup> June, 2018

**TATA POWER**  
Lighting up Lives!



1	2
Sl. No.	Information to Bidder
1	Bill of Quantity mentioned in the tables are indicative, this may vary to meet the functional or site requirement. It is the responsibility of the Bidder to include all Hardware, Software and Services as per functional requirement specified in the RFP and as per the phases mentioned.
2	Bidder to refer Approved make and model of the equipment to be considered for this project. All bidder's own and bought out items shall be subject to Purchaser's prior approval.
3	The bidder shall propose and design the solution considering all the functional requirement stated in the RFP and shall submit the overall System Architecture considering current and phase wise implementation.
4	System shall be modular in such a way that it shall allow flexible configuration of the system, adding modules as and when required. The system shall facilitate a gradual growth of the system through phased implementation as the Power System Network operating requirements expand or change.
5	Bidder shall include license for redundant applications as applicable. Bidder shall also consider the enterprise version of software as feasible to meet the required functionality and to reduce the overall cost.
6	All the offered system will be with Operating System and shall be of latest version at the time of delivery and phase wise commissioning
7	All Systems Application, OS and configuration tools shall be kept current with latest OS version, Application Software, Configuration tools as and when the new system will be implemented/added in a phased manner.
8	Configuration of all RTU and other system shall be identical except IP Schema and specific requirement of the site.
9	The RTU should be modular to enhance the capacity and expected communication response speed are achieved with distributed system and final architecture frozen during detailed engineering.
10	The offered solution shall meet all the Cyber Security Requirement as per the standards such as NERC_CIP, NISTR, ISO 27001 and NCIIPC guidelines. All the Cyber Security measures shall address Operational Technology requirement. Bidder shall ensure that the proposed architecture at Substation are certified by Cyber Security auditor for the compliance as per Industry standards. Bidder to demonstrate all the cyber security measures considered and implemented during FAT and SAT.
11	The proposed system will be integrated with other external systems and the required interfaces shall be considered accordingly. Since all external systems are different, special studies for interfaces shall be conducted for seamless integration.
12	The platform services shall be common to the whole family of products (Main & Standby RTU, Controller of DC System etc.); thus, integrated control of power system network is possible from one base platform. Allows data to be distributed across a number of sites and systems.
13	The bid shall include Unified data engineering environment for data take-on and data maintenance, facilitating a single point of entry for both data configuration and use for multiple application/calculation and data management.
14	Bidder to indicate clearly the no. of Software licenses (proprietary & third party) included taking into account no. of RTUs, Communication Equipment, Controller, redundant equipment, I/O Tags etc. Bidder shall also indicate the (slab-wise) incremental price for each of these licenses as applicable. It will be deemed to be nil if not indicated separately. Bidder shall consider enterprise license for common applications for proposed system.
15	Each selected application shall include necessary prerequisites, if any.
16	All cabling (Communication, Power Supply, Field, Interfaces) is in Bidder's scope. This includes supply, laying, termination and connection to equipment.
17	All Networking accessories and all types of Cables required for integration of other systems shall be considered by the bidder.

1	2
Sl. No.	Information to Bidder
18	Necessary Communication equipment (Industrial grade) such as Layer2 switches, Router, Networking cables, patch cords etc. for integrating the Substation Automation System with Purchaser's SCADA System through NBSP Communication network shall be in the scope of the Bidder. All structure cabling at Sub-Stations (if any) is in Bidder scope. All the Communication equipment shall be DC Powered.
19	Bidder to ensure the deployment of the resources and service requirement during Standard and Post Warranty Support for all the supplied equipment (Bidder's Own and bought out items). SLA will be prepared with the successful bidder to achieve the 24X7 availability and reliability of the installed system
20	It is the responsibility of the bidder to provide Patch Management, Software upgradation, Firmware Upgradation for Bidder's Owned items, Sub-vendor items, Communication and Networking items during Standard and Post Warranty duration as per the SLA
21	Purchaser may procure any item from elsewhere. Integration of those with supplied system is in Bidder's scope.
22	All annual maintenance charges of supplied Hardware, OS & Software are inclusive in the Warranty and Post Warranty of Bidder's Owned items, Sub-vendor items, Communication and Networking items, software licenses their renewal, upgrades etc.
23	All the materials to be delivered should be F.O.R at TPCODL sites.
24	The bidders are advised to quote prices strictly in the format attached.
25	The bidder must fill each and every column of the format attached. Mentioning "extra/inclusive" in any of the column may lead for rejection of the price bid.
26	No cutting/ overwriting in the prices is permissible.
27	The unit price to be indicated in col. No. 8 should be exclusive of taxes & duties which are to be indicated in separate columns meant for the purpose.
28	The bids will be evaluated commercially on the overall all-inclusive lowest cost lowest for the individual LOT as defined in the tender BOQ as calculated in Schedule of Items TPCODL however, reserves right to split the order line item wise and/or quantity wise among more than one Bidder. Hence, all bidders are advised to quote their most competitive rates against each line item.
29	In case of increase in quantity for any item, the unit rate mentioned above shall be considered for the same.
30	HSN/SAC codes for respective line item must be mandatorily provided wherever applicable.
31	TPCODL reserve the right to split the order quantity to any extent amongst the bidders.

	Supply (INR)	Services (INR)	Standard & Extended Warranty (INR)	*Optional Item # 1 (Ph 1) (INR)	Mandatory Spares (Ph 2) (INR)	Training (INR)	Total (INR)
	All Inclusive	All Inclusive	All Inclusive	All Inclusive	All Inclusive	All Inclusive	All Inclusive
<b>Phase # 1</b>	0	0	0	0	-	0	0
<b>Phase # 2</b>	0	0	0	-	0	0	0
<b>Grand Total (Phase 1+ Phase 2) (INR)</b>	<b>0</b>						

\*Optional Item not included in total cost for Phase #1

**Note:**

Bidder to note that the prices quoted for optional item will be used for any Addition/Deletion of module as per the site Requirement. The Modules shall be considered with all required software, Cables, Connectors etc.



for

Sl. No.	Item	Description	Item	Reference	UOM	Qty
<b>Phase # 1</b>						
<b>A</b>		<b>RTU Based Substation Automation System (Indoor Type)</b>				
A1	Conventional Substations (22 Nos.)	RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	A1	RTU_CONV_SS_BOM_PH1	Lot	18
A2		RTU System Applications Software Licenses with OS	J.1 - J.5		Lot	18
A3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	18
A4		RTU System Engineering, Installation, Commissioning & Testing Services	K.1		Lumpsum	18
<b>Total of A</b>						
<b>B</b>		<b>SIC System (Indoor Type)</b>				
B1	Conventional Substations (22 Nos.)	SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	C3	RTU_CONV_SS_BOM_PH1	Lot	18
B2		SIC System Applications Software Licenses with OS	J.6 - J.7		Lot	18
B3		SIC System Engineering, Installation, Commissioning & Testing Services	K.3		Lumpsum	18
<b>Total of B</b>						
<b>C</b>		<b>RTU Based Substation Automation System (Outdoor Type)</b>				
C1	Conventional Substations (22 Nos.)	RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	B.2	RTU_CONV_SS_BOM_PH1	Lot	4
C2		RTU System Applications Software Licenses with OS	J.1 - J.5		Lot	4
C3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	4
C4		RTU System Engineering, Installation, Commissioning & Testing Services	K.2		Lumpsum	4
<b>Total of C</b>						
<b>D</b>		<b>SIC System (Outdoor Type)</b>				
D1	Conventional Substations	SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	D.4	RTU_CONV_SS_	Lot	4

for

Sl. No.	Item	Description	Item	Reference	UOM	Qty
D2	Substations (22 Nos.)	SIC System Applications Software Licenses with OS	J.6 - J.7	BOM_PH1	Lot	4
D3		SIC System Engineering, Installation, Commissioning & Testing Services	K.4		Lumpsum	4
<b>Total of D</b>						
<b>E</b>	Conventional Substations (22 Nos.)	<b>Contact Multiplier Relay with Mounting Base</b>		RTU_CONV_SS_ BOM_PH1		
E1		Contact Multiplier Relay with Mounting Base	E.5		Lot	1
E2		Installation and Commissioning of Contact Multiplier Relays with bases in CRP Panel	K.5		Lot	1
<b>Total of E</b>						
<b>F</b>	Conventional Substations (22 Nos.)	<b>Interposing Relay with Mounting Base for Digital Output</b>		RTU_CONV_SS_ BOM_PH1		
F1		Interposing Relay with Mounting Base for Digital Output	F.6		Lot	1
F2		Installation and Commissioning of Interposing Relays with bases in SIC Panel	K.6		Lot	1
<b>Total of F</b>						
<b>G</b>	Conventional Substations (22 Nos.)	<b>Multi Function Meter</b>		RTU_CONV_SS_ BOM_PH1		
G1		Multi Function Meter for all 33, 11 KV Feeders and BUS PTs	21		Lot	1
G2		Installation and Commissioning of Multifunction Meters in CRP Panel an it integration with RTU	K.7		Lot	1
<b>Total of G</b>						
<b>H</b>	Conventional Substations (22 Nos.)	<b>GPS Clock with NTP Server</b>		RTU_CONV_SS_ BOM_PH1		
H1		GPS Clock with NTP/SNTP Server	20		Nos.	22
H2		Installation and Commissioning of GPS Receiver and its integration with site equipment	K.8		Nos.	22
<b>Total of H</b>						
<b>I</b>	Conventional Substations	<b>Temperature &amp; Humidity Sensor</b>		RTU_CONV_SS_ BOM_PH1		
I1		Temperature & Humidity Sensor	24		Nos.	15
I2		Installation and Commissioning of Temperature & Humidity Sensor and its Integration with RTU	K.9		Nos.	15
<b>Total of I</b>						

for

Sl. No.	Item	Description	Item	Reference	UOM	Qty
<b>J</b>	Conventional Substations (22 Nos.)	<b>Instrumentation Cable for Status, Control &amp; Power Supply</b>		RTU_CONV_SS_BOM_PH1		
J1		Instrumentation Cable for Status, Control & Power Supply	G.7-G.12		Lot	1
J2		Laying and Termination of Instrumentation and Power Supply Cables	K.10		Lot	1
<b>Total of J</b>						
<b>K</b>	Conventional Substations (22 Nos.)	<b>Communication Cable for MFM, IEDs Integration</b>		RTU_CONV_SS_BOM_PH1		
K1		Communication Cable for MFM, IEDs Integration	H.13-H.16		Lot	1
K2		Laying and Termination of Instrumentation and Power Supply Cables	K.11		Lot	1
<b>Total of K</b>						
<b>L</b>	Conventional Substations (22 Nos.)	<b>24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller</b>		RTU_CONV_SS_BOM_PH1		
L1		24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller	I.17-I.19		Nos.	22
L2		DC System Controller OS, Application Software Licenses	J.9-J.10		Nos.	22
L3		Decommissioning of existing DC System (Battery & Battery Charger) and Installation and Commissioning of New DC System (Battery & Battery Charger and DCDB) & restoration of DC supply to existing DCDB	K.12		Nos.	22
<b>Total of L</b>						
<b>M</b>	<b>Engineering Configuration Laptop</b>					
M1	Engineering Configuration Laptop					

for

Sl. No.	Item	Description	Item	Reference	UOM	Qty
M2	Conventional Substations	Microsoft Windows compatible with latest version of configuration software, Microsoft Office License pack, Antivirus Symantec Endpoint protection small business edition with three year subscription, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU and Protection IEDs, Simulation Software, Applicable Software licenses for SIC System and shall be in-line with RTU Software. Proposed Licenses shall be independent of Engineering	23	RTU_CONV_SS_BOM_PH1	Set	7
<b>Total of M</b>						
<b>N</b>	<b>Earthing and Earth Pit</b>					
N1	Conventional Substations (22 Nos.)	Earthing and Earth Pit	22	RTU_CONV_SS_BOM_PH1	Set	22
N2		Installation and Commissioning of Earth Pit and laying and termination of earthing cable for RTU, SIC and DC System	K.13			
<b>Total of N</b>						
<b>TOTAL OF (A+B+C+D+E+F+G+H+I+J+K+L+M+N)</b>						
<b>O</b>	<b>Standard and Extended Warranty</b>					
O.1	Standard Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.	L.1		Lumpsum	1
<b>Total of O.1</b>						
O.2	Extended Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products for next 5 years over and above as mentioned in item O.1	L.2		Lumpsum	1
<b>Total of O.2</b>						

for

Sl. No.	Item	Description	Item	Reference	UOM	Qty
O.3	Extended Warranty Support	Hardware & Software warranty support for next 5 years over and above as mentioned in clause O.1 and O.2 for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products.	L.3		Lumpsum	1
<b>Total of O.3</b>						
<b>Total of O</b>						
P	Training	<b>Training (50 Man-days)</b>			Man-days	
P.1		RTU based Automation System - On-site Training	M.1			50
<b>Total of P</b>						
<b>Grand Total (Supply + Services + Warranty + Training) for Phase # 1</b>						
Q	Optional Item #1	Optional item of RTU	N		Lumpsum	1

1	2	3	4	5	6	7	8	9	10	11	12
Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
A	<b>Pre-Wired RTU Panel (Indoor Application)</b>										
1	Pre-Wired RTU Panel	<b>Pre-Wired RTU Panel (Indoor Application)</b> <b>RTU Redundancy :</b> Mandatory <b>I/O Requirement:</b> with 96 DI, 48 DO, 16 AI with Auxiliary relay for each Digital Output <b>Communication Ports:</b> RS-485 - Minimum 6 nos. ports, 4 nos. Ethernet ports (Independent Ethernet Port for Master and IED communication) <b>Power supply:</b> Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact <b>Protocols :</b> IEC104, IEC103, IEC61850 (ED1, ED2), MODBUS (Serial), MODBUS (TCP/IP) with Server and Client license, SNMP, SNMP, MQTT <b>Software Licenses:</b> Application Software, Configuration tools, Diagnostic tools. Logic building Application-Interlock logic, Calculation Package, SMS Utility Software <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application. <b>Other Accessories:</b> Pre-fabricated cables for I/O modules, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies	Set		1	18			0	0	0
	Managed Layer2 Ethernet Switch	<b>Managed L2 Ethernet Switch for IED Communication &amp; for SCADA Integration</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (4 Nos., SM) & Copper Ports (8 Nos.) <b>Power Supply:</b> Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in RTU Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	18			0	0	0
	Managed Layer2 Ethernet Switch	<b>Managed L2 Ethernet Switch for 33 &amp; 11 kV IED Communication</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (2 Nos., MM) & Copper Ports (10 Nos.) <b>Power Supply:</b> Non-Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in CRP (33 & 11 kV) Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	18			0	0	0
	Networking Accessories	<b>Networking Accessories for Integration of IEDs, Ethernet Switches &amp; RTU</b> All required networking accessories like patch panel (for each ethernet switch), LIU, patch cords (Fibre Optic, UTP as per the Ethernet Switch Configuration) of suitable length, Conduits for all non-armored cables, RJ45 connectors, I/O boxes with Quad face plate and connectors etc.	Set		1	18			0	0	0
<b>Sub Total of RTU System for Indoor Application</b>											0
B	<b>Pre-Wired RTU Panel (Outdoor Application)</b>										

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
2	Pre-Wired RTU Panel	<b>Pre-Wired RTU Panel (Outdoor Application)</b> RTU Redundancy : Mandatory I/O Requirement: with 96 DI, 48 DO, 16 AI with Auxiliary relay for each Digital Output Communication Ports: RS-485 - Minimum 6 nos. ports, 4 nos. Ethernet ports (Independent Ethernet Port for Master and IED communication) Power supply: Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact Protocols : IEC104, IEC103, IEC61850 (ED1, ED2), MODBUS (Serial), MODBUS (TCP/IP) with Server and Client license, SNTp, SNMP, MQTT Software Licenses: Application Software, Configuration tools, Diagnostic tools. Logic building Application-Interlock logic, Calculation Package, SMS Utility Software Mounting: To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application. Other Accessories: Pre-fabricated cables for I/O modules, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies	Set		1	4			0	0	0
	Managed Layer2 Ethernet Switch	<b>Managed L2 Ethernet Switch for IED Communication &amp; for SCADA Integration</b> Communication Ports: 12 PORT L2 W/100/1000 MBPS, Combination of FO (4 Nos., SM) & Copper Ports (8 Nos.) Power Supply: Redundant 24 V DC through MCBs with add-on NO contact Mounting Arrangement: To be mounted in RTU Panel Qty: 2 nos. Preferred Make: Ruggedcom/Hirschman/MOXA	Set		1	4			0	0	0
	Managed Layer2 Ethernet Switch	<b>Managed L2 Ethernet Switch for 33 &amp; 11 kV IED Communication</b> Communication Ports: 12 PORT L2 W/100/1000 MBPS, Combination of FO (2 Nos., MM) & Copper Ports (10 Nos.) Power Supply: Non-Redundant 24 V DC through MCBs with add-on NO contact Mounting Arrangement: To be mounted in CRP (33 & 11 kV) Panel Qty: 2 nos. Preferred Make: Ruggedcom/Hirschman/MOXA	Set		1	4			0	0	0
	Networking Accessories	<b>Networking Accessories for Integration of IEDs, Ethernet Switches &amp; RTU</b> All required networking accessories like patch panel (for each ethernet switch), LIU, patch cords (Fibre Optic, UTP as per the Ethernet Switch Configuration) of suitable length, Conduits for all non-armored cables, RJ45 connectors, I/O boxes with Quad face plate and connectors etc.	Set		1	4			0	0	0
<b>Sub Total of RTU System for Outdoor Application</b>											0
C	<b>Pre-Wired SIC Panel (Indoor Application)</b>										
3	Signal Interface Panel	<b>SIC- Panel for Termination of field cable and housing of interface and I/O modules (Indoor Application)</b> Input/Output Interface: For integration of I/O modules, interface modules etc. These I/O, Interface modules shall communicate to both Main and Stand-by RTU as per Item no. 1. Communication Ports: Interface modules shall have ports to communicate with Main & Standby RTU Protocols : Interface modules shall use Open Protocols, No proprietary protocols are envisaged Power supply: Redundant 24 V DC Supply with Diode O-ring unit and MCBs with add-on NO contact Mounting: To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application. Other Accessories: Pre-fabricated cables for I/Os cards, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies, Necessary TBs, Din rail channels and other accessories.	Set		1	18			0	0	0
<b>Sub Total of SIC Panel for Indoor Application</b>											0
D	<b>Pre-Wired SIC Panel (Outdoor Application)</b>										

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
4	Signal Interface Panel	<b>SIC- Panel for Termination of field cable and housing of interface and I/O modules (Outdoor Application)</b> <b>Input/Output Interface:</b> For integration of I/O modules, interface modules etc. These I/O, Interface modules shall communicate to both Main and Stand-by RTU as per Item no. 1. <b>Communication Ports:</b> Interface modules shall have ports to communicate with Main & Standby RTU <b>Protocols :</b> Interface modules shall use Open Protocols, No proprietary protocols are envisaged <b>Power supply:</b> Redundant 24 V DC Supply with Diode O-ring unit and MCBs with add-on NO contact <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application. <b>Other Accessories:</b> Pre-fabricated cables for I/Os cards, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies, Necessary TBs, Din rail channels and other accessories.	Set		1	4			0	0	0
<b>Sub Total of SIC Panel for Outdoor Application</b>											
E	<b>Contact Multiplier Relay with Mounting Base [Total Substations=22 (Indoor (18)+ Outdoor(4))]</b>										
5	CMR with Mounting Base	<b>Contact Multiplier Relay with Mounting Base:</b> 1. Contact Material : Silver Alloy 2. Contact Rating : 5 Amps. @ 24 V DC 3. Contact Resistance : 50 M ohms max. (Initial) 4. Dielectric Strength : i) Between open contacts : 500 V Rms ii) Between Contact and Coil : 2000 V Rms 5. Insulation Resistance : 500 M ohms @ 500 V DC, 250C 6. Operate time at Nominal Voltage : 20 milli seconds 7. Release time at nominal Voltage : 10 milli seconds 8. Ambient temperature : 0 to 70°C 9. Life expectancy : i. Mechanical : 106 operations. ii. Electrical : 105 operations at rated load 10. Coil Resistance at nominal Voltage (DC) : 30,000 ohms +10% at 250°C 11. Type of contact multiplier : 4R – 2 – 220 LD with DIN rail mounting with LED indicator 12. Type of mounting : Socket mounting. 13. No. of Poles. : 2 No. + 2 Nc. 14. Other Accessories: Necessary TB, Din rail channel and other accessories to mount in CRP	Nos./Substation		96	2112			0	0	0
<b>Sub Total of Contact Multiplier Relay with Mounting Base</b>											
F	<b>Interposing Relay with Mounting Base for Digital Output [Total Substations=22 (Indoor+ Outdoor)]</b>										
6	Interposing Relay for Digital Output	<b>Interposing Relays for Digital Output</b> 1. Auxiliary Power. : 24 V DC 2. Input signal from field : 24 VDC. 3. Input impedance : More than 50 Kilo ohms. 4. Output signal to the RTU : 24 V DC digital input module. 5. Contact mechanism : Self Reset 6. Contact Make & Carry : 30 A for 3 Sec. & 5A continuously at 660V 7. Operating time : Approx. 15m sec. 8. Other Accessories: Necessary TB, Din rail channel and other accessories to mount in SIC Panel	Nos./Substation		48	1056			0	0	0
<b>Sub Total of Interposing Relays for Digital Output</b>											
G	<b>Instrumentation Cable for Status, Control &amp; Power Supply [Total Substations=22 (Indoor+ Outdoor)]</b>										



Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
7	Instrumentation Cable 12 Core Armored 0.5 mm <sup>2</sup> for Status and Indications	<b>Instrumentation Cable for Status and Indications</b> 12 Core armored 0.5 sq.mm. 1100 V rated, annealed stranded copper, PVC insulated, individual and overall shielded, field cable <b>Preferred Make:</b> CCI / FINOLEX / HAVELLS / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		600	13200			0	0	0
8	Instrumentation Cable 7 Core Armored 1.5 mm <sup>2</sup> for Control Output	<b>Instrumentation Cable for Control Output</b> 7 Core armored 1.5 sq.mm. 1100V rated, annealed stranded copper, PVC insulated, individual and overall shielded, field cable <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		280	6160			0	0	0
9	Twisted Pair Shielded & Overall shielded Instrumentation Cable 5 Pair Armored 1.0 mm <sup>2</sup> for Analog Input	<b>Twisted paired Shielded &amp; Overall Shielded Cable for Analog Inputs</b> 5 Pair armored 1.0 sq.mm copper twisted paired shielded and Overall shielded cable for Analog inputs from CRP panel to the RTU <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		50	1100			0	0	0
10	10C X 2.5 mm <sup>2</sup> Copper cable for extension of CT	<b>Control Cable for CT Extension</b> 10 core X 2.5 sq.mm. multistrand copper cable for extending CT & CVT inputs to the MFM in the CRP panel. <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		20	440			0	0	0
11	4C X 2.5 mm <sup>2</sup> Copper cable for extension of PT	<b>Control Cable for PT Extension</b> 4 core X 4 sq.mm. multistrand copper cable for extending PT inputs to the MFM in the CRP panel <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		20	440			0	0	0
12	3C X 4 mm <sup>2</sup> power Supply Cable for extension of DC Supply	<b>Power Supply Cable from DCDB to RTU &amp; SIC Panel</b> 3 core X 4 sq.mm. Armored multistrand Power Supply cable for extending Power Supply from DCDB to RTU & SIC Panel <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		100	2200			0	0	0
<b>Sub Total of Instrumentation Cable for Status, Control &amp; Power Supply</b>											0
H	<b>Communication Cable for MFM, IEDs Integration</b>										
13	4P X 0.36 mm <sup>2</sup> Armored Communication Cable for MFM	<b>Communication Cable:</b> 4P X 0.36 Sq.mm Armored multistrand Pair and Overall shielded, for Multifunction Meter looping. <b>Preferred Make :</b> Belden/LAPP/SATYAM	Meters/ Substation		120	2640			0	0	0
14	Armored CAT6 UTP Cable	Armored CAT6 UTP Cable <b>Preferred Make : Systemax</b>	Meters/ Substation		50	1100			0	0	0
15	Un-Armored CAT6 UTP Cable	Un-Armored CAT6 UTP Cable <b>Preferred Make : Systemax</b>	Meters/ Substation		100	2200			0	0	0
16	Armored FO Cable 12 Core SM/MM	Armored Fibre Optic Cable for SCADA 12 core, SM/MM <b>Preferred Make Finolex / KEC / Apar</b>	Meters/ Substation		100	2200			0	0	0
<b>Sub Total of Communication Cable for MFM, IEDs Integration</b>											0
I	<b>24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller</b>										
17		24V, 70 Amp Float Cum Boost Charger with Microprocessor based Controller (N+1)	No.		1	22			0	0	0

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
18	24 V DC SYSTEM	24V, 150 AH VRLA Type Storage Battery (Type-1)	Set		1	4			0	0	0
		24V, 200 AH VRLA Type Storage Battery (Type-2)	Set		1	18			0	0	0
19		DCDB with 2 Incomers and 15 Outgoing Feeders	No.		1	22			0	0	0
<b>Sub Total of DC System</b>											0
<b>Grand Total Supply (A+B+C+D+E+F+G+H+I)</b>											0
20	GPS Clock with NTP Server	<p><b>GPS Clock with NTP Server</b></p> <p><b>GPS Receiver Clock:</b> 19" rack mountable chassis w/sliding Rapid/Versa rails and cable management arm, Size - 1U/2U, Front keyboard with status LEDs and LCD display, Battery Backup</p> <p><b>Outputs:</b> TCP/IP (Redundant), Potential Free Pulse Contacts for 1 PPM, 1 PPS, 1 PPH, Potential free alarm contacts</p> <p><b>Protocols:</b> NTP, SNTP, Pulse</p> <p><b>Power Supply:</b> 24 V DC Power Supply, with battery backup</p> <p><b>Antenna :</b> Helical, with connectors, min 50 mtrs Low loss cable, Lighting Arrester with wall mounting arrangement, Length of the Low Loss Antenna Cable will be as per site requirement</p> <p><b>Mounting :</b> To be mounted in RTU Panel</p> <p><b>Preferred make -</b> Sertel / Masibus/Sands</p>	Nos.		1	22			0	0	0
<b>Sub Total of GPS Clock with NTP Server</b>											0
21	Multifunction Meter	<p><b>Multi Function Meter :</b> For all 33 &amp; 11 KV Feeders</p> <p>Multifunctional 3-phase Power meter, four quadrant active and reactive energy polyphase static meter</p> <p><b>Accuracy Class:</b> 0.2 S as per IEC62053:22</p> <p><b>Voltage Inputs:</b> Operating range : 690 V AC line-to-line, 460 V AC line-to-neutral</p> <p><b>Current Inputs:</b> 1A / 5A (User selectable CT secondary 1A / 5A, PT Secondary)</p> <p><b>Wiring configurations:</b> 3OP2, 4LN3, 3DIR2, 4LL3, 3OP3, 3LN3, 3LL3, 3BLN3, 3BLL3 (All wiring configurations selected via the front panel)</p> <p><b>Communication Port:</b> RS 485 Serial Port with removable connector</p> <p><b>Protocols:</b> MODBUS RTU, Assignable Register map, Device Address (User Configurable - (1-247))</p> <p><b>Auxiliary Supplies:</b> 24 V DC</p> <p><b>Other Accessories:</b> Necessary TB, Din rail channel and other accessories for flash mounting in CRP</p> <p><b>Preferred Make:</b> SATEC PM130EH+</p>	Nos./Substation		10	220			0	0	0
<b>Sub Total of Multi Function Meter</b>											0
22	Earthing and Earth Pit	<p><b>Earthing:</b></p> <p>a) Earth Pit: Separate earth pits should be provisioned for attaining the resistance value of maximum 2 Ohms.</p> <p>b) Earthing Wires: RTU Panels, SIC Panel, DC Systems are to be wired with Earth Pit. Copper wires size would be minimum of 10 Sq.mm.</p>	Set		-	22			0	0	0
<b>Sub Total of Earthing and Earth Pit</b>											0
<b>Grand Total Supply (A+B+C+D+E+F+G+H+I) + Item 20 + Item 21 + Item 22</b>											0
23	Engineering Configuration Laptop	<p><b>Configuration Laptop</b></p> <p><b>Hardware:</b> Laptop with latest processor, 1 TB SSD, 8 GB RAM, DVD RW, Ethernet Port, 4 USB Ports, 15" Display with 1 no. serial to USB converter</p> <p><b>Software License:</b> Microsoft Windows compatible with latest version of configuration software, Microsoft Office License pack, Antivirus Symantec Endpoint protection small business edition with three year subscription, Configuration &amp; maintenance software tools, Diagnostic tools. Logic building Application of RTU and Protection IEDs, Simulation Software, Applicable Software licenses for SIC System and shall be in-line with RTU Software. Proposed Licenses shall be independent of Engineering Configuration Laptop Hardware.</p> <p><b>Preferred Make -</b> "DELL/HP"</p>	Nos.		-	7			0	0	0
24	T&H Sensor	Temperature & Humidity Transmitter : for integration with RTU on RS485 MODBUS	Nos.		-	15			0	0	0

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
											0
<b>J</b>	<b>RTU and SIC System Software</b>										
J.1	RTU	RTU OS, Application Software Licenses (Main & Standby)	Lumpsum		1	22			0	0	0
J.2		5000 Physical I/O tags, 40 IEDs - IEC61850 (ED1, ED2), 25 IEDs - Serial Protocol	Lumpsum		1	22			0	0	0
J.3		RTU shall Communicate to Eight Independent Remote SCADA Master on IEC 60870-5-104	Lumpsum		1	22			0	0	0
J.4		SMS Utility Software				22			0	0	0
J.5		<b>Protocols</b> : IEC 60870-5-101, IEC 60870-5-104, IEC 61850 (ED1, ED2), MODBUS (Serial & TCP/IP), MQTT, SNMP (V1.0, V2.0, V3.0), NTP & SNTP, RSTP, PRP & HSR	Lumpsum		1	22			0	0	0
<b>Sub Total Software (J.1... J.5)</b>											0
J.6	SIC	Interface Module shall be in-line with RTU Application Software	Lumpsum		1	22			0	0	0
J.7		<b>Protocols</b> : Communication between SIC I/O interface modules shall be on Open Protocol, No proprietary protocol is envisaged, SNMP (V1.0, V2.0, V3.0), NTP & SNTP	Lumpsum		1	22			0	0	0
<b>Sub Total Software (J.6 + J.7)</b>											0
J.8	Ethernet Switch	Software for Local and Remote configuration of Ethernet Switches - Enabling Monitoring, Configuration, Maintenance and backup of configuration files	Lumpsum		1	22			0	0	0
<b>Sub Total Software Ethernet Switch</b>											0
J.9	DC System Controller	Controller OS, Application Software Licenses (Integration with Main & Standby RTU)	Lumpsum		1	22			0	0	0
J.10		<b>Protocols</b> : IEC 60870-5-104, IEC 61850 (ED1, ED2), MODBUS (Serial & TCP/IP), SNMP (V1.0, V2.0, V3.0), NTP & SNTP	Lumpsum		1	22			0	0	0
<b>Sub Total Software (J.9 + J.10)</b>											0
<b>K</b>	<b>Services</b>										
K.1	<b>Services of RTU based System for Indoor Application</b>	Integration and Commissioning RTU Based System for Indoor Application a) Site Survey, Design, Engineering, Finalization of BOM, FDS b) Transportation, Delivery, Unloading and Storage c) Installation and commissioning of Pre-wired RTU and Networking equipment d) Civil Activities for installation of RTU panel e) Cable laying, termination and continuity check of all cables f) Integration of all Protection, MFM, Condition Monitoring devices etc. g) Powering up of all supplied materials h) Configuration of RTU and its accessories i) Integrated testing with Purchaser's SCADA System j) I/O testing, Pre- SAT testing of Hardware and Software functionality k) Integrated FAT & SAT for Hardware and Software l) Demonstration of System Capacity and Performance Guarantee Test m) Submission of As-Built Drawings, RTU Backup	Lumpsum		1	18			0	0	0
K.2	<b>Services of RTU based System for Outdoor Application</b>	Integration and Commissioning RTU Based System for Outdoor Application a) Site Survey, Design, Engineering, Finalization of BOM, FDS b) Transportation, Delivery, Unloading and Storage c) Installation and commissioning of Pre-wired RTU and Networking equipment d) Civil Activities for installation of RTU panel e) Cable laying, termination and continuity check of all cables f) Integration of all Protection, MFM, Condition Monitoring devices etc. g) Powering up of all supplied materials h) Configuration of RTU and its accessories i) Integrated testing with Purchaser's SCADA System j) I/O testing, Pre- SAT testing of Hardware and Software functionality k) Integrated FAT & SAT for Hardware and Software l) Demonstration of System Capacity and Performance Guarantee Test m) Submission of As-Built Drawings, RTU Backup	Lumpsum		1	10			0	0	0

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
K.3	Services of SIC based System for Indoor Application	Integration and Commissioning SIC System for Indoor Application a) Design, Engineering, Finalization of BOM b) Transportation, Delivery, Unloading and Storage c) Civil Activities for installation of RTU panel d) Installation and commissioning of Pre-wired SIC and Networking equipment (if Any) e) Cable laying, termination and continuity check of all cables f) Powering up of all supplied materials g) Configuration of SIC Interface Module and its accessories h) Integrated testing with RTU System i) I/O testing, Pre- SAT testing of Hardware and Software functionality j) Integrated FAT & SAT for Hardware and Software k) Submission of As-Built Drawings	Lumpsum		1	12			0	0	0
K.4	Services of SIC based System for Outdoor Application	Integration and Commissioning SIC System for Outdoor Application a) Design, Engineering, Finalization of BOM b) Transportation, Delivery, Unloading and Storage c) Civil Activities for installation of RTU panel d) Installation and commissioning of Pre-wired SIC and Networking equipment (if Any) e) Cable laying, termination and continuity check of all cables f) Powering up of all supplied materials g) Configuration of SIC Interface Module and its accessories h) Integrated testing with RTU System i) I/O testing, Pre- SAT testing of Hardware and Software functionality j) Integrated FAT & SAT for Hardware and Software k) Submission of As-Built Drawings	Lumpsum		1	4			0	0	0
K.5	Services for CMR	Installation and Commissioning of Contact Multiplier Relays with bases in CRP Panel	Lumpsum		1	22			0	0	0
K.6	Services for Interposing Relays	Installation and Commissioning of Interposing Relays with bases in SIC Panel	Lumpsum		1	22			0	0	0
K.7	Services for MFM	Installation and Commissioning of Multifunction Meters in CRP Panel at it integration with RTU	Lumpsum		1	22			0	0	0
K.8	Services for GPS	Installation and Commissioning of GPS Receiver and its integration with site equipment	Lumpsum		1	22			0	0	0
K.9	Services for T&H	Installation and Commissioning of Temperature & Humidity Sensor and its Integration with RTU	Lumpsum		1	15			0	0	0
K.10	Services for Control Cable	Laying and Termination of Instrumentation and Power Supply Cables	Lumpsum		1	22			0	0	0
K.11	Services for Communication Cable	Laying and Termination of Communication Cables	Lumpsum		1	22			0	0	0
K.12	Services for DC System	Decommissioning of existing DC System (Battery & Battery Charger) and Installation and Commissioning of New DC System (Battery & Battery Charger and DCDB) & restoration of DC supply to existing DCDB	Lumpsum		1	22			0	0	0
K.13	Services for Earthing & Earth Pit	Installation and Commissioning of Earth Pit and laying and termination of earthing cable for RTU, SIC and DC System	Lumpsum		1	22			0	0	0
<b>Sub Total T = (K.5 + K.6 + K.7 +K.8+K.9+ K.10 + K.11 + K.12 + K.13)</b>									0	0	0
<b>Total Services for Indoor Application (K.1 + K.3)</b>									0	0	0
<b>Total Services for Outdoor Application (K.2 + K.4)</b>									0	0	0
<b>Grand Total Services for Indoor Application [(K.1 + K.3) +(18/22) * T]</b>									0	0	0
<b>Total Services for Outdoor Application [(K.2 + K.4) +(4/22) *T]</b>									0	0	0

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
<b>L</b>		<b>Standard and Extended Warranty</b>									
L.1	Standard Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.	Lumpsum			1			0	0	0
<b>Total of L.1</b>											
L.2	Extended Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products for next 5 years over and above as mentioned in item O.1	Lumpsum			1			0	0	0
<b>Total of L.2</b>											
L.3	Extended Warranty Support	Hardware & Software warranty support for next 5 years over and above as mentioned in clause O.1 and O.2 for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products.	Lumpsum			1			0	0	0
<b>Total of L.3</b>											
<b>Total of L</b>											
<b>M</b>		<b>Training (50 Man-days)</b>									
M.1	Training	RTU based Automation System - On-site Training	Man-days			50			0	0	0
<b>Total of M</b>											
<b>N</b>	<b>Optional Item : RTU</b>										
N.1	Optional Item #1	RTU Chassis	No.	-	1				0	0	0
N.2		CPU Module of the RTU	No.	-	1				0	0	0
N.3		Power Supply Module of the RTU	No.	-	1				0	0	0
N.4		Memory Module of the RTU	No.	-	1				0	0	0
N.5		Communication Module (Ethernet)	No.	-	1				0	0	0
N.6		Communication Module (Serial)	No.	-	1				0	0	0
N.7		DI Cards for Digital Inputs	No.	-	1				0	0	0
N.8		DO Cards for Digital Output	No.	-	1				0	0	0
N.9		AI Cards for Analog Inputs	No.	-	1				0	0	0
N.10		Bus Coupler Module (If Applicable)	No.	-	1				0	0	0
N.11		Remote I/O Rack with all accessories, cables etc. (if Applicable)	No.	-	1				0	0	0
N.12		Interface Module for Digital Inputs with FRC cable	No.	-	1				0	0	0
N.13		Interface Module for Digital Outputs with FRC cable	No.	-	1				0	0	0
N.14		Interface Module for Analog Inputs with FRC cable	No.	-	1				0	0	0
N.15		Any Other Modules Specific to OEM Solution	Lot	-	1				0	0	0
N.16		Managed Ethernet Switch - RTU	No.	-	1				0	0	0
N.17		Managed Ethernet Switch - CRP	No.	-	1				0	0	0
N.18		CMR Relay with Base	No.	-	1				0	0	0
N.19		HDR Relay with Base	No.	-	1				0	0	0
<b>Total of N</b>											

Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>Phase # 2</b>							
<b>A</b>	<b>RTU Based Substation Automation System (Indoor Type)</b>						
A1	Conventional Substations (67 Nos.)	RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	A1	RTU_CONV_SS_BOM_PH2	Lot	50	0
A2		RTU System Applications Software Licenses with OS	J.1-J.5		Lot	50	0
A3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	50	0
A4		RTU System Engineering, Installation, Commissioning & Testing Services	K.1		Lumpsum	50	0
<b>Total of A</b>							<b>0</b>
<b>B</b>	<b>SIC System (Indoor Type)</b>						
B1	Conventional Substations (67 Nos.)	SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	C.3	RTU_CONV_SS_BOM_PH2	Lot	50	0
B2		SIC System Applications Software Licenses with OS	I.6-I.7		Lot	50	0
B3		SIC System Engineering, Installation, Commissioning & Testing Services	K.3		Lumpsum	50	0
<b>Total of B</b>							<b>0</b>
<b>C</b>	<b>RTU Based Substation Automation System (Outdoor Type)</b>						
C1	Conventional Substations (67 Nos.)	RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	B.2	RTU_CONV_SS_BOM_PH2	Lot	17	0
C2		RTU System Applications Software Licenses with OS	J.1-J.5		Lot	17	0
C3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	17	0
C4		RTU System Engineering, Installation, Commissioning & Testing Services	K.2		Lumpsum	17	0
<b>Total of C</b>							<b>0</b>
<b>D</b>	<b>SIC System (Outdoor Type)</b>						
D1	Conventional Substations (67 Nos.)	SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	D.4	RTU_CONV_SS_BOM_PH2	Lot	17	0
D2		SIC System Applications Software Licenses with OS	I.6-I.7		Lot	17	0
D3		SIC System Engineering, Installation, Commissioning & Testing Services	K.4		Lumpsum	17	0
<b>Total of D</b>							<b>0</b>
<b>E</b>	<b>Contact Multiplier Relay with Mounting Base</b>						
E1	Conventional Substations (67 Nos.)	Contact Multiplier Relay with Mounting Base	E.5	RTU_CONV_SS_BOM_PH2	Lot	1	0
E2		Installation and Commissioning of Contact Multiplier Relays with bases in CRP Panel	K.5		Lot	1	0
<b>Total of E</b>							<b>0</b>
<b>F</b>	<b>Interposing Relay with Mounting Base for Digital Output</b>						
F1	Conventional Substations (67 Nos.)	Interposing Relay with Mounting Base for Digital Output	F.6	RTU_CONV_SS_BOM_PH2	Lot	1	0
F2		Installation and Commissioning of Interposing Relays with bases in SIC Panel	K.6		Lot	1	0
<b>Total of F</b>							<b>0</b>
<b>G</b>	<b>Multi Function Meter</b>						
G1	Conventional Substations (67 Nos.)	Multi Function Meter for all 33, 11 KV Feeders and BUS PTs	21	RTU_CONV_SS_BOM_PH2	Lot	1	0
G2		Installation and Commissioning of Multifunction Meters in CRP Panel an it integration with RTU	K.7		Lot	1	0
<b>Total of G</b>							<b>0</b>
<b>H</b>	<b>GPS Clock with NTP Server</b>						
H1	Conventional Substations (67 Nos.)	GPS Clock with NTP Server	20	RTU_CONV_SS_BOM_PH2	Nos.	67	0
H2		Installation and Commissioning of GPS Receiver and its integration with site equipment	K.8		Nos.	67	0
<b>Total of H</b>							<b>0</b>
<b>I</b>	<b>Temperature &amp; Humidity Sensor</b>						
I1	Conventional Substations (67 Nos.)	Temperature & Humidity Sensor	24	RTU_CONV_SS_BOM_PH2	Nos.	15	0
I2		Installation and Commissioning of Temperature & Humidity Sensor and its Integration with RTU	K.9		Nos.	15	0
<b>Total of I</b>							<b>0</b>
<b>J</b>	<b>Instrumentation Cable for Status, Control &amp; Power Supply</b>						
J1	Conventional Substations (67 Nos.)	Instrumentation Cable for Status, Control & Power Supply	G.7-G.12	RTU_CONV_SS_BOM_PH2	Lot	1	0
J2		Supply, Laying and Termination of Instrumentation and Power Supply Cables	K.10		Lot	1	0
<b>Total of J</b>							<b>0</b>
<b>K</b>	<b>Communication Cable for MFM, IEDs Integration</b>						
K1	Conventional Substations (67 Nos.)	Communication Cable for MFM, IEDs Integration	H.13-H.16	RTU_CONV_SS_BOM_PH2	Lot	1	0
K2		Supply, Laying and Termination of Instrumentation and Power Supply Cables	K.11		Lot	1	0
<b>Total of K</b>							<b>0</b>
<b>L</b>	<b>24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller</b>						
L1	Conventional Substations (67 Nos.)	24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller	L17-I.19	RTU_CONV_SS_BOM_PH2	Nos.	67	0
L2		DC System Controller OS, Application Software Licenses	J.9-J.10		Nos.	67	0
L3		Decommissioning of existing DC System (Battery & Battery Charger) and Installation and Commissioning of New DC System (Battery & Battery Charger and DCDB) & restoration of DC supply to existing DCDB	K.12		Nos.	67	0
<b>Total of L</b>							<b>0</b>
<b>M</b>	<b>Engineering Configuration Laptop</b>						
M1	Engineering Configuration Laptop						
M2	Conventional Substations (67 Nos.)	Microsoft Windows compatible with latest version of configuration software, Microsoft Office License pack, Antivirus Symantec Endpoint protection small business edition with three year subscription, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU and Protection IEDs, Simulation Software, Applicable Software licenses for SIC System and shall be in-line with RTU Software. Proposed Licenses shall be independent of Engineering	23	RTU_CONV_SS_BOM_PH2	Set	8	0
<b>Total of M</b>							<b>0</b>
<b>N</b>	<b>Earthing and Earth Pit</b>						
N1	Conventional Substations	Earthing and Earth Pit	22	RTU_CONV_SS			0

Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>Phase # 2</b>							
N2	(67 Nos.)	Installation and Commissioning of Earth Pit and laying and termination of earthing cable for RTU, SIC and DC System	K.13	_BOM_PH2	Set	67	0
<b>Total of N</b>							0
<b>TOTAL OF (A+B+C+D+E+F+G+H+I+J+K+L+M+N)</b>							0
O		<b>Standard and Extended Warranty</b>					
O.1	Standard Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.	L.1		Lumpsum	1	0
<b>Total of O.1</b>							0
O.2	Extended Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products for next 5 years over and above as mentioned in item O.1	L.2		Lumpsum	1	0
<b>Total of O.2</b>							0
O.3	Extended Warranty Support	Hardware & Software warranty support for next 5 years over and above as mentioned in clause O.1 and O.2 for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products.	L.3		Lumpsum	1	0
<b>Total of O.3</b>							0
<b>Total of O</b>							0
P		<b>Mandatory Spares</b>					
P.1	Spares	Spares for RTU Based Automation System	M.1	Mandatory Spares	Lot	1	0
<b>Total of P</b>							0
Q		<b>Training (50 Man-days)</b>					
Q.1	Training	RTU based Automation System - On-site Training	N.1		Man-days	50	0
<b>Total of Q</b>							0
<b>Grand Total (Supply + Services + Warranty + Spares + Training) for Phase # 2</b>							<b>0</b>

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1	2	3	4	5	6	7	8	9	10	11	12	
Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)	
A	<b>Pre-Wired RTU Panel (Indoor Application)</b>											
1	<b>Pre-Wired RTU Panel</b>	<p><b>Pre-Wired RTU Panel (Indoor Application)</b>  <b>RTU Redundancy</b> : Mandatory  <b>I/O Requirement</b>: with 96 DI, 48 DO, 16 AI with Auxiliary relay for each Digital Output  <b>Communication Ports</b>: RS-485 - Minimum 6 nos. ports, 4 nos. Ethernet ports (Independent Ethernet Port for Master and IED communication)  <b>Power supply</b>: Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact  <b>Protocols</b> : IEC104, IEC103, IEC61850 (ED1, ED2), MODBUS (Serial), MODBUS (TCP/IP) with Server and Client license, SNTP, SNMP, MQTT  <b>Software Licenses</b>: Application Software, Configuration tools, Diagnostic tools. Logic building Application-Interlock logic, Calculation Package, SMS Utility Software  <b>Mounting</b>: To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.  <b>Other Accessories</b>: Pre-fabricated cables for I/O modules, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies</p>	Set		1	50			0	0	0	
	<b>Managed Layer2 Ethernet Switch</b>	<p><b>Managed L2 Ethernet Switch for IED Communication &amp; for SCADA Integration</b>  <b>Communication Ports</b>: 12 PORT L2 W/100/1000 MBPS, Combination of FO (4 Nos., SM) &amp; Copper Ports (8 Nos.)  <b>Power Supply</b>: Redundant 24 V DC through MCBs with add-on NO contact  <b>Mounting Arrangement</b>: To be mounted in RTU Panel  <b>Qty</b>: 2 nos.  <b>Preferred Make</b>: Ruggedcom/Hirschman/MOXA</p>	Set		1	50			0	0	0	
	<b>Managed Layer2 Ethernet Switch</b>	<p><b>Managed L2 Ethernet Switch for 33 &amp; 11 kV IED Communication</b>  <b>Communication Ports</b>: 12 PORT L2 W/100/1000 MBPS, Combination of FO (2 Nos., MM) &amp; Copper Ports (10 Nos.)  <b>Power Supply</b>: Non-Redundant 24 V DC through MCBs with add-on NO contact  <b>Mounting Arrangement</b>: To be mounted in CRP (33 &amp; 11 kV) Panel  <b>Qty</b>: 2 nos.  <b>Preferred Make</b>: Ruggedcom/Hirschman/MOXA</p>	Set		1	50			0	0	0	
	<b>Networking Accessories</b>	<p><b>Networking Accessories for Integration of IEDs, Ethernet Switches &amp; RTU</b>  All required networking accessories like patch panel (for each ethernet switch), LIU, patch cords (Fibre Optic, UTP as per the Ethernet Switch Configuration) of suitable length, Conduits for all non-armored cables, RJ45 connectors, I/O boxes with Quad face plate and connectors etc.</p>	Set		1	50			0	0	0	
<b>Sub Total of RTU System for Indoor Application</b>												0
B	<b>Pre-Wired RTU Panel (Outdoor Application)</b>											



Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)	
2	Pre-Wired RTU Panel	<p><b>Pre-Wired RTU Panel (Outdoor Application)</b>                      RTU Redundancy : Mandatory                      I/O Requirement: with 96 DI, 48 DO, 16 AI with Auxiliary relay for each Digital Output                      Communication Ports: RS-485 - Minimum 6 nos. ports, 4 nos. Ethernet ports (Independent Ethernet Port for Master and IED communication)                      Power supply: Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact                      Protocols : IEC104, IEC103, IEC61850 (ED1, ED2), MODBUS (Serial), MODBUS (TCP/IP) with Server and Client license, SNTP, SNMP, MQTT                      Software Licenses: Application Software, Configuration tools, Diagnostic tools. Logic building Application-Interlock logic, Calculation Package, SMS Utility Software                      Mounting: To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.                      Other Accessories: Pre-fabricated cables for I/O modules, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies</p>	Set		1	17			0	0	0	
	Managed Layer2 Ethernet Switch	<p><b>Managed L2 Ethernet Switch for IED Communication &amp; for SCADA Integration</b>                      Communication Ports: 12 PORT L2 W/100/1000 MBPS, Combination of FO (4 Nos., SM) &amp; Copper Ports (8 Nos.)                      Power Supply: Redundant 24 V DC through MCBs with add-on NO contact                      Mounting Arrangement: To be mounted in RTU Panel                      Qty: 2 nos.                      Preferred Make: Ruggedcom/Hirschman/MOXA</p>	Set		1	17			0	0	0	
	Managed Layer2 Ethernet Switch	<p><b>Managed L2 Ethernet Switch for 33 &amp; 11 kV IED Communication</b>                      Communication Ports: 12 PORT L2 W/100/1000 MBPS, Combination of FO (2 Nos., MM) &amp; Copper Ports (10 Nos.)                      Power Supply: Non-Redundant 24 V DC through MCBs with add-on NO contact                      Mounting Arrangement: To be mounted in CRP (33 &amp; 11 kV) Panel                      Qty: 2 nos.                      Preferred Make: Ruggedcom/Hirschman/MOXA</p>	Set		1	17			0	0	0	
	Networking Accessories	<p><b>Networking Accessories for Integration of IEDs, Ethernet Switches &amp; RTU</b>                      All required networking accessories like patch panel (for each ethernet switch), LIU, patch cords (Fibre Optic, UTP as per the Ethernet Switch Configuration) of suitable length, Conduits for all non-armored cables, RJ45 connectors, I/O boxes with Quad face plate and connectors etc.</p>	Set		1	17			0	0	0	
<b>Sub Total of RTU System for Outdoor Application</b>												0
C	<b>Pre-Wired SIC Panel (Indoor Application)</b>											
3	Signal Interface Panel	<p><b>SIC- Panel for Termination of field cable and housing of interface and I/O modules (Indoor Application)</b>                      Input/Output Interface: For integration of I/O modules, interface modules etc. These I/O, Interface modules shall communicate to both Main and Stand-by RTU as per Item no. 1.                      Communication Ports: Interface modules shall have ports to communicate with Main &amp; Standby RTU                      Protocols : Interface modules shall use Open Protocols, No proprietary protocols are envisaged                      Power supply: Redundant 24 V DC Supply with Diode O-ring unit and MCBs with add-on NO contact                      Mounting: To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.                      Other Accessories: Pre-fabricated cables for I/Os cards, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies, Necessary TBs, Din rail channels and other accessories.</p>	Set		1	50			0	0	0	
<b>Sub Total of SIC Panel for Indoor Application</b>												0
D	<b>Pre-Wired SIC Panel (Outdoor Application)</b>											

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
4	Signal Interface Panel	<p><b>SIC- Panel for Termination of field cable and housing of interface and I/O modules (Outdoor Application)</b></p> <p><b>Input/Output Interface:</b> For integration of I/O modules, interface modules etc. These I/O, Interface modules shall communicate to both Main and Stand-by RTU as per Item no. 1.</p> <p><b>Communication Ports:</b> Interface modules shall have ports to communicate with Main &amp; Standby RTU</p> <p><b>Protocols :</b> Interface modules shall use Open Protocols, No proprietary protocols are envisaged</p> <p><b>Power supply:</b> Redundant 24 V DC Supply with Diode O-ring unit and MCBs with add-on NO contact</p> <p><b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.</p> <p><b>Other Accessories:</b> Pre-fabricated cables for I/Os cards, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies, Necessary TBs, Din rail channels and other accessories.</p>	Set		1	17			0	0	0
<b>Sub Total of SIC Panel for Outdoor Application</b>											
E	<b>Contact Multiplier Relay with Mounting Base</b>										
5	CMR with Mounting Base	<p><b>Contact Multiplier Relay with Mounting Base:</b></p> <ol style="list-style-type: none"> <li>Contact Material : Silver Alloy</li> <li>Contact Rating : 5 Amps. @ 24 V DC</li> <li>Contact Resistance : 50 M ohms max. (Initial)</li> <li>Dielectric Strength : <ol style="list-style-type: none"> <li>Between open contacts : 500 V Rms</li> <li>Between Contact and Coil : 2000 V Rms</li> </ol> </li> <li>Insulation Resistance : 500 M ohms @ 500 V DC, 250C</li> <li>Operate time at Nominal Voltage : 20 milli seconds</li> <li>Release time at nominal Voltage : 10 milli seconds</li> <li>Ambient temperature : 0 to 70°C</li> <li>Life expectancy : <ol style="list-style-type: none"> <li>Mechanical : 106 operations.</li> <li>Electrical : 105 operations at rated load</li> </ol> </li> <li>Coil Resistance at nominal Voltage (DC) : 30,000 ohms +10% at 250°C</li> <li>Type of contact multiplier : 4R – 2 – 220 LD with DIN rail mounting with LED indicator</li> <li>Type of mounting : Socket mounting.</li> <li>No. of Poles. : 2 No. + 2 Nc.</li> <li>Other Accessories: Necessary TB, Din rail channel and other accessories to mount in CRP</li> </ol>	Nos./Substation		96	6432			0	0	0
<b>Sub Total of Contact Multiplier Relay with Mounting Base</b>											
F	<b>Interposing Relay with Mounting Base for Digital Output</b>										
6	Interposing Relay for Digital Output	<p><b>Interposing Relays for Digital Output</b></p> <ol style="list-style-type: none"> <li>Auxiliary Power. : 24 V DC</li> <li>Input signal from field : 24 VDC.</li> <li>Input impedance : More than 50 Kilo ohms.</li> <li>Output signal to the RTU : 24 V DC digital input module.</li> <li>Contact mechanism : Self Reset</li> <li>Contact Make &amp; Carry : 30 A for 3 Sec. &amp; 5A continuously at 660V</li> <li>Operating time : Approx. 15m sec.</li> <li>Other Accessories: Necessary TB, Din rail channel and other accessories to mount in SIC Panel</li> </ol>	Nos./Substation		48	3216			0	0	0
<b>Sub Total of Interposing Relays for Digital Output</b>											
G	<b>Instrumentation Cable for Status, Control &amp; Power Supply</b>										

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
7	Instrumentation Cable 12 Core Armored 0.5 mm <sup>2</sup> for Status and Indications	<b>Instrumentation Cable for Status and Indications</b> 12 Core armored 0.5 sq.mm. 1100 V rated, annealed stranded copper, PVC insulated, individual and overall shielded, field cable <b>Preferred Make:</b> CCI / FINOLEX / HAVELLS / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Sub station		600	40200			0	0	0
8	Instrumentation Cable 7 Core Armored 1.5 mm <sup>2</sup> for Control Output	<b>Instrumentation Cable for Control Output</b> 7 Core armored 1.5 sq.mm. 1100V rated, annealed stranded copper, PVC insulated, individual and overall shielded, field cable <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Sub station		280	18760			0	0	0
9	Twisted Pair Shielded & Overall shielded Instrumentation Cable 5 Pair Armored 1.0 mm <sup>2</sup> for Analog Input	<b>Twisted paired Shielded &amp; Overall Shielded Cable for Analog Inputs</b> 5 Pair armored 1.0 sq.mm copper twisted paired shielded and Overall shielded cable for Analog inputs from CRP panel to the RTU <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Sub station		50	3350			0	0	0
10	10C X 2.5 mm <sup>2</sup> Copper cable for extension of CT	<b>Control Cable for CT Extension</b> 10 core X 2.5 sq.mm. multistrand copper cable for extending CT & CVT inputs to the MFM in the CRP panel. <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Sub station		20	1340			0	0	0
11	4C X 2.5 mm <sup>2</sup> Copper cable for extension of PT	<b>Control Cable for PT Extension</b> 4 core X 4 sq.mm. multistrand copper cable for extending PT inputs to the MFM in the CRP panel <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Sub station		20	1340			0	0	0
12	3C X 4 mm <sup>2</sup> power Supply Cable for extension of DC Supply	<b>Power Supply Cable from DCDB to RTU &amp; SIC Panel</b> 3 core X 4 sq.mm. Armored multistrand Power Supply cable for extending Power Supply from DCDB to RTU & SIC Panel <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Sub station		100	6700			0	0	0
<b>Sub Total of Instrumentation Cable for Status, Control &amp; Power Supply</b>											
H	<b>Communication Cable for MFM, IEDs Integration</b>										
13	4P X 0.36 mm <sup>2</sup> Armored Communication Cable for MFM	<b>Communication Cable:</b> 4P X 0.36 Sq.mm Armored multistrand Pair and Overall shielded, for Multifunction Meter looping. <b>Preferred Make : Belden/LAPP/SATYAM</b>	Meters/Sub station		120	8040			0	0	0
14	Armored CAT6 UTP Cable	Armored CAT6 UTP Cable <b>Preferred Make : Systemax</b>	Meters/Sub station		50	3350			0	0	0
15	Un-Armored CAT6 UTP Cable	Un-Armored CAT6 UTP Cable <b>Preferred Make : Systemax</b>	Meters/Sub station		100	6700			0	0	0
16	Armored FO Cable 12 Core SM/MM	Armored Fibre Optic Cable for SCADA 12 core, SM/MM <b>Preferred Make Finolex / KEC / Apar</b>	Meters/Sub station		100	6700			0	0	0
<b>Sub Total of Communication Cable for MFM, IEDs Integration</b>											
I	<b>24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller</b>										

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
17	24 V DC SYSTEM	24V, 70 Amp Float Cum Boost Charger with Microprocessor based Controller (N+1)	No.		1	67			0	0	0
18		24V, 150 AH VRLA Type Storage Battery (Type-1)	Set		1	18			0	0	0
		24V, 200 AH VRLA Type Storage Battery (Type-2)	Set		1	49			0	0	0
19		DCDB with 2 Incomers and 15 Outgoing Feeders	No.		1	67			0	0	0
<b>Sub Total of DC System</b>											0
<b>Grand Total Supply (A+B+C+D+E+F+G+H+I)</b>											0
20	GPS Clock with NTP Server	<b>GPS Clock with NTP Server</b> <b>GPS Receiver Clock:</b> 19" rack mountable chassis w/sliding Rapid/Versa rails and cable management arm, Size - 1U/2U, Front keyboard with status LEDs and LCD display, Battery Backup <b>Outputs:</b> TCP/IP (Redundant), Potential Free Pulse Contacts for 1 PPM, 1 PPS, 1 PPH, Potential free alarm contacts <b>Protocols:</b> NTP, SNTP, Pulse <b>Power Supply:</b> 24 V DC Power Supply, with battery backup <b>Antenna :</b> Helical, with connectors, min 50 mtrs Low loss cable, Lighting Arrester with wall mounting arrangement, Length of the Low Loss Antenna Cable will be as per site requirement <b>Mounting :</b> To be mounted in RTU Panel <b>Preferred make -</b> Sertel / Masibus/Sands	Nos.		1	67			0	0	0
<b>Sub Total of GPS Clock with NTP Server</b>											0
21	Multifunction Meter	<b>Multi Function Meter :</b> For all 33 & 11 KV Feeders Multifunctional 3-phase Power meter, four quadrant active and reactive energy polyphase static meter <b>Accuracy Class:</b> 0.2 S as per IEC62053:22 <b>Voltage Inputs:</b> Operating range : 690 V AC line-to-line, 460 V AC line-to-neutral <b>Current Inputs:</b> 1A / 5A (User selectable CT secondary 1A / 5A, PT Secondary) <b>Wiring configurations:</b> 3OP2, 4LN3, 3DIR2, 4LL3, 3OP3, 3LN3, 3LL3, 3BLN3, 3BLL3 (All wiring configurations selected via the front panel) <b>Communication Port:</b> RS 485 Serial Port with removable connector <b>Protocols:</b> MODBUS RTU, Assignable Register map, Device Address (User Configurable - (1-247)) <b>Auxiliary Supplies:</b> 24 V DC <b>Other Accessories:</b> Necessary TB, Din rail channel and other accessories for flash mounting in CRP <b>Preferred Make:</b> SATEC PM130EH+	Nos./Substation		10	670			0	0	0
<b>Sub Total of Multi Function Meter</b>											0
22	Earthing and Earth Pit	<b>Earthing:</b> a) Earth Pit: Separate earth pits should be provisioned for attaining the resistance value of maximum 2 Ohms. b) Earthing Wires: RTU Panels, SIC Panel, DC Systems are to be wired with Earth Pit. Copper wires size would be minimum of 10 Sq.mm.	Set		-	67			0	0	0
<b>Sub Total of Earthing and Earth Pit</b>											0
<b>Grand Total Supply (A+B+C+D+E+F+G+H+I) + Item 20 + Item 21 + Item 22</b>											0

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
23	Engineering Configuration Laptop	<b>Configuration Laptop</b> <b>Hardware:</b> Laptop with latest processor, 1 TB SSD, 8 GB RAM, DVD RW, Ethernet Port, 4 USB Ports, 15" Display with 1 no. serial to USB converter <b>Software License:</b> Microsoft Windows compatible with latest version of configuration software, Microsoft Office License pack, Antivirus Symantec Endpoint protection small business edition with three year subscription, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU and Protection IEDs, Simulation Software, Applicable Software licenses for SIC System and shall be in-line with RTU Software. Proposed Licenses shall be independent of Engineering Configuration Laptop Hardware. <b>Preferred Make - "DELL/HP"</b>	Nos.		-	8			0	0	0
24	T&H Sensor	Temperature & Humidity Transmitter : for integration with RTU on RS485 MODBUS	Nos.			15			0	0	0
<b>0</b>											
<b>J</b>	<b>RTU and SIC System Software</b>										
J.1	RTU	RTU OS, Application Software Licenses (Main & Standby)	Lumpsum		1	67			0	0	0
J.2		5000 Physical I/O tags, 40 IEDs - IEC61850 (ED1, ED2), 25 IEDs - Serial Protocol	Lumpsum		1	67			0	0	0
J.3		RTU shall Communicate to Eight Independent Remote SCADA Master on IEC 60870-5-104	Lumpsum		1	67			0	0	0
J.4		SMS Utility Software				67			0	0	0
J.5		<b>Protocols :</b> IEC 60870-5-101, IEC 60870-5-104, IEC 61850 (ED1, ED2), MODBUS (Serial & TCP/IP), MQTT, SNMP (V1.0, V2.0, V3.0), NTP & SNTP, RSTP, PRP & HSR	Lumpsum		1	67			0	0	0
<b>Sub Total Software (J.1... J.5)</b>											
J.6	SIC	Interface Module shall be in-line with RTU Application Software	Lumpsum		1	67			0	0	0
J.7		<b>Protocols :</b> Communication between SIC I/O interface modules shall be on Open Protocol, No proprietary protocol is envisaged, SNMP (V1.0, V2.0, V3.0), NTP & SNTP	Lumpsum		1	67			0	0	0
<b>Sub Total Software (J.6 + J.7)</b>											
<b>0</b>											
J.8	Ethernet Switch	Software for Local and Remote configuration of Ethernet Switches - Enabling Monitoring, Configuration, Maintenance and backup of configuration files	Lumpsum		1	67			0	0	0
<b>Sub Total Software Ethernet Switch</b>											
<b>0</b>											
J.9	DC System Controller	Controller OS, Application Software Licenses (Integration with Main & Standby RTU)	Lumpsum		1	67			0	0	0
J.10		<b>Protocols :</b> IEC 60870-5-104, IEC 61850 (ED1, ED2), MODBUS (Serial & TCP/IP), SNMP (V1.0, V2.0, V3.0), NTP & SNTP	Lumpsum		1	67			0	0	0
<b>Sub Total Software (J.9 + J.10)</b>											
<b>0</b>											
<b>K</b>	<b>Services</b>										
K.1	Services of RTU based System for Indoor Application	Integration and Commissioning RTU Based System for Indoor Application a) Site Survey, Design, Engineering, Finalization of BOM, FDS b) Transportation, Delivery, Unloading and Storage c) Installation and commissioning of Pre-wired RTU and Networking equipment d) Civil Activities for installation of RTU panel e) Cable laying, termination and continuity check of all cables f) Integration of all Protection, MFM, Condition Monitoring devices etc. g) Powering up of all supplied materials h) Configuration of RTU and its accessories i) Integrated testing with Purchaser's SCADA System j) I/O testing, Pre- SAT testing of Hardware and Software functionality k) Integrated FAT & SAT for Hardware and Software l) Demonstration of System Capacity and Performance Guarantee Test m) Submission of As-Built Drawings, RTU Backup	Lumpsum		1	50			0	0	0

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
K.2	Services of RTU based System for Outdoor Application	Integration and Commissioning RTU Based System for Outdoor Application a) Site Survey, Design, Engineering, Finalization of BOM, FDS b) Transportation, Delivery, Unloading and Storage c) Installation and commissioning of Pre-wired RTU and Networking equipment d) Civil Activities for installation of RTU panel e) Cable laying, termination and continuity check of all cables f) Integration of all Protection, MFM, Condition Monitoring devices etc. g) Powering up of all supplied materials h) Configuration of RTU and its accessories i) Integrated testing with Purchaser's SCADA System j) I/O testing, Pre- SAT testing of Hardware and Software functionality k) Integrated FAT & SAT for Hardware and Software l) Demonstration of System Capacity and Performance Guarantee Test m) Submission of As-Built Drawings, RTU Backup	Lumpsum		1	17			0	0	0
K.3	Services of SIC based System for Indoor Application	Integration and Commissioning SIC System for Indoor Application a) Design, Engineering, Finalization of BOM b) Transportation, Delivery, Unloading and Storage c) Civil Activities for installation of RTU panel d) Installation and commissioning of Pre-wired SIC and Networking equipment (if Any) e) Cable laying, termination and continuity check of all cables f) Powering up of all supplied materials g) Configuration of SIC Interface Module and its accessories h) Integrated testing with RTU System i) I/O testing, Pre- SAT testing of Hardware and Software functionality j) Integrated FAT & SAT for Hardware and Software k) Submission of As-Built Drawings	Lumpsum		1	50			0	0	0
K.4	Services of SIC based System for Outdoor Application	Integration and Commissioning SIC System for Outdoor Application a) Design, Engineering, Finalization of BOM b) Transportation, Delivery, Unloading and Storage c) Civil Activities for installation of RTU panel d) Installation and commissioning of Pre-wired SIC and Networking equipment (if Any) e) Cable laying, termination and continuity check of all cables f) Powering up of all supplied materials g) Configuration of SIC Interface Module and its accessories h) Integrated testing with RTU System i) I/O testing, Pre- SAT testing of Hardware and Software functionality j) Integrated FAT & SAT for Hardware and Software k) Submission of As-Built Drawings	Lumpsum		1	17			0	0	0
K.5	Services for CMR	Installation and Commissioning of Contact Multiplier Relays with bases in CRP Panel	Lumpsum		1	67			0	0	0
K.6	Services for Interposing Relays	Installation and Commissioning of Interposing Relays with bases in SIC Panel	Lumpsum		1	67			0	0	0
K.7	Services for MFM	Installation and Commissioning of Multifunction Meters in CRP Panel an it integration with RTU	Lumpsum		1	67			0	0	0
K.8	Services for GPS	Installation and Commissioning of GPS Receiver and its integration with site equipment	Lumpsum		1	67			0	0	0
K.9	Services for T&H	Installation and Commissioning of Temperature & Humidity Sensor and its Integration with RTU	Lumpsum		1	15			0	0	0

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)	
K.10	Services for Control Cable	Laying and Termination of Instrumentation and Power Supply Cables	Lumpsum		1	67			0	0	0	
K.11	Services for Communication Cable	Laying and Termination of Communication Cables	Lumpsum		1	67			0	0	0	
K.12	Services for DC System	Decommissioning of existing DC System (Battery & Battery Charger) and Installation and Commissioning of New DC System (Battery & Battery Charger and DCDB) & restoration of DC supply to existing DCDB	Lumpsum		1	67			0	0	0	
K.13	Services for Earthing & Earth Pit	Installation and Commissioning of Earth Pit and laying and termination of earthing cable for RTU, SIC and DC System	Lumpsum		1	67			0	0	0	
<b>Sub Total T = (K.5 + K.6 + K.7 +K.8+K.9+ K.10 + K.11 + K.12 + K.13)</b>											0	0
<b>Total Services for Indoor Application (K.1 + K.3)</b>											0	0
<b>Total Services for Outdoor Application (K.2 + K.4)</b>											0	0
<b>Grand Total Services for Indoor Application [(K.1 + K.3) +(50/67) * T]</b>											0	0
<b>Total Services for Outdoor Application [(K.2 + K.4) +(17/67) *T]</b>											0	0
L		<b>Standard and Extended Warranty</b>										
L.1	Standard Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.	Lumpsum		-	1			0	0	0	
<b>Total of L.1</b>												0
L.2	Extended Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products for next 5 years over and above as mentioned in item O.1	Lumpsum		-	1			0	0	0	
<b>Total of L.2</b>												0
L.3	Extended Warranty Support	Hardware & Software warranty support for next 5 years over and above as mentioned in clause O.1 and O.2 for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products.	Lumpsum		-	1			0	0	0	
<b>Total of L.3</b>												0
<b>Total of L</b>												0
M		<b>Mandatory Spares</b>										
M.1		RTU with all accessories, cables etc. except I/O modules	Sets			5			0	0	0	
M.2		CPU Module of the RTU	Nos.			10			0	0	0	
M.3		Power Supply module of the RTU	Nos.			10			0	0	0	
M.4		Memory Module of the RTU	Nos.			10			0	0	0	
M.5		Communication Module (Ethernet) - As per the proposed Solution	Nos.			10			0	0	0	
M.6		Communication Module (Serial) - As per the proposed Solution	Nos.			10			0	0	0	
M.7		DI Cards for Digital Inputs (DI Channels/Module = 16 DI)	Nos.			10			0	0	0	
M.8		DO Cards for Digital Output (DO Channels/Module = 8 DO)	Nos.			10			0	0	0	
M.9		AI Cards for Analog Inputs (AI Channels/Module = 4 AI)	Nos.			15			0	0	0	
M.10		Bus Coupler Module (If Applicable)	Nos.			5			0	0	0	
M.11		Remote I/O Rack with all accessories, cables etc. (if Applicable)	Sets			5			0	0	0	
M.12		Interface Module for Digital Inputs with FRC cable	Sets			10			0	0	0	
M.13		Interface Module for Digital Outputs with FRC cable	Sets			10			0	0	0	
M.14		Interface Module for Analog Inputs with FRC cable	Sets			15			0	0	0	

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
M.15	Spares	CMR with Base	Sets			150			0	0	0
M.16		Interposing Relay with Base	Sets			75			0	0	0
M.17		Armored FO Cable	meter			1000			0	0	0
M.18		Communication Cable – CAT6 Patch Cord of 2 Meter length	Nos.			50			0	0	0
M.19		Communication Cable – CAT6 Patch Cord of 5 Meter length	Nos.			100			0	0	0
M.20		Communication Cable – CAT6 Patch Cord of 10 Meter length	Nos.			100			0	0	0
M.21		Communication Cable - FO Patch Cord (SM) of 2 Meter length (Connector shall be as per the proposed FO port considered in the Ethernet Switch)	Nos.			20			0	0	0
M.22		Communication Cable - FO Patch Cord (MM) of 10 Meter length (Connector shall be as per the proposed FO port considered in the Ethernet Switch)	Nos.			20			0	0	0
M.23		Multifunction Meter	Nos.			25			0	0	0
M.24		IEC 61850 complied L2 Managed Ethernet Switch (RTU Panel)	Nos.			10			0	0	0
M.25		IEC 61850 complied L2 Managed Ethernet Switch (CRP Panel)	Nos.			10			0	0	0
M.26		Fully Loaded LIU Boxes (If Applicable)	Nos.			10			0	0	0
M.27		Diode OR-ing Unit (If Applicable)	Nos.			10			0	0	0
M.28		Battery Charger - Rectifier Unit	Sets			10			0	0	0
M.29		DC MCB (10 nos. of Each Type)	Nos.			10			0	0	0
M.30	DC System Controller	Sets			5			0	0	0	
<b>Total of M</b>											<b>0</b>
<b>N</b>	Training	<b>Training (50 Man-days)</b>									
N.1		RTU based Automation System - On-site Training	Man-Days			50			0	0	0
<b>Total of N</b>											<b>0</b>



PQR for RTU based Sub-Station Automation System at 33/11 kV Substations		
1	2	3
Parameter	TPCODL Requirement	Documents To be submitted by Bidder to ascertain meeting of Pre-qualification requirement
Infrastructure	<p>1. The Bidder must have a presence in India for last 5 years, meeting requirement as specified below:</p> <p>1.1. Registered in India under the Companies Act of India 1956, as on Bid submission date for supply of the Sub-Station Automation System.</p> <p>1.2. Having experience and infrastructure to carry-out in-house Design, Engineering, Supply, Erection, Commissioning, Routine &amp; Acceptance Tests, Service Support during Warranty and Post Warranty, Training facility of Sub-Station Automation System in India as Bidder.</p> <p>1.3. The Bidder shall be the Original Equipment Manufacturer for Hardware and Software of the proposed Sub-Station Automation System.</p>	<p>1) Self-undertaking to be submitted in this regard. TPCODL reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.</p> <p>2) Bidder shall submit a valid ongoing collaboration and technology transfer/license agreement with Principal</p> <p>3) Technical support facilities including qualified man-power, testing tools and instruments and integration facilities available within India.</p>
Supply and Experience	<p>1. Bidder must have executed at least 100 Nos. of RTUs at 33/22/11 kV Substations commissioned and Integrated with SCADA &amp; ADMS system at Metro / District / Regional level for Power Utility during the last five (5) years. In addition, the Bidder must have executed at least 50 Nos. of RTU in one project.</p> <p>2. Bidder to submit performance certificate of Two projects (one with 50 Nos. of RTUs and other with minimum 25 Nos. of RTUs which is running in satisfactory condition for last two (2) years. In case the bidder has a previous association with TPCODL for similar products and services, the performance feedback for that bidder by TPCODL's User Group shall only be considered irrespective of performance certificates issued by any third organization. Copy of performance certificates to be submitted in this regard.</p> <p>3. In case bidder uses experience of parent organization based out-side India to meet the QR, then bidder shall submit concurrence from the parent organization to support the supply and experience criteria</p>	<p>1) Supply List &amp; Performance Certificates from the Utilities / Clients.</p> <p>2) Both Parent Company and Subsidiary Company shall provide a Deed of Joint Undertaking (DJU) and will be jointly and severally responsible for the execution of contract (If applicable) and after sales support.</p> <p>3) The Bidder shall share responsibility matrix, division of works etc. between Parent Company and Bidder.</p>
Type Test	<p>1. The bidder shall submit Type test reports obtained from CPRI / ERDA / KEMA / International Accredited Lab for the offered solution. The type tests should have been conducted on the equipment / material of the same design.</p> <p>In case the type test reports furnished are not for the offered equipment / material but for the equipment / material with and/or different capacity, then type test shall be carried out for the offered equipment / material from CPRI / ERDA / KEMA / International Accredited Lab without any cost implication to the Purchaser and the Type Test reports shall be submitted before dispatch of the equipment / material.</p> <p>(Bidder needs to submit an undertaking that type test shall be carried out for the offered equipment / material from CPRI / ERDA / KEMA / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before dispatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with and/or different capacity, (if applicable)).</p>	<p>1) Bidder shall submit the Type Test Report. The type tests should have been conducted within 5 years prior to the date of bid opening.</p> <p>2) Undertaking that type test shall be carried out for the offered equipment / material from NABL / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before dispatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with and/or different capacity, (if applicable)</p> <p>3) Bidder shall submit the undertaking.</p>
Documents	<p>Bidder must agree for handing over, to Purchaser, all project related drawings in AutoCAD format as a part of as built drawings at the end of the project in addition to pdf. The pdf versions of above drawings shall be submitted for formal approval process during detailed engineering.</p>	<p>Bidder to Confirm</p>
Equipment, Spare Support and Availability	<p>Min 15 Years</p>	<p>Bidder to submit each Product Life Cycle Details and Confirmation</p>
Commercial Capability	<p>The bidder should have average annual turnover of Rs. 20 Crores in the last three years.</p>	<p>Bidder to submit the relevant document along with Copy of Audited balance sheet and Profit and Loss Statement to be submitted).</p>

Remote Terminal Unit (RTU)			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
1	Remote Terminal Units (RTU)	19" Modular / Din Rail Mounted It shall have capability to be part of a larger BCU/RTU family	
2	Make	Please Refer Annexure-6 of Section E	
3	Model		
4	Digital Inputs (Physical)	As specified in the I/O Requirement	
5	Digital Outputs (Physical)	As specified in the I/O Requirement	
	Close / Open	Required	
	Raise / Lower	Required	
6	Analog Inputs (Physical)	As specified in the I/O Requirement	
7	Energy Meters / Numerical Relays Integration	Facility to interface Multifunction Meters and Numerical Relays	
7.1	Accumulator Data from Multi-Function Meter	Capable of Acquiring 32 bit Analog and Accumulator Data from Multifunction Meters	
8	Distributed I/O modules	Required	
9	Ports Requirement and Type	All ports shall be galvanically isolated	
		6 nos. RS 485 Port, 2 nos. RS 232 Port 4 Nos. Ethernet Ports	
	For Structuring (Configuration) System (Separate Port)	A galvanically isolated USB port for local engineering through laptop	
10	Protocol Support	IEC 61850, IEC 60870-5-103, IEC60870-5-104 (Master & Slave), MODBUS (Serial & RTU), SNTP & SNMP with Server and Client licenses	
11	Time synchronization between RTU, I/O modules, IEDs and Gateway	Required on SNTP and direct pulse (1 PPS, 1 PPM). RTU shall have capability for Time Synchronization from Minimum 2 Server with priority selection	
	Real time stamping at RTU level, I/O level	Required, Mandatory	
12	<b>Response Time</b>		
	Digital Input	1 msec or better	
	Analog Measurement	1 sec or better	
	Digital Output	<1 sec or better	
13	I/O handling Capacity	Min 5000 Physical Tags / RTU	
14	Pseudo Points (Digital, Analog)	Required	
15	Calculated Points (Digital, Analog)	Required	
16	SOE List storage	Min 1000 (shall be user configurable)	
	SOE list Retention Period	1 Month	
17	Fault Disturbance Recorder	1000 events	
	FDR Retention Period	1 Month	
18	Development of Interlock logic	Required, Mandatory	

Remote Terminal Unit (RTU)			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
19	Support of mathematical function - Arithmetic, Logical, Trigonometric functions, Differential and Integration functions, Timer, Counter etc.	Required, Mandatory	
20	Logic and Calculation functionality	Required, Mandatory	
21	Check-Before-Execute Scheme for Control	Required (Bidder shall submit their Check-before-Execute scheme)	
22	Auxiliary Relays for Digital Outputs	Required, Auxiliary relays with Min 10 Ampere rating with 2 NO contacts (to be wired in Series) for each digital outputs	
23	Status LEDs on all module – for fault indication and Inputs / Outputs	Required	
24	Module replacement in RTU	Hot-Swappable module	
25	Software – All diagnostic tools, simulator tool, maintenance tools, configuration application for database and process control program development, documentation and maintenance	Required	
26	Engineering Functions	a) Configuration shall be possible both locally and remotely	
		b) RTU shall have multilevel passwords	
		c) On-line monitoring facility of real time data for monitoring/analyzing the real time status of the process, program logic from the engineering station	
		d) Allow configuration of the RTU with different versions of the Configuration Tool	
		e) ICD file generation shall be possible from the proposed Configuration Tool	
		f) RTU must have the provision to configure the IP of the redundant SCADA Systems (Socket IP)	
27	Cyber Security	Bidder to confirm Cyber security measures as indicated in the Specification (Please Refer Section-B, Chapter # 1 RTU Specification, Item 1.42)	
28	Battery Backup / Flash-PROM backup	Required	

Managed Layer - 2 Switch			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
1	Make	Please Refer Annexure-6 of Section E	
2	Model		
3	Type of Switch	Industrial Grade, 19" Rack mountable Managed Switch	
4	No. of Ports per switch	Minimum 12	
4.1	No. of Copper ports (10/100 mbps)	Minimum 8 ports	
4.2	No. of Fiber Ports (100/1000 mbps)	Minimum 4 Ports (SM, LC Port, 25 km)	
4.3	SFPs to be considered for fiber ports	Required, Mandatory	
4.4	Copper Ports		
5	<b>Compliance</b>		
5.1	Shall support 802.1Q VLAN, 801.2p, 802.1d STP, 802.3ad (Port aggregation), 802.1w RSTP, 802.1s MSTP, 802.3ad LACP, IEEE 802.1ab Link Layer Discovery Protocol and also suitable for Ring Configuration	Required	
5.2	IEEE 1613 compliance	Mandatory	
5.3	IEC 61850 Compliance	Mandatory	
5.4	QAS (802.1p)	Mandatory	
6	Time Synchronization	SNTP, IEEE1588 V2	
7	Suitable for PRP/HSR architecture	Mandatory	
8	Other Required Features	Automatic Learning, Negotiation, and Crossover Detection	
		Support Industrial Automation Protocols i.e. IEC61850, MODBUS, Ethernet/IP etc.	
		Shall support Layer 2 switch ports with Secure VTP or similar protocols to reduce administrative burden for VLANs Configuration	
		Shall support both Rapid Spanning Tree Protocol (RSTP) & Multiple Spanning Tree Protocol (MSTP)	
		Port Mirroring	
		Discover the neighboring device, giving the details about the platform, IP Address, Link connected through etc.	
		Shall support to prevent edge devices not in the network administrator's control from becoming STP root nodes	
	Shall support configurable SNMP traps		
9	Management Tools support	Web-based, Telnet & Command Line Interface (CLI) for quickly configuring major managed functions	
		SNMPv1/v2c/v3 for different levels of network management	
		Remote Monitoring (RMON)	
		Rich set of diagnostics with logging and alarms	

Managed Layer - 2 Switch			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
10	Auxiliary Power Supply	Redundant Power supply module of 24V DC +/- 20 % shall be available ( Based on the Architecture proposal). The Switch shall have in-built adequate protection against reversed polarity, over current and under voltage conditions, to prevent the internal logic from being damaged and becoming unstable causing mal-operation	
11	Health Monitoring of Hardware such as Ethernet ports, Power supply cards & Communication links and internal voltages through SNMP/IEC61850 to SCADA System/Purchaser's NMS	Protocol shall be SNMP	

Managed Layer - 2 Switch			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
1	Make	Please Refer Annexure-6 of Section E	
2	Model		
3	Type of Switch	Industrial Grade, 19" Rack mountable Managed Switch	
4	No. of Ports per switch	Minimum 12	
4.1	No. of Copper ports (10/100 mbps)	Minimum 10 ports	
4.2	No. of Fiber Ports (100/1000 mbps)	Minimum 2 Ports (MM, LC Port)	
4.3	SFPs to be considered for fiber ports	Required, Mandatory	
4.4	Copper Ports		
5	<b>Compliance</b>		
5.1	Shall support 802.1Q VLAN, 801.2p, 802.1d STP, 802.3ad (Port aggregation), 802.1w RSTP, 802.1s MSTP, 802.3ad LACP, IEEE 802.1ab Link Layer Discovery Protocol and also suitable for Ring Configuration	Required	
5.2	IEEE 1613 compliance	Mandatory	
5.3	IEC 61850 Compliance	Mandatory	
5.4	QAS (802.1p)	Mandatory	
6	Time Synchronization	SNTP, IEEE1588 V2	
7	Suitable for PRP/HSR architecture	Mandatory	
8	Other Required Features	Automatic Learning, Negotiation, and Crossover Detection	
		Support Industrial Automation Protocols i.e. IEC61850, MODBUS, Ethernet/IP etc.	
		Shall support Layer 2 switch ports with Secure VTP or similar protocols to reduce administrative burden for VLANs Configuration	
		Shall support both Rapid Spanning Tree Protocol (RSTP) & Multiple Spanning Tree Protocol (MSTP)	
		Port Mirroring	
		Discover the neighboring device, giving the details about the platform, IP Address, Link connected through etc.	
		Shall support to prevent edge devices not in the network administrator's control from becoming STP root nodes	
	Shall support configurable SNMP traps		
9	Management Tools support	Web-based, Telnet & Command Line Interface (CLI) for quickly configuring major managed functions	
		SNMPv1/v2c/v3 for different levels of network management	
		Remote Monitoring (RMON)	
		Rich set of diagnostics with logging and alarms	

Managed Layer - 2 Switch			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
10	Auxiliary Power Supply	Non-Redundant Power supply module of 24V DC +/- 20 % shall be available ( Based on the Architecture proposal). The Switch shall have in-built adequate protection against reversed polarity, over current and under voltage conditions, to prevent the internal logic from being damaged and becoming unstable causing mal-operation	
11	Health Monitoring of Hardware such as Ethernet ports, Power supply cards & Communication links and internal voltages through SNMP/IEC61850 to SCADA System/Purchaser's NMS	Protocol shall be SNMP	

Annexure- 3B- SAS Specification for Conventional Substation			
GPS Receiver with Frequency, Time & Date Display			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
1	Make	Please Refer Annexure-6 of Section E	
2	Model		
3	Network support	Multiple LAN network topology Multiple SNTP ports supporting different IP networks (Minimum 2 different LAN networks)	
4	Tracking	GPS-L1, C/A code (1575.42 MHz), Minimum 12 channel (tracks up to 12 satellites) or more Minimum Accuracy 1 microsecond or better Code/Carrier tracking	
5	Front Keypad	For Configuration of Local time offset, Output code select, Backlight control, Out-of-lock time, Auto-Survey, Position, Event input, Antenna delay, Programmable Pulse setup, Off or Zero delay, Serial and IP port configuration.	
6	Redundant High Interference GPS Antenna and mounting adapter kit	Required	
7	IEEE1588 V2/NTP/SNTP Server	Mandatory	
8	Mounting Type	19" Rack Mountable, Size : 2 U, Chassis: Rack Chassis w/sliding Rapid/Versa Rails and Cable management Arm, with all other mounting accessories	
9	LED Indicators and LCD Display	<b>LED Indicators</b> : Power, Watchdog, GPS Locked, Event, GPS data	
		<b>LCD display for</b> : 4-rows x 40-character backlit LCD, Functions- showing local date and time, Position: latitude, longitude, altitude, Receiver and clock status, Deviation, Event time.	
10	Outputs	<b>TCP/IP</b>	
		Min 2 Nos. independent SNTP Ports to synchronize various automation systems on NTP / SNTP protocol	
		GPS Clock shall have suitable format / software for NTP / SNTP to broadcast the time on TCP/IP network to all devices	
		IP address of the GPS shall be user configurable	
		<b>Pulse</b>	
		2 Nos. Potential free contact (minimum pulse duration 50 msec). The pulse output shall be user configurable to provide pulse rates of 1 PPS, 1 PPM, 1 PPH, accuracy < 1 micro-second with GPS locked contacts suitable for 24/48 V DC, 100 mA	
<b>Potential Free Contacts for Alarms</b>			
		Dry and isolated alarm contacts for GPS Sync Lost, Power Failure, Watchdog and 1 spare (Configurable)	



GPS Receiver with Frequency, Time & Date Display			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
11	Power Supply	Power supply module of 24V DC +/- 20 % . The Equipment shall have adequate protection against reversed polarity, over current and under voltage conditions, to prevent the internal logic from being damaged and becoming unstable causing mal-operation	
12	Electronic Earthing	Provision of electronic earthing to the nearest grounding box/earth pit	
13	Environment	GPS Receiver with accessories will be installed in the RTU Panel with no temperature or humidity control. The GPS Receiver shall be capable of operating in ambient temperature from 0 to +65 degree C with rate of temperature change of 20 degree C/hour and relative humidity of 95%, non-condensing	
14	Other Required Features	Offset Adjustment	
		Propagation Delay Compensation to achieve overall accuracy of < +/- 1.5 microseconds	
		Internal time base stability < 1 PPM or better	
		Web-Interface for Configuration	
		Amplifier to be included if required	
15	Antenna	Type – Helical	
		Axial Ratio – 5dbs – 5db	
		Noise < 1 db	
		Operating Temperature - 30°C to +80°C	
		Connector – N or BNC-J	
		Output Data - NEMA 0183 format	
		Coaxial Cable – Low loss cable, Minimum 50 m length cable for connecting to antenna and an option to extend the cable length (Actual length shall be decided at the time of detailed engineering).	
		Mounting – Fixed (sky view) outdoor	
		Weather Condition – All seasons	
		Weight of the Antenna – less than 0.5 kg	
Lighting Arrester – Mandatory			
16	Expected Accuracy	IEC60870-5-103, IEC60870-5-104 < 10 Milliseconds	
		<b>NTP, SNTP:</b> WAN < 10 msec LAN < 1 msec	

Annexure- 3B- SAS Specification for Conventional Substation			
Multi- Function Meter (MFM)			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
1	Make	Please Refer Annexure-6 of Section E	
2	Model		
3	Accuracy Class	Class 0.2S / 0.5S (IEC62053-11 and IEC62053-22)	
4	Sampling rate	128 Samples/Cycle for true RMS measurement	
5	Voltage Input	0 to 690 V L-L, 400 V L-N	
	Voltage Burden	< 0.15 VA	
	PT Ratio	1.0 - 6500	
	Primary Value of PT	Shall be programmable	
	Range of Reading	1 - 999000 V	
6	Current Input	1 A / 5A selectable from the front display	
	CT Burden	< 0.1 VA per phase	
	CT range	0.1% to 200%	
	Current over range	5A CT = 15A RMS continuous, 250A for 1 Sec 1A CT = 3A RMS continuous, 50A for 1 Sec	
	Range of Reading	0-60000 Amp	
	Primary Value of CT	Shall be programmable	
7	Power Factor	0.5 (lag) to 1.0 (unity) and 1.0 (unity) to 0.5 (lead)	
8	Accuracy kW / kWh	0.5 S as per IEC62053:22	
9	Real time & Average parameters	Required	
10	Four Quadrant measurement	Required	
11	LED Load Bar Indication	Optional	
12	Self-Diagnostic LED	Required	
13	Real time clock	Required	
14	Min./Max of parameters	Required	
15	THD	Required	
16	Individual Harmonics up to 39th	Required	
17	Real time waveform monitoring	Standard software to monitor real-time waveform	
18	Communication Port	Min 1 no. RS 485 port	
19	Isolation	Galvanic	
20	Communication protocols	MODBUS RTU, ASCII, selectable at site	
21	User defined registers	Preferred	
22	Energy pulse LED for calibration test	Required	
23	Relay output	Optional	

24	Auxiliary Power Supply	Power Supply 24 V DC +/- 20% The MFM shall have in-built adequate protection against reversed polarity, over current and under voltage conditions, to prevent the internal logic from being damaged and becoming unstable causing mal-operation	
25	Environment	MFM will be installed on the Relay Panel in Control room with no temperature or humidity control. The MFM shall be capable of operating in ambient temperature from 0 to +65 degree C with rate of temperature change of 20 degree C/hour and relative humidity of 95%, non-condensing	
26	Mounting Panel cutout	92 mm x 92 mm, flush mounting	
27	Programming features	The meter should allow the user to configure the registers for the electrical parameters. Unit should be fully programmable in the field and also remote configuration including PT/CT ratios and should have adequate protection for authorization for changes.	
28	Parameters to be monitored and reported:	Volt, Amp, Cos (Phi), kWatt, kvar, kVA, HZ, MWH Import & Export, MVARH Import & Export.	

Engineering Station (Laptop)			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
1	Make	Please Refer Annexure-6 of Section E	
2	Model		
3	Hardware	Laptop with latest processor, 64 bit, 1 TB HDD, 8 GB RAM, DVD RW, 4 USB Ports, 15" Display with 1 no. serial to USB converter	
4	Software	Microsoft Windows & Office License	
		Antivirus software	
		RTU Configuration Software	
		IEC61850 Configuration Tool	
		RTU/BCU/BCPU, Master Simulation & Protocol Analyzer Software	
5	Accessories	Wireless Mouse & Laptop Bag	
6	Auxiliary Power Supply	230V AC	

Temperature & Humidity Sensor			
SL. NO.	TECHNICAL PARTICULARS	TPCODL REQUIREMENT	BIDDER RESPONSE
1	Make	Please Refer Annexure-6 of Section E	
2	Model		
3	Operating Range	-40.0 to + 85 °C (Temperature) 0.0 to 100.0% RH (RH)	
4	Measuring Range	-40.0 to + 65 °C (Temperature) 0.0 to 100.0% RH (RH)	
5	Temperature Accuracy	+/- 0.1 °C	
6	RH Accuracy	+/- 0.1 % RH @ 24 °C	
7	Long term stability for humidity sensor	< 1% RH / Year	
8	Local Display	4 Digit (min), red, Seven Segment Display, Independent displays for T & % RH, Visible at least from 15 mtrs.	
9	Output for Temperature & % RH	Isolated 4 wire / 3 wire RS 485 electrical port with MODBUS RTU protocol	
10	Min / Max Load	V-signal $\geq$ 1Kohms/V, mA-signal $\leq$ 500 ohms	
11	Front Keyboard	Required for programming and calibration (if applicable)	
12	Enclosure (Size)	Robust Industrial Housing, Suitable for Internal and External use	
	Additional Enclosure for Outdoor Application	Transmitter shall be mounted in the industrial grade weather proof Box	
13	Mounting Arrangement	Wall mounted, with necessary mounting arrangement for internal and external use	
14	Protection	Necessary protection shall be provided for the sensors	
15	Protection Rating	IP 65	
16	Data Logging	Optional	
17	Self-Diagnostic LED	Required	
18	Power Supply	Power Supply 24V +/- 20% The Sensor shall have in-built adequate protection against reversed polarity, over current and under voltage conditions, to prevent the internal logic from being damaged and becoming unstable causing mal-operation	
19	Environment	Sensor will be installed in the Switchyard/GIS, Switchgear rooms, Battery Room, Control & Relay room etc. where no temperature or humidity control is available.	

TP Central Odisha Distribution Ltd.

Automation &amp; Technology

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## SECTION – A

### PROJECT SPECIFICATIONS



TP CENTRAL ODISHA DISTRIBUTION LIMITED  
(A Tata Power & Odisha Govt. Joint Venture)  
2nd Floor, IDCO Tower, Janpath, Bhubaneswar, Odisha 751022

Revision	Date	Description	Approvals		
			Prepared By	Checked By	Approved By
R0	10 <sup>th</sup> July 2021	Released for Procurement	Automation Team	TKB/GSB	AKA

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## **Project Specification**

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## 1.0 Intent of Specification

Tata Power Central Odisha Distribution Limited (TPCODL) hereinafter called the "OWNER" or "PURCHASER", proposes to implement RTU based Automation System for Conventional Substations to integrate with SCADA, DMS & OMS System at the Purchaser's Main Control Center (MCC) and Backup Control Centre (BCC) for remote monitoring and control. The proposed Remote Terminal Unit (RTU) shall communicate with the SCADA, DMS & OMS System at MCC and BCC over IEC 60870-5-104 protocol for real time status of the switchyard and other accessories in the substation. The RTU shall be capable to acquire signal through hardwiring and communication (IEC 61850, IEC60870-5-103, IEC60870-5-104 and Modbus Protocol). The proposed RTU shall communicate simultaneously with Purchaser's minimum eight (8) SCADA System (redundant) over IEC 60870-5-104 with different network.

Bidder shall refer the entire project specifications to understand the execution methodology and interface equipment specification for the complete Scope of Work of this project. The bidder shall consider the entire scope of supply and services accordingly.

The document covers the specific requirements for complete design, detailed engineering, installation, testing and commissioning of

- a) RTU based Automation System
- b) Site survey related to the proposed project

This specification describes the technical requirements of the systems to be procured.

### 1.1 Introduction to Tata Power Central Odisha Distribution Limited

TP Central Odisha Distribution Limited (TPCODL) is incorporated as a joint venture of Tata Power (51%) and Govt of Odisha (49%) on the Public-Private Partnership (PPP) model. Govt. of Odisha (GoO)'s share is held by it through its 100% owned company GRIDCO. TPCODL took over the license of distribute electricity in the central part of Odisha, which was earlier served by erstwhile CESU. TPCODL's utility business is governed by the provisions of license issued by Hon'ble OERC for distribution and retail supply of electricity in Central Odisha.

TPCODL licensed area is spread over a geography of 29354 Sq. Km and serve the registered consumer base of 2.6 million with a peak load of around 1580 MW. It receives electrical power at a sub transmission voltage of 33 kV from Odisha Power Transmission Corporation Limited (OPTCL) 220 / 132 / 33 kV Grid Substations and then distributes the power at 33 kV /



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11 kV / 440 V / 230 V depending on the demand of the consumers. For effective operations, the license area is divided into 5 circles which is further sub divided into 20 Divisions and 64 Sub-divisions which manage the commercial and O&M activities in order to serve its consumers. The entire TPCODL distribution network covering all the 5 circles i.e. Bhubaneswar # 1, Bhubaneswar # 2, Cuttack, Dhenkanal and Paradeep is comprising of 371 nos. of Primary Sub-Stations (33/11kV). Out of the total 371 substations, 178 substations are conventional substations which is being intended for RTU based Automation System.

### 1.2 General Information of Tata Power Central Odisha Distribution Limited

Description	UoM	Quantity
Distribution Network	Sq. Km.	29354
Number of Circles	Nos.	5
Number of Divisions	Nos.	20
No. of Sub-Divisions	Nos.	64
Consumer Base	Million	2.6
AT & C loss (as on 31st Mar 2020)	%	30.44
Primary Substations	Nos.	371
33 kV Feeders	Nos.	190
11 kV Outgoing Feeders	Nos.	1019
Total Circuit length 33 KV Feeders	Kms	3911.58
Total Circuit length of LT Network	Kms	55359
Power Transformers (33/11 kV)	Nos.	666
Distribution Transformers	Nos.	71889
Total Installed Capacity of Primary S/s	MVA	4475
Peak Demand	MW	1603
Annual Consumption	MUs	8600

### 1.3 Present SCADA & Substation Automation System

The SCADA/DMS System is implemented in Bhubaneswar and Cuttack Town of TPCODL under R-APDRP Scheme in the year 2016 by M/s Dongfeng Electronics Co. Ltd. (DFE) as the SCADA/DMS Implementation Agency (SIA). Current System is now established as Centralized SCADA System and in use for remote monitoring and control of 200 nos. of 33/11kV substations of TPCODL distribution network.

In addition to SCADA / DMS implementation, the Remote Terminal Units were also installed at 56 nos. of 33 / 11 kV Substations (56 Nos. out of 371 Nos. Substations). These RTUs was

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integrated over MPLS / VPN link with the respective Control Centers (CC) located in Bhubaneswar, Cuttack and Puri town. The protection BCPUs of 33 kV and 11 kV feeders are integrated to the respective RTUs on IEC61850. The Digital Input / output (Status, Open/Close/Reset/Tap Change control, Protection Alarms) of the respective bays are acquired through these BCPUs on SCADA System. For monitoring of the Analog measurement, separate Multifunction Meters are used, which are integrated to the Station RTU over MODBUS (Serial) Protocol. The Communication link for integration of these RTUs is MPLS network of the service provider (NBSP).

Similarly, 134 Nos. of ODSSP Substations are also being integrated with existing SCADA/DMS System. The protection BCPUs of 33 kV and 11 kV feeders are integrated to the respective RTUs on IEC61850. The Digital Input / output (Status, Open/Close/Reset/Tap Change control, Protection Alarms) of the respective bays are acquired through these BCPUs on SCADA System. For monitoring of the Analog measurement, separate Multifunction Meters are used, which are integrated to the Station RTU over MODBUS (Serial) Protocol. The Communication link for integration of these RTUs is MPLS network of the service provider.

SCADA enablement of remaining substations are planned in a phased manner. Currently the Conventional Substations are locally monitored and controlled under the coordination of Power System Control Centre. On similar line of RAPDRP and ODSSP substations, these conventional substations will also be integrated to Centralized SCADA/DMS System. This RFP covers the technical requirements for remote Monitoring and Control of the conventional Substations in as-is condition of the existing electrical infrastructure from Purchaser's Centralized SCADA System. As these substations will be converted to fully Grid Substation Automation System progressively (i.e. BCPUs, Condition Monitoring Devices etc.), same RTU is planned to be used for integration with Substation equipment and to the Control Centers.

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## 2.0 Project Information

Sl. No.	Item Description	
1.0	<b>Owner</b>	Tata Power Central Odisha Distribution Limited (A Tata Power & Odisha Govt. Joint Venture), 2nd Floor, IDCO Tower, Janpath, Bhubaneswar, Odisha 751022
2.0	<b>Consultant</b>	Not Applicable
3.0	<b>Location of the sites</b>	Within the Operational Area/Distribution Network of TPCODL
4.0	<b>Connectivity</b>	Sites are connected by road to Bhubaneshwar, Cuttack, Paradeep, Dhenkanal
5.0	<b>Transport</b>	Access roads are available for movement of materials to site. Movement of heavy materials would be through existing roads/rail up to TPCODL Premises
6.0	<b>Maximum Altitude above Sea Level</b>	1000 mtr.
7.0	<b>Climatic Conditions</b>	
7.1	<b>Temperatures</b>	
(a)	Maximum Ambient Air Temperature	50 Degree C
(b)	Maximum Daily Average Ambient Air Temperature	35 Degree C
(c)	Minimum dry bulb temperature	10 Degree C
(d)	Design temperature for electrical equipment / devices	65 Degree C
7.2	<b>Relative humidity</b>	
(a)	<b>Maximum during monsoon</b>	100%
(b)	<b>Minimum during December</b>	22%
(c)	<b>Design humidity</b>	95%
7.3	<b>Rainfall</b>	
(a)	Average Number of Thunderstorm days per annum	70 (isokeraunic level)
(b)	Average Number of Rainy Days per Annum	120 days
7.4	<b>Wind Velocity:</b> 300 km/hr., 200 km/hr. and 160 km/hr. environmentally, some of the regions, where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for electronic equipment. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.	
7.5	<b>Seismic conditions</b>	
(a)	Earthquakes of an intensity in horizontal direction	Equivalent to seismic acceleration of 0.3g
(b)	Earthquakes of an intensity in vertical direction	Equivalent to seismic acceleration of 0.15 g (g being acceleration due to gravity)
7.6	<b>Air Quality</b>	
(a)	Atmosphere polluted with industrial gases and wastes because	

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		of proximity to industrial area.
8.0	<b>Auxiliary Power Supply</b>	
(a)	<b>AC supply</b>	230V, 1 phase, 2 wire, 50 Hz supply with one lead earthed shall be provided Voltage variation $\pm 10\%$ Frequency variation $\pm 5\%$ Combined voltage & frequency variation 10%
(b)	<b>DC Supply</b>	24V $\pm 10\%$ , DC from the Sub Station DC System

### 3.0 Scope of Work

The scope of this specification covers all the technical requirement with all accessories, tools and tackles of Design, Engineering, Supply, Insurance, Testing at Manufacturer's works, packing, forwarding, Transportation, Delivery at site, unloading at site/stores Installation, Testing & Commissioning of RTU and seamless integration with Purchaser's SCADA Systems, and other systems for the conventional substation, Warranty and Post Warranty support as per the detailed specifications. Including all works required for successful integration with all IEDs, meters etc.

Any item though not specifically mentioned but is required to complete the project shall be considered and the same shall be supplied and installed by the bidder.

The indicative Bill of Material is attached with this document for bidder's reference and for bid purpose only (*Refer Annexure-7 of Section-E, Indicative Bill of Material for Proposed RTU based Automation System*). Attached BOM is indicative, Bidder shall submit the detailed BOM along with the offer, as per the System/Architecture offered to meet the specified requirements.

Bidder to note that the proposed system architecture shall give more emphasis on the following aspects

- a. Reliability
- b. High Availability
- c. Cyber Security Resilience

The project is proposed to be implemented in phases as mentioned below:

**Phase 1 (FY'21-22):** Scope of work as mentioned for 22 Nos. of Substations (*Refer Annexure-3 of Section-E Phase-1 (FY'21-22) for Sub-Station details*).

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**Phase 2 (FY'22-23):** Scope of work as mentioned for 67 Nos. of Substations (*Refer Annexure-3 of Section-E Phase-2 (FY'22-23) for Sub-Station details*).

**Phase 3 (FY'23-24):** Scope of work as mentioned for 90 Nos. of Substations (*Refer Annexure-3 of Section-E Phase-3 (FY'23-24) for Sub-Station details*).

### 3.1 General

- a. It is in the interest of the bidder to visit the site(s), at his own cost, to assess the requirements before bidding for the project. Bidder may decide to visit all sites or sites on sample basis, with in the defined timelines as mentioned in Calendar of events.

After the placement of the award, the bidder shall carry out site survey of all Substations, to collect the required information for completion of detailed engineering. Bidder to note that any addition of the quantity required for sites during detailed engineering, will be in the scope of the bidder, with no commercial implication to TPCODL.

- b. Bidder to note that any system (Hardware & Software) considered under this RFP for meeting the functional requirement shall be from the same OEM.
- c. ***No Hardware & Software shall be manufactured, delivered, customized exclusively for this project/contract.***

### 3.2 Engineering

- a. Based on the Site Survey, bidder to finalize the substation wise scope of work, BOM, Identification of the Contacts for Status, Protection and Control, Communicable IEDs, Availability of CT/PT for analog measurement.
- b. Finalization of Functional Design Specifications, Substation-wise Automation System Architecture, GTP, I/O List, Schematic Diagrams of Panel, Cable Requirement, Auxiliary Power System requirement.
- c. Preparation of Interconnecting Schedule (Field, Communication, Inter/Intra Panel)
- d. Layout finalization for installation of Panels, Cable route etc.
- Space available in the control room shall be utilized to house all the panels (RTU, SIC, Communication, DC System). Bidder to ensure optimal utilization of space to accommodate all the required equipment (i.e. RTU, SIC, Communication and DC System).

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- The Conventional substations where there is no Control room / insufficient space in Control room for housing RTU, SIC & DC System, these systems shall be installed in outdoor switchyard. Bidder to make the appropriate housing arrangement for installation of these panels for outdoor application.
- Housing of RTU and SIC shall be considered adjacent to each other. If there is space for one panel only in the control room, then both RTU and SIC shall be considered for outdoor mounting.
- e. Appropriate IP class shall be considered for all the equipment planned to be installed in open space. For indoor application bidder may consider panel enclosure with IP54, for outdoor application bidder shall consider IP65, IP67 as per the site requirement.

### 3.3 Installation & Commissioning

#### 3.3.1 CRP

- a. Supply, installation and wiring of multipliers for providing potential free contacts for Digital Inputs such as status indication of Isolators, Breakers and others signal in the existing CRP/Field Marshalling Box as per "Indicative Signal List" (*Refer Annexure-4 of Section-E* for Indicative Signal List).
- b. Providing and mounting adequate copper lugs, TBs & Din rail channel of standard make in the CRP.
- c. Bidder to mount the CMRs with bases in CRP panel with proper arrangement i.e. segregated for Input, Output and Power Supply requirement. Mounting of TBs for the proposed scope shall not disturb the existing wiring and arrangement.
- d. The auxiliary contact used in CRP panel for Digital Inputs (Status and Protection) shall be used for contact multiplication to extend the same to proposed RTU/SIC. The other contact of the CMR shall be restored in the CRP for current application.
- e. Supply, Installation and Commissioning of the MFM in the CRP shall be in the scope of the Bidder. Bidder shall make appropriate cutout in the CRP panel for installation of MFM.
- f. Supply, Laying and Termination of power supply cable for extending 24V DC inputs to the MFM in the CRP.
- g. All the MFM shall be looped for communication with the proposed RTU.

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- h. Supply, Laying and Termination of CT, PT cables for extending CT & CVT / PT inputs to the MFM from the TTB located in the CRP.
- i. Instrumentation and control cable shall be laid through the existing cable trenches whereas the communication cable shall be laid through PVC coated steel flexible conduit.
- j. Integration of IEDs through Ethernet/Serial Cable with RTU. Bidder to consider all networking accessories to connect station IEDs to all the proposed managed ethernet switches.

### 3.3.2 RTU

- a. Data acquisition and Control is primarily planned through BCPUs, therefore the integration of these BCPUs through ethernet switch and upto the RTU is in the scope of the bidder.
- b. In substation, where the data acquisition and control is not available through BCPUs, same will be achieved through CMR & HDR respectively.
- c. Supply, laying, wiring with proper termination of copper control cable for extending the status inputs from control panels (CMR output contact) to the RTU/SIC panel.
- d. Interposing Relay (Heavy duty Relay) shall be supplied and installed in the RTU/SIC panel along with wiring of the control cable to extend the control output of the RTU to CRP/Field panel.
- e. Analog output of WTI, OTI & TPI shall be connected with Analog input card of the RTU. Required instrumentation cable supplying, laying and termination is in the scope of the bidder.
- f. In some substations space for RTU and SIC shall be created by dismantling and shifting the existing unused dead panel by the bidder.
- g. Configuration of the RTU as per requirement, integration of the IEDs and Condition Monitoring devices of the Auxiliary System
- h. Proposed Temperature and Humidity sensor shall be installed at appropriate location and integration of the same with RTU.
- i. Configuration of the Ethernet switch.

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### 3.3.3 DC System

- a. Supply and installation of DC System shall be in the scope of the Bidder.
- b. Extension of AC supply to the DC System and extension of DC output to DCDB shall be in scope of the bidder.
- c. Bidder to consider new DCDB to meet all power supply requirement of CMR, RTU, SIC, MFM etc. The new DCDB shall have independent feeders for each application. As proposed RTU and SIC panel will have the redundant DC source with Diode-oring unit installed in respective panel.
- d. DC System (Station Battery and Battery Charger) shall be equipped with a controller which can communicate over Modbus RTU protocol. The Bidder must do necessary arrangement to communicate the same with the proposed RTU system.
- e. The Bidder has to dismantle the existing DC System (Station Battery and Battery Charger, DC Wiring) by the proposed one.

### 3.4 Substation Earthing

- a. Bidder to submit the details of earthing requirement for the proposed solution.
- b. Providing of proper earthing to RTU, SIC, DC System and armored cable with separate Earth pit shall be in the scope of the Bidder.
- c. Earthing cable with proper sizing shall be laid from the RTU and SIC panel to the earth pits.
- d. Bidder to ensure maximum earth value of 2 Ohms.
- e. Bidder to consider proper grounding of the outdoor panels for adequate protection from heavy lightning, Gusty Wind and Cyclone

### 3.5 Control, Instrumentation and Communication Cable

- a. For outdoor CRP, the bidder shall supply armored control cable and shall lay the cable through the cable trenches.
- b. The auxiliary contact used in CRP panel for Digital Inputs (Status and Protection) shall be used for contact multiplication to extend the same to proposed RTU/SIC.
- c. Supply, Laying and termination of control cable from SIC to CRP Panel for digital output.
- d. Supply, Laying, Wiring and Termination of control cable, multi-strand copper control cable for extending CT & CVT / PT inputs to the MFM in the CRP.



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- e. Supply, Laying and termination of communication cable for IEDs and Condition monitoring devices and auxiliary system
- f. Supply, Laying and termination of control cable from Isolator Box to SIC panel.
- g. Supplying, Laying and Termination of auxiliary power supply cable for extending 24V DC inputs from DCDB to the MFM in the CRP. All the MFM shall be looped to the RTU panel for communication with the proposed RTU.
- h. All the MFM shall be looped to the RTU panel for communication with the proposed RTU. Looping from MFM to MFM shall not be allowed directly. Looping shall be done from MFM to the terminal block and subsequently terminal block to terminal block in the panel.

### 3.6 Panel Erection

- a. Appropriate civil work shall be carried out before installation of RTU and SIC panel.
- b. Nuts and bolts shall be properly fastened to fix the panel on the floor.
- c. In case of outdoor application, Proper concrete based plinth with suitable height shall be built which shall be strong and specious enough to hold the RTU and SIC panel. The height shall be selected based on the record of rain water in the substation.
- d. Appropriate IP class shall be considered for all the equipment planned to be installed in open space. For indoor application bidder may consider panel enclosure with IP54, for outdoor application bidder shall consider IP65, IP67 as per the site requirement.
- e. In some substations space for RTU and SIC shall be created by dismantling and shifting the existing unused dead panel by the bidder.
- f. Bidder to note that the substations comes under Cyclone prone area, with average wind speed of 180 km/hour, hence adequate measures shall be taken by the bidder during design of the solution, especially for outdoor installation.

### 3.7 Communication Infrastructure

- a. Communication components and accessories such as Converters, Serial Server, Ethernet switches, and other accessories such as cables, connectors etc. required for the RTU based automation systems shall be in the scope of the bidder.

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- b. Installation of Ethernet Switches, Media converter (if required), communication cable supply, laying, termination is in the scope of the bidder for the RTU based automation system supplied at conventional substations to meet all the functional requirement specified in this RFP.
- c. Communication components and accessories such as Converters, Serial Server, Ethernet switches, and other accessories such as cables, connectors etc. required for the RTU based automation systems shall be in the scope of the bidder.
- d. Communication equipment's like Router cum Firewall, POE and its associated power supply and any other accessories required to make through the communication between RTU and MPLS cloud shall be installed in the RTU panel. Bidder to take care during detailed engineering. However, supply of these equipment's except the communication cable shall not be in the scope of the bidder.
- e. Installation of communication equipment, communication establishment, cable supply, laying, termination is in the scope of the bidder for the RTU based automation system supplied at conventional substations to meet all the functional requirement specified in this RFP.

### 3.8 Integration

- a. Configuration of the RTU and other Systems as per RFP shall be carried out by the Bidder followed by local testing, FAT and SAT.
- b. During local testing (Pre-SAT) each Digital Input, Digital output and Analog Inputs shall be tested with the RTU, by simulating at switchgear end with satisfactory result. Each MFM data shall be verified with RTU after integration over Modbus protocol.
- c. RTU configuration shall be tested complete in all respect so that integration testing shall be carried out smoothly without any technical issues during point to point testing with Purchaser's SCADA Systems. However, the necessary configuration at the Control Centre end shall be taken care by the Purchaser.

### 3.9 Safety

- a. Bidder to adhere the safety guidelines and policy of TPCODL. Bidder shall refer the Safety document attached with the bid document.

### 3.10 Documentation, Backup

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- a. The Documents shall be submitted as proposed. Master Document List (MDL) shall be prepared by Bidder and submitted for Purchaser's approval.
  - b. Bidder shall provide all documentation in soft / hard form about licensing information for each software supplied (OS, application software, configuration, diagnostics, simulation & testing tools). ***(Please refer Section D, Drawings & Documents)***
  - c. The offered system shall store the copy of the system configuration, user configurable database, tools and relevant software as a backup at Purchaser's identified location for restoration under a disaster recovery plan.
  - d. The bidder shall provide complete engineering data, drawings, reports, manuals and services offered etc. i.e. complete set of documentation / drawings / architectures/ Inter-Operability Tables (IOTs) submission of Test Reports, job progress reports etc.
  - e. It is the responsibility of the Bidder to handover all project related drawings in AutoCAD formats only. The pdf version of above drawings / documents shall also be submitted for formal approval process.
  - f. Submission of technical documentation related to design, installation, testing, operation & maintenance of the equipment and submission of Test Reports, job progress reports etc. in hard copies (3 sets) and soft copies (3 sets, preferably in PDF).
  - g. Providing complete source code, including customization
- 3.11 Training**
- a. Training of Purchaser's Personnel at site with all required training setup for each individual trainee. ***(Please refer Section A, Item 15.0 for Training requirement)***
- 3.12 Mandatory & Recommended Spares**
- a. Supply of recommended and mandatory spares for all supplied items ***(Please refer Section A, Item 17.0 for Spares Requirement)*** as mentioned in the separate section
- Bidder shall refer the entire project specifications of the RFP to understand the execution methodology, supply, services and interface requirement for complete Scope of work of this project.

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It is not the intent of this specification to specify completely herein, all details of design & construction of Automation System. It is the bidder's responsibility to complete the installation and commissioning of the system as per the functional requirement mentioned in the RFP.

***It is not the intent of this specification to specify completely herein, all details of design & construction of the proposed System. However, the bidder is encouraged to provide latest hardware and software technology used worldwide to meet the specified requirement and at the same time system shall conform in all respects to high standards of engineering, design & workmanship.***

## 4.0 Terminal Points

### 4.1 Bidder

- 4.1.1 Site Survey, BOM and Scope finalization, Engineering, Preparation of Architecture, Layout, ICS and other documents Substation wise covering all the functional requirement envisaged by the Purchaser and documented in the RFP.
- 4.1.2 Supply and Installation of RTU and other offered systems.
- 4.1.3 Integration of the existing system field devices and hardware signals (IEDs, MFM & hardware signals) to proposed RTU based Automation system. Supply of the required material including cables, erection, installation, cable laying & termination, database and logic development, FAT, pre-SAT testing, SAT and demonstration of the required performance is the sole responsibility of the bidder.
- 4.1.4 Provision of the required power supply from ACDB, DCDB. It is the bidder's responsibility to lay the required cable up to the equipment supplied by bidder and further make the provision to distribute for the systems supplied under this contract.
- 4.1.5 Suitable separate Earthing system (including earth pit) for offered system
- 4.1.6 Integration with Control Centre SCADA Systems as specified in the specifications
- 4.1.7 Bidder shall depute adequate manpower, resources and material to complete the project as per the schedule mentioned in the RFP. If Purchaser feels that the adequate resources and material are not provided, reserves the right to ask the bidder to supply the required material and depute additional resources to complete the project in time.

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- 4.1.8 There shall be only one point of contact for Purchaser, i.e. the bidder who will be awarded the contract will be responsible for delivering the project solely. Any Sub-Contracting of any part of the work will be the responsibility of the lead Bidder as specified by Purchaser.
- 4.1.9 All application software, hardware, data, plans, drawings, specifications, designs, reports and other documents procured or developed by the selected Bidder in the execution of the contract shall remain the property of the Purchaser, right from the beginning of the contract, during the whole duration of the project and after the expiry or termination of the contract. Purchaser shall also remain the sole owner of the property (Hardware/software) in case the contract is terminated for any other reason. The source code/Application of the customized part of the application software in RTU will remain as exclusive property of Purchaser, even after the termination or expiry of the contract. The ownership shall also remain with Purchaser in case the selected Bidder fails to execute tasks to the satisfaction of the Purchaser.
- 4.1.10 Any deviation from this RFP / Technical Specification or as per the requirement of Purchaser, if noticed, may be brought forth in the Bid offer / pre-bid meeting / meeting before award of contract. Any such deviation, if informed thereafter bidder will supply Hardware and Software as per the site and functional requirement free of cost to the Purchaser. The decision of Purchaser will be final.
- 4.1.11 The selected bidder, after award of contract, will finalize the actual quantities to be deployed based on site survey, after approval from Purchaser, before initiating the purchase process of such items. All the hardware and software shall be procured and delivered after taking prior approval of Purchaser for each consignment. However, if any change in the quantity of the material, there should not be any additional cost to the purchaser.
- 4.1.12 Engineering and technical assistance during the contract and extended warranty and maintenance period.
- 4.1.13 Provide calculation for power requirement for each cabinet and equipment
- 4.1.14 Maintaining backup of all RTU configuration for all substations and handover the same in duplicate to Purchaser.
- 4.1.15 Provide a Quality Assurance Plan and access to the manufacturing process.
- 4.1.16 The bidder shall provide all additional equipment and services required to ensure compatibility with Purchaser's systems.

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4.1.17 The bidder shall demonstrate a specified level of performance of the offered system during FAT and SAT.

4.1.18 Bidder shall submit the project plan with major mile stone prior to the start of the execution of the project

#### 4.2 Purchaser

4.2.1 Will assist the bidder to provide the necessary work permits for working in operational area

4.2.2 Participation of Purchaser's engineers during RTU Engineering & Configuration, however bidder shall be responsible for validation of this database.

4.2.3 Providing all the necessary data regarding the electrical network

4.2.4 Providing details of the existing systems for specified integration

4.2.5 Review and Approval of IP Schema for all the IEDs, RTU, in-line with existing System

4.2.6 Providing communication backbone for interconnection with existing systems

4.2.7 Review and approval of the Bidder's designs, drawings, and recommendations

4.2.8 Review and approval of test procedures

4.2.9 Participation in and approval of "Type", factory and site acceptance tests

4.2.10 Review and approval of training plans.

4.2.11 Coordination of the Bidder's activities with the Purchaser's concerned departments

#### 5.0 Exclusions

The Bidder shall be responsible for providing all the hardware and software, RTU Engineering /Configuration and services required for commissioning of project except mentioned below

5.1 Buildings

5.2 Air Conditioning

5.3 Fire Fighting/Detection system

But Bidder must indicate the optimal space requirements for systems/panels/equipment being supplied under this project, so that entire substation infrastructure can be installed in the available space as per the space availability at each site.

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## 6.0 Instruction to Bidders

### 6.1 Bidder Confidentiality

All information contained in this specification is confidential and shall not be disclosed, published or advertised in any manner without written authorization from Purchaser, includes all bidding information submitted. All specification, data and documents submitted by bidder remain the property of Purchaser and all bidders are required to return these documents to Purchaser upon request. Bidders who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

- 6.1.1 Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process. Any effort by a Bidder to influence the Purchaser's processing of Bids or award decisions may result in the rejection of the Bidder's Bid.
- 6.1.2 Prior to the detailed evaluation, Purchaser will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.
- 6.1.3 Bid determined as not substantially responsive will be rejected by the Purchaser and/or the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non-conformity.
- 6.1.4 The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the Purchaser, shall be written in the English Language. Any printed literature furnished by the Bidder may be written in another Language, provided that this literature is accompanied by an English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.
- 6.1.5 Bidders shall quote for the entire Scope of Supply / work with a break up of prices for individual items and Taxes & duties. The total bid price shall also cover all the Bidder's mentioned in or obligations mentioned in or reasonably to be inferred from the bidding documents in respect of Design, Supply, Transportation to site, all in accordance with the requirement of bidding documents. The bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total price with taxes, duties & freight up to destination at

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various sites of Purchaser. The prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during the execution of the supply work, breakup of price constituents.

- 6.1.6 The quantity break up shown else-where in Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any items not indicated but are required to complete the job, shall be deemed to be included in prices quoted.
- 6.1.7 The bidder is not allowed to modify or withdraw its bid after the Bid's submission.
- 6.1.8 The Principal & their Indian Representative shall be responsible jointly and severally for the design, supply, erection, commissioning & satisfactory performance of the supplied system and specified Post Warranty Maintenance, Activities and support. The Principal shall also vet the design and participate in the engineering, commissioning at site, Acceptance Tests & Training. The Indian Representative shall have full facilities for design, Supply, erection, commissioning, system integration, factory and site acceptance test, satisfactory performance of supplied system and specified post warranty maintenance.
- 6.1.9 Bidder/Principal shall demonstrate required functionality and capability in Purchaser's office during technical evaluation before bid submission
- 6.1.10 In case of agreement dishonored by any party (Bidder/ Principal), during life of the delivered system, Principal shall be responsible for providing the services to the Purchaser. Bidder/ Principal shall submit the address and contact details of the Principal's Purchaser account holder.
- 6.1.11 The Bidder (including Principal) shall give an undertaking to provide full range of services (including hardware and software maintenance, modifications and upgrade support) for the life of the delivered RTU system and other sub-vendor equipment and services.

## 6.2 **Type Tests Reports**

The type tests specified in Purchaser specifications should have been carried out within five years prior to the date of opening of technical bids and test reports are to be submitted along with the bids. If type tests carried out are not within the five years prior to the date of bidding, the bidder will arrange to carry out type tests specified, at his cost. The decision to accept/reject such bids rests with Purchaser. Type test reports should be issued by third party



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government accredited laboratory or internationally recognized laboratory like CPRI / ERDA / KEMA / International Accredited Lab.

### 6.3 Technical Clarifications

TPCODL do not entertain any deviation on the project specifications. The bidder should submit declaration on no deviation. However, if there are any deviations the Bidder should bring in notice of the Purchaser with proper documentations justifying the deviation. The Purchaser will take a call after going through the document and the decision of the Purchaser will be final. No explanation shall be provided to the Bidder for that. After scrutiny of qualifying criteria, technical commercial criteria offered by the bidder, clarifications will be sought from the bidders for any deviations with respect to the Purchaser specifications and attempt will be made to bring all bids on a common platform.

### 6.4 Bid Evaluation Criteria / Bid Selection / Bid Award Decision

6.4.1 The decision to place purchase order/LOI solely depends on Purchaser on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity. In addition to other factors that Purchaser may deem relevant.

6.4.2 Purchaser reserves all the rights to award the contract to one or more bidders to meet the delivery requirement and timely project completion or nullify the award decision without any reason.

6.4.3 In case any Bidder is found unsatisfactory during the delivery process, the award will be cancelled and penalized for non-execution of the project in time. In addition, the Purchaser may downgrade the rating of the Bidder which will affect the future businesses/opportunities with TPCODL.

### 6.5 Climate Change and Waste Management

Significant quantities of waste are generated during the execution of project and an integrated approach for effective handling, storage, transportation and disposal of the same shall be adopted. This would ensure the minimization of environmental and social impact in order to combat the climate change.

It is bidder's responsibility to transport and shift all the waste material generated to Purchaser's designated location for further disposal/processing.

### 6.6 Ethics Policies, Mandates and Considerations

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Purchaser is an ethical organization and as a policy Purchaser lays emphasis on ethical practices across its entire domain. Bidder should ensure that they should abide by all the ethical norms and in no form either directly or indirectly be involved in unethical practice. Bidder is advised to refer GCC attached for more information.

#### 6.7 **Safety Considerations**

Safety related requirements as mentioned in our safety Manual. All Associates shall strictly abide by the guidelines provided in the safety manual at all relevant stages during the contract period. Bidder is advised to refer GCC attached for more information.

- a. All the equipment shall be as per IEC / IS standards.
- b. As the work has to be carried out in operational area, necessary work permit shall be prepared and approved from authorized persons.
- c. While working on site, use of PPE (personal protective equipment) is mandatory.
- d. Installation and commissioning of equipment, laying of cables activities shall be done by adequately trained persons with proper procedure including required outages of equipment/system.
- e. Bidder shall furnish O & M manuals clearly bringing out safety aspects of equipment.
- f. Bidder's all site persons have to go through Safety Training at Purchaser's site
- g. Bidder to depute Safety officer, to ensure the activities at site during installation and commissioning of the system are as per Purchaser's safety policy and procedures.
- h. The Bidder's safety officer shall work along with Purchaser's Safety officer as per the policies and requirement stated in the Safety document.

#### 6.8 **Bidder's Technical and Commercial Proposal**

##### 6.8.1 **General Guideline**

- a. Purchaser will select the 'bidder' in accordance with the eligibility criteria indicated in **Item 8.0** of this document.
- b. The bidders are invited to submit a Technical Proposal and a Commercial Proposal for goods and related services required for the project as defined in RFP. This proposal will be the basis for finalization of the contract with the successful bidder.

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- c. The bidders must familiarize themselves with local conditions and take these into account while preparing their proposals. To facilitate the bidders in making the Proposal, the Purchaser shall have a 'Pre-Bid Discussion/meeting as per the schedule mentioned in RFP.
- d. Please note that costs involved in preparation of the proposal and of negotiating the contract, including a visit to the Purchaser are not reimbursable. Bid prices shall be quoted in INR only.

### 6.9 Risk & Mitigation Planning

Bidder shall assess underlying risks in implementation of the Project and detail out the methodology to mitigate them. It may include development of a risk assessment matrix indicating severity of the risk, chance of its occurrence and its mitigation approach.

### 7.0 Codes and Standards Applicable

The design, manufacture and performance of the RTU System shall comply with all the requirements of the latest editions of international codes and standards applicable. Nothing in this specification shall be construed to relieve the Bidder of this responsibility.

Emissions Standards		
1	EN55011 (CISPR 11)	ISM RF Equipment – Electromagnetic Disturbance Characteristics
2	60255-25	Electromagnetic emission tests for measuring & protection equipment
3	61000-3-2:2000	EMC-Limits for harmonic current Emissions.
4	61000-3-3:1994+2001	EMC Limits-Limitations in voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.
Immunity Standards		
1	61000-4-2 1995-01 60255-22-2, IEEE C37.90.3	Electrostatic discharge (ESD) immunity test
2	61000-4-3 1998-11 60255-22-3, IEEE C37.90.2 (10V/m)	Radiated, radio-frequency electromagnetic field immunity test
3	61000-4-4 1995-01 60255-22-4, IEEE C37.90.1	Electrical fast transient/burst immunity test
4	61000-4-5 1995-02	Surge immunity test
5	61000-4-6 1996-03	Immunity to conducted disturbances, induced by radio-frequency fields
6	60255-22-6	Electrical fast transient/burst immunity test

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7	61000-4-81993-06	Immunity to power frequency magnetic fields
8	61000-4-12	Oscillatory waves immunity test
9	1995-05 60255-22-1 IEEE C37.90.1	Damped Oscillatory and Ring wave
<b>Safety</b>		
1	61010-1	Harmonized Safety Standard
2	60255-5 2000-12	Insulation coordination for measuring relays and protection equipment- Requirements and tests
<b>Power Supply Standards</b>		
1	61000-4-11 1994-06	AC Power supply interruptions
2	61000-4-16 1998-01	Immunity to conducted, common mode disturbances.
3	61000-4-17	Ripple on DC power supply
4	61000-4-29+ 2000-08 60255-11	Voltage dips, short interruptions & voltage variations on DC input power port immunity test
<b>Environmental Standards</b>		
1	60068-2-1 1994-05	Environmental Testing Cold
2	600068-2-2 1974	Environmental Testing Dry Heat
3	60068-2-6 1995-03 60255-21-1	Environmental Testing Vibration tests (sinusoidal)
4	60068-2-27 1987	Environmental Testing Shock
5	60068-2-29 1987	Environmental Testing Bump
6	60068-2-30 1980	Environmental Damp Heat cyclic (12+12 hour cycle)
7	60068-2-31 1969	Environmental Testing Drop and Topple
8	60255-21-2	Shock and bump tests
9	IEC 61850-3	Substation Environment Requirement
<b>Communication Standards</b>		
1	IEC 61850-5 to 10 IEEE 802.3 CSMA/CD	Substation Comm. Standard access method and physical layer specifications
<b>Other Applicable Standards</b>		
1	IS 9000	Basic Environmental testing procedure for electrical and electronic items
2	IS 694-1990	PVC insulated cables for working voltage up to and including 1100V

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3	IS 2629-1985	Recommended practice for Hot Dip Galvanizing of iron & Steel.
4	IS 2633-1986	Test for uniformity of Zinc Coating
5	IEC 60529	Degrees of Protection provided by enclosures (IP Code)
6	IEC 62052-11	Electricity metering equipment (AC) – General requirements, tests & test conditions
7	IEC 62053-22	Static meter for active energy (Class 0.2S and 0.5S)

Wherever, new standards & revisions are issued during the period of the contract, the Bidder shall attempt to comply with such standards, with no financial implication to Purchaser.

In the event of the bidder offers to supply material and/or equipment in compliance to any standard other than those listed herein, the bidder shall include with their proposal, full salient characteristics of the new standard for comparison.

## 8.0 Bidder's Qualification Requirement, Experience, Evaluation Criteria

### 8.1 Bidder's Qualification Requirement

As per section 1.7 of tender document.

### 8.2 Bidder's Project Experience

8.2.1 Bidder shall provide details of projects with application modules and other requirements Eligibility Criteria which have been successfully completed during the last 5 financial years. Please do not supply the names of clients who are no longer using your product/system. Bidders need to submit the details as per the format in the table provided and necessary supporting documents should be attached with RFP:

Sl. No.	Name of the Project	Client Name and Contact Details	Whether the Project was successfully commissioned	Date and Year of Commissioning	Value of the Project	Indicate the RTU with modules implemented in the project	Indicate the integration with SCADA System	Indicate whether interface was included in the project? If Yes, please provide the details	Indicate the protocol implemented viz IEC60870-5-101/104, IEC61850, Modbus (IP, Serial)

**Table: Details of Project Experience**

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**Note:** Kindly provide Client Performance Certificates for the completed projects provided for establishing/confirming the requisite details for project experience as mentioned above Or Copy of LoA/ Work Order along with proof of release of final payment.

- 8.2.2 The Bidder should have at least 20 personnel on its roles with a minimum experience of 5 years on RTU and substation automation/Communication System/Cyber Security. Signed resume of employees authenticated & signed by the bidder needs to be submitted. Scanned signatures of the employees shall be accepted.
- 8.2.3 The offered product shall comply to all open protocols used in electrical substation application such as IEC60870-5-xxx, IEC61850 (ED1, ED2), Modbus etc. and compatible with all other OEMs product. Any interoperability issues arising during commissioning and during guarantee period, bidder shall undertake to resolve them within maximum 1 months' period without any additional cost to the Purchaser.
- 8.2.4 Product shall confirm to Cyber Security norms from product development, design and engineering for Power Utility, compliance to industry standard NERC-CIP, IEC62443, NIST and IEC62351.
- 8.2.5 Bidder shall agree to comply with minimum quality requirements and Contractor Safety Code of Conduct, defined in bid documents.
- 8.2.6 Bidder must agree for handing over, to Purchaser, all project related drawings in AutoCAD format only. The pdf/ hard copy drawings shall be submitted for formal approval process
- 8.2.7 Bidder shall submit the acceptance of TPCODL's preferred list of Vendor / Sub Vendor / OEM, which is shared as part of Technical Specifications and the same shall be acceptable to the bidder. ***(Refer Annexure-6 of Section-E, Preferred/Approved make of Equipment/System).***
- 8.2.8 Bidder shall confirm the equipment and Spare Support and Availability for the period of 15 years. Bidder shall submit each equipment product life cycle details along with the technical proposal (for Own and Sub Vendor Equipment).

*The bidder may avail credentials of its parent company for fulfillment of eligibility criteria as mentioned above.*

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8.2.9 The offered product shall comply to all open protocols such as IEC61850, IEC60870-5-104 etc. and compatible with all OEMs product. Any interoperability issues arising during commissioning and guarantee period, bidder shall undertake to resolve them within maximum 1-month period.

### 8.3 Bid Evaluation Criteria

8.3.1 The Bids will be evaluated technically (in terms of quality, technical merit, functional characteristics, schedule, after-sales service, local support in India and technical back-up).

8.3.2 The technical merits and quality and functional characteristics of the offered equipment and work will be evaluated in terms of its ability to meet specific technical requirements included in the Contract Documents. The Bidder shall therefore be prepared to submit at the request of Purchaser adequate information or Work meets the intent of the technical requirements.

8.3.3 Purchaser shall be fully entitled to adopt whatever means it deem fit to evaluate the bids at its sole discretion, which shall not be questioned by the bidder under any circumstances whatsoever.

8.3.4 The evaluation team will thoroughly review the proposals submitted by various bidders. The broad technical evaluation will be based as below

- a. Technical Proposal: 100% Weight
- b. Pre-bid meetings will be conducted with all the bidders

Minimum qualification mark for technical score as mentioned in the RFP shall be 90 out of 100.

### 8.3.5 Technical Evaluation

The technical bid has a weightage of 100%. Technical evaluation will happen in two stages.

- a. **Stage-1:** Preliminary Evaluation

In stage-1, the following shall be confirmed: Deviations, Acceptance of terms and conditions, Acceptance to scope of work and compliance to technical specification (***Scope of work as mentioned in Section A and technical details in Section B***). In case the bid doesn't meet all the mandatory requirements, the bid shall be termed as non-responsive and will not be evaluated further.

- b. **Stage-2:** The distribution of weights for bid-evaluation are as follows

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Sl. No.	Description	Weight	
A	Technical Proposal		100
1	Project Experience	40	
2	Presence in India	10	
3	Team Details (CV)	20	
4	Technical Know-How	30	
	<b>Total Marks</b>		<b>100</b>

Sl. No.	Description	Max Score
<b>Technical Solution Score</b>		<b>100</b>
<b>1</b>	<b>Project Experience</b>	<b>40</b>
a)	<p>Number of RTU Based Automation projects successfully completed in last 5 years. Similar to Technical Requirements as per the specification</p> <ul style="list-style-type: none"> <li><b>10 marks</b> shall be awarded for a single project meeting the functionality as mentioned in the QR.</li> <li>In case multiple projects are submitted, <b>2 marks</b> shall be awarded for each project subject to a ceiling of 10 marks. Satisfactory performance certificates of the running projects</li> <li><b>5 marks</b> shall be awarded for RTU integration with multiple OEM's protection, control and condition monitoring devices on industry standard protocol.</li> </ul>	15
b)	<p>Project experience in implementation of RTU based Automation Systems having similar solution</p> <p>Bidder having experience in satisfying the following criteria:</p> <ul style="list-style-type: none"> <li>Execution of Automation project in Non-SCADA enabled Conventional Types of substations <b>(4 Marks)</b></li> <li>RTU, Distributed I/Os, Communication devices and other system installed &amp; running satisfactorily for outdoor application. <b>(5 Marks)</b></li> <li>RTU integration over IEC 60870-5-104 protocol with multiple OEM's SCADA Systems. <b>(3 marks)</b></li> <li>Experience on implementation of Cyber Security measure in Sub Station Automation (RTU, IEDs etc.) <b>(3 marks)</b></li> <li>Experience on implementation of IOT based application for RTU based Automation Systems <b>(3 marks)</b></li> <li>Project Experience in RTU Integration over <b>(4 marks)</b> <ol style="list-style-type: none"> <li>IEC 61850 (ED1 &amp; latest ED2), implementation of logic using GOOSE</li> <li>MODBUS (RTU, TCP/IP), integration of multiple OEM IEDs</li> </ol> </li> </ul>	25



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	<ul style="list-style-type: none"> <li>Project experience in integration of Renewable Energy System (Solar, Battery Storage) <b>(3 marks)</b></li> </ul> <p>The bidder shall be awarded marks indicated for satisfying the above criteria in one project or multiple projects put together. For satisfying of single criteria, only indicated marks shall be awarded, irrespective of its implementation in number of projects.</p>	
<b>2</b>	<p><b>Presence in India</b></p> <p>a) Manufacturing in India as an initiative of Government of India "Make in India" <b>(3 Marks)</b></p> <p>b) The bidder with design / Engineering / Testing / Installation / Commissioning / Maintenance / Patch Management / Timely Upgradation facility in house (In India) as on date of release of RFP <b>(7 Marks)</b></p>	10
	<p><b>Team Details (CVs)</b></p>	20
	<p>Experience minimum 5 years in area of RTU based Automation Systems engineering and commissioning based on IEC 61850 (Ed.1 &amp; Latest Ed.2), IEC60870-5-103, IEC 60870-5-104, Modbus RTU &amp; TCP etc.</p> <p>For submission of CV, <b>1 mark</b> shall be awarded per CV subject to ceiling of <b>5 marks</b> that can be obtained in this category.</p>	5
<b>3</b>	<p>Experience minimum 5 years in area of Control and protection systems engineering and commissioning in power distribution application.</p> <p>For submission of CV, <b>1 mark</b> shall be awarded per CV subject to ceiling of <b>5 marks</b> that can be obtained in this category.</p>	5
	<p>Experience minimum 5 years in area of RTU integration with SCADA systems on IEC 60870-5-104, Cyber Security and Communication Networking.</p> <p>For submission of CV, <b>1 mark</b> shall be awarded per CV subject to ceiling of <b>5 marks</b> that can be obtained in this category.</p>	5
	<p>Experience minimum 5 years in implementation of logic based RTU systems like load shading, group control, control logic, reverse blocking, auto reclose etc.</p> <p>For submission of CV, <b>1 mark</b> shall be awarded per CV subject to ceiling of <b>5 marks</b> that can be obtained in this category.</p>	5

Sl. No.	Description of Technical Know-How	Max Score
<b>Technical Know-How:</b>		
The Bidder is expected to satisfy the following criteria for the proposed RTU based Automation Systems:		30 marks
a)	Proposed product should be under life cycle growth (latest and having a life span under production for minimum next 10 years) as per Life Cycle of the product.	3 marks
b)	RTU shall be capable to import multiple SCD files generated by multiple OEM	3 marks
c)	RTU shall acts as SNTP Server & Client	3 marks
d)	RTU shall support SNMP for Network & Asset Management	3 marks
e)	Configuration Tools should be complete in all respect like configuration of all	3 marks

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Sl. No.	Description of Technical Know-How	Max Score
	types of interfaces and application as per RFP and complied to the format of SCD file for integration of multi vendors substation protection and control IEDs with RTU.	
f)	Hardware and software of the proposed RTU shall be of the same OEM	3 marks
g)	RTU integration with multiple OEM's protection, control, condition monitoring devices and SCADA on industry standard protocol	3 marks
h)	Upload and Download of the RTU configuration file from RTU to the engineering station.	3 marks
i)	RTU shall comply to RSTP, HSR and PRP network protocol	3 marks
j)	RTU systems implemented for applications such as load shading, group control, control logic, reverse blocking, auto reclose etc.	3 marks
k)	RTU shall be complied to Cyber Security requirement for critical infrastructure.	3 marks

- 8.3.6 The bids will be evaluated technically on the compliance to specification terms and conditions as detailed in the various sections of the document.
- 8.3.7 Bidder must mandatorily quote against each item as per the functional requirement and of indicative bill of material.
- 8.3.8 Bidder must comply with Qualification requirement and compliance sheet.
- 8.3.9 Bidder must submit the list of sites and contact details in which similar solution have been developed and successfully running its operation. Purchaser team reserves the right to visit those sites and bidder shall facilitate such visit.
- 8.3.10 Bidders shall quote for all items specified including options and all the sub items in the specified format. Bids not complying with this requirement shall be liable for rejection. All bids and combination of bids shall be opened and evaluated simultaneously so as to determine the bid combination offering the most advantageous solution for the Purchaser.
- 8.3.11 The evaluation shall be made primarily on technical parameters and also the overall cost of the items and quantities mentioned in the schedule of quantities. However, while placing the order, or during the execution, the Purchaser reserves the right to modify the quantities of individual items.

## 9.0 Project Schedule / Calendar of Events / Milestones

- a. The Bidder shall provide a detailed Implementation Schedule indicating major Bidder and Purchaser activities, major completion milestone events, and interdependencies between events. Required Purchaser activities and associated dates must be clearly shown and include

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interdependencies to the Bidder's scheduled activities. The schedule shall be in terms of months after Receipt of Order (ARO), not absolute dates.

- b. The Bidder shall perform all scheduling activities with Microsoft Project/any standard software, such that all schedules as periodically transmitted to Purchaser include both hard copy and electronic versions.
- c. Following is the expected delivery schedule.

### 9.1 Delivery Schedule (Phase # 1, Phase # 2)

#### 9.1.1 For Phase-1 FY'21-22

Sr. No.	Milestone	Target
1	PO Placement	Zero Day
2	MDL & Project Detailed, Project Execution Schedule submission & approval	Within 15 days from Sr. No. 1
3	Architecture and other Drawings, Bill of Material finalization, Functional and Design Specifications (FDS), FAT & SAT documents submission & approval	Within 30 days from Sr. No. 1
4	Procurement of Hardware, Software and Manufacturing of Panel	Within 60 days from Sr. No. 3
5	Inspection of equipment (FAT)	Within 5 days from Sr. No. 4
6	Delivery of RTU Panel and other System	Within 15 days from Sr. No. 5
7	Completion of installation of RTU Panel and other system, cable laying, termination, RTU configuration as per substation data point etc.	Within 45 days from Sr. No. 6
8	Pre-SAT Testing	Within 10 days from Sr. No. 7
9	Final Integration Testing with SCADA	Within 15 days from Sr. No. 8
10	Resolving punch points and demonstration to Purchaser	Within 15 days from Sr. No. 9
11	Project closure after resolving of Punch points submission of documents and Software licenses	After 5 days from Sr. No. 10
12	Overall project schedule	200 days

#### 9.1.2 For Phase-2 FY'22-23

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Sr. No.	Milestone	Target
1	Review and Resubmission of Project Execution Schedule for approval	Zero Day from Project Closure of Phase # 1
2	Architecture and other Drawings, Bill of Material finalization, Functional and Design Specifications (FDS), FAT & SAT documents submission & approval	Within 60 days from Sr. No. 4 of Phase # 1
3	Procurement of Hardware, Software and Manufacturing of Panel	Within 105 days from Sr. No. 2
4	Inspection of equipment (FAT)	Within 15 days from Sr. No. 3
5	Delivery of RTU Panel and other System	Within 15 days from Sr. No. 4
6	<ul style="list-style-type: none"> <li>• Completion of installation of RTU Panel and other system, cable laying, termination, RTU configuration as per substation data point etc.</li> <li>• Pre-SAT Testing</li> <li>• SAT &amp; Integration Testing with SCADA</li> <li>• Resolving punch points and demonstration to Purchaser</li> </ul>	Within 260 days from Sr. No. 5
7	Project closure after resolving of Punch points submission of documents and Software licenses	After 45 days from Sr. No. 6
8	Overall project schedule	500 days

## 9.2 Calendar of Events

Sr. No.	Events	Target
1	Detailed bid documents / hosting of detailed bid documents in Purchaser's ARIBA website	Zero Date
2	Pre-Bid Meeting with Bidders	Within 10 days from Sr. No. 1
3	Site visits by Bidder	Within 15 days from Sr. No. 1
3	Receipt of pre-bid queries, if any	Within 20 days from Sr. No. 1
4	Posting of Consolidated replies for the pre-bid queries to all bidders	Within 5 days from Sr. No. 3

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5	Receipt of Bids	Within 10 days from Sr. No. 4
6	Opening of technical bids	Next working day from Sr. No. 5
7	Date & Time of opening of Price of qualified bids	Will be notified to the successful bidders through our website / mail.

### 9.3 Mile Stones

Payment shall be made as per the finalized payment terms with Purchaser's procurement team as per the milestones mentioned below:

Sl. No.	Milestone Number	Milestone Description	Payment Plan (% of Contract Price)	Remarks
1	MS-01	Prebid meeting	-	
2	MS-02	Bid Submission	-	
3	MS-03	Bid Discussion	-	
4	MS-04	PO Placement	-	
<b>RTU Based Substation Automation System for Conventional Substations</b>				
<b>Phase -1 Conventional Substation 22 Nos.</b>				
5	MS-5	Submission and Approval of following <ul style="list-style-type: none"> <li>• Site Survey</li> <li>• List of Deliverables (BOM)</li> <li>• Configuration Drawings</li> <li>• Detailed Project Schedule</li> <li>• Functional Design Document</li> <li>• Design Documentation for Hardware &amp; Software System</li> <li>• Application Overview Document</li> <li>• Any Other Documentation related to Design Engineering</li> </ul>	10% of Total Contract Price for Phase-1, on Pro-rata Basis	Phase-1 (22 Nos. S/s)
6	MS-6	System hardware staging completed in the Factory, Complete installation of all the Bidder standard baseline system (Hardware & Software) <ul style="list-style-type: none"> <li>• Hardware Test Review &amp; Signoff</li> <li>• Software Test Review &amp; Signoff</li> <li>• Function Test Review &amp; Signoff</li> <li>• Successful completion of FAT and resolution of all variances to Purchaser's satisfaction</li> </ul>	15% of Total Contract Price for Phase-1, on Pro-rata Basis	Phase-1 (22 Nos. S/s)

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Sl. No.	Milestone Number	Milestone Description	Payment Plan (% of Contract Price)	Remarks
7	MS-7	<ul style="list-style-type: none"> <li>Delivery of the System (Hardware, Networks, Operating Systems, etc.) &amp; acceptance by TPCODL EIC,</li> </ul>	20% of Total Contract Price for Phase-1, on Pro-rata Basis	Phase-1 (22 Nos. S/s)
8	MS-8	<ul style="list-style-type: none"> <li>Complete installation of the system at Purchaser's site, and successful completion of system startup activities.</li> <li>Installation and commissioning of RTU based Automation System and its applications as per specification etc.</li> <li>Installation and Commissioning of DC System</li> <li>Integration of IEDs and Condition Monitoring System</li> <li>Integration with Purchaser's SCADA Systems</li> <li>Pre-SAT test acceptance</li> </ul>	15% of Total Contract Price for Phase-1, on Pro-rata Basis	Phase-1 (22 Nos. S/s)
9	MS-9	<p>Successful completion of SAT and resolution of all variances to Purchaser's satisfaction after completion of all test plans and procedures. This includes:</p> <ul style="list-style-type: none"> <li>Site Preparation Plan</li> <li>Witness demonstrations of all custom features</li> <li>Field Update Period completed</li> <li>Rectification of Bugs/ Issues if any reported after Pre-SAT</li> <li>Training on O &amp; M of System</li> <li>Availability of Complete functionality as specified in the specification and scope of Work</li> <li>Demonstration of Performance Guarantee Parameters</li> <li>Cyber Security Test</li> <li>System Handover for Operation</li> </ul>	25% of Total Contract Price for Phase-1, on Pro-rata Basis	Phase-1 (22 Nos. S/s)
10	MS-10	<p>Operational Acceptance and submission As-built drawings, spares:</p> <ul style="list-style-type: none"> <li>Successful completion of System Availability and Performance Guarantee tests</li> </ul>	15% of Total Contract Price for	Phase-1 (22 Nos. S/s)

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Sl. No.	Milestone Number	Milestone Description	Payment Plan (% of Contract Price)	Remarks
		<ul style="list-style-type: none"> <li>Submission of Operator's User's Manual, Modification if any to the Operator's User's manual and submission of approved manual</li> <li>Submission of Backup of entire system on secondary media</li> <li>Delivery of all As-built drawings, database and logic files, source code and final documents Delivery of spares, maintenance &amp; testing equipment's etc.</li> </ul>	Phase-1, on Pro-rata Basis	
<b>Phase 2: Conventional Substation 67 Nos.</b>				
11	MS-11	Submission and Approval of following <ul style="list-style-type: none"> <li>Site Survey</li> <li>List of Deliverables (BOM)</li> <li>Configuration Drawings</li> <li>Detailed Project Schedule</li> <li>Functional Design Document</li> <li>Design Documentation for Hardware &amp; Software System</li> <li>Application Overview Document</li> <li>Any Other Documentation related to Design Engineering</li> </ul>	10% of Total Contract Price for Phase-2, on Pro-rata Basis	Phase-2 (67 Nos. S/s)
12	MS-12	System hardware staging completed in the Factory, Complete installation of all the Bidder standard baseline system (Hardware & Software) <ul style="list-style-type: none"> <li>Hardware Test Review &amp; Signoff</li> <li>Software Test Review &amp; Signoff</li> <li>Function Test Review &amp; Signoff</li> <li>Successful completion of FAT and resolution of all variances to Purchaser's satisfaction</li> </ul>	15% of Total Contract Price for Phase-2, on Pro-rata Basis	Phase-2 (67 Nos. S/s)
13	MS-13	<ul style="list-style-type: none"> <li>Delivery of the System (Hardware, Networks, Operating Systems, etc.) &amp; acceptance by TPCODL EIC</li> </ul>	20% of Total Contract Price for Phase-2, on Pro-rata Basis	Phase-2 (67 Nos. S/s)
		<ul style="list-style-type: none"> <li>complete installation of the system at Purchaser's site, and successful completion of system startup activities.</li> </ul>	15% of Total Contract	

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Sl. No.	Milestone Number	Milestone Description	Payment Plan (% of Contract Price)	Remarks
		<ul style="list-style-type: none"> <li>Installation and commissioning of RTU based Automation System and its applications as per specification etc.</li> <li>Installation and Commissioning of DC System</li> <li>Integration of IEDs and Condition Monitoring System</li> <li>Integration with Purchaser's SCADA Systems</li> <li>Pre-SAT test acceptance</li> </ul>	Price for Phase-2, on Pro-rata Basis	
14	MS-14	<p>Successful completion of SAT and resolution of all variances to Purchaser's satisfaction after completion of all test plans and procedures. This includes:</p> <ul style="list-style-type: none"> <li>Site Preparation Plan</li> <li>Witness demonstrations of all custom features</li> <li>Field Update Period completed</li> <li>Rectification of Bugs/ Issues if any reported after Pre-SAT</li> <li>Training on O &amp; M of System</li> <li>Availability of Complete functionality as specified in the specification and scope of Work</li> <li>Demonstration of Performance Guarantee Parameters</li> <li>Cyber Security Test</li> <li>System Handover for Operation</li> </ul>	25% of Total Contract Price for Phase-2, on Pro-rata Basis	Phase-2 (67 Nos. S/s)
15	MS-15	<p>Operational Acceptance and submission As-built drawings, spares:</p> <ul style="list-style-type: none"> <li>Successful completion of System Availability and Performance Guarantee tests</li> <li>Submission of Operator's User's Manual, Modification if any to the Operator's User's manual and submission of approved manual</li> <li>Submission of Backup of entire system on secondary media</li> <li>Delivery of all As-built drawings, database and logic files, source code and final documents Delivery of spares, maintenance &amp; testing equipment's etc.</li> </ul>	15% of Total Contract Price for Phase-2, on Pro-rata Basis	Phase-2 (67 Nos. S/s)

**All invoices to be cleared within 30 days of invoice date; certified by TPCODL EIC.**

## 10.0 Submissions by Bidders

### 10.1 Mandatory Documents required along with the Bid



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Bidders are requested to submit their offer in line with this bid document. Purchaser shall respond to the clarification raised by various bidders and the replies will be sent to all participating bidders through ARIBA.

Bidder shall submit the document as specified in **Section-D** and in various section of this document.

Technical bid shall be properly indexed and to be submitted in Soft and three nos. Hard Copy.

#### 10.2 **Departure from Specifications**

Bidder shall necessarily submit a signed and stamped copy of this BID (in original) as a token of acceptance of all the terms and conditions of this BID. Replication of this BID on bidders' document shall not be acceptable. Normally no deviation is accepted to BID document supplied with the bid & bid with deviation is liable to be rejected. However, in case of any deviations to this BID, all such deviations shall be furnished by the bidders in the Schedule of Deviations attached as Section-C, Item-C3, and submit the same as a part of the Technical Bid.

#### 10.3 **Right of Acceptance / Rejection of Technical Proposal**

Bids would be rejected in absence of following documents:

- a. Details required for PQR not submitted
- b. Complete technical details are not enclosed
- c. Proposed Architecture not submitted
- d. The offer does not contain un-priced detailed Bill of Material as per the proposed architecture and in-line with Indicative BoM attached with RFP
- e. Bid is received after due date and time
- f. False Information / Details

Purchaser reserves the right to accept/reject any or all the bids without assigning any reason thereof.

#### 10.4 **Documentation & Licenses**

Bidder shall submit the documents as per **Section D** for bid submission and Post Award. Bidder to ensure that all software procured shall be perpetual license in the name of the Purchaser.

#### 11.0 **Project Management**

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### 11.1 Project Implementation

This section specifies project implementation requirements, including Purchaser and the Bidder responsibilities, project management procedures, project documents, the activities leading up to shipment of the RTU and other systems, and the installation, commissioning, and site test activities.

### 11.2 Project Management

The Bidder and Purchaser shall assign a project manager with the authority to make commitments and decisions that are binding on the either side with the following responsibilities:

#### 11.2.1 Purchaser's Project Manager

Purchaser's project manager shall be responsible for representing Purchaser's interests throughout the project. Purchaser's project manager will, from time to time, authorize other staff to act in this regard for specific tasks. The project manager will also change such assignments from time to time. Such actions shall be submitted to the Bidder in writing.

All correspondence with Purchaser shall be addressed to Purchaser's project manager.

#### 11.2.2 The Bidder's Project Manager and Project Personnel

The Bidder shall designate a project manager who shall be responsible for the co-ordination of all project work and for the communications between the Bidder and Purchaser. Except for conditions outside the control of the Bidder, the Bidder's project manager shall not be removed or replaced without the approval of Purchaser.

Bidder shall submit the manpower deployment plan along with the bids, describing the key roles of each person. The project shall be staffed with a core project team. Additional personnel shall be assigned to work under the direction of the core team. Core project team members shall have experience as stated elsewhere in this document.

The Bidder shall inform Purchaser of any pending or possible changes in the use or status of all Bidder project personnel. Any changes to Bidder staff, including work assignments and participation level, shall be announced as soon as practical and shall be subject to Purchaser's approval. Purchaser shall have the right to have any Bidder staff removed from the project for cause.

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### 11.3 Project Management Practices

Bidder shall provide high-level details of the project management practices that will be followed to manage the project. The project management practices would include (but not be limited to) details of:

- a. Bidder must provide details of how they envisage the contract being managed and control mechanisms; regular and active review meetings; Project management of individual work streams and overall program management of the entire service; Performance reporting
- b. Bidder should outline their proposed governance structure and designate a Service Manager to co- ordinate their activities and provide a focal point of contact to which Purchaser can refer on any matter concerning the service.
- c. Reporting lines and decision-making powers within the bidder's organization must be submitted
- d. Reporting formats and templates that would be followed by the bidders
- e. Outline the proposed escalation procedures if issues arise.

### 11.4 Project Schedule

The project should be implemented as per the prescribed schedule. Based upon this schedule the bidder shall submit a preliminary implementation plan along with the bid. The detail project implementation schedule shall be submitted by the bidder after award for Purchaser's approval, which shall include at least the following activities:

- a. Site Survey
- b. Documents submission and approval schedule
- c. Factory & Site Testing Schedule
- d. RTU Database development schedule
- e. Hardware purchase & Manufacturing, Software development & integration schedule
- f. Dispatch Schedule
- g. Installation / commissioning schedule
- h. Training schedule

### 11.5 Progress report

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A progress report shall be prepared by the Bidder each month against the activities listed in the project schedule. The report shall be made available to Purchaser on a monthly basis, e.g., the 10th of each month. The progress report shall include all the completed, ongoing and scheduled activities.

#### 11.6 Transmittals

Every document, mail, letter, progress report, change order, and any other written transmissions exchanged between the Bidder and Purchaser shall be assigned a unique transmittal number. The Bidder shall maintain a correspondence index and assign transmittal numbers consecutively for all Bidder documents. Purchaser will maintain a similar correspondence numbering scheme identifying documents and correspondence that Purchaser initiates.

#### 11.7 Implementation Responsibilities

The general responsibilities of Purchaser and the Bidder are presented below. Other sections in the Specification may also present responsibilities. If the requirements of any other sections conflict with the responsibilities of this section, the responsibilities of the other sections shall take precedence over this section.

##### 11.7.1 Bidder's Responsibilities

The Bidder's specific responsibilities shall include:

- a. Providing all RTU and other systems equipment and related support materials, including all interconnecting cables and wiring between all Bidder-provided equipment and between the RTU and any equipment furnished by Purchaser
- b. Defining the stock of spare parts needed to maintain for system availability
- c. Providing all engineering, software design, development, and integration services necessary for RTU and Other Systems implementation
- d. Ensuring that all reasonable security measures have been incorporated in the RTU and Other Systems upon delivery, is free of viruses, trapdoors, and other software contaminants, contains no software enabled with "electronic self-help", is purged of all sample scripts and sample code, and has had all default accounts and passwords removed or disabled

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- e. Managing, coordinating, and scheduling the activities of all Sub-vendors employed by the Bidder for this project. This shall include the resolution of all problems that may arise in connection with the hardware, software, and services supplied by the Sub-vendors.
- f. Implementing the RTU and Other Systems according to the quality standards acceptable to Purchaser
- g. Training Purchaser staff so that they will be self-sufficient and able to operate, maintain, and upgrade the complete RTU and Other Systems
- h. Supplying RTU and Other Systems documentation such as instruction manuals, maintenance manuals, drawings, software design and user documentation, and other appropriate material that together fully defines the supplied system and allows Purchaser to operate, maintain, backup, restore, and upgrade the RTU and Other Systems hardware and software
- i. Supplying final ("as built") documentation that is accurate and complete.
- j. Providing adequate facilities and resources for, as well as performing, factory testing
- k. Providing an environment that allows for reproducible execution of all RTU and Other Systems functional performance tests conducted during factory acceptance testing
- l. Transportation, delivery and temporary storage of all Bidder-provided equipment and materials to Purchaser's site or sites
- m. Performing the installation of the RTU and Other Systems at Purchaser's site under Purchaser's supervision
- n. Performing, with Purchaser's assistance, system start-up after satisfactory system installation, i.e. powering up the system, loading correct versions of all software and databases, activating data links, verifying correct operation of the system, and turning over to Purchaser an operational system ready for site testing
- o. Performing after delivery and start-up of the system, but prior to any site testing, setting up all functions for proper operation (system and function "tuning")
- p. Performing the test at Purchaser's site, including correcting all reported variances
- q. Ensuring and periodically demonstrating that the work is progressing according to the approved schedule
- r. Maintaining the RTU and Other Systems up to the start of the warranty

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- s. Providing and implementing all required warranty services

#### 11.7.2 Purchaser's Responsibilities

Purchaser will be responsible for the following:

- a. Providing input raw AC power to equipment enclosures
- b. Reviewing and approving project deliverables such as, but not limited to, detailed implementation schedule, software and hardware functional design documents, user manuals, drawings, progress reports, training program, quality assurance plan, test plans and procedures, test results, support services (including maintenance), and as-built system documents
- c. Coordinating and supervising the Bidder's work to be performed at Purchaser facilities
- d. Attending pre-factory tests (at Purchaser's discretion)
- e. Participating in factory tests and approving test results
- f. Assist the Bidder with the installation
- g. Monitoring the site tests and approving test results
- h. Monitoring the availability test and approving test results
- i. Preparing variance reports, resolving variance issues, and approving corrected variances
- j. Determining if the Bidder's work is progressing in accordance with the schedule
- k. Verification of all Bidder materials, installation practices, and workmanship conform to requirements
- l. Providing facilities for on-site training and Bidder offices.

## 12.0 Quality Requirements, Inspection, Installation, Commissioning and Testing

### 12.1 Quality Assurance

Quality of service - Bidder must provide details of their proposed approach to quality assurance to ensure the quality of services in accordance with RFP Document. This should include:

- a. Responsibility of quality of service;
- b. How the bidder will ensure quality service is provided;
- c. How quality will be measured
- d. Bidder shall submit their quality certification / Assessment document. Bidder shall provide the following information along with the documents.

Description	Bidder's Response
-------------	-------------------

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Certification / Assessment Name	
Who issued the Certification / Assessment?	
When was the Certification / Assessment obtained?	
Does this Certification / Assessment process involve periodic reviews and observations / remarks after such review? If so, please provide details and specify when your company is due for its next quality review?	

**Table: Details of Certification**

All materials and parts of the Bidder's own and Sub-Vendors System / Sub-System to be supplied under this project shall be current, in line with industry standard.

#### 12.1.1 Quality Assurance and Testing

To ensure that the Bidder produces a well-engineered and contractually compliant RTU and Other Systems, a quality assurance program shall be followed and both structured and unstructured tests shall be performed.

#### 12.1.2 Quality Assurance Program

The Bidder must employ documented Quality Assurance (QA) techniques and practices throughout this project. This QA program shall be adhered to for the preparation of all Contract deliverables, including documentation, hardware, firmware and software. The program shall provide for the minimization of defects, the early detection of actual or potential deficiencies, timely and effective corrective action, and a method to track all such deficiencies.

#### 12.2 Inspection

Purchaser shall be allowed access to the Bidder's facilities during system design, manufacturing and testing and to any facility where hardware or software is being produced. The Bidder shall provide office facilities, equipment, and documentation necessary to complete all inspections and to verify that the RTU and Other Systems is being fabricated and maintained in accordance with the Specification to Purchaser's representatives.

Purchaser shall be allowed to review and verify the functional implementation of RTU and Other Systems software informally in conjunction with scheduled project meetings at the Bidder's facilities. No test plans, procedures, or reports are required to support these informal software demonstrations.

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Purchaser shall be allowed to inspect the Bidder's hardware and software quality assurance standards, procedures, and records. Documents identified in the approved product quality assurance plan will be inspected to verify that the Bidder has performed the required quality assurance activities.

The inspection rights described above shall not apply to sub-bidders supplying standard computer or peripheral equipment and third-party software products. However, inspection rights shall apply to Sub-Vendors that are developing new software, offering solutions for inclusion in the RTU and Other Systems.

### 12.3 Commissioning

#### 12.3.1 Receipt at site, Handling, Storage & Insurance

Bidder shall make his own necessary arrangements for storage space for the proposed system on receipt at Site.

Delivery and movement of material to site from stores shall be the responsibility of Bidder.

All Insurance including but not restricted to transit, storage, and installation and commissioning till the acceptance of the complete system shall be the responsibility of the Bidder.

#### 12.3.2 Installation

Installation of the complete system is under Bidder's scope. Installation work shall be scheduled and carried out in coordination with Purchaser's representatives. All related drawings, installation manuals and recommended practices shall be submitted in advance for Purchaser's approval. Installation shall be certified by the Principal's representative.

#### 12.3.3 Cabling Scope (Supply, Laying, Installation and Termination)

The following shall be in the bidder's scope

- a. All cables to and from any equipment supplied by Bidder
- b. All cables shall be tagged appropriately, cross ferruling shall be used for identification of the Cable, Inter/Intra Panel wiring.
- c. All cables between Purchaser's Power Supply Distribution Board to any equipment supplied by the Bidder.



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- d. Earthing interface to earth pit based on the earthing scheme provided by the Bidder (It shall be completely Bidder's responsibility to ensure proper earthing).
- e. The above includes all electrical and communication cables (if any) and all associated terminals, Connectors, tools, distribution board, MCBs and other accessories.
- f. Any civil work for housing the control cable, communication cables in the switch yard / control room.

#### 12.3.4 Commissioning Activities

- a. The commissioning of the system (hardware and software) including SAT and one Month Trouble free operation shall be the responsibility of Bidder.
- b. Adequate number of qualified engineers (Hardware & Software) as approved by Purchaser shall be posted at site during the entire period of installation & commissioning for RTU based substation automation.
- c. Daily site work shall be planned and executed as per due approvals from Purchaser's representative.
- d. Bidder shall submit detailed site organization chart of Personnel for Purchaser's approval. Purchaser reserve the right to review the same. Bidder's commissioning engineers shall also train purchaser's engineers during commissioning apart from scheduled Training.
- e. The responsibility for Installation, Commissioning, Performance guarantee and warranty shall remain with the Bidder.
- f. The Bidder shall furnish procedures, protocols for commissioning and acceptance test activities.
- g. All tools (both hardware and software), test instruments, simulation jigs, documents, programming equipment etc. required for Installation, Testing & Commissioning are in the scope of bidder.
- h. All passwords, access keys etc. are the property of the Purchaser and shall be handed over to the Purchaser.
- i. All interoperability tables for interfacing to other systems shall be supplied.
- j. Principal's qualified representatives including specialists shall participate at site for supervision, & certification of commissioning and Acceptance tests.

***The Bidder shall comply and adhere to the safety policy of the Purchaser. Hence necessary safety apparels shall be borne by the Bidder for their personnel at their cost. Also, it is the responsibility of the Bidder to ensure compliance to all statutory requirements of their workmen. All workmen engaged at TPCODL site should have necessary ESIC & PF registration.***

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## 12.4 Testing

### 12.4.1 Test Responsibilities

Both Purchaser and Bidder shall designate test coordinator, prior to the start of the factory test, each coordinator shall be responsible for insuring that the tests are conducted in accordance with the requirements of this Contract. The coordinators shall each have the authority to make binding commitments for their Purchaser such as approvals of test results and scheduling for variance corrections or, as a minimum, to cause such commitments to be expeditiously made.

Unless otherwise stated in this Specification, the Bidder shall be responsible for all factory tests. This responsibility shall include the conduct of the tests and all record keeping and document production. Bidder will support the factory testing by supplying staff to execute the test procedures under the Purchaser's supervision.

### 12.4.2 Test Documents

Test plans, procedures, and records shall be provided by the Bidder for all tests to ensure that each test is comprehensive and verifies the proper performance of the RTU and Other Systems elements under test. During the development of test plans and test procedures, emphasis shall be placed on testing each conditional logic statement, checking error conditions, and documenting the simulation techniques used. The test plans and test procedures shall be modular to allow individual test segments to be repeated as necessary.

All test plans and test procedures (standard, modified standard, and custom functions) shall be submitted to Purchaser for approval and shall be subject to the approval process as defined in ***Section-D, Item 2.5 Document Review and Approval.***

### 12.4.3 Test Plans

The test plans shall describe the overall test process, including the responsibilities of individuals and the documentation of the test results. The following shall be included in the test plans:

- a. The schedule for the test
- b. The responsibilities of Bidder and Purchaser personnel, including record-keeping assignments
- c. Any forms to be completed as part of the tests and the instructions for completing the forms
- d. Procedures for monitoring, correcting, and testing variances
- e. Procedures for controlling and documenting all changes made to the hardware and software after the start of testing

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- f. Block diagrams of the hardware test configuration, including the Bidder- and Purchaser-supplied RTUs, external communication channels, and any test or simulation hardware.

Test plans shall be provided for the Factory Acceptance Test, Site Acceptance Test, and Availability Test.

#### 12.4.4 Test Procedures

The test procedures shall describe the methods and processes to be followed in testing the RTU and Other Systems. The test procedures shall be modularized, such that individual functions of the RTU and Other Systems can be independently tested and so that the testing proceeds in a logical manner. This section uses the term segment to refer to a higher-level part of a test procedure and the term step to refer to the most detailed level of test instruction.

The test procedures shall include the following items:

- a. The name of the function to be tested
- b. References to the functional, design, user, and any other documents describing the function
- c. A list of test segments to be performed and a description of the purpose of each test segment
- d. The set-up and conditions for each segment, including descriptions of the test equipment and data to be supplied by the Bidder and by Purchaser.
- e. Descriptions of the techniques and scenarios to be used to simulate system field inputs and controlled equipment
- f. Descriptions, listings, and instructions for all test software tools and displays
- g. Step-by-step descriptions of each test segment, including the inputs and user actions for each test step
- h. Forms for the recording of test results
- i. The expected results for each segment, including pass/fail criteria
- j. Copies of any certified test data to be used in lieu of testing, if approved by TPCODL.

The Bidder shall note that Purchaser will not accept any certified test data in lieu of testing except where specifically stated in the Contract.

#### 12.4.5 Test Records

Complete records of all tests result shall be maintained. The records shall be keyed to the test procedures. The following items shall be included in the test records:

- a. Reference to the appropriate test procedure

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- b. Date of the test
- c. Description of any test conditions, input data, or user actions differing from that described in the test procedure
- d. Test results for each test segment including a passed/failed indication. All information recorded during the test such as measurements, calculations, or times shall be included in the results.
- e. Identification of the Bidder's and Purchaser's representatives performing and witnessing the test
- f. Provision for comments by Purchaser's representatives
- g. References to all variance reports generated
- h. Copies of reports, display copies, and any other hardcopy generated as part of the test.

#### 12.4.6 **Variance Recording and Resolution**

A variance tracking system shall be placed in service no later than one month before the start of Pre-FAT and shall remain in use through the completion of the warranty. Both the Bidder and Purchaser may initiate variances at any time. Variances may be used to record system deficiencies at any time, even if the system is not undergoing testing. This variance tracking system shall record and track variances for:

- a. Documentation deficiencies
- b. Functional deficiencies
- c. Performance deficiencies
- d. Procedural deficiencies (as when deviations from contractually required QA procedures are observed)
- e. Test deficiencies (as when the system cannot satisfactorily complete a test procedure due to a problem with the test).

The variance recording and tracking system shall produce reports of all variance information and shall produce subsets of the variances based on searches of the variance parameters singly and in combination. Variance reports shall always be available to Purchaser. The Bidder shall periodically distribute a variance summary that lists for each variance the report number, a brief overview of the variance, its category, and its priority.

#### 12.4.7 **Variance Records**

The record of each variance shall include the following information:

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- a. The date of the initial discovery of the variance
- b. A variance number – a sequential number assigned when the variance is entered into the tracking system
- c. An identification of the person submitting the variance and the names of any other witnesses or knowledgeable Purchaser or Bidder staff
- d. An identification of the RTU and Other Systems component, such as a hardware item or software function, against which the variance is being written
- e. An identification of the test plan or procedure, if applicable. The stage or step of the plan or procedure shall be identified
- f. An overview of the variance suitable for use in keyword searches
- g. A detailed description of the variance
- h. A variance category:
  - i. Open (recorded but not scheduled for further action)
  - ii. Assigned (scheduled for further action)
  - iii. Pending (the variance has been resolved but not tested)
  - iv. Closed (Purchaser has accepted the resolution)
- i. The date of assignment into each category
- j. A variance priority:

**Critical** To be used only if the RTU and Other Systems is in commercial use, this priority identifies a problem that prevents the use of a system features that is essential to Purchaser's operation of the power system

**High** Denotes the failure of the RTU and Other Systems to perform a required feature in a manner that significantly reduces the utility of the systems or feature or which delays further testing of the systems or features

**Normal** Denotes the failure of the RTU and Other Systems to perform a required feature in a manner that reduces the utility of the systems or features. Normal priority variances shall not delay any testing

**Low** Denotes the failure of the RTU and Other Systems to perform a required feature in a manner that reduces the utility of the systems only slightly. Low priority variances shall not delay any testing. Variances that record transient failures, which cannot be readily

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reproduced, shall be initially assigned to this priority. Subsequent occurrences of the transient failure shall result in raising the priority of the variance.

A description of the resolution, including identification of all hardware, software, and documents modified or otherwise changed and the names of the Bidder or Purchaser staff involved with the resolution

- k. A record of all testing performed
- l. Identification of Purchaser staff accepting the resolution and the date of acceptance.

#### 12.4.8 **Schedule for Variance Correction**

The Bidder and Purchaser shall meet periodically to review the variance list. Each new variance opened since the previous meeting shall be scheduled for correction at the meeting. Purchaser and Bidder shall follow these guidelines for scheduling corrections:

- a. A schedule for the correction of critical and high priority variances shall be set within one working day of their discovery. The schedule for correction of all other variances shall be set within one working week of their addition.
- b. Purchaser and the Bidder shall assign resources for the correction of critical variances with the intent of correcting the variance within two working days of their opening.
- c. Purchaser and the Bidder shall establish a mutually agreeable date for the correction of high priority variances, with the overall objective of:
  - i. If the RTU and Other Systems is in productive use, correcting the variances within one calendar week of their discovery
  - ii. Prior to the commencement of productive use, maintaining the overall project schedule
- d. Purchaser and the Bidder shall establish a mutually agreeable date for the correction of normal priority variances, with the overall objective of:
  - i. If the RTU and Other Systems is in productive use, correcting the variances within one calendar month of their discovery
  - ii. Prior to the commencement of productive use, maintaining the overall project schedule
- e. Low priority variances may be scheduled for correction at any time and shall not exceed 30 days after identification.

#### 12.4.9 **Variance Resolution**

A variance shall be deemed resolved only upon written acceptance of the correction by Purchaser. Prior to submitting the corrected variance for acceptance by Purchaser, the Bidder

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shall take all reasonable steps to verify that the correction has resolved the variance and the Bidder shall update the variance record to reflect the corrective action taken. Purchaser shall then schedule any testing to be performed in conjunction with the Bidder.

A variance shall be deemed accepted and the variance record shall be completed only after Purchaser has tested the corrected variance to its satisfaction. The Bidder shall support all testing deemed necessary by Purchaser to verify the corrections.

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#### 12.4.10 Test Schedule

The sequence of tests to be performed and their scheduling with respect to other activities shall be mutually decided.

#### 12.4.11 Test Initiation

The following conditions must be satisfied before starting any test:

- a. Purchaser has approved all plans and procedures for the test
- b. Purchaser has reviewed or approved all relevant documentation
- c. A copy of all relevant documentation including design and maintenance documents, user manuals, test plans, and test procedures has been placed on the test floor
- d. A complete regeneration of the software under test has been performed immediately prior to the start of testing
- e. All operating system parameters, files, and configuration information has been saved to archive media so that the RTU and Other Systems operating environment can be recreated
- f. All database, display, and report definitions have been saved to archive media so that the System databases, displays, and reports can be recreated if necessary
- g. All source code libraries have been saved to archive media so that RTU and Other Systems software can be regenerated if necessary
- h. For the factory test, preliminary testing, as described in **Item-12.4.15 Preliminary Factory Testing** has been completed and the Bidder has submitted written certification that the preliminary testing has been successfully completed.

For the availability test, all critical, high, and normal variances have been corrected and verified to the satisfaction of Purchaser

#### 12.4.12 Test Completion

A test shall be deemed to be successfully completed only when:

- a. All variances have been resolved to the satisfaction of Purchaser
- b. All test records have been transmitted to Purchaser
- c. Purchaser acknowledges, in writing, successful completion of the test.

#### 12.4.13 Test Suspension

If Purchaser believes, at any time, that the quantity or severity of RTU and Other Systems variances warrants suspension of any or all testing, the test shall be halted, remedial work shall



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be performed, and the test shall be repeated. The repeat of the test shall be scheduled for a date and time agreed upon by both the Bidder and Purchaser.

#### 12.4.14 **Modifications to the RTU and Other Systems during Testing**

No changes shall be made to the RTU after factory testing has started without the express authorization of Purchaser. It will be Purchaser's intent to carefully control the test environment so that all changes can be readily identified and so that any changes installed for any purpose can be removed and the previous test environment restored. Purchaser shall have the right to suspend testing, to revert to a previous version of any software or hardware, and to restart any testing previously performed if, in its opinion, changes have been made to the system under test without authorization.

#### 12.4.15 **Preliminary Factory Testing**

The Pre-FAT shall be a complete dry run of the FAT, following the test plans and procedures. The intent is for the Bidder to detect and correct most design, integration, database, display, and performance problems prior to the FAT. The Bidder's project manager shall sign off each test. The completed test results shall be sent to Purchaser for inspection before Purchaser's personnel travel to the Bidder's facilities for the FAT. All tests shall be conducted using Purchaser-specific databases unless Purchaser authorizes the Bidder to use a test database.

The Bidder shall notify Purchaser at least fifteen days prior to the start of the Pre-FAT, and Purchaser shall have the option to witness all or parts of it. The Bidder shall notify Purchaser when the Pre-FAT has been successfully completed and the RTU and Other Systems is ready for FAT.

#### 12.4.16 **Factory Acceptance Test (FAT)**

Factory tests shall include:

- a. Equipment test
- b. Functional test
- c. Performance test
- d. Stability test
- e. Unstructured test

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a. **Equipment Test**

The equipment test shall verify that the RTU and Other Systems includes all required equipment, that the equipment is properly configured, and that the equipment can successfully execute the diagnostic programs provided.

The equipment tests shall include a visual inspection for proper workmanship, including cables, connectors, and labeling. The assembly drawings and configuration drawings shall also be verified at this time. These tests shall also verify that the required RTU and Other Systems capacity performance and expansion requirements as specified in this specification have been satisfied.

b. **Functional Test**

The functional test shall use an equipment configuration that may include an extension of the Bidder's deliverables as required to prove the correct functionality of the RTU and Other Systems. The test procedures shall consider all additional test equipment and shall ensure that the additional equipment does not create false test results. The functional tests shall rigorously exercise all functions and devices, both individually and collectively, and shall verify the correct functional operation of all hardware and software. These tests shall include the following, as may be applicable to the system under test:

- a. Verification of all required functionality of the system, such as RTU and Other Systems, applications, data exchange, and information storage and retrieval. Verification shall include all standard and custom functions as well as purchased options.
- b. Verification that all software has been correctly sized and meets Purchaser's capacity requirements
- c. Verification of proper acquisition, processing, and storage of data from appropriate sources, and verification of protocol and data exchanges with all external systems that will interface with the system. Where necessary, the Bidder shall provide appropriate simulations of the external systems; such simulations must themselves be verified before being used.
- d. Verification of all user interface functions
- e. Verification of the application program and system development capabilities including, software configuration management, source code development, documentation management, user interface development, real-time data set development, database generation and maintenance, report generation and modification, alarm and event message definition, test environments, and other utility functions

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- f. Verification of communications maintenance capabilities including diagnostics, communications maintenance (RTU, data links, interfaces etc.), and local input/output maintenance.
- g. Verification of all hardware maintenance capabilities.
- h. Verification of the proper response of the system to at least the following abnormal situations:
  - i. Loss and restoration of processors and servers, including auxiliary memory
  - ii. Loss and restoration of user interface equipment
  - iii. Loss and restoration of archive storage devices
  - iv. Loss and restoration of external subsystems
  - v. Loss and restoration of input power
  - vi. Loss and restoration of communication network processors
  - vii. Loss and restoration of any other peripheral devices
  - viii. Loss and restoration of local and wide area network elements
  - ix. Detection of and recovery from communication errors
  - i. Demonstration of the security of the system from unauthorized access
  - j. Verification of the redundancy and failure recovery schemes of the system
  - k. Verification that changes of system time will not prevent the system from operating properly and that the system can correctly handle the beginning of a new day, month and year; leap years and the change in century and decade.
  - l. Documentation verification that will verify that all documentation to be delivered with the system is present and meets requirements.
- c. **Performance Test**

The performance test shall verify that the specified performance requirements are met. Simulation shall be provided by the Bidder, where necessary, to create the conditions for the specified performance scenarios. The simulations shall be tested first to verify that the desired activity is being simulated. Execution of the performance tests shall be automated as much as possible so that test runs can be reproduced.
- d. **Stability Test**

A 100-hour continuous run of the system shall be performed after successful completion of the functional and performance tests. The stability test will be considered successful if no critical

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function is lost, no major hardware failure occurs, no failover occurs, and no restarts occur within the test period.

Major hardware failure is defined for the purpose of this test as the loss of hardware such as a processor, Power Supply, Communication port, I/O cards etc.

During this test, the system shall be exercised (with simulated inputs, events, and conditions) in a manner that approximates an operational environment. Purchaser will simulate unstructured user activity during this test. Purchaser will not purposely cause any hardware or software failure, that is, failover and restart testing is not a goal of this test.

The Bidder shall assist Purchaser in this test as required by Purchaser; this assistance will be primarily in the form of helping the set-up of the test, explaining the best procedures to run the test, and explaining all unexpected results.

e. **Unstructured Test**

The test schedule shall allow time throughout the functional testing for unstructured testing by Purchaser. Time for unstructured testing shall be reserved at the rate of at least two hours of unstructured testing for each eight hours of structured testing, but no less than two days total. This time will be used by Purchaser to perform additional tests, the need for which may be recovered during the formal testing, and to investigate any potential problems detected. The unstructured tests will be performed during the functional and performance test period and during the stability test at the discretion of Purchaser.

The Bidder shall assist Purchaser in this test as required by Purchaser; this assistance will be primarily in the form of helping the set-up of the test, explaining the best procedures to run the test, and explaining all unexpected results.

12.4.17 **Site Acceptance Test (SAT)**

The site test includes the installation test, the functional test, and the performance test as specified in the factory test that will be conducted at Purchaser's site after shipment and installation of the RTU and Other Systems.

SAT shall cover all equipment and functions as specified for the complete system (all hardware & software) and connectivity with Purchaser's system. As such SAT shall cover all the tests listed in FAT along with site-specific tests including interconnections with field equipment and other systems. Apart from testing and commissioning, SAT shall include one month of continuous

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trouble-free operation of the complete system without major intervention. In case of interruptions, one month trial shall be restarted after attending to the problem.

- i. IEDs used for protection, control, etc.; the inter-bay bus (and associated communications hardware/software), the station bus (and associated communications hardware/software), the time synchronization system and the local/station HMI (if any) are to be considered as SAS components, and shall undergo commissioning requirements as part of the SAT.
- ii. Vendor shall furnish, advance SAT protocols and list of vendor's instruments for site testing. Tests shall include demonstration of loading & expandability of the system.
- iii. SAT shall be performed after the system has been installed, the final software has been loaded in each subsystem, all I/Os and functionality checked, system has been running and all commissioning checks have been completed successfully.
- iv. Unstructured tests shall be employed as necessary, to verify overall system operation under field conditions.

#### 12.4.18 Installation Test

The installation tests shall be conducted by the Bidder and include:

- a. A repetition of the equipment test
- b. Loading of configuration of the RTU and Other Systems software and starting the system. At the option of Purchaser, configuration shall be recompiled, if required.
- c. In cooperation with Purchaser, establishment of the communication with all data sources and other systems that interface with the Systems
- d. Initialization and preliminary tuning of application software as needed.

#### 12.4.19 Functional and Performance Tests

The site functional and performance tests shall be comprised of a subset of the functional and performance tests of **Section 14**, The tests to be performed shall be proposed by the Bidder and approved by Purchaser. These tests shall be extended as necessary to test functions simulated during the FAT, such as communications with all field devices and all other systems that interface with the RTU and Other Systems. The extended tests shall be performed to a test procedure prepared by the Bidder and approved by Purchaser. Unstructured tests shall also be employed, as necessary, to verify overall operation of the systems under actual field conditions.

#### 12.4.20 Availability Test

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RTU and Other Systems and device availability in accordance with the criteria specified in the specification, System Availability shall be demonstrated by the availability test.

Predicted availability of equipment supplied shall exceed the following:

System Function	System Availability
Control and Monitoring of any one equipment (Breaker, Isolator etc.)	99.99%
Monitoring of Any One Single Alarm	99.99%
Monitoring of Any One Analog Input	99.99%

#### 12.4.21 Test Activity

The test activity shall consist of normal RTU and Other Systems in use. Purchaser will modify the configuration during the availability test. Such modifications will be described to the Bidder at least 48 hours in advance of implementation to allow assessment of impact on the availability test, except where such changes are necessary to maintain control of the power system.

#### 12.4.22 Test Definitions

The definitions of the time periods used in determining the duration of the test and the success of the test shall be as follows:

**Downtime** – Downtime occurs whenever the criteria for successful operation defined in specification, Availability Requirements – RTU and Other Systems, are not satisfied. Downtime shall be measured from the start of diagnostic procedures until full service is restored. In the event of multiple failures, the total elapsed time for repair of all problems (regardless of the number of maintenance personnel available) shall be counted as downtime.

**Hold time** – Certain periods of time during which the RTU and Other Systems is down may be due to circumstances that are beyond the control of either party. These contingencies may prevent successful operation of the systems but are not valid for the purpose of measuring systems availability. Such periods of unsuccessful operation may be

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declared hold time by mutual agreement of Purchaser and the Bidder. Specific instances of hold time are:

- Scheduled shutdown** – During scheduled shutdowns or if an equipment failure occurs due to scheduled maintenance, the resulting system outage shall be hold time, provided that service can be restored according to the Bidder-specified procedures within 30 minutes.
- Power Interruption & environmental excursion** – Loss of power or manual shutdown of the RTU and Other Systems in the event of power excursion or the loss of environmental control shall be considered hold time. If the systems are operated during periods of power or environmental conditions beyond those specified, any resultant downtime shall be considered hold time.
- Intermittent failure** – Periods during which an intermittent, recurring failure is experienced will be considered hold time, provided that the Bidder is engaged in remedial action and normal operation of the RTU and Other Systems can be restored within 30 minutes by Bidder-defined procedures whenever the failure occurs. Instead of accounting for the actual intermittent downtime, one hour of downtime shall be counted for each 120 hours of otherwise successful operation while the problem persists.
- Failure of Purchaser software** –Time during which the RTU and Other Systems software is upgraded shall be considered hold time. Of course, Systems can be restored within 30 minutes by Bidder-defined procedures.
- Corrected design defect** – Hold time may be declared by mutual agreement to ensure against similar future occurrences if a failure occurs due to a defect in design for which the Bidder defines and implements corrective measures. In such a case, enough hold time shall be allocated to allow verification of the corrective action.
- Logistics delays** – If repairs are delayed due to previous use of spare parts or because of Purchaser’s failure to purchase recommended spare parts, hold time will be declared after diagnosis of the failure and while the

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Bidder is pursuing replacement parts in an expeditious fashion. A maximum of 48 hours of hold time will allowed for each occurrence of logistics delay.

**Service response time** – Hold time shall be declared from the time that a failure is detected until diagnostic procedures are begun. A maximum 24 hours of hold time will be allowed for each failure.

**Total time** – The time elapsed from the start of the availability test until the end of the availability test

**Test time** – The time elapsed from the start of the availability test until the end of the availability test, excluding hold time. That is,

$$\text{Test\_time} = \text{Total Time} - \text{Hold\_time}$$

#### 12.4.23 Duration and Criteria for Passing

In order to establish that all failures have been satisfactorily repaired prior to the end of the availability test, no downtime, intermittent (hold time) failures, or more than one uncommanded failover shall have occurred within 200 hours of the test's conclusion. The test shall be extended, if necessary, to satisfy this requirement.

After successful completion of site acceptance test and 72 hours have passed, system availability shall be computed using the following formula:

$$\text{System\_Availability} = [(\text{Test\_time} - \text{Down Time}) / \text{Test\_time}] \times 100\%$$

If the system availability requirements presented in the specification, System Availability, have not been met, the test shall continue until the specified availability is achieved. Alternatively, and at Purchaser's discretion, the test may be restarted.

When it has been determined that the system availability requirement has been met, the availability of each System device shall be calculated and compared against the device availability requirements as specified, Availability Requirements – RTU and Other Systems. If one or more devices do not meet the requirements, the test shall be extended until Purchaser and the Bidder mutually agree that corrective action has been completed for those devices. Corrective action shall include all necessary procedures to test and verify proper operation to Purchaser's satisfaction.



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### 13.0 System Capacity, Performance and Demonstration

Proposed System shall meet performance standards required to maintain real-time monitoring and control of the network. Performance shall be evaluated according to the amount of time and controller resources required for accomplishing a variety of tasks. The tasks are grouped into the following major function areas:

- a. Data Acquisition and processing
- b. Data Archive processing
- c. Data transfer to Control Centre
- d. Response to the request of SCADA-DMS-OMS System

#### 13.1 System Capacity

The system functions and associated databases shall be capable of accommodating at least a 100% increase in the delivered capacity without requiring regeneration, recompilation, or any other processing other than definition of the database by Purchaser.

Similarly, the RTU and SIC rack shall have provision to add additional DI (224 DI) module, DO module (80 DO) to meet the site requirement.

- a. The system functions and their associated databases shall be dimensioned as per the functional requirement of the Purchaser, specified in this document. E.g. Bay augmentations, Integration of distribution level data etc.
- b. The main memory of each processor shall be capable enough to twice the delivered capacity within the delivered enclosures by Purchaser.
- c. Fifty percent of the auxiliary memory capacity of each Controller shall be completely available for future use by Purchaser. The auxiliary memory of each processor, console, and storage unit shall be expandable to twice the delivered capacity within the delivered enclosures by Purchaser.
- d. Inspection and verification, to the extent possible, that provision to upgrade and expand the system are furnished as required by the contract.

#### 13.2 System Scenarios

The System performance shall be tested under the following system scenarios:

- a. Base Conditions
- b. Steady-State Conditions

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- c. High Activity Scenario Conditions

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### 13.2.1 Base Conditions

The following conditions shall apply:

- a. The System shall be configured with all hardware and functions required by this Specification including hardware and functions specified as optional.
- b. All System function execution parameters shall be as mentioned in this document.
- c. System functions shall execute at the periodicities and execution times specified in this document
- d. The System software and databases shall be configured in accordance with the required System Capacity.
- e. The pre-defined time change shall occur such that all data acquisition and processing associated with the time System functions, including report production, are executed.

### 13.2.2 Steady State Conditions

The Steady State Conditions shall consist of the Base Conditions and the following activities over a sixty- minute period:

- a. Twenty-five percent of all the analog points shall change sufficiently each time they are acquired. Sixty alarms per minute (Thirty status alarms and Thirty analog alarms) shall be generated and processed. Each of these alarms may be acknowledged within sixty seconds at Purchaser's discretion.
- b. One supervisory control sequence consisting of the opening or closing of one device shall be executed at each operation console every one minutes.

### 13.2.3 High Activity Scenario Conditions

The high activity scenario shall consist of the base conditions and the following activities over a fifteen- minute period:

- i. All processor inputs scanning, and processing is in progress and all the data is transmitted over the main data bus every sec
- ii. All controls in operation
- iii. Control / information request is initiated from all terminals.
- a. Hundred percent of all the analog points shall change sufficiently each time they are acquired to require complete processing by the System.

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- b. A burst of 70% a COS shall be generated and processed within the first sixty seconds of the scenario.
- c. Five supervisory control sequences consisting of the opening or closing of devices shall be executed at each operating console every one minute.

### 13.3 System Functional Tests

The purpose of the system functional tests is to rigorously exercise all functions and to verify the correct functional operation of all hardware and software. The system functional tests shall include, but not be limited to, the following tests. The Purchaser shall also be able to perform other tests not specifically mentioned.

- a. Verification of proper data acquisition & control from the RTUs, IEDs
- b. Verification of proper data acquisition from the Multifunction Meters
- c. Verification of proper data acquisition & control from Purchaser's other condition monitoring systems.
- d. Verification of the proper response of the system to include
  - i. Loss / Restoration of IEDs and RTUs
  - ii. Loss / Restoration of Input Power
  - iii. Loss / Restoration of Communication System
- e. Verification of System Redundancy including fail-over procedures and restart.
- f. Verification of all development and maintenance capabilities Including:
  - i. Database Generation and Maintenance
  - ii. Back-up and Restoration functions of all systems.

### 13.4 System Response

Satisfaction of the performance requirements will be verified during factory test and the site test for each of the system and applications and the other functional requirement mentioned in the specification. Under Base Condition, Steady State Condition and High Activity Scenario Condition the system response shall be tested and response time as per the specifications shall be achieved.

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- a. All Digital Inputs shall be reported with a resolution of 1 msec.
- b. All Digital Inputs shall have individual channel reporting
- c. Supervisory control operation shall be completed, and the result displayed at workstation consoles within 1 seconds plus scan-in progress, communication, and field device operation delays.
- d. The system shall report correct Time Stamping when all process inputs scanning & processing is in progress & all the data is transmitted over Data Bus every sec.

#### 13.4.2 Resource Monitoring

Resource utilization shall be measured, calculated and displayed for the System processors, devices, and networks. The minimum set of parameters to be presented include:

- a. Time utilization (percent processor utilization) of each function per processor
- b. Time Synchronization
- c. Time utilization of each function
- d. Data transfers per second/minute/hourly

#### 13.4.3 System Utilization

Name	Utilization	Comments
<b>Main Memory</b>	30%	Normal
	50%	Peak
<b>Processor Utilization</b>		
Application processor	<30%	Normal
	<50%	Peak
Communication processor	<30%	Normal
	<50%	Peak
<b>Local Area Networks</b>	40%	Normal Loading
	60%	Peak Loading
<b>Auxiliary Memory</b>		
Allocated capacity	50%	
Access and transfer capacity	30%	Normal
	50%	Peak

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#### 14.0 Warranty, Maintenance, Upgrades, Patch Management & Database Modification Requirements

This Section specifies the requirements for Warranty, hardware & software maintenance for the System, Post Warranty maintenance, support, system upgrades, patch management etc.

Bidder to note the environmental condition of locations, the proposed system is being planned to be installed and operational.

- a. Bidder shall submit the details to facilitate to carry out online and offline maintenance of the components supplied as a part of the system. In general, this should include adequate testing equipment, tools, safety devices and other accessories.
- b. Bidder should provide Maintenance strategy of the product (Own & Sub-Vendor) being offered so as to schedule appropriate timeline for maintenance.

##### 14.1 Maintenance Performance Requirement

Purchaser envisaged that all offered equipment shall not require routine or planned maintenance. Therefore, no fans or moving parts shall be used in any of the system to avoid any need for maintenance. To ensure this, all the supplied equipment should be constructed to resist the entry of Dust, Water etc. A single technician shall be able to remove and replace for repair purposes, without special tools and test equipment, all equipment involved in the offered system. Restoration of equipment to full operational use shall be possible within 15 minutes (nominally) of repairs being completed. It should not be necessary to dismantle (remove multiple pieces of) the system in order to replace a module.

##### 14.2 Service Life

Bidder to note that the equipment shall be capable of complying with all standards, including performing its intended purpose, for a minimum of 15 years from the date of commissioning.

The bidder shall indicate the following:

- a. The date at which the product was released for sale.
- b. The anticipated date at which the product will be withdrawn from sale, but support will continue to be provided for Spares and Services.
- c. The anticipated date that product support will be withdrawn, i.e. spares and technical support will also be no longer available.

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#### 14.3 Interchangeability

All the parts/modules shall be interchangeable individually (e.g. RTU parts/modules shall be interchangeable individually, and as a whole RTU). Any such change or replacement shall not reduce the capability of the equipment to conform to the requirements of this specification. This is applicable for all the parts/module supplied by the bidder under this contract.

#### 14.4 Definitions

The responsibility for maintenance of hardware and software will vary depending on the time during the Contract. So that the times for changes in responsibility can be determined, the following definitions shall be used:

**Delivery** – Delivery of any item shall be interpreted as receipt of the item at Purchaser's facility.

**Commissioning** – Commissioning of any item shall be interpreted as receipt of the item at Purchaser's facility, installation on-site, successful completion of the site tests, and correction of all variances from the tests.

#### 14.5 Deliverable Hardware and Software Version

The delivered Hardware and Software shall be the latest version being delivered by the manufacturer of the Hardware & Software six months prior to its delivery to Purchaser's facility. During delivery of the system, all the RTU of a Bidder across the TPCODL network shall be upgraded to the latest version.

All hardware and software shall be of compatible versions. That is, the Bidder shall be responsible to ensure that all delivered hardware and software versions will inter-operate successfully. If it becomes necessary to upgrade some hardware or software to meet this requirement, the cost and time shall be borne by the Bidder. If it is necessary to revert to a previous version of any hardware or software to overcome incompatibilities among the hardware or software, the Bidder shall bear the cost and time of the "downgrade" and shall present a plan to correct the problems with the newer release. Such corrections shall also be at the Bidder's sole expense.

#### 14.6 Warranty and Post Warranty support

- a. **Maintenance services** for the supplied Hardware, System and application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.

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- b. Bidder shall provide **Maintenance Services** for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products for next 5 years over and above as mentioned in item a.
- c. Training
- d. SLA will be prepared and adhered by Bidder, Sub-Vendor's of bidder for extending the Hardware, Software and Service support to Purchaser for the period mentioned above. To mitigate major failure like Complete system failure, RTU system instability, loss or failure of any major subsystem or system component such as to cause a significant adverse impact to system availability, performance, or operational capability. Some of the salient points as example are documented below:
- i. Bidder shall report to site within 48 hours of receipt of reporting of the failure occurrence
  - ii. Bidder shall provide replacement of the faulty equipment within 7 days after confirmation of the fact that the equipment can't be repaired at site. Failure to this clause may have some penalty reference on Bidder.
  - iii. Bidder will mandatorily provide detailed analysis report of the faulty equipment within 15 days from the date of the site visit.
  - iv. Any spare Equipment replacement, testing and its commissioning to be done by bidder, with no cost implications to Purchaser. Any tools, equipment, Software or Hardware required for testing of the System (e.g. IEDs/RTU) will be the responsibility of the Bidder, this includes all system supplied by bidder under this contract.
  - v. Any up gradation in application software and hardware will be informed to Purchaser and necessary up gradation to be carried out by Bidder with no cost implications to Purchaser.

***Bidder to note that Tri-Party agreement will be prepared for Bidder, Sub-Vendor to have protection against quitting of executing bidder and its alliances during commissioning, warranty and post warranty period as specified in this document.***

#### 14.7 Hardware Maintenance

The project schedule shall include an allowance for hardware maintenance prior to the availability test. The Bidder will not be granted any relief for project delays caused by maintenance problems prior to the availability test.

##### 14.7.1 Pre-Delivery Maintenance

The Bidder shall have the responsibility for maintenance of all hardware prior to delivery to Purchaser's site. This maintenance may be performed by a maintenance contract with Original Equipment Manufacturers (OEMs) or other parties.



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#### 14.7.2 Maintenance During Commissioning

The Bidder shall have the responsibility for maintenance of all hardware after delivery and prior to commencement of the Warranty. This maintenance may be performed by a maintenance contract with OEMs or other parties or by Bidder staff.

Failed equipment shall be replaced or repaired and spares inventories (if any) replenished to their delivered level throughout the period of commissioning. Any spare parts found to be defective during initial delivery inspection or during this period shall be replaced within **one week** after notification. There shall be no charges to Purchaser for these replacement parts, including delivery charges. All spare parts replaced under maintenance shall be new parts unless otherwise accepted by Purchaser.

#### 14.7.3 Maintenance Under Warranty

Maintenance during the warranty shall be in conformance with the terms of the warranty sections of this RFP (**Item 14.6**).

During the warranty period, Purchaser's hardware maintenance responsibilities will include the following:

- a. Provision of trained staff, responsible for call-out when problems occur
- b. Providing local assistance to the Purchaser during problem resolutions

The Bidder's hardware maintenance responsibilities shall include the following:

- a. Providing maintenance of all equipment, including spare parts
- b. Providing materials and instruction for appropriate engineering changes for equipment
- c. Provision of technical guidance towards the resolution of all hardware problems for equipment.

When needed, the Bidder shall respond to requests for technical support within Two Hours, 24 hours a day, seven days a week.

Failed equipment shall be replaced or repaired, and spares inventories replenished to their delivered level throughout this period. Any spare parts found to be defective during initial delivery inspection or during the Warranty period shall be replaced within one week after notification. There shall be no charges to Purchaser for these replacement parts, including

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delivery charges. All spare parts replaced under maintenance shall be new parts unless otherwise accepted by Purchaser.

The Bidder's technical support staff shall work with Purchaser's technical staff to establish a strategy to efficiently resolve each identified problem. If at any time, Purchaser believes that the Bidder's technical support is not effectively resolving a problem, Purchaser may request that the Bidder's system expert or staff from the equipment's manufacturer be dispatched to Purchaser's facility. The Bidder's technical team shall be at Purchaser's facility within 48 hours of that request to provide hands-on support towards the problem resolution. Purchaser will not be responsible for any expenses connected to the technical support, including travel expenses.

The Resolution time for different complaints shall be as per the below matrix:

Category	Definition	Maximum Resolution Time
<b>Severity 1 Urgent</b>	Complete system failure, severe system instability, loss or failure of any major subsystem or system component such as to cause a significant adverse impact to system availability, performance, or operational capability	0-12 hrs.
<b>Severity 2 Serious</b>	Degradation of services or critical functions such as to negatively impact system operation. Failure of any redundant system component such that the normal redundancy is lost Non-availability of information at control center	0-24 hrs.
<b>Severity 3 Minor</b>	Any other system defect, failure, or unexpected operation. Request for information, technical configuration assistance, "how to" guidance, and enhancement requests.	0-48 hrs.

**Failure by the Bidder to comply with the above-mentioned timelines, shall attract a penalty @ Rs. 1000 per hour. Penalty amounts shall be recovered from the amounts due to Bidder or by invoking the Contract Performance Bank Guarantee submitted by Bidder against this Contract.**

#### 14.7.4 Post Warranty Maintenance Support

The following post-warranty maintenance services shall be provided for all hardware:

Contract maintenance, eight hours per day, seven days per week, two-hour response. The Bidder's technical support staff shall work with Purchaser's technical staff to establish a strategy to efficiently resolve each identified problem. If at any time, Purchaser believes that the Bidder's technical support is not effectively resolving a problem, Purchaser may request that the Bidder's system expert or staff from the equipment's manufacturer be dispatched to

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Purchaser's facility. The Bidder's technical team shall be at Purchaser's facility within 24 hours of that request to provide hands-on support towards the problem resolution. Purchaser will not be responsible for any expenses connected to the technical support, including travel expenses.

The maintenance contracts shall cover preventative and remedial maintenance, spare parts, and installation of all engineering, equipment, and field change and upgrades. Purchaser agrees to notify the Bidder of their intent to install any changes or upgrades so that their compatibility with the other elements of the System may be determined.

The SLAs for support including response time, resolution time, applicable penalties for non-compliance etc. shall remain same as per the terms and conditions prevailing during the warranty period.

#### 14.7.5 **Hardware Minimum Support Period**

The Bidder shall guarantee the availability of spare parts and hardware maintenance support services for all System equipment for a minimum period of 15 years. Subsequent to this minimum support period, the Bidder shall provide to Purchaser a minimum of two year's advance notice of their intent to terminate such services.

#### 14.8 **Upgrades, Patch Management & Modifications**

- a. Bidder shall continuously keep the Purchaser informed of all Software and Hardware upgrades as & when these are released.
- b. Bidder shall supply upgrades and patches of all installed software (both own and third party) for a period of eight years from the date of system acceptance without commercial implication.
- c. Bidder shall rectify all design defects and software bugs at no extra cost for a period of 15 years from the date of system acceptance.
- d. Bidder shall support the system totally for Fifteen (15) years, even if no upgrades are implemented.
- e. Bidder shall provide lifetime support (15 years) for the system. To meet this requirement, Bidder shall refer with OEMs on the product's life cycle management and obsolescence. Bidder shall attaché the product life cycle matrix for hardware and software offered under this RFP.
- f. The system referred to above includes Bidder's own as well as third party components.

#### 14.9 **Database modification during Warranty and Post Warranty Period**

All database modification major or minor (including new bay, new station inclusion and new equipment/device) is in the scope of the bidder, after the system handover and during the

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warranty and extended warranty period. The Scope covers RTU configuration and necessary changes for control center communication. It is bidder's responsibility to provide resources as and when required by the purchaser for these changes and testing of the same as per the project and planned activity schedule. One of the examples of Configuration changes/modification are as mentioned below:

1. Addition/Deletion of 33/11 kV Bays
2. Addition of Auxiliaries Tags
3. Addition/ Deletion of System/IEDs/Devices/SCADA enabled equipment/sensors
4. Reconfiguration of RTU for new Control Centers

## 15.0 Training

Bidder shall provide training to the Purchaser's personnel on the operation and maintenance of the system supplied equipment including Non-OEM equipment/3rd Party equipment. The training shall cover development, integration, installation and commissioning of both software & hardware components of the system.

The Bidder shall provide Classroom as well as hands-on training on the offered System. All required training materials such as System Catalogs, Test Instruments, Demo Equipment, and Simulation Jigs, etc. shall be arranged by the Bidder for own and Sub-Vendor Equipment. The training shall equip the Purchaser's engineers for Installation, Commissioning, Operation and Post-Warranty Maintenance of Hardware, Software (Operating System, Administration and Applications), protocols and all Sub-Vendor systems.

The Bidder shall prepare and deliver a comprehensive training program on the operation and maintenance of RTU and associated accessories under this project. Configuration of RTU, training shall cover the skills required for the maintenance and expansion of additional feeder/IEDs/Substation. Hardware training shall qualify Purchaser to perform routine preventive maintenance, diagnostic testing on the processors, peripheral equipment, LANs & communications equipment.

Bidder shall indicate their Training facilities including test tools and simulation facilities. Bidder shall provide the training calendar and details of topics considered for the equipment offered.

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The schedule, location and detailed content of each course will be finalized during detailed engineering.

Bidder to consider 50 man-days training for each phase for on-site training to Purchaser's personnel. Bidder to note that the indicated man-days will be utilized in batches (3-4), according to availability of the Purchaser's personnel.

### 15.1 Training Requirement

Bidder shall provide training to the purchaser's personnel on the operation and maintenance of the system supplied by him.

General requirements relating to the training are specified below:

- a) Personnel who speak understandable English and who are experienced in instruction shall conduct training courses.
- b) Class Room and Hands-on training shall be on the identical system being supplied to Purchaser.
- c) Bidder shall provide all necessary training material. Each trainee shall receive individual copies of the technical manuals and pertinent documents. These materials shall be supplied at least one month before the scheduled commencement of the training course.
- d) The purchaser shall be permitted to video tape all training classes.
- e) Class materials, including documents sent before the training classes and class handouts, shall become the purchaser's property. The purchaser may copy this material for in-house training and organization use only.
- f) Training sessions conducted at site shall accommodate the number of candidates in batches.
- g) Bidder to note that, requirement of Training for RTU system is explained in detail, on similar line bidder to arrange training for all Non-OEM systems such as Ethernet Switch, DC System and its controller etc.

#### 15.1.1 Course Descriptions

Course descriptions shall be included with the training plan that shall provide the following information for each course included in the training plan:

- a) The course name (and number if applicable)
- b) A brief description of the course

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- c) A description of the intended audience for the course
- d) A description of the relation of the course to others in the training plan
- e) The duration of the course
- f) A breakdown of the course schedule, identifying classroom and hands-on periods
- g) A list of the training materials to be supplied
- h) A list of reference material to be used in the course
- i) A list of any prerequisite training or experience expected of the students.

At Purchaser's request, the Bidder shall provide a description of all courses offered by the Bidder and its Sub-vendors.

## 15.2 Training Curriculum

The training curriculum presented in this section is intended to describe the contents of the training when viewed. The subjects covered by individual courses may differ as long as the overall objectives are satisfied.

### 15.2.1 RTU Hardware Training

RTU system hardware course shall be designed to provide Purchaser's personnel enough knowledge of the overall design and operation of the system so that they can correct obvious problems, configure the hardware, perform preventive maintenance, run diagnostic programs, and communicate with OEM personnel. The following subjects shall be covered:

- a) Configuration of the System Hardware.
- b) Basic and advance training of operation, maintenance techniques and diagnostic procedures for each element of the offered system, e.g., Processors, Auxiliary Memories, LANs, Routers etc. Configuration of all the hardware equipment.
- c) Techniques and procedures to expand and add IEDs/Feeder/Substation/Communication channels etc.
- d) Theory of operation and maintenance of the redundant/non-redundant hardware configuration, failover hardware, configuration control panels, and failover switches. Maintenance of protective devices and power supplies.
- e) Theory of design and operation, maintenance techniques and practices, diagnostic procedures, and (where applicable) expansion techniques and procedures. Course content shall include

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hands-on training for the specific subsystems that are part of Purchaser's equipment or part of similarly designed and configured subsystems. All interfaces to the computing equipment shall be covered in detail.

- f) Preventive and Corrective maintenance of all equipment, including use of special tools and instruments.
- g) Capable to diagnose and debug problem in the RTU. Course should familiarize the different error code of the RTU and how to rectify them.

#### 15.2.2 System Software Training

The Bidder shall provide a System Software course that covers the following topics:

- a) All applicable programming languages, Stand-alone Service and Utility packages of the system. An introduction to software architecture, effect of tuning parameters (OS software, Network software, database software etc.) on the performance of the system.
- b) Operating System course consisting of the user aspects of the operating system, such as program loading and integrating procedures; scheduling, management, service, and utility functions; and system expansion techniques and procedures.
- c) System Initialization and Failover, execution of diagnostic procedures and the interpretation of diagnostic outputs.

#### 15.2.3 Application Software Training

Comprehensive application software course, covering all applications database Logic and display building etc. The training shall include minimum the following:

- a) Overview of the application software and data flows.
- b) Programming Standards and Interface conventions.
- c) Functional capabilities, design, and major algorithms. Associated maintenance and expansion techniques.
- d) Software development techniques and conventions for the preparation and integration of new software functions.
- e) Generation of application software

#### 15.2.4 RTU Configuration/Engineering Training

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The database and logic building course shall cover how to configure the inputs & outputs signals of the RTU, communications with IED, communication with Control Centre, build the configuration database, storing and retrieving of the configuration file, database administration to maintain and modify the database and its structures. Following minimum topics shall be covered:

- a) How to set up configuration database for RTU, identifying different component for configuration
- b) How to configure I/Os
- c) How to configure IEDs
- d) How to configure Control Centre Communication
- e) How to Configure Cyber Security features of RTU
- f) How to Compile Configuration
- g) How to Import / Export configuration file
- h) How to download/upload configuration file
- i) How to maintain different configuration file

#### 15.2.5 RTU System Administration

System administration course shall cover the procedures necessary to operate the RTU configuration software, managing users and their roles. At the end of this course, participants shall be able to:

- a) Start up the RTU configuration Tools and its components
- a) Shut down the Software and its components
- b) Switch functions to backup equipment
- c) Take equipment out of service and its restoration
- d) Interpret and react to messages generated by error-monitoring functions
- e) Test field device and communication links
- f) Implement procedures for installing new devices
- g) Use procedures for altering and replacing the configurations



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- h) Identify procedures for using diagnostics
- i) Describe the backup functions required for normal maintenance
- j) Upgradation of System Software, Patch Management and Firmware Upgradation of OS and Application Software etc.

#### 15.2.6 Simulator Training

This course shall cover the operation of the Simulator, scenario building, and maintenance. Enable the Purchaser personnel to:

- a) Prepare training scenarios using the scenario building tools
- b) Simulate the communication over IEC 61850 protocol with devices
- c) Simulate the communication over IEC 60870-5-104/101/103 and Modbus protocol

Similarly, the bidder shall arrange training on Sub-vendor equipment supplied under this RFP.

#### 16.0 Tools Tackles for Erection & Commissioning

Bidder to consider and supply special tools and tackles (Hardware and Software) required for erection, commissioning and maintenance of the offered system. After commissioning of the system all tools and tackles shall be handed over to Purchaser's Project/Maintenance team.

All tools (both hardware and software), test instruments, simulation jigs, documents, programming equipment etc. required for Installation, Testing & Commissioning are in the scope of the bidder.

All configuration cables and other specialized testing passive devices to be provided with the supply of material.

#### 17.0 Spares

- a. Bidder needs to include competitive price for Mandatory Spare parts against the below specified list and schedules.
- b. Bidder shall include list of spares with quantities as recommended by him required for 15 years trouble free operation of equipment.
- c. The spares supplied shall be strictly interchangeable with parts for which they are intended for replacement.

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- d. The spares shall be treated and packed for long storage (minimum 15 years) under the climatic conditions prevailing at the site.
- e. The start-up spares shall be delivered at the site well in time before the start-up and commissioning of the plant.
- f. Bidder to note the environmental condition of locations, the proposed system is being planned to be installed and operational.

#### 17.1 **Start-Up Spares:**

The start-up spares are those spares which will be required during start-up and commissioning of the equipment/systems, and until Final Take Over. It is the responsibility of the bidder to supply all the necessary spares as required until the equipment/systems are handed over to the Purchaser. An adequate stock of start-up spares shall be available at the site such that the start-up and commissioning of the equipment/systems, performance testing and handing over the equipment/systems to the Purchaser be carried out without hindrance and delay. All start-up spares which remain unused after the taking over the system shall remain the property of the Purchaser. The Bidder shall furnish the Schedule of Start-up Spares.

#### 17.2 **Mandatory Spares**

Essential spares are those considered necessary by the owner for ten (10) years of normal Sub-Station Automation System operations. A list of such spares has been listed in the below mentioned table and the same shall be included in bidder's scope. When an item of spares is indicated as 'percentage', it shall be considered as percentage of total number of that item of spares of overall project, unless specified otherwise and the fraction shall be rounded-off to the next higher whole number. Whenever the item of spares has been indicated as 'set' the same shall mean the supply for a single equipment/system. One set of spares for the particular equipment shall mean the total quantities of that particular spares for a single equipment e.g., 'set' of RTU, SIC etc. The 'set' shall however include all components required to replace that item of spares. The Owner reserves the right to buy any of the essential spare parts as considered necessary.

In case during start-up and commissioning certain essential spares are used up, the same shall be replaced within one (1) month without any commercial implications.

Bidder shall furnish details for all essential spares as per the approved vendor document list.

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Bidder to consider following mandatory spares in the offer.

SL. No.	System	UoM	Qty
1	RTU with all accessories, cables etc. except I/O modules	Sets	5
2	CPU Module of the RTU	Nos.	10
3	Power Supply module of the RTU	Nos.	10
4	Memory Module of the RTU	Nos.	10
5	Communication Module (Ethernet) - As per the proposed Solution	Nos.	10
6	Communication Module (Serial) - As per the proposed Solution	Nos.	10
7	DI Cards for Digital Inputs (DI Channels/Module = 16 DI)	Nos.	10
8	DO Cards for Digital Output (DO Channels/Module = 8 DO)	Nos.	10
9	AI Cards for Analog Inputs (AI Channels/Module = 4 AI)	Nos.	15
10	Bus Coupler Module (If Applicable)	Nos.	5
11	Remote I/O Rack with all accessories, cables etc. (if Applicable)	Sets	5
12	Interface Module for Digital Inputs with FRC cable	Sets	10
13	Interface Module for Digital Outputs with FRC cable	Sets	10
14	Interface Module for Analog Inputs with FRC cable	Sets	15
15	CMR with Base	Sets	150
16	Interposing Relay with Base	Sets	75
17	Armored FO Cable	meter	1000
18	Communication Cable – CAT6 Patch Cord of 2 Meter length	Nos.	50
19	Communication Cable – CAT6 Patch Cord of 5 Meter length	Nos.	100
20	Communication Cable – CAT6 Patch Cord of 10 Meter length	Nos.	100
21	Communication Cable - FO Patch Cord (SM) of 2 Meter length (Connector shall be as per the proposed FO port considered in the Ethernet Switch)	Nos.	20
22	Communication Cable - FO Patch Cord (MM) of 10 Meter length (Connector shall be as per the proposed FO port considered in the Ethernet Switch)	Nos.	20
23	Multifunction Meter	Nos.	25
24	IEC 61850 complied L2 Managed Ethernet Switch (RTU Panel)	Nos.	10
25	IEC 61850 complied L2 Managed Ethernet Switch (CRP Panel)	Nos.	10
26	Fully Loaded LIU Boxes (If Applicable)	Nos.	10
27	Diode OR-ing Unit (If Applicable)	Nos.	10
28	Battery Charger - Rectifier Unit	Sets	10
29	DC MCB (10 nos. of Each Type)	Nos.	10



**TP Central Odisha Distribution Ltd.****Automation & Technology**

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The Bidder shall provide the MTBF of various components, sub-assemblies, assemblies etc. (recommended as spares) and the relationship between MTBF and spare quantities recommended. The bidder is required to list the spares.

The Bidder shall submit the product life cycle details of the all hardware offered under this RFP.

**End of Section-A**

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## Section – B

### Detailed Technical Specifications



**TP CENTRAL ODISHA DISTRIBUTION LIMITED**  
(A Tata Power & Odisha Govt. Joint Venture)  
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Revision	Date	Description	Approvals		
			Prepared By	Checked By	Approved By
R0	10 <sup>th</sup> July 2021	Released for Procurement	Automation Team	TKB/GSB	AKA

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## **Section – B**

# **Detailed Technical Specifications**

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# **Chapter # 1**

## **RTU Specification**

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The Intent of this specification is to implement RTU based automation system for conventional substations for integration with Purchaser's SCADA, DMS & OMS System at the TPCODL's Main Control Center (MCC) and Backup Control Centre (BCC). The proposed Remote Terminal Unit (RTU) shall facilitate controlling and monitoring of the 33/11kV Sub-Transmission Substations from the SCADA, DMS & OMS System at MCC and BCC over IEC 60870-5-104 protocol.

## 1.0 Remote Terminal Unit (RTU)

RTU is envisaged for data acquisition and integration with control centers to carry out remote monitoring and control of the Substation. A state-of-art microprocessor based industrial RTU designed for the electrical process environment in both decentralized and centralized manner shall be considered. The RTU shall guarantee high availability and ensure safe and secure operations of all substation equipment.

The RTU shall be multifunctional, designed in accordance with applicable International Electro-Technical Commission (IEC), Institute of Electrical and Electronics Engineer (IEEE), American National Standards Institute (ANSI), and National Equipment Manufacturers association (NEMA) standards, unless otherwise specified in this Technical specification. In all cases the provisions of the latest edition or revision of the applicable standards in effect shall apply.

RTUs shall be redundant to provide a reliable system for acquisition of required information from the RTUs, BCPUs, Numerical relays, Multifunction meters, Condition Monitoring Devices, and other communicable devices as well as hardware signal through I/O cards.

All functional capability described herein shall be provided by the bidder even if a function is not initially implemented. As a minimum, the RTU shall be capable of performing the following functions:

- 1.1 The proposed RTU shall be suitable for decentralized and centralized architecture to address the requirement of present and future.
- 1.2 The proposed RTU, I/O and Interfacing modules shall be of the same family of RTU or Embedded, industrial grade system with high availability & reliability. RTU hardware shall be easily scalable for expansion and to integrate IEDs in future on open protocols.
- 1.3 The RTU shall be redundant in hot standby mode with bump less Auto Changeover.

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- 1.4 RTU shall have vast protocol support capability, adaptable for customization and additional protocols and Multi master communication capability.
- 1.5 The RTU shall support a wide range of Server/Client protocols including IEC61850 (ED1 & ED2 edition), IEC 60870-5-104 (Master/Slave), IEC 60870-5-103, Modbus - RTU, Modbus - TCP/IP (Master).
- 1.6 The RTU shall have min 5,000 Physical I/O tags and shall support integration of at least 40 IEDs on IEC 61850 and at least 25 IEDs on serial protocols. Bidder to consider the hardware such as I/O peripheral, Serial Ports, Communication processors, Converters etc., in the RTU accordingly.
- 1.7 The proposed RTU shall communicate simultaneous with eight independent remote master (redundant) stations on IEC 60870-5-104 Protocol.
- 1.8 RTU to the Purchaser's SCADA Systems shall allow scanning & control of all defined points (Physical/Pseudo points) within the substation independently to each of the SCADA systems. Proposed system shall simultaneously respond to independent scans & commands from Purchaser's SCADA ADMS Systems. Proposed system shall support the use of a different communication data exchange rate (bits per second), scanning cycle, and/or communication protocol for each remote control center. Also, each control center's data scan and control commands may be different for different data points within the proposed system's database.
- 1.9 The RTU shall be 19" Rack mounted / Din Rail Mounted.
- 1.10 Disturbance and fault record collection over IEC 60870-5-104 protocol
- 1.11 Shall support IEC 61131 based programming logic. The RTU shall support programming language (Functional Block) with arithmetic & logical functions to incorporate Interlock Logic for SCADA Controls. Bidder to ensure supply of necessary hardware and software to achieve the functionality.
- 1.12 Web Server functionality to monitor and configure the RTU along with Substation IEDs by authorized users (AAA functionality).
- 1.13 Should provide latest Microsoft Windows based maintenance and configuration tools. The tools should have functionality of both remote and local access.
- 1.14 Time synchronization based on SNTP (Server/ Client) and Protocol specific synchronization (IEC 60870-5-104 etc.). The RTU shall accept minimum two independent sources for time

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synchronization over SNTP/Protocol specific Synchronization. RTU in turn shall synchronize the IEDs integrated on different protocols.

- 1.15 RTU shall support SNMP protocol for device monitoring and management from Purchaser's Network Management System.
- 1.16 RTU shall support configuration File Upload and Download from the Engineering Station (Configuration Laptop), functionality shall support both Local & Remote configuration.
- 1.17 RTU shall be capable of acquiring 32-bit analog and accumulator data from Multi-function meters on MODBUS (RTU & TCP/IP)/IEC61850/IEC60870-5-104.
- 1.18 RTU communication protocol shall be configured to report analog & Status changes by exception to master stations. However, RTU shall support periodic reporting of analog data and periodicity shall be configurable from 1 sec to 1 hour. Digital status shall have higher priority than the analog data. In addition, analog values shall also be reported to Master station by exception on violation of a defined threshold limit.
- 1.19 The XML based Substation Configuration Description Language (SCL) of IEC 61850 configuration interfaces shall allow information to be shared between the various configuration tools, reducing the overall engineering time.
- 1.20 User friendly on-line health and data monitoring facility shall be provided to maintenance engineer for monitoring/analyzing the real time status of the process, program logic from the engineering station (Configuration tool – Laptop) from Local and Remote.
- 1.21 The Master Station user shall be able to perform a virtual connection through RTU with any RTU/BCPU/IED, provided by the communication protocol functionality, to support the information transfer to/from RTU/BCPU/IEDs. e.g., the Master Station shall gather on-demand IED data; visualize IED configuration parameters. On the other hand, the Master Station shall be able to download to the BCPU/IEDs configuration parameters, code changes, etc.
- 1.22 The system shall comprise of features namely failsafe control (i.e. check-before-execute, selection timeout etc.), Interlock & Sequential Logic Control system, Sequence of Event Recording (SER), Interfacing with third party IEDs (e.g. Multifunction Meters, Condition Monitoring & Protection system etc.), interfacing with third party computer system, Integration of data as per time base (e.g. 15 minutes energy integration), direct GPS clock connectivity, through SNTP server or through the Master (Main & Standby) for time synchronization.

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- 1.23 In case of power supply failure, auto start-up and restoration of the RTU shall be possible without manual intervention.
- 1.24 All the cards/modules of the RTU, Ethernet Switch etc. must have conformal coating for protection against harsh environments.
- 1.25 It shall be possible to increase the number of communication ports in the RTU by addition of cards, if required in future. The RTU shall support the use of a different communication data exchange rate and scanning cycle on each port and different database for each master station.
- 1.26 Internal battery backup to hold data in SOE buffer with time & date in case of failure of supply.
- 1.27 The proposed RTU shall be KEMA Certified or by equivalent certification body like NABL /CPRI/International Accredited Lab.
- 1.28 Separate set of communication modules shall be used for communicating to slave IEDs and to Purchaser's FEP/Master Systems.
- 1.29 It shall be capable to perform all functions for entire substation including future requirements. Processor & RAM shall be selected in such a manner that during normal operation not more than 30% capacity of processing & memory are used.
- 1.30 RTU shall communicate to MCC, BCC system over IEC60870-5-104 protocol.
- 1.31 Continuous self-supervision function with self-diagnostic feature shall be included.
- 1.32 RTU & Communication Redundancy
- The RTU shall be redundant with all functionalities, so that the RTU can communicate with the Remote Control Centre, even when one of the units fails.
  - The failover process should cause the assignment of all the functions of the failed unit to the healthy unit. The changeover between the two redundant units shall be transparent and shall not require any manual intervention. The changeover process of the RTU shall be bump less and with no data loss.
  - Main and Standby RTU shall support all functionalities independently i.e. all Substation IEDs and Communication to Control Centre. Failover should take place in case of failure of the unit and failure of any communication channel.

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### 1.33 Communication

#### 1.33.1 Ports

- Each Communication unit should have redundant Ethernet ports with single IP address for simultaneous communication with Min Eight (8) independent redundant master's using IEC60870-5-104 protocol.
- Inbuilt Redundant Ethernet ports with single IP address for simultaneous communication with IEDs (IEC61850 ED1, ED2).
- All the serial devices of the substation shall simultaneously communicate to main and standby RTU.
- 6 nos. RS 485 electrical ports for communication with serial devices over IEC60870-5-103, Modbus and IEC 60870-5-101 protocol.
- In addition to above, Ports for internal communication, maintenance and configuration shall be considered.

#### 1.33.2 Protocols

- The communication protocol for RTU to Master Control Center must be IEC 60870-5-104.
- IEC 61850 Ed.1 & 2, IEC 60870-5-104, IEC60870-5-101, IEC 60870-5-103, MODBUS (Serial and TCP/IP), MQTT shall be supported. The RTU shall meet the IEC 61850 standard in every respect and interoperability with other manufactures IEDs and tools shall be verified.
- Time synchronization over SNTP and Communication protocol from Master.
- Master and slave licenses shall be considered for all the above-mentioned protocols.
- Should generate XML file for integration/engineering with vendor Independent SCADA systems
- RTU shall be RSTP/PRP/HSR compliant for communication redundancy.
- SNMP (v1, v2c and v3) for Health monitoring of the Hardware.

### 1.34 Input / Output Requirement

- a. Hot replacement of all I/O modules
- b. A complete set of process interface

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- c. High disturbance immunity, meeting the requirements of the IEC directives 89/336/EEC and 73/23/EEC when placed in cabinets.
- d. Comprehensive self-diagnostics
- e. On-board processing capabilities such as time-tagging, event handling, filtering and gain control.
- f. Shall supports transparent virtual redundancy for Main & Redundant RTU
- g. Modularity, permitting step-by-step expansion
- h. Reliability and auto-diagnostics
- i. Easy to configure
- j. Quick fault finding with help of LEDs of each module and channel
- k. Support of dual redundancy in power supply
- l. The relative time error between events (DI signals) handled within one controller shall be <1 ms (interrupt driven). The relative time error between events handled within separate RTU shall not be more than 2 ms.
- m. Input / Output Requirement for each Substation: Typical Input/Outputs requirement

	Digital Inputs (DI)	Digital Output (DO)	Analog Input (AI)
33/11 kV Substation	96	48	16

The following Input / Output modules are envisaged to acquire the field information. Bidder to note that, the I/O requirement considered from hybrid architecture, i.e. Acquisition of I/O from IEDs and as well from proposed I/O modules.

- a. Analog input
- b. Digital inputs
- c. Digital outputs

#### 1.34.1 Analog Input Sub System

- The entire analog, Telemetered, Non-Telemetered and calculated point values shall be stored in the database in engineering units

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- The system shall provide the capability to perform analog-to-digital conversion accuracy monitoring and raising an alarm should any such points exceed tolerance

a. **Analog Signal Conditioning**

- Galvanic isolation of input and output signals
- Input filtering and non-linear filtering for attenuation of noise-level
- Amplification of low-level signals
- Cold junction compensation

b. **Analog Signal Monitoring**

- Power supply failure monitoring due to loose plug connection, short circuit, wire break and voltage interruption
- Transducer / Energy Meter monitoring for parity, wire break, live zero and end limit values
- Short circuit proof
- Monitoring of A/D conversion
- On-line simulation
- Cable monitoring for open circuit
- Fuse protection and fuse failure detection
- Communication monitoring
- Configurable Dead band

c. **Design and Performance requirement of Analog Input modules**

The Analog Input module shall be a solid-state type. The following features shall be provided:

- The decoding logic shall ensure that no two channels are selected simultaneously
- Cross-Talk attenuation between selected and unselected channel shall be more than 80 dB
- The Analog – to – digital converter (ADC) shall preferably be of successive approximation type, the following feature shall be provided:
  - Guarded input section to ensure large common mode noise rejection



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- Provisions for ADC overflow detection
- Repeatability of +/- 0.025% of full scale
- The following design features shall be provided to offer protection to the analog input modules:
  - Protection for continuous overload up to 200% of all input ranges. Such overload on any analog input point shall not affect the accuracy of the next analog input in the same range.
  - Features to ensure that power line voltage variations up to +/-20% and line frequency variation up to +/- 10% do not affect the accuracy of the system
  - Connection of any point for indefinite time shall not damage the system
  - Provision for isolating failed channels and for ensuring that such partial failure does not affect remaining healthy channels
  - Modular design to enable easy field expandability
  - Provision for two high accuracy reference voltages to be used for checking the accuracy of the ADC for linearity, zero drift and gain. The reference voltage shall be set at equal intervals with respect to the ADC range. This check shall be made automatically at periodic intervals not exceed 6 secs and shall be alarmed if conversion is out of tolerance
  - On-line replacement of individual modules in case of failures
  - Surge withstands capability as per IEEE standards.
- Measurement range: +/- 2.5 V, +/- 5 V, +/- 10 V, 0-+/- 5 mA, 0-+/- 10 mA, 0-+/- 20 mA, 4-20mA
- Resolution: 14 bits + sign
- Type of input: Differential
- Input impedance (Voltage input) – 2 Megaohms
- Shunt resistance – 250 ohms
- Common Mode Voltage – 100 V
- Conversion time - < 100 millisecond
- Fusing of Transducer Supply – Individual
- Temperature drift with Gain=1 - 0.05%/10°C (Typical), 0.1%/10°C (Max)

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### 1.34.2 Digital Input Sub System

Digital input with memory shall be considered in case when two items of information received simultaneously i.e. the current point state and flag indicating if the state has changed more than once since the last scan cycle. Number of changes shall be computed using the new state, the memory flag & the last state.

#### a. Digital Input Signal Conditioning

- Galvanic isolation of input signals
- Input filtering for noise-level

#### b. Digital Input Signal Monitoring

- Contact monitoring
- Contact bounce protection
- Power Supply failure
- Fail safe condition on failure of card / channel
- On-line simulation / blocking
- Fuse protection and fuse failure detection
- Communication monitoring
- Cable monitoring

#### c. Design and Performance requirement of Digital Input modules

The digital input modules shall be provided for the periodic scanning of both low resolution and high-resolution digital inputs. The following design features shall be provided:

- Internal voltage source to convert contact state of potential free contacts, either changeover or ON-OFF into logic level signals. Possibility of surface film or contamination on the contacts shall be considered while selecting this source
- Voltage level sensing units, with non-zero values for the binary status output
- Differential input circuit to offer common mode isolation
- Choice of polarity and threshold range

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- Buffer registers
- Filtering to protect against contact bounce or electrical noise on input lines
- Detection of card power supply failure
- Surge withstands capability as per IEEE standards
- Self-Checking features for detecting faulty operation
- Status indicating LEDs for each input
- On-line replacement of individual modules in case of failure
- Simulation facility
- Digital inputs with interrupt-controlled updating
- Provision for isolating failed channels and for ensuring that such partial failure does not affect remaining healthy channels
- The digital input can be inverted so the value is 1 when the electrical signal is off, and 0 when it is on
- Rated Voltage – 24 V DC
- Input Voltage Range “1” – 18 – 30 V
- Input Voltage Range “0” – (-) 28 – 10V
- Input Resolution – 1 mSec
- Time Stamping – at Card level
- Event Detection – Yes
- Current consumption (+5V) – 460 mA
- Number of channels per module / card – 16 (max)

### 1.34.3 Digital Output Sub System

#### a. Digital Output Signal Conditioning

- Galvanic isolation of output signals

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**b. Digital Output Signal Monitoring**

- Contact monitoring
- Contact bounce protection
- Power Supply failure
- Fail safe condition on failure of card / channel
- On-line simulation / blocking
- Fuse protection and fuse failure detection
- Communication monitoring
- Cable monitoring

**c. Design and Performance requirement of Digital Output modules**

The digital output module shall provide contact closure outputs by driving relays. The features to be provided are as follows:

- On-line replacement of individual modules in case of failure
- Long life, bounce free, high-speed mercury wetted or dry reed relays
- Surge withstands capability as per IEEE standards
- Type of Output – Opto isolated short circuit protected transistor output
- Number of channels per module / card – 32 (max)
- Voltage rating – 24 V DC
- Load Supply – 19.2 V (minimum), 56 V (maximum)

**1.35 Algorithm and Logic**

- a. The RTU shall be based on advanced and proven algorithms and an easy and efficient upgrade of the RTU functionality shall be possible.
- b. The RTU shall support IEC61131 for constructing the interlock logic functions.
- c. The RTU shall facilitate user defined logic functions such as automatic control sequences by means of available logic elements. e.g., with one command perform a safe change of the

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connection of a selected line from one bus-bar to another bus-bar in double bus-bar switchgear.

- d. Command is always to be given in two stages: selection of the object and command for operation under all mode of operation. Final execution shall take place only when selection and command are actuated (Select-before-execute).
- e. It shall also be possible to interconnect and derive input and output signals, logic functions, using built-In functions, complex voltage and currents, additional logics (AND-gates, OR gates and timers).
- f. A delay/integrator shall allow the pick-up and reset of binary signals of IEDs to be delayed before being displayed or used to control other functions.

#### 1.36 Self-Supervision

- a. The RTU shall have extensive self-supervision including all functional module and communication channel.
- b. The RTU shall have LEDs for healthiness / error indication
- c. RTU shall have the facility to generate & download the log files for maintenance and troubleshooting.
- d. Each RTU shall be independent from each other and its functioning shall not be affected by any fault occurring in any of the equipment of the station.
- e. Command execution timer (configurable) must be available for each control point. If the control action is not completed within a specified time, the command should get cancelled (Run Time Command cancellation). The timer for time-out feature shall also be user configurable.
- f. In case of restoration of communication links, power supply after failure, the software along with hardware shall be capable of automatically synchronizing with the remaining system without any manual intervention.
- g. It shall be possible to re-boot the RTU through the LAN/WAN from a remote location.

#### 1.37 Event Recording pertaining to RTU

- a. The RTU shall support event recorder that can handle up to 2000 time tagged events. Events shall be stored in non-volatile memory. In case of failure of RTU or communication channel, the

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recorded events shall be communicated to the master as soon as communication is restored after failure.

- b. The RTU shall have an internal clock with the stability of minimum 10 ppm or better. The RTU time shall be set from time synchronization messages received from GPS clock or Master station. SOE time resolution shall be 1ms or better.
- c. The RTU shall maintain a clock and shall time-stamp the digital status data. Any digital input data in the RTU shall be assignable as an SOE point. Each time a SOE status indication point changes the state, the RTU shall time-tag the change and store in SOE buffer within the RTU. SOE shall be transferred to Master Station through RTU as per IEC 60870-5-104 protocol.
- d. It shall be possible to retrieve the recorded event on the Purchaser's SCADA system.

#### 1.38 Power Supply

- a. The RTU shall be powered from the 24 V DC +/- 20% Power Supply. The RTU shall accept power from the DC system with the following characteristics:
- b. Bidder shall consider Dual Input Source for energizing the RTU along with Diode-oring unit.
- c. Nominal Voltage of 24V DC with operation between 18 and 30 VDC. The voltage may vary during normal operation between these limits with a duration not less than 1 msec.
- d. Reverse polarity protection.
- e. The RTUs shall operate with grounded input power from purchaser
- f. The RTU shall have adequate protection against reversed polarity, over current and under voltage conditions.
- g. Each Input / Output Supply within the panel shall be through power supply distribution module with MCBs with NO contacts (for supply monitoring).

#### 1.39 Time Synchronization

- a. RTU time synchronization shall be through GPS clock via communication ports on SNTP or over the Communication protocol from master (IEC 60870-5-104).
- b. RTU in turn shall be capable of synchronizing all the slave IEDs
- c. Timing Accuracy: The RTU shall time-tag event reports to an absolute accuracy of 1ms or better.

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- d. RTU shall generate an alarm if it gets drifted or loose the synchronization signal.
- e. RTU shall have min 2 (two) source input for Time synchronization with priority provision
- f. Bidder to propose the solution for time synchronization of the RTU, if the same drifts beyond specified limit (e.g. 30 minutes drift)
- g. With each power cycle the RTU shall synchronize with GPS receiver or with Master.

#### 1.40 Environment requirements, Reliability & Cooling

- a. The Unit shall have high reliability in operation and shall not use cooling fans. The unit shall have vermin proof enclosure and shall insulate electronics, internal components and electronics from external environment in order to avoid failures due to dust, humidity, fungus etc.
- b. The RTU Panel hardware installed in Switchyard shall comply to IP65/IP67 enclosure.
- c. The RTU panel shall be installed in Substation control room buildings with no temperature or humidity control. RTUs shall be capable of operating in ambient temperature from 0 to +65-degree C with rate of temperature change of 20-degree C/hour and relative humidity 95%, non-condensing.

#### 1.41 Expansion in future

Offered system shall be suitable for extension in future for additional BCPUs & other IEDs. During such requirement, all the drawings and configurations shall be designed in such a manner that its extension shall be easily performed by the Purchaser. During such event, normal operation of the existing substation shall be unaffected, and system shall not require a shutdown. The Bidder shall provide all necessary hardware and complete set of software tools along to perform addition of bays in future and complete integration with Purchaser's SCADA System. These hardware and software tools shall be able to configure IED, add additional analogue measurements, digital I/Os, modify interlocking logics etc. for additional bays/equipment which shall be added in future.

#### 1.42 Cybersecurity

- a. Secure access- Level Wise enabling of settings with User Rights should be incorporated with Password protection in the RTU. Each User shall have his/her own User Id & Passwords.
- b. User Credentials to access RTU shall be authenticated through Purchaser's Active directory Server.

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- c. All actions/modifications/deletions shall be logged in the RTU. These logs shall be pushed to Purchaser's Central Asset Management system/SOC.
- d. It shall be possible to access the RTU through a web browser (Https Support) anywhere from the LAN for configuration, diagnosis, monitoring, file upload & download, simulation and log retrieval by using appropriate user account management viz. Role based access control & password complexity
- e. The RTU should also supports Authentication and Authorization of individual users, Security logging.
- f. RTU shall be NERC-CIP/NIST 7628, IEC62351, IEC 62443 and IEEE 1686 compliant.
- g. RTU shall be enabled with System hardening viz. disabling/removal of unused ports and services.
- h. RTU Should support System Audit Logs, SYS logs etc.

#### 1.43 Reliability

Reliability of the equipment's offered shall be better than 99.9999% per year availability for overall end equipment. RTU reliability and availability calculation shall be provided with engineering document for approval.

#### 1.44 Signal Interface Panel (SIC)

SIC panel is envisaged for data acquisition from field equipment using field interface module, which shall be interfaced with proposed RTU I/O modules seamlessly. A state-of-art Passive/Active Interface module are envisaged for the electrical process environment in both decentralized and centralized manner. The Interface modules shall guarantee high availability and ensure safe and secure operations of all substation equipment.

The Interface module shall be designed in accordance with applicable International Electro-Technical Commission (IEC), Institute of Electrical and Electronics Engineer (IEEE), American National Standards Institute (ANSI), and National Equipment Manufacturers association (NEMA) standards, unless otherwise specified in this Technical specification. In all cases the provisions of the latest edition or revision of the applicable standards in effect shall apply.



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All functional capability described herein shall be provided by the bidder even if a function is not initially implemented. As a minimum, the Interface module, communication interface along with other accessories shall be capable of performing the following functions:

- 1.44.1 The separate SIC panel is envisaged for housing of the I/O Interface System/modules and other components such as Signal Interfacing Modules, Control Output Relays, Latching Relay, Terminal Blocks, Suitable Cable Ducts, wiring etc. as per the RFP requirement.
- 1.44.2 Bidder to accommodate all RTU (Main and Stand-by), interface modules relays, Terminal Blocks in maximum of 2 panels and shall judiciously optimize the space requirement. As described in the RFP, Purchaser is having a space constraint and prefer to accommodate all the hardware in a single panel.
- 1.44.3 Details of Digital Input, Output and Analog Input requirement are described in Item 1.34 of RTU specification.
- 1.44.4 The proposed Interface modules shall be suitable for decentralized and centralized architecture to address the requirement of present and future.
- 1.44.5 The proposed RTU, I/O and Interfacing modules shall be of the same family of RTU or Embedded, industrial grade system with high availability & reliability. Interface modules hardware shall be easily scalable for expansion.
- 1.44.6 All the interface modules shall be directly connected to the I/O modules of the RTU. In case bidder is proposing the use of remote I/O architecture, then proposed Remote I/O shall be of the same RTU family and communicate with Main and Redundant RTU seamlessly.
- 1.44.7 Auto Changeover of Main and Standby RTU shall also ensure the switching of non-redundant I/O system as envisaged in the RFP. This changeover from Main to Standby and vice-versa shall be bump less with no loss of data.
- 1.44.8 Remote I/O rack or individual interface module shall use the open protocol as of RTU. No proprietary protocol between Remote I/O and RTU is envisaged.
- 1.44.9 The proposed Remote I/O / Interface Modules shall provide the data to eight independent remote master (redundant) stations through RTU.
- 1.44.10 I/O interface System/Modules to the Purchaser's SCADA Systems through RTU shall allow scanning & control of all defined points (Physical/Pseudo points) within the substation

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independently to each of the SCADA systems. Proposed system shall simultaneously respond to independent scans & commands from Purchaser's SCADA/DMS/OMS Systems. It is envisaged that Proposed RTU system shall support the use of a different communication data exchange rate (bits per second), scanning cycle, and/or communication protocol for each remote control center. Also, each control center's data scan and control commands may be different for different data points within the proposed system's database, hence proposed I/O interface system shall also be supporting the required functionality.

- 1.44.11 The I/O Interface system can be 19" Rack mounted / Din Rail Mounted.
- 1.44.12 Bidder to note that, distributed configuration is not envisaged at RTU and at Interface System/Module level. The proposed Remote I/O or interface module configuration shall be part of the Main and Standby RTU, no separate configuration is envisaged at I/O interface System/Module level.
- 1.44.13 Web Server functionality to monitor and configure the RTU along with Substation IEDs by authorized users (AAA functionality) shall also be extended to monitor the I/O interface system.
- 1.44.14 Interface modules shall also be time synchronized through Main/Standby RTU for time stamping at I/O level.
- 1.44.15 SNMP protocol support required in RTU shall also be extended to I/O interface level.
- 1.44.16 Analog Input Interface module shall support resolution of 14 Bit + Sign.
- 1.44.17 Proposed I/O interface shall be completely aligned with resolution required for Digital I/Os and Analog Inputs.
- 1.44.18 User friendly on-line health and data monitoring facility shall be provided to maintenance engineer for monitoring/analyzing the real time status of the process, program logic from the engineering station (Configuration tool – Laptop) from Local and Remote.
- 1.44.19 In case of power supply failure, auto start-up and restoration of the RTU along with I/O interface shall be possible without manual intervention.
- 1.44.20 All the Interface cards/modules must have conformal coating for protection against harsh environments.
- 1.44.21 The proposed I/O interface modules shall be certified by CPRI/ERDA/International Accredited Lab.

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1.44.22 Continuous self-supervision function with self-diagnostic feature shall be included.

1.44.23 Remote I/O and RTU Communication Redundancy

- The Remote I/O interface system shall ensure the data to both Main and Standby RTU seamlessly, so that the RTU can send the entire data to Control Centre, even when one of the units fails.
- The failover process should cause the assignment of all the functions of the failed unit to the healthy unit. The changeover between the two redundant units shall be transparent and shall not require any manual intervention. The changeover process of the RTU/Remote I/O system shall be bump less and with no data loss.
- Main and Standby RTU shall support simultaneous communication with I/O interface system.

1.44.24 **Communication**

I/O interface system/modules shall communicate to Main and Standby RTU simultaneous and independently on open protocols. No Proprietary protocol is envisaged for communication between I/O interface system and RTU.

- Time synchronization over SNTP and Communication protocol from RTU/Master.
- SNMP (v1, v2c and v3) for Health monitoring of the Hardware

1.44.25 **Input / Output Requirement**

Input / Output interface system/module are envisaged to acquire the field information. Bidder to note that, the I/O requirement considered from hybrid architecture, i.e. Acquisition of I/O from IEDs and as well from proposed I/O modules. As per the I/O requirement, the appropriate number of interface modules shall be considered by the bidder for the following types

- a. Analog input
- b. Digital inputs
- c. Digital outputs

1.44.25.1 **Analog Input Interface Module/System**

- Interface modules for Analog Input shall be in-line with proposed Analog Input modules. For technical details please refer RTU Specification Item 1.34 (a)

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- Analog Interface module shall be with knife edge fuse connector for each channel.
- The Interface module shall be with pluggable connector for field inputs, which can be removed without disturbing the filed cable during replacement of Interface module.
- Each interface module shall have common fuse and LED indication for Auxiliary Supply (24V DC +/- 20%). Same shall be monitored by RTU.
- Prefab cable of adequate length shall be used between Interface module and I/O module of the RTU. This cable shall also be with pluggable connector.

#### 1.44.25.2 Digital Input Interface Module/System

- Interface modules for Digital Input shall be in-line with proposed Digital Input modules. For technical details please refer RTU Specification Item 1.34 (b)
- Digital Input Interface module shall be with knife edge connector for each channel.
- The Interface module shall be with pluggable connector for field inputs, which can be removed without disturbing the filed cable during replacement of Interface module.
- Each interface module shall have common fuse and LED indication for Auxiliary Supply (24V DC +/- 20%). Same shall be monitored by RTU.
- Prefab cable of adequate length shall be used between Interface module and I/O module of the RTU. This cable shall also be with pluggable connector.

#### 1.44.25.3 Digital Output Interface Module/System

- Interface modules for Digital Output shall be in-line with proposed Digital Output modules. For technical details please refer RTU Specification Item 1.34 (c)
- Each Digital Output shall be along with Interposing relay for switchyard equipment Open/Close, device resetting commands.
- Bidder to shall also consider disconnecting type terminal blocks for field wiring of digital outputs.
- Digital Output Interface module shall be with knife edge connector for each channel.
- The Interface module shall be with pluggable connector for field outputs, which can be removed without disturbing the filed cable during replacement of Interface module.

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- Each interface module shall have common fuse and LED indication for Auxiliary Supply (24V DC +/- 20%). Same shall be monitored by RTU.
- Prefab cable of adequate length shall be used between Interface module and I/O module of the RTU. This cable shall also be with pluggable connector.

#### 1.44.26 Self-Supervision

- a. The I/O interface system shall have extensive self-supervision including all functional module and communication channel.
- b. The I/O interface system shall have LEDs for healthiness / error indication
- c. Each I/O interface system/modules shall be independent from each other and its functioning shall not be affected by any fault occurring in any of the equipment of the station.
- d. In case of restoration of communication links, power supply after failure, the software along with hardware shall be capable of automatically synchronizing with the remaining system without any manual intervention.

#### 1.44.27 Power Supply

- a. The I/O interface System/Modules shall be powered from the 24 V DC +/- 20% Power Supply. The I/O interface system/modules shall accept power from the DC system with the following characteristics:
- b. Bidder shall consider Dual Input Source used for energizing the RTU along with Diode-Oring unit for I/O interface System/Modules.
- c. Nominal Voltage of 24V DC with operation between 18 and 30 VDC. The voltage may vary during normal operation between these limits with a duration not less than 1 msec.
- d. Reverse polarity protection.
- e. The I/O interface System/Modules shall operate with grounded input power from purchaser
- f. The I/O interface System/Modules shall have adequate protection against reversed polarity, over current and under voltage conditions.
- g. Each Input / Output Supply within the panel shall be through power supply distribution module with MCBs with NO contacts (for supply monitoring).

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**1.44.28 Time Synchronization**

- a. I/O interface System/Modules time synchronization shall be through RTU.
- b. Timing Accuracy: The I/O interface System/Modules shall time-tag event reports to an absolute accuracy of 1 msec or better.
- c. I/O interface System/Modules shall generate an alarm if it gets drifted or loose the synchronization signal.
- d. With each power cycle the I/O interface System/Modules shall time synchronize with RTU.

**1.44.29 Environment requirements, Reliability & Cooling**

- a. The I/O interface System/Modules panel shall have high reliability in operation and shall not use cooling fans. The unit shall have vermin proof enclosure and shall insulate electronics, internal components and electronics from external environment in order to avoid failures due to dust, humidity, fungus etc.
- b. The I/O interface System/Modules Panel hardware installed in Switchyard shall comply to IP65/IP67 enclosure.
- c. The I/O interface System/Modules panel shall be installed in Substation control room buildings with no temperature or humidity control. RTUs shall be capable of operating in ambient temperature from 0 to +65-degree C with rate of temperature change of 20-degree C/hour and relative humidity 95%, non-condensing.

**1.44.30 Expansion in future**

Offered system shall be suitable for extension in future for additional I/O requirement. During such event, normal operation of the existing substation shall be unaffected, and system shall not require a shutdown. The Bidder shall provide all necessary hardware and complete set of software tools along to perform addition of bays in future and complete integration with RTU System. These hardware and software tools shall be able to add additional analogue measurements, digital I/Os etc. for additional bays/equipment which shall be added in future.

**1.45 Engineering Station (Laptop)**

Engineering LAPTOP shall be industrial grade LAPTOP system loaded with software for RTU configuration, diagnosis, simulation, Logic development in RTU Also, shall be loaded with configuration and management software of RTUs, BCUs on IEC 61850 LAN.

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A tool for user friendly engineering and disturbance handling shall be available.

- a. Engineering laptop shall have SSD hard disk (Minimum 1 TB). Refer BOM for the configuration.
- b. Configuration of all input and output logical, communication interfaces and other built-in functions and signals shall be possible both locally and remotely from the Master Station for configuration & maintenance activity.
- c. Configuration application shall have multilevel passwords to safeguard control, logic, and automation settings.
- d. Data collection, data modelling, configuration and parameter setting
- e. Engineering of process information for automation and control center systems
- f. Engineering of process information for automation of non-bidder systems and their individual parameters.
- g. User friendly on-line monitoring facility of real time data shall be provided to maintenance engineer for monitoring/analyzing the real time status of the process, program logic from the engineering station.

#### 1.45.1 Configuration Application

- a. SCL Tool shall be used to model the (IEDs) as stipulated in the standard IEC 61850. SCL Tool shall be capable of generating the configuration files for any IEC 61850 compliance IED.
- b. The main functions that the application shall perform are:
- c. Read and edit any type of configuration file compliant with the defined restrictions by the schema of the SCL language.
- d. Model devices from the libraries of Logical Nodes (LNs), Common Data Class (CDCs) and Common Data Attributes (CDAs) defined in the norm.
- e. Generation of the modelling and SCL configuration files for devices IEC 61850.
- f. Capacity to manage projects with several devices, generating the files for the configured devices.
- g. Visualization and edition of the components of the standard library of the norm. This can be customized with user additions or generate custom libraries for specific projects.

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- h. Export files of data templates (Data Type Templates) that can be reused to model new devices. This avoids the need to create all these sections in new models.
- i. Compatible with IEC 61980-6 Ed:1, Ed:2, and other associated models like IEC 61850-7-410, IEC 61850-7-420
- j. Create SCD / SSD / SED / ICD / IID SCL Files
- k. Import & Export of SCD / SSD / SED / ICD / IID / CID SCL Files
- l. Facilitate enhanced management of SCL files and its validation
- m. Wizard for handling major process and work flow
  - SLD Wizard: to draw and add Substation Configurations to the Project
  - IED Configuration Wizard: to add and edit IED Configurations to the project
  - SCD Wizard: to add external SCDs /SEDs to the Project
- n. Library Support
  - SLD library support for reusing substation drawings in multiple projects
  - Data model library as per IEC 61850-6 Ed:1 and Ed:2
  - Flexible design that enable user to create & edit data model library

#### 1.45.2 RTU/IED simulator & protocol analyzer software tool

- a. RTU simulator tool shall be provided to test the communication interfaces of Master station, RTU, RTU and IEDs.
- b. The Master station simulator tool shall be capable of emulating the master station on open protocol such as IEC 60870-5-104, 101, 103, Modbus, & IEC61850 etc. The RTU simulator shall also be capable of emulating the slave protocols for all the applicable open protocols. Bidder shall submit the details of the offered simulator packages along with the bid.
- c. The protocol analyzer shall be used to monitor all communication traffic on a channel (between Master station & RTU/RTU & between RTU/RTU & IEDs without interfering channels operation. Channel traffic captured in the active or passive modes of operation shall be displayed.
- d. The Master station simulator and protocol analyzer tool shall be provided and shall have following features:



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- Each received message shall be checked for validity, including the check sum.
- The tool shall maintain and display error counters so that the number of errors during a period of unattended testing can be determined.
- All fields of a message shall be displayed. A pass/fail indication for the message shall be included.

#### 1.46 **Layer 2 Industrial Grade Managed Ethernet Switch**

Technical specifications for the Managed Layer 2 Industrial grade, 61850-3 compliant Ethernet switch is given below:

- a. The switch shall be of industrial grade type designed for continuous operation.
- b. Switch shall have minimum 12 ports – RJ45 / Fibre ports of 10/100/1000 Mbps
  - o No. of CU Ports : 8 CU Ports (RTU)
  - o No. of CU Ports : 10 CU Ports (CRP)
  - o No. of FO Ports : 4 FO Ports (RTU), Speed of FO: 100 MBPS, Type of FO: Single Mode, Type of Connector: LC Type – 100 FX
  - o No. of FO Ports : 2 FO Ports (CRP), Speed of FO: 100 MBPS, Type of FO: Multi Mode, Type of Connector: LC Type – 100 FX
- c. Switch shall be 19-inch rack mountable with Power Socket and Ports at rear side
- d. LED indicators for link establishment and data transfer for each port
- e. Should support remote configuration
- f. It should own separate maintenance/console port
- g. Latency shall not be more than 10  $\mu$ s.
- h. Should support SNMP Server v1.0/v2.0/v3.0
- i. Should be KEMA Certified or equivalent
- j. All the cards/modules of the Switch must have conformal coating for protection against harsh environments.

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- k. Switch shall support IEEE802 series for VLAN, RSTP, MSTP and Suitable for ring configuration etc.
- l. Switch shall be IEC 61850 EMC and operating conditions for Power Substations environment.
- m. Switch shall be IEEE 1613 Environmental Standard for Electric Power Substations environment.
- n. Switch shall have design for minimum Heat generation and high MTBF (minimum time between failure)
- o. Switch shall Support Simple plug and play operation - automatic learning, negotiation, and crossover detection
- p. Switch shall Support Quality of Service (802.1p) for real-time traffic
- q. Switch shall Support SNTP time synchronization (client and server) for synchronization of networks
- r. Switch shall Support Industrial automation features (e.g. Modbus, Ethernet/IP and IEC61850 protocols for transparent data transmission)
- s. Switch shall be suitable for PRP/HSR configuration and devices.
- t. Switch shall Support Management Tools like:
  - Web-based, Telnet & Command Line Interface (CLI) for quickly configuring major managed functions
  - SNMPv1/v2c/v3 for different levels of network management
  - Remote Monitoring (RMON)
  - Rich set of diagnostics with logging and alarms
  - Bidder shall supply Console Cable along with each switch

#### 1.46.1 LAYER 2 features

- a. The Switch should support Layer 2 switch ports with Secure VTP or similar protocols to reduce administrative burden of configuring VLANs on multiple switches in turn eliminating the configuration errors & troubleshooting in secure manner.
- b. The Switch should support Rapid Spanning Tree Protocol & Multiple Spanning Tree Protocol.

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- c. The Switch shall have IEEE compliance for 802.1Q VLAN, 801.2p, 802.1d STP, 802.3ad (Port aggregation), 802.1w RSTP, 802.1s MSTP, 802.3ad LACP, IEEE 802.1ab Link Layer Discovery Protocol.
- d. The switch should have support for Port mirroring
- e. The Switch should be able to discover the neighboring device of the same vendor giving the details about the platform, IP Address, Link connected through etc, thus helping in troubleshooting connectivity problems or equivalent
- f. The Switch should support a mechanism to prevent edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes

#### 1.46.2 Management features

- a. Switch Latency period: 7 Microsecond or better
- b. Transfer Rate of the Switch: 50.4 Gbit/sec
- c. The Switch should support SNMP v2c, V3
- d. The Switch should support Configurable SNMP traps
- e. The Switch should support Logging to syslog with time stamp
- f. Java Run time version - Latest
- g. The Switch should support NTP, SNTP support.
- h. Full environmental monitoring of PSUs, Fans, temperature and internal voltages, with SNMP traps to alert network managers in case of any failure

#### 1.46.3 Power supply

- a. 24 V DC power supply module, with  $\pm 20\%$  tolerance
- b. Separate MCB with appropriate rating shall be used to power up the Switch
- c. Provision for connecting redundant power supply option should be available.

#### 1.46.4 Environmental

- a. The switches should have IEEE 802.3az Energy efficient Ethernet and ROHS compliance

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- b. Switch should be capable of operating under normal room temperature without the requirement of Air conditioning.
- c. Conformal Coating: Required
- d. Operating Temperature: -5° to +85°C.
- e. IEC60068-2-1 - Cold Temperature  
 IEC60068-2-2 - Dry Heat  
 IEC60068-2-30 - Humidity (Damp Heat, Cyclic)  
 IEC60068-21-1 - Vibration  
 IEC60068-21-2 - Shock, IEC61850-3- Environmental

#### 1.46.5 Product Conformity

Product Conformity	Purchaser Requirement
IEEE 802.3-10BaseT	Yes
IEEE 802.3u-100BaseTX	Yes
IEEE 802.3u-100BaseFX	Yes
IEEE 802.3ab-1000BaseT	Yes
IEEE 802.3ad-Link Aggregation	Yes
IEEE 802.3x-Flow Control	Yes
IEEE 802.1d-MAC Bridges	Yes
IEEE 802.1d-STP	Yes
IEEE 802.1p-class of service	Yes
IEEE 802.1Q-VLAN tagging	Yes
IEEE 802.1Q-2005 (formerly IEEE 802.1s) MSTP	Yes
IEEE 802.1w-RRST	Yes
IEEE 802.1x-port based Network Access Control	Yes

#### 1.47 Multi-Function Meter (MFM)

Bidder to consider Multifunction meter for each 33 & 11 kV feeders, which shall be mounted on the CRP panel for 33 kV and 11 kV feeders. These meters shall be integrated to RTU on MODBUS. Separate MFM shall be considered for Bus PTs (Bus Voltages). In case these meters are required to put in daisy chain, no more than ten MFM shall be considered in each loop.

Sl. No.	Description	Functionality Expected	Bidder Response
1	Sampling rate	128 samples per cycle for true RMS	

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		measurement	
2	Voltage Input	0 to 690VAC	
3	Voltage Burden	< 0.15VA	
4	Current Input	1 A or 5A Site selectable	
5	CT Burden	0.1VA	
6	CT range	0.1% to 200%	
7	Current over range	Three times continuously, eighty times for one sec	
8	Accuracy kW / kWh	0.5S as per IEC62053:22	
9	Real time & average parameters	Required	
10	Four quadrant measurement	Required	
11	LED Load Bar Indication	Optional	
12	Self Diagnostic LED	Required	
13	Real time clock	Required	
14	Min./Max of parameters	Required	
15	THD	Required	
16	Individual Harmonics upto 39th	Required	
17	Real time waveform monitoring	Standard software to monitor real-time waveform	
18	RS485 communication	Min 1 port	
19	Isolation	Galvanic	
20	Communication protocols	MODBUS RTU, ASCII, selectable at site	
21	User defined registers	Preferred	
22	Energy pulse LED for calibration test	Required	
23	Relay output	Optional	
24	Aux. power supply	24 V DC +/- 20%	
25	Ambient operating temperature	-20 to 60 °C	
26	Mounting Panel cutout	92 x 92 mm	

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## 1.48 Temperature & Humidity Sensor

### 1.48.1 Functional Requirement

Temperature & Humidity Sensor is required for measurement of climatic condition of (temperature and humidity) Switchyard / Switchgear / Control Room.

### 1.48.2 General requirement

- a. Transmitter shall be Microcontroller based design
- b. Isolated 4-20 mA proportional and linearized for both Temperature and % Humidity
- c. RS 485 MODBUS RTU serial interface or Ethernet TCP/IP (optional)
- d. Local display for temperature and humidity
- e. Transmitter shall also be suitable for outdoor application (Switchyard); Bidder shall consider necessary protection for outdoor application
- f. Mounting arrangement: Suitable for wall mounting, all necessary mounting accessories, cables etc. shall be included in the offer with the transmitter
- g. Auto-diagnostic and Auto correction sensors
- h. Analog output shall be selectable and scalable
- i. Heat from the electronic components shall not affect the sensors.
- j. Bidder shall specify the frequency of calibration required for the offered model for desirable accuracy. Bidder shall also mention that the calibration can be done at site by the Purchaser or required to be sent to the OEM

Sl. No.	Description	Functionality Expected	Bidder Response
1	Make		
2	Model		
3	Operating Range	-40.0 to + 85 °C (Temperature)	
		0.0 to 100.0% RH (RH)	
4	Measuring Range	-40.0 to + 65 °C (Temperature)	
		0.0 to 100.0% RH (RH)	

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5	Accuracy	Temperature: +/- 0.1 °C	
		RH: +/- 0.1 % RH @ 24 °C	
6	Long term stability for humidity sensor	< 1% RH / Year	
7	Local Display	4 Digit (min), red, Seven Segment Display, Independent displays for T & % RH, Visible at least from 15 mtrs.	
8	Power Supply	24 V DC +/- 20%	
9	Output for Temperature & % RH	1) Temperature – 4-20 mA proportional to temperature range as mentioned in item 2 (14-bit resolution) 2) % RH – 4-20 mA proportional to % RH range as mentioned in item 2 (14-bit resolution)	
10	Min / Max Load	V-signal ≥ 1Kohms/V, mA-signal ≤ 500 ohms	
11	Serial Output	Isolated 4 wire / 3 wire RS 485 electrical port with MODBUS protocol Or Ethernet Port with RJ45 connector and on open protocol	
12	Front Keyboard	Required for programming and calibration	
13	Enclosure (Size)	Robust Industrial Housing, Suitable for Internal and External use	
14	Additional Enclosure for Outdoor Application	Transmitter shall be mounted in the industrial grade weather proof Box	
15	Mounting Arrangement	Wall mounted, necessary mounting arrangement shall be included in the offer for internal and external use	
16	Protection	Necessary protection shall be provided for the sensors	
17	Protection Rating	IP 65	

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## 1.49 Networking Accessories

### 1.49.1 Fiber Patch Cords

Mono mode or multimode patch cords of suitable length shall be supplied which are compatible to the end devices and LIUs.

**Preferred make:** Systemax / Tyco / 3M

### 1.49.2 LIUs

LIUs which are part of the proposed Substation Automation System shall be rack mounted type and shall be installed in RTU/SIC panel (L2 switches). The type and number of LIUs shall be as per the number of cables to be terminated. All the LIUs shall have FC type connectors. LIUs shall include all the accessories for terminating the cable such as pigtail, splice holder, coupler etc. All cores of the fiber cable shall be terminated on the LIU. LIU shall be rodent proof.

**Preferred make for LIUs:** Raychem / 3M / Tyco

### 1.49.3 Patch Panel

All structured Ethernet copper cabling shall be terminated on of Cat 6 E type patch panels on L2 switch side.

**Preferred make:** Systemax

### 1.49.4 I/O Box

All the structured CAT6 cabling on the device side shall be terminated on I/O boxes.

**Preferred make:** Systemax

### 1.49.5 Ethernet Patch cords

All the terminations on the switches / devices shall be done using factory crimped, flexible Cat 6 E UTP Patch cords of suitable length.

**Preferred make:** Systemax

### 1.49.6 Fiber Terminations

All the fiber terminations on L2 or L3 switches shall be done using SFPs which are compatible for the switch model. The SFP shall have diagnostic monitoring feature. All SFPs shall have 1G uplink speed. Use of standalone Ethernet media converter / FOTE should be avoided.



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## 1.50 RTU and SIC Panel

### 1.50.1 Panel and other Accessories

- a. All the panels shall be of IP54 class and industrial grade.
- b. Control panel shall be suitable for bottom cable entry.
- c. Interconnection between panels shall be by prefabricated cables.
- d. The Bidder shall submit the GA drawing considering the maintenance and aesthetic requirements and submit the drawings along with bill of material for purchaser's review.
- e. The bidder shall guarantee the satisfactory functioning of the system hardware mounted in the panels even in the event of failure of air-conditioning.
- f. Proper size Cable trays shall be provided in the panel after reviewing the number of cables to be terminated in the panel.
- g. Enough space (for easy termination, for easy viewing of cable tags) shall be provided between the terminal channels and cable trays.
- h. Terminals shall be distributed functionally in the panel.
- i. Panel door locks shall have the common key.
- j. Acrylic glass sheet shall be provided, wherever the power cables & terminations are exposed and prone to be fatal.
- k. Electrostatic strap shall be fitted with each panel.

### 1.50.2 Sheet Metal Work

The panel frame shall be fabricated using suitable mild steel structural sections or pressed and shaped cold rolled sheet steel of thickness not less than 2.5 mm.

Frames shall be enclosed by cold rolled sheet steel of thickness not less than 2 mm, smoothly finished, leveled and free from flaws. Stiffeners shall be provided wherever necessary. The Panels shall be provided with MS Base Channel of 75 x 50 mm

All panel edges and door edges shall be reinforced against distortion by rolling, bidding or by the addition of welded reinforcement member.

Cut-Outs shall be true in shape and devoid of sharp edges.

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The complete structure shall be rigid, self- supporting, free from vibration, twists and bends.

### 1.50.3 Constructional Features

SAS cabinet shall be indoor type, floor mounted, with dimension (2315(H) x 800(W) x800(D)) and both sides opening with swing frame. Front glass door with 19” rack arrangement.

Anti-vibration pad of 15 mm thickness should be provided. Panel base frame should be of 100 mm height.

The panel shall be -

- a. Panel shall be of the metal enclosed indoor, floor mounted.
- b. Preferred make of panel shall be
  - o RTU & SIC – Rittal make
- c. Made up of the requisite vertical sections.
- d. of dust, moisture and vermin proof construction
- e. It shall have lifting i-bolts for hooks of good capacity and even distributed lifting. Test certificates shall be available for the lifting bolts.
- f. Suitable to provide a degree of protection of not less than IP 54 as per IS: 2147.
- g. It is the responsibility of the bidder to ensure that the equipment specified, and such unspecified complementary equipment required for completeness of the SAS design shall be properly accommodated in the panel, in such a way that the maintenance, identification, isolation of any component or circuit shall be easy. Equipment shall be mounted such that removal and replacement can be carried out individually without affecting the services of the adjacent devices. No price increase at a later date on this account shall be allowed.
- h. Of self-cooled design with adequate louvers on sides. The louvers shall have screens and filters on inner side of panel. The screens shall be of fine wire mesh made of brass or GI wire.
- i. Shall have maintenance access to the hardware and wiring through lockable full height doors.
- j. Shall have the provisions for bottom cable entry.

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- k. The safety ground shall be isolated from the signal ground and shall be connected to the ground network each ground shall be a copper bus bar. The grounding of the panels to the owner's grounding network shall be done by the contractor.
- l. All panels shall be supplied with 230 V AC, 50 Hz, single-phase switch and socket arrangement for maintenance.
- m. RTU and interface panels shall be provided with 2 Nos. (one front side and one rear side) internal maintenance lamps (CFL) and space heaters and gaskets.
- n. All panels shall be indoor, dust-proof with rodent protection, and meet IP54 class of protection for indoor and IP6x for outdoor application.
- o. There shall be no sharp corners or edges. All edges shall be rounded to prevent injury.
- p. Document Holder shall be provided inside the cabinet to keep test report, drawing, maintenance register etc.
- q. Provided with labels on the front and rear indicating the panel designation.
- r. Proper provision must be provided for the entry of FO cables and Ethernet cables at the bottom. AC & DC incoming cable entry provision should also be there.
- s. Provided with pocket on rear door for keeping A4 size copy of panel drawings.
- t. Provided with 4 nos. of lifting hooks.
- u. Provided with neoprene gaskets all-round the perimeter of covers, gland plates, removable covers and doors.
- v. 150 sq.mm copper earth bar must be provided for equipment earthing.
- w. All sheet steel work shall be degreased, pickled, phosphate and then applied with two coats of zinc chromate primer and two coats of finishing synthetic enamel paint, both inside and outside. The paint shade shall be Siemens Grey (RAL 7032). The final finished thickness of paint film on steel shall not be less than 100 microns and shall not be more than 150 microns.
- x. For every distribution of AC and DC circuits MCB's must be provided. These MCB's must be rated according to the load on the distributed circuit.
- y. Each RTU/Gateway, Switch panels shall be provided with 20% spare terminals.

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- z. If I/O interface boards are used for field input connection proper isolation facility shall be provided. Preferably disconnecting type of terminal blocks shall be used for all inputs.
- aa. Interconnection between panels shall be by prefabricated cables.
- bb. Terminal blocks shall be having provision for isolation, with full-depth insulating barriers made from moulded self-extinguishing material. Terminal blocks shall be appropriately sized and rated for the electrical capacity of the circuit and wire used. No more than two wires shall be connected to any terminal. Required number of TBs shall be provided for common shield termination for each cable.
- cc. All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trim shall be made up of flame-retardant material and shall not produce toxic gasses under fire conditions
- dd. Proper lighting arrangement shall be made on both sides of the panel if both sides of the panels are used.
- ee. Space heater with thermostat shall be provided in the panel to maintain the required temperature.
- ff. Disconnecting type terminal blocks shall be used for CT, PT and for all Digital Outputs.
- gg. Enough space (for easy termination, for easy viewing of cable tags) shall be provided between the terminal channels and cable trays.
- hh. Terminals shall be distributed functionally in the panel.
- ii. The panel shall also have a document pocket.
- jj. Horizontal and vertical Grounding bus shall be provided in the panel. Green coloured wires shall be used for grounding purpose. Cable gland plate fitted on the bottom of the panel shall be connected to earthing of the Panel/Station through a flexible braided copper conductor rigidly.

#### 1.50.4 **Wiring /Cable Requirements**

The RTU / SIC panels shall gather all signals from and to the devices located in Control & Relay panels in the substation control room. Pre-wired and prefabricated cabling may be used. All wires that carry low-level signals shall be adequately protected and separated as far as possible from power wiring. All wires shall be identified either by using ferrules or by colour coding. In addition, cables shall be provided with cable numbers at both ends, attached to the cable itself

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at the floor plate where it enters the cubicles. The cable distance shall be site surveyed by the bidder. The distance between RTU / SIC panels and Control & Relay panels in the substation control room is approximately 30 mtrs. These cable lengths mentioned are for indicative purpose only. The bidders are required to quote as per their site survey

The external Cabling between the RTU and SIC panels shall use shielded cables. The external cables (except communication cables) shall have the following characteristics:

- a. All cables shall have stranded copper conductor
- b. Minimum core cross-section of (3/20) 2.5 mm<sup>2</sup> for Control outputs and 0.5 mm<sup>2</sup> for Status inputs
- c. Minimum core cross-section of (3/20) 2.5 mm<sup>2</sup> for PT cables and for CT cables.
- d. Rated voltage Vo/V of 0.6 / 1.1kV
- e. External sheathing of cable shall have oxygen index not less than 29 & temperature index not less than 250. Cable sheath shall meet fire resistance test as per IS 1554 Part- I.
- f. Shielding, longitudinally laid with overlap.
- g. Dielectric withstand 2.5 kV at 50 Hz for 5 minutes
- h. External marking with manufacture's name, type, core quantity, cross-section, and year of manufacture.
- i. The Communication cable shall be of shielded, twisted pairs and of 0.22sq mm<sup>2</sup> size with dielectric withstand of 1 kV at 50 Hz for 1 minute.

RTU/SIC cabinet shall be wired with all the DC distribution wiring and AC wiring for the Illumination and fans. Following sizes of wires shall be

**Colour Codes**

<b>DC wiring</b>	<b>1.5 sq.mm</b>	<b>Red/Black</b>
<b>AC wiring</b>	<b>1.5 sq.mm</b>	<b>Red/ Black</b>

Engraved identification ferrules marked to correspond with the wiring diagram shall be fitted at both ends of each wire. These ferrules shall fit tightly on the wires and should not fall off when the wire is removed. The wires should be terminated on terminal blocks using soldering crimping type of tinned copper lugs. Insulated sleeves shall be neatly punched and cleaned

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without affecting access to equipment mounted within the cabinet. Wiring troughs shall be provided for cable routing inside the cabinet. One piece molded, 650 V grade terminal blocks complete with insulated barriers, screws, identification strips shall be used. Terminal links shall be of Elmex or Connectwell make. Terminals for power connections shall be adequately rated for the circuit current and the rating of other terminal blocks for central indication etc. shall not be less than 15 amps. At least twenty percent spare terminal blocks shall be provided. All the terminal blocks should be provided with proper identification strips. Terminal blocks shall be provided with transparent acrylic covers.

All internal wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and terminal blocks. Cable ways & troughs shall be used for this purpose.

Wire termination shall be made with solderless crimping type and tinned copper lugs, which firmly grip the conductor. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire and shall not fall off when the wire is disconnected from terminal blocks.

#### 1.50.5 Labels

All equipment shall be provided with individual labels with equipment designation engraved. Also, the control cabinet shall be provided on the front with a label engraved with designation of the cabinet as furnished by PURCHASER. Labels shall be made up of non-rusting metal or 3 ply lamicaid. Labels shall have white letters on black or dark blue background. Sizes of labels and lettering are subject to PURCHASER's approval.

Manufacturer's label should be provided at the rear door, which should mention the project ref, substation, P.O ref, circuit details, drawing ref.

#### 1.50.6 Earthing Terminals

Control cabinet shall be provided with two separate earthing terminals suitable to receive PURCHASER's earthing conductors of size specified.

Positive connection between all the frames of equipment mounted in the switchboard and earth bus bar shall be provided by using insulated copper wire/bars bus bars of cross section

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equal to that of the bus bar or equal to half the size of circuit load current carrying conductor, whichever is smaller.

All equipment shall be connected to the earth busbar using 1100/650V grade PVC insulated 2.5 sq.mm stranded tinned copper earthing conductor.

All hinged doors shall be positively connected to the earthing bus terminals, with the help of braided copper conductors of adequate size.

An electrostatic discharge arrangement shall be provided in each panel so as to discharge human body before he handles the equipment inside the panels

#### 1.50.7 Terminal Blocks

Terminal blocks shall be having provision for disconnection (isolation), with full-depth insulating barriers made from mounded self-extinguishing material. Terminal blocks shall be appropriately sized and rated for the electrical capacity of the circuit and wire used. No more than two wires shall be connected to any terminal. Each analog input signal, digital status input and digital output signals shall require two terminals per point plus a common shield termination for each cable. All terminal blocks shall be suitably arranged for easy identification of its usages such as CT circuits, PT circuits, analog inputs, status inputs, control outputs, auxiliary power supply circuits, communication signals etc.

#### 1.51 RTU Test

The contractor shall supply type tested RTU. The bidder shall submit RTU type test reports along with the bid for the same and model of RTU. The type test reports minimum shall include the tests indicated in Table 1 and 2. Type test reports as per other equivalent standards are also accepted provided, they meet or exceed minimum requirements specified in this specification. In case the RTU type test report do not meet specification requirements, the relevant type tests shall be performed without extra cost to TPCODL. The vendor should submit proof of RTU certificate (As conforming to IEC 61850, IEC 60870-5-104/101) BY KEMA.

Routine test to be performed in the factory and the field test to be performed in the site on the RTU / SIC panels are indicated in Table – 1.

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Test No.	DESCRIPTION OF THE TEST	Type test	Routine test	Field test
<b>1.0</b>	<b>Functional Tests for RTU/SIC</b>			
1.1	Check for BOQ, Technical details, Construction & Wiring as per RTU/SIC drawings		√	√
1.2	Check for RTU database & configuration settings		√	√
1.3	Check the operation of all Analog inputs, Status input & Control output points of RTU/SIC		√	√
1.4	Check operation of all communication ports of RTU		√	√
1.5	Check for communication with multiple master stations using partitioned databases		√	√
1.6	Check for auto restoration of RTU on DC power recovery after its failure		√	√
1.7	Test for RTU self-diagnostic feature		√	√
1.8	Test for RTU time synchronization from Master and GPS		√	√
1.9	Test for RTU SOE feature		√	√
1.10	Test for down loading of RTU data base from master station		√	√
1.11	End to end test (between RTU & Master station) for all I/O points			√
1.12	RTU Analog accuracy test for Analog inputs		√	
1.13	Test for RTU operation with DC power supply voltage variation		√	
1.14	Test for RTU internal Clock stability		√	
1.15	Test for RTU Noise level measurement		√	
1.16	Test for IEC 60870-5 -104 & IEC 61850 protocol implemented and matching with protocol profile of existing RTU		√	
1.17	Test for Control Security and Safety for Control outputs		√	√
1.18	Other functional tests as per technical specification requirements		√	
1.19	Test for RTU as Data concentrator for IEC 60870-5-104 and MODBUS, IEC60870-5-103 protocol		√	√
1.20	Test for operation of redundant CPU and Power supply unit		√	√
1.21	Test for Modems		√	√
<b>2.0</b>	<b>EMI/EMC Immunity Tests for RTU</b>			
2.1	Surge Immunity Test as per IEC 60870-2-1	√		
2.2	Electrical Fast Transient Burst Test as per IEC-60870-2-1	√		
2.3	Damped Oscillatory Wave Test as per IEC 60870-2-1	√		
2.4	Electrostatic Discharge test as per IEC 60870-2-1	√		
2.5	Radiated Electromagnetic Field Test as per IEC 60870-2-1	√		
2.6	Damped Oscillatory magnetic Field Test as per IEC-60870-2-1	√		
2.7	Power Frequency magnetic Field Test as per IEC-60870-2-1	√		
<b>3.0</b>	<b>Insulation Test for RTU</b>			



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3.1	Power frequency voltage withstand Test as per IEC 60870-2-1	√		
3.2	1.2/50 μs Impulse voltage withstand Test as per IEC 60870-2-1	√		
3.3	Insulation resistance test	√		
<b>4.0</b>	<b>Environmental Test for RTU</b>			
4.1	Dry heat test as per IEC60068-2-2	√		
4.2	Damp heat test as per IEC60068-2-3	√		

**Table – 1: List of Tests on RTU/SIC**

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## **Chapter # 2**

### **DC System:24 V VRLA Type Storage Battery**

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## 2.0 Technical Specification For 24 V VRLA Type Storage Battery

### 2.1 Scope

This part of the specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading of 24V VRLA 150 AH (Type-1) and 200 AH (Type-2) Battery along with battery charger and other accessories for efficient and trouble-free operation. Dismantling and replacement of the purchaser's existing battery and battery charger with proposed and suitable DC system. The materials offered shall have been successfully Type Tested during last five years on the date of bid opening. The Type Test reports shall be submitted along with the bid.

It is not the intent to specify completely herein all the details of technical design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to TPCODL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

### 2.2 Standards

The equipment shall comply in all respects with the latest edition of relevant Indian Standard Specifications and IEC except for the modifications specified herein. A Photo copy of such standards in English shall be enclosed with the offer.

Sl. No.	Code	Brief Description of the Standard
1	IS 266-1993	Battery grade Sulphuric Acid
2	IS 1146-1981	Rubber and plastic container for lead acid storage batteries
3	IS 1069-1993	Water for storage batteries
4	IS 694-1990	PVC insulated cables
5	IS 1651-1991	Stationery cells & batteries lead acid type (with tubular positive plates)
6	IS 9224-1991	Stationery cells & batteries lead acid type (with plante positive plates)
7	IS 3116-2002	Low voltage fuses
8	IS 4540-1968	Sealing compound for lead acid batteries
9	IS 3895-1966	Semiconductor rectifier assemblies and equipment, mono-crystalline
10	IS 6071-1986	Semiconductor rectifier cells and stacks mono-crystalline
11	IS 8320-2000	General requirements and methods of tests for lead acid storage batteries

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### 2.3 Installations

Equipment covered under these specifications shall be suitable for indoor/outdoor installation.

### 2.4 Details of Specifications of VRLA Type (24V)

#### 2.4.1 Battery

The batteries shall be made of closed type lead acid cells with VRLA Type (24V) plates manufactured to conform to IS: 1652-1991.

#### 2.4.2 Capacity

The capacity of the batteries shall be of two types (i.e. 150 AH and 200 AH) as follows:

- a. Voltage - 24V
- b. Output at 27°C – 150 AH (Type-1) and 200 AH (Type-2) at 10 hrs. discharge rate.

The batteries shall normally remain under 'floating' condition with the 'trickle' charger supplying the continuous load. However, the batteries shall be capable of supplying the following loads under emergency conditions without any assistance from the chargers and without their terminal voltage falling below 21.6V [90% of rated voltage].

The number of cells for 24V batteries shall be so chosen that for the nominal floating voltage of the cells, the battery voltage shall be 26V and for the minimum [discharged condition] voltage of the cells, the voltage of the battery shall not be less than 21.6, while the assigned rating of the battery bank cannot be lowered below its rated voltage of 24V volts. Minimum no of cell shall not be less than 12.

### 2.5 Design and Constructional Details

The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g. General Technical requirement are tabulated below:

Sl. No.	Particular	TPCODL Requirement
1	Type of battery	Lead acid battery
2	Container	Transparent
3	Nominal DC system voltage	24 V
4	Number of Batteries	One Set
5	Number of Cells	12
6	Cell Type	Plante/Tubular Gel Type
7	Cell Voltage	

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a)	Nominal	2 V
b)	End Cell Voltage	1.85 V
8	Capacity of Battery (10 Hour rate of discharge)	150 AH( Type-1) & 200 AH ( Type-2)
9	Float Charging Voltage	2.15 V to 2.25 V
10	Boost Charging Voltage	2.00 V to 2.75 V per Cell
11	Mounting Arrangement	Double Row, Single Tier

### 2.5.1 Plates

Positive plates shall be made of flat pasted type using lead-cadmium antimony alloy for durability, high corrosion resistant, maintenance free, long life both in cyclic as well as in float applications. Negative plates shall be heavy duty, durable flat plate using lead calcium alloy pasted box grid. Negative plates shall be designed to match the life of positive plates and combination of negative and positive plates shall ensure long life, durability and trouble-free operation of battery.

### 2.5.2 Container and Lid

The containers and lids shall be made of a special grade polypropylene copolymer plastic material. They shall be sufficiently robust and not liable to deformation under internal operating pressures and within the temperature range naturally encountered, leak proof, non-absorbent and resistant to the acid with low water vapor permeability. The surface of the container shall be free from blisters, rough spots, scales, blow holes and other imperfections or deformations. The cell plates shall be suspended without touching the bottom of the container. It shall provide enough sediment space so that the plates can shed their active material without shorting the plates in the cell during the expected life of the battery without cell cleaning. The plastic container shall conform to all the requirements as mentioned in IS 1146. The covers shall be furnished with acid spray proof vent plugs. The cell post polarity shall be marked on the cover. The electrolyte level lines for upper and lower limits shall be marked on all four sides of each container

### 2.5.3 Separators

The separators shall be of synthetic material conforming to the latest edition of IS-6071-1986. These shall permit free flow of electrolyte and would not be affected by the chemical reaction inside the cell and shall last for indefinite time. The internal resistance factor of the separators shall assure high discharge characteristics under all operating conditions. Proper arrangement to keep end plates in position shall be furnished by the bidder along with his offer.

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#### 2.5.4 Electrolyte

The electrolyte shall be prepared from the battery grade Sulphuric acid conforming to IS-266-1993 and shall have a specific gravity of 1.2 at 27°C. The battery shall be shipped uncharged with the electrolyte. Electrolyte for the first filling shall be supplied with 10% extra in non-returnable containers. The Sulphuric acid of battery grade shall be colorless liquid. The concentrated Sulphuric acid on dilution with an equal volume of distilled water shall be free from suspended matter and other visible impurities. The Sulphuric acid shall meet the requirements of columns – 4 and 5 Table –1 of IS-266-1993.

#### 2.5.5 Plate Group Bar with Terminals

The plate group bar with terminals shall conform to IS-1652-1991. The positive and negative terminals shall be clearly marked for easy identification. The legs of the plates of like polarity shall be connected to the load, turned to a horizontal group bar having an upstanding terminal post adopted for connection to the external circuit. The group bars shall be sufficiently strong to hold the plates in position.

#### 2.5.6 Buffers/Spring

Suitable buffers / springs shall be provided in the cells to keep the end plates in position. These shall have adequate length and strength.

#### 2.5.7 Cell Lids

Lids used with sealed or closed type cells shall be of glass, plastic or ebonite and shall be provided with vent plugs. Terminal post shall be suitably sealed at the lid to prevent escape of acid spray, by means of rubber grommets, sealing compound or other suitable device. The positive and negative terminal posts shall be clearly and indelibly marked for easy identification. Sealing compound shall conform to IS 3116.

#### 2.5.8 Water

Water used for preparation of electrolyte and also to bring the level of electrolyte to approximately correct height during operation / testing shall conform to relevant standards.

#### 2.5.9 Venting device

The venting device shall be anti-splash type and shall allow gases to escape freely but shall effectively prevent acid particles or spray from coming out. There shall be two vent holes, one

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serving as a guide for acid level indicator for checking the electrolyte level and other to permit drawing of electrolyte samples, servicing, checking of specific gravity etc.

#### 2.5.10 Fasteners

Bolts, nuts and washers for connecting the cells shall be effectively lead-coated to prevent corrosion. Where it is not possible to bolt the cell terminals directly to assemble a battery, separate lead-coated copper or aluminum connectors of suitable size shall be provided to join the cells.

#### 2.5.11 Stand & Battery Racks

The cells shall be supported on insulated rack fixed with pads and with adequate clearances between the adjacent cells. The battery racks shall be made of best quality, seasoned teak wood, with at least three (3) coating of anti-acid paint of approved shade. Racks shall be rigid, numbering tags for each cell shall be attached on the racks

#### 2.5.12 Marking

Acid level line shall be permanently and indelibly marked around on all the containers.

The unit shall be provided with a name plate clearly visible and effectively secured against removal. The name plate shall be indelibly and distinctly marked with all essential particulars as per relevant standards along with the following:

- a. Manufacturer's name
- b. Month and Year of manufacture
- c. Serial number and Type designation
- d. Lead acid chemistry type of the battery
- e. Nominal voltage of each cell
- f. Ah capacity at 1C rate of the battery
- g. Rated voltage
- h. No. of cells in each module
- i. No. of modules
- j. Installed battery capacity (kWh)

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- k. Input charge voltage
- l. Charge current
- m. Discharge current
- n. Guarantee period
- o. Reference standard
- p. Property of: Tata Power Central Odisha Distribution Company Limited

Also, the danger plate should be shown in front of the enclosure / Cabinet / Racks housing the battery banks.

#### 2.5.13 Connectors

Bars tinned copper lead connectors shall be employed for inter-cell and inter row, inter-t connections. However, the tee-off connection from the battery unit shall be made with acid resisting cables of suitable size. A suitable terminal box along with acid-resisting cable shall be provided by the Contractor for this purpose. The connectors shall preferably be of bolted type and the bolts and nuts shall be of similar material as that of connectors and shall be provided with corrosion resisting lead coating. The connectors shall be of enough cross-section to withstand all the working conditions including one-minute discharge rate as well as short circuit conditions. Terminals post shall be designed to accommodate external bolted connection conveniently. The junction between terminal posts and cover and between cover and container shall be so sealed as to prevent any seepage of electrolyte.

Positive and negative terminals posts of cells shall be clearly and unmistakably identifiable. The positive terminals shall be marked with red color in addition to '+' marking and negative terminal shall be marked suitably. The terminals and connectors shall not be covered with grease instead anti oxidation jelly shall be used.

- a. Lead coated connection hardware such as bolts, nuts etc. 5% extra, or any other connector suitable for VRLA type Battery.
- b. Ampere-hour Meter [10-hour discharge rate] of 100 –150 AH range-1 no.(Type-1) and 150-200 AH range-1 no. (Type-2)
- c. Any other accessories not specified but required for installation, satisfactory operation and maintenance of batteries for a period of 5 [five] years.



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#### 2.5.14 Maximum Short Circuit Current

The Bidder shall state the maximum short circuit current of each battery along with the safe duration in seconds which it can withstand. Methods proposed to be adopted for protecting batteries from the short circuit conditions should also be stated to avoid damage to the battery and loss to the associated equipment.

#### 2.5.15 Charging

The bidders shall state whether an equalizing charge is recommended for the battery. If so, the equalizing charge voltage, current, duration and the interval between the equalizing charging shall be specified in the Data sheet. Bidder shall also indicate the requirements for boost charging.

#### 2.5.16 Life

The minimum guaranteed life span of the battery should not less than 5 years. The bidder shall quote in his offer the guaranteed life of the battery when operating under the conditions specified.

#### 2.6 Instruction Manuals

Fifteen sets of instruction manuals for installation, commissioning, charging and maintenance instruction shall have to be furnished.

#### 2.7 Tests

##### 2.7.1 Type Tests

The bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA or any NABL accredited laboratory. Type tests should have been conducted in certified Test laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL.

- a. Verification of constructional requirements
- b. Verification of marking
- c. Verification of dimensions

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- d. Test on capacity
- e. Test for Loss of Capacity on Storage
- f. Test for retention of charge
- g. High rate discharge at Normal Temperature
- h. Endurance Test
- i. Ampere-hour and watt-hour efficiency test
- j. Test for voltage during discharge

If the Type Test report [s] does/do not meet the requirements as per this specification, at its discretion may ask the Contractor to conduct the above type tests [s] at the Contractor's cost in the presence of purchaser's representative without any financial liability to purchaser.

#### 2.7.2 Acceptance Tests

Following shall constitute the acceptance tests which shall be test witnessed by the purchaser's representative at the works of the manufacturer at the cost of supplier.

- a. Verification of marking
- b. Verification of dimensions
- c. Test for capacity for 10 hours discharge rate along with the Test for voltage during discharge.
- d. Ampere-hour and watt-hour efficiency test.

2.7.3 The Purchaser may at his discretion undertake test for capacity and voltage during discharge after installation of the battery at site without any extra cost.

2.7.4 The Contractor shall arrange for all necessary equipment including the variable resistor, tools, tackles and instruments. If a battery fails to meet the guaranteed requirement, TPCODL shall have the option of asking the Contractor to replace the same within 15 [fifteen] days from the date of declaring the same to be insufficient/failed / not as per the specification [s].

#### 2.8 Drawings / Documents

The tenderer shall submit the following drawings / documents along with his offer failing which the offer is liable for rejection.

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- a. General battery arrangement, proposed size of individual and over all dimensions along with sectional views showing all connections etc.
- b. Pamphlets and technical literature giving detailed information of the batteries offered.
- c. The Contractor shall submit the following drawings / documents in two copies for approval
  - i. Lay out details of the batteries.
  - ii. OGA and cross-sectional details for battery cells.
  - iii. Instruction manuals for initial charging and subsequent charging.
  - iv. Technical data, curves etc.

#### 2.9 Guaranteed Technical Particulars

The Guaranteed Technical Particulars shall be furnished along with the drawing for approval.

#### 2.10 Deviation from Specification:

All deviations from the specification shall be separately listed, in the absence of which it will be presumed that the provisions of these specifications are complied with by the bidder.

#### 2.11 Recommended and Mandatory spares

Recommended and Mandatory spares shall be supplied by the bidder, without any cost implication to TPCODL.

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## **Chapter # 3**

# **70A Battery Charger for 24 V-150 AH (Type-1) & 24 V-200 AH (Type-2) VRLA Type Battery with Microprocessor based Communicable Controller**

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This part of the specification covers the technical requirements of design, Engineering, manufacture, stage testing, inspection and testing before dispatch, packing, forwarding, delivery at site and unloading of SMPS based battery charger with DCDB suitable for Indoor/Outdoor installation, complete with all fittings accessories and associated mandatory auxiliary equipment which are required for efficient and trouble-free operation.

The system is required for reliable and uninterrupted D.C. supply for closing and tripping coils of circuit breakers, relays, RTU, Communication equipment, IEDs etc. in 33/11 kV distribution Substations of TPCODL.

It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to TPCODL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

### **3.0 Technical Specification of 70A Battery Charger for 24 V-150 Ah (Type-1) & 24 V - 200 Ah (Type-2) VRLA Type Battery**

(70 Amp single phase Charger (Float Cum Boost Charger) suitable for 24V, 150 AH (Type-1) & 24V, 200 AH (Type-2) Maintenance Battery Type VRLA)

#### **3.1 Brief Description**

Charging equipment comprising of a Float cum Boost (70 Amp, Float Cum Boost Charger) suitable for 24V, 150 AH (Type-1) & 24V, 200 AH (Type-2), Maintenance free VRLA Battery charger, is required to meet the D.C. power requirement of the sub-station under normal conditions, i.e., when AC auxiliary power supply is available and also to keep all the cells in the state of full charge. The float charger shall supply the continuous DC load at the bus bars in addition to keeping, batteries floated in a healthy condition. In case of failure of A.C. mains or sudden requirement of additional DC power, the battery shall meet the demand as the battery shall be connected in parallel with the charger. After the battery has discharged to a

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considerable extent, it shall be fully recharged by the 'boost' charger unit in a short period so as to prepare it for the next emergency. Even during the 'boost' charging of the battery, the continuous DC load at the bus shall be met by the trickle-charging unit. The 'boost' charging unit shall however be provided with suitable control arrangement to function as a standby for float charging unit in case of necessity.

### 3.2 Applicable Standards

The equipment shall comply in all respects with the latest edition of relevant Indian Standard Specifications and IEC except for the modifications specified herein. A Photo copy of such standards in English shall be enclosed with the offer.

Sl. No.	Code	Brief Description of the Standard
1	IS:3895/1966	Specification for the rectifier equipment
2	IS: 1248	Specification for Indicating instrument
3	IS:375 /1963	Specification for wiring
4	IS: 4540/1968	Specification for Mono crystalline semiconductor rectifier Assemblies
5	IS:13947/ 1993	Specification for Air Break Switch/Contactor
6	IS: 8828/1993	Specification for Miniature circuit breaker
7	IS:6619	Safety code for semiconductor rectifier Equipment
8	IS:2147	Degree of protection for cubicle
9	IS 6619: 1972	Safety Code for Semi-conductor Rectifier Equipment
10	UL 1564	UL Standard for Safety Industrial Battery Chargers
11	IEC 61000-4-17	Electromagnetic compatibility (EMC) – Part 4-17: Testing and measurement techniques – Ripple on DC input power port immunity test

3.3 The system shall employ a modular configuration to provide flexibility in view the future load requirements of DC power. All factory wiring for the rack shall be for the ultimate capacity so that only plugging of FR/FC module shall enhance the DC power plant output. The modules shall be accommodated in a rack. Following are the major components, which should be considered in float cum boost charger:

Sl. No.	Component Name	Float Charger	Float Cum Boost Charger
1	Triple pole ON/OFF AC Moulded Case Circuit Breaker (MCCB 50 KA) for the AC incoming of the FC or FCB Charger with alarm contact for annunciation.	1 No.	1 No.
2	LED type pilot lamps with series resistors to indicate AC mains 'ON' condition	3 Nos.	3 Nos.
3	Double wound impregnated naturally air cooled three phase mains transformer necessary secondary tapes	1 No.	1 No.

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	for achieving required control DC output voltage.		
4	Three phase, full wave, fully controlled rectifier bridge comprising of MOSFETs / IGBTs liberally rated, mounted on heat sinks and complete with resistor / condenser network for surge suppression, with rectifier MCBs & its trip alarm indication	1 No.	1 No.
5	Filter circuit comprising of smoothing choke and condenser with MCBs for condenser & its trip alarm indication.	1 No.	1 No.
6	Electronic controller to stabilize the DC output voltage of the float charger as per battery cell voltage for input voltage variation of +/-10% from 415V, frequency variation of +/-5% from 50 Hz and simultaneous DC load variation of 0-100% and also complete with load limiting circuit to droop the float charger output voltage upon overloads to enable the Battery to take over	1 No.	1 No.
7	Dropper diode selector switch with minimum three positions along bypass scheme in case voltage reaches to one specified level.	As per battery design	As per battery design
8	Auto/Manual selector switch for selecting the mode of operation of float charger	1 No.	1 No.
9	Potentiometers for setting DC output voltage in the Auto Mode and for adjusting the voltage in the Manual Mode	1 set of two Nos.	1 set of two Nos.
10	The float charger DC output current measurement.	1 No.	1 No.
11	The float charger DC output voltage measurement.	1 No.	1 No.
12	Double pole ON/OFF DC Moulded Case Circuit Breaker (MCCB 10KA) for the float charger Output With alarm contact for annunciation	1 No.	1 No.
13	Float Charger Blocker diode with suitable heat sink	1 Set	1 Set
14	DC 'ON' indicating LED type pilot lamp	1 No.	1 No.
15	Float charger DC under voltage Sensing	1 No.	1 No.
16	Float charger DC over voltage Sensing	1 No.	1 No.
17	Auxiliary AC contactor to be interlocked with the DC contactor on the positive bus		1 No.
18	Constant current/ Constant voltage selector switch to select the Boost/ Float mode of operation for the Float cum Boost charger		1 No.
19	DC contactor with power 'NC' contact interlocked with the AC Auxiliary Contactor of the float cum boost charger so that whenever the float cum Boost charger	1 No.	1 No.

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	operated in its constant current Mode, the contact of DC Contactor on the positive bus bar opens out thus preventing the reflection of the excessive boost charging voltage across the DC load terminals.		
20	Silicon blocking diode connected in series to the 84th cell of the Battery Bank to maintain continuity in the DC supply even during the second power failure during boost charging of the battery (required in case of Ni-cd Battery)	2 Nos.	2 Nos.
21	The charge/ discharge current of Battery	1 No.	1 No.
22	Double pole ON/OFF DC MCB with lock and key for connecting the discharge resister for periodical 10Hr discharge	1 No.	1 No.
23	The Battery voltage to be measure of MU1000C or equivalent for SCADA compatibility	1 No.	1 No.
24	Earth fault sensing	1 No.	1 No.
25	Battery DC Voltage low Sensing	1 No.	1 No.
26	Battery DC Voltage high sensing	1 No.	1 No.
27	Digital meters: - AC Moving iron Voltmeter of size 96 Sq.mm. with suitable selector switch & HRC fuses –	1 Set	1 Set
28	Digital meters: - AC Moving iron ammeter of size 96 Sq.mm. with suitable current transformer & selector Switch	1 Set	1 Set
29	AC mains under/over voltage circuit solid state sensing type	1 No.	1 No.
30	Space heater (80 W) with Thermostat with MCB	1 No.	1 No.
31	Cubicle Lamp of LED type with an ON/OFF switch and a fuse	1 No.	1 No.
32	3 pins 5 A sockets as convenience outlet with an On/Off switch and a fuse	1 No	1 No
33	Alarm Annunciation a) Load voltage high b) Over voltage, under voltage or output fail. c) Mains out of range d) System Over Load e) Mains ON/Battery Discharge f) Temp. Compensation fail g) Battery Fail or No Battery h) Battery Isolated from the load i) DC Earth Leakage j) I/P MCCB Trip/Off k) FC & FCB O/P MCCB Trip/Off	1 No.	1 No.



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	l) DCDB Incomer MCCB Trip/Off m) Rectifier Module fail All alarm circuits shall be provided with suitable delay to ensure that they do not operate to transient. Every alarm, condition shall be accompanied with an audio alarm with audio cut off facility. Potential free contacts two (one for alarm and one redundant) shall be provided for extension of alarms to centralized display.		
34	Microprocessor based Digital Controller form to suit SCADA Compatibility through MODBUS (Serial) Protocol. Controller shall have display feature consisting of following features: Float Voltage Boost Voltage Float Current Boost Current Load Voltage Load Current Battery Voltage Battery Current DC Leakage Additionally, Analog meter dedicated for monitoring of DC leakage to be provided.	1 No.	1 No.
35	Digital leakage current Indicator	1 No.	1 No.
36	Lamp indication to be provided whether battery charger is running on Float mode or Boost Mode.	1 No.	1 No.
37	Any item not specifically mentioned, but required for efficient working of the equipment	As applicable	As applicable

**3.4 Arrangements**

**3.4.1 Trickle (Float) Charger**

The trickle charger shall have arrangement for regulation of D.C. output voltage by

- a. Automatic voltage regulation system
- b. Shall be of thyristor control type with both 'auto/manual' control arrangement.

**3.4.2 Quick (Boost) Charger**

The quick charger shall be similar type as trickle charging equipment but shall have the following features.

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- a. Shall be provided with control arrangement for 'auto/manual' current regulation features, necessary for quick charging
  - b. Shall also have 'auto/manual' voltage control arrangement for use when the charger will be utilized as a trickle charger.
- 3.4.3 The 'Trickle' and 'Quick' charger shall be self-supporting cubicle type with front panels hinged and suitable for mounting instruments, incoming A.C (3-ph) circuit breaker with thermal and instantaneous releases relays, contactors and control switches etc. The panels shall have access from the backside also. These cubicles shall also house transformers, rectifiers and other equipment's, accessories, as stipulated in this specification.
- 3.5 Design and Construction Details**
- 3.5.1 The battery chargers of 24V/70 Amp in N+1 configuration with ultimate capacity as per Type-1 and Type-2 shall be of SMPS type suitable for VRLA Batteries. The system shall consist of a Distribution / Switching / Alarms arrangement (DSA) and Float / Boost Rectifier-cum-Chargers (FC/FCB) in a rack. It shall employ modular configuration for flexible provision of DC Power. It shall employ menu driven Micro Processor Controlled Techniques for DSA as well as module for control, monitoring and alarm to achieve better reliability of the system. The SMPS battery chargers shall be capable of continuous operation with float voltage for Li-Ion batteries while supplying the constant DC load
- 3.5.2 The 'trickle' charger and 'quick' charger shall be complete with silicon controlled rectifier units, dry type air-cooled transformers, control electronics, smoothing filters etc. suitable for operation from 415V + 10%, 50 Hz + 5%, 3-ph A.C. supply. The charger output shall be stabilized to + 1% of set value for + 10% input voltage variations and 0-100% load variation.
- 3.5.3 The SMPS battery chargers shall have constant voltage characteristics throughout the range (from zero to full load) at the floating value of the voltage so as to keep the batteries fully charged but without harmful overcharge.
- 3.5.4 The battery charger shall have full-wave, Half-controlled thyristor control bridge rectifier circuit. The charger output voltage shall suit the battery offered. The float voltage shall be adjustable from 80% to 115% of nominal voltage. The boost voltage shall be adjustable from 80% to 135% of nominal voltage. Ripple voltage shall be less than 3% RMS voltage.

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- 3.5.5 Each float charger shall be capable of floating each cell of the battery bank at the specified voltage and supplying specified float current continuously under normal system operation.
- 3.5.6 Under normal operation, the float charger shall be supplying the DC load current and at the same time trickle charge the station battery. When the battery voltage goes down considerably, automatic transfer arrangement shall be provided such that the battery is disconnected from the float charger and gets connected to the Boost charger. However, when battery is on boost charge, DC load shall be fed from the float charger. In addition, means shall be provided to ensure interruption free availability of control power from the battery whenever there is a power failure irrespective of whether the battery is on boost charge or float charge.
- 3.5.7 The selection of electronic components shall be used on ambient temperature of 50 degree Centigrade and shall be of worst-case design to ensure continuous and trouble-free service. The control electronics shall be built on plug in type glass epoxy printed circuit boards of modular design.
- 3.5.8 The maximum temperature, attained by any part of trickle charger and quick charger, when in service at site under continuous full load conditions shall not exceed the permissible limits as fixed by relevant standards and as corrected to site condition.
- 3.6 Charger Panel**
- 3.6.1 Charger Panels shall be rigid, self-supporting structures, completely assembled and totally enclosed cubicle type construction, made out of structural steel members with sheet steel-coverings.
- 3.6.2 The enclosure of the charger shall be made of CRCA sheet steel of thickness not less than 3 mm for load bearing members, 2 mm for door and non-load bearing members and 3 mm for gland plates. Panels shall be offered with base frame of 3.0 mm thick CRCA sheet, painted black all around, suitable for bolting/ welding/ grouting on to the foundation. Gaskets on doors and inter panel gaskets shall be of neoprene rubber.
- 3.6.3 The panel shall have hinged front and back doors with concealed type hinged locks and latches.
- 3.6.4 The panel shall have adequate cross –ventilation arrangement to avoid any undue rise in temperature.
- 3.6.5 All equipment's and wiring used in the panel shall be tropicalized dust proof and vermin-proof.
- 3.6.6 Power wiring for the chargers shall be done with 1.1KV grade, heavy duty, single core, stranded copper conductor PVC insulated cables or suitable sized PVC sleeved copper bus bars. Control

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wiring for the charger shall be done with 1.1KV grade PVC insulated copper wires of cross section 2.5 sq. mm for all control connection. Wire of 2.5 sq. mm cross section shall be used for control bus. All control wiring shall be ferruled.

- 3.6.7 Necessary terminals for grounding the panel with two separate earthing shall be arranged for bottom entry and suitable cable glands shall be provided for the cables.
- 3.6.8 Each charger panel shall incorporate all the necessary controls, Indications, interlocks, protective devices and timing features to ensure any operation. Provision shall be made with necessary contact / relays for annunciation in the event of alternating current power failures to the charger and automatic shutdown of the charger by over-voltage / current devices. Annunciation shall however be prevented when the charger is manually shutdown or when AC power supply is momentarily interrupted for adjustable period of 1 to 5 seconds.
- 3.6.9 The float and equalizer charging rates shall both be adjustable from the front of the charger control panel. Each charger shall be protected against any damage from over voltage/ load currents and shall be so designed that it can continuously deliver at least rated current output without operation of the protective over-load device for abnormal conditions of low battery voltage down to 19.2V (80%) of the rated voltage). But the chargers shall be disconnected from A.C. input supply through an over-voltage relay, if the input voltage exceeds 10% of the rated voltage of the equipment. Necessary selector switches for 'Trickle Charging' and 'Quick charging' shall be provided. There shall be 'make before break' type blocking Diodes and other equipment's to be shown in the drawing or otherwise found necessary for charging or otherwise found necessary for charging the battery without increasing the voltage beyond safe value across the load shall also be supplied by the tenderer.
- 3.6.10 The rectifier units of the chargers shall be capable of supplying an impulse load of 6/7 times its rated capacity. The trickle charger in conjunction with automatic voltage regulators shall have drooping characteristics, so as to transfer the load beyond its capacity to the battery.
- 3.6.11 The incoming and outgoing circuits shall be provided with MCCBs with static releases for overload, short circuit and earth fault protections. The incoming power supply to the chargers will be from two sources with a facility of changeover switch. The changeover facility shall be provided in the charger itself.
- 3.6.12 The battery circuit shall be provided with HRC fuse protection over a suitably rated load break isolator switch and reverse protection circuits.
- 3.6.13 Input volt meter and ammeter shall be of digital type and shall be 96 x 96 mm. Square. These meters shall be of accuracy class not less than 1.0 and shall be of flush mounting type with

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required PTs and CTs and selector switches. Output voltmeter shall be digital, and ammeter shall be moving iron type and shall be 96 x 96 mm square. These meters shall be of accuracy class not less than 1.0 and shall be flush mounting type. The ammeter shall be Centre zero type for measurement of charging and discharging current from the battery.

3.6.14 Cluster LED lamps for indicating 'Input on' condition and 'Output on' condition, float status on / off, boost status on / off etc. shall be provided. Annunciation with audio visual alarms shall be provided for the following.

- a. Input mains failure
- b. Input phase failure
- c. Input fuse failure
- d. Rectifier fuse failure
- e. Filter fuse failure
- f. DC over voltage
- g. DC under voltage
- h. Output fuse failure
- i. Charger over-load
- j. Earth leakage
- k. Alarm supply fuse failure
- l. Charger trip
- m. Output MCCB tripped
- n. AC under voltage
- o. Battery low condition

ACCEPT, TEST AND RESET push buttons shall be provided. 20% spare annunciation windows shall be provided.

3.6.15 Any other item(s) not stipulated in this specification, but required for installation, operation and maintenance of the battery charger is / are included in the scope of supply without any extra charge to TPCODL.

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### 3.7 TESTS

#### 3.7.1 Type Tests

The bidder shall submit the Type Test reports along with the drawing for approval for the following type tests conducted on float cum boost charger as per relevant IS and IEC within five years from the date of opening of the bid

- a. Measurement of voltage regulation / AVR regulation
- b. Efficiency and power factor measurement test
- c. Temperature rises test so as to determine the temperature rise of SCR, Transformer primary, Secondary and core, Diode, capacitor, choke and cabinet etc.
- d. Measurement of insulation resistance.
- e. AC input to earth
- f. AC input to DC output
- g. DC output to earth
- h. Test for rectifier transformer
- i. DC voltage current characteristic
- j. High Voltage Tests.
- k. Determination of regulation
- l. Measurement of ripple
- m. Reverse leakage test.

#### 3.7.2 Acceptance Tests

Followings shall constitute the Acceptance tests which shall be tested by the purchaser's representative at the works of the manufacturer at the cost of the supplier (both for FC cum BC) for each charger. No sampling is allowed.

- a. Measurement of voltage regulation / AVR Regulation
- b. Efficiency and power factor measurement

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- c. Temperature rise test so as to determine the temperature rise of SCR, Transformer primary, secondary and core, diode, capacitor, choke and cabinet etc.
- d. Measurement of insulation resistance.
- e. AC input to earth
- f. AC input to DC output
- g. DC output to earth
- h. Test for rectifier transformer (all relevant tests as per corresponding ISS)
- i. DC voltage current characteristic
- j. High voltage tests.
- k. Determination of regulation.
- l. Measurement of ripple  
Tests for indications and alarms as per this specification
- m. Tests for indicating instruments.
- n. Determination of system set points.
- o. Soft start test

N.B.: The supplier shall provide arrangements for monitoring the temperature across the elements, as stipulated above, continuously during the temperature rise test without disconnection of any of the temperature measuring devices across the hottest spot of each of the above elements. All other tests, as may be necessary to ensure that all equipment's are satisfactory shall also be carried out. In addition to the above tests, manufacturer's test certificates, vendor's test certificates for different equipment's, accessories, instruments etc. shall be submitted, whenever required by the purchaser.

### 3.8 Drawings / Documents

The tenderer shall submit the following drawings / documents for approval.

- a. OGA of the battery chargers
- b. General layout with overall dimensions

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- c. Electrical schematic diagram showing connections and controls.
- d. Leaflets and technical literature giving detailed information of the panels offered.

The contractor shall submit the following drawings / documents in 7 (seven) copies within 15 (fifteen) days from the date of issue of the purchase order for purchaser's approval.

- a. OGA of the battery chargers
- b. General layout with overall dimensions marked along with sectional views showing cable entry position etc.
- c. Rating calculations for transformer, rectifiers, diode, capacitor, inductor etc.
- d. Detailed schematic and connection and control wiring diagram for all the equipment's.
- e. Complete bill of materials.
- f. Technical excerpts on operation.
- g. The circuit diagram of charger including circuit diagrams of all cards to facilitate the maintenance of chargers.

### 3.9 **Guaranteed Technical Particulars**

The guaranteed technical particulars of this specification shall be furnished along with the tender. Any tender, lacking complete information in this respect is likely to be rejected.

### 3.10 **Deviation from Specification**

All deviations from the specification shall be separately listed in the technical deviation sheet, in the absence of which it will be presumed that the provisions of these specifications are complied with by the tenderer.

### 3.11 **General Technical Requirements for Battery Charger**

Sl. No.	Item Description	Functionality Expected	Bidder's Response
1	Manufacturer Name		
2	Model		
3	Type	Float & Float Cum Boost Charger for VRLA Type, full wave, full controlled type.	
4	Ratings	70 A Float cum Boost for 24V, 150 AH (Type-1) & 24V, 200 AH (Type-2) VRLA Type Battery	



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5	AC Input i) Voltage ii) Frequency iii) Phase	FC & FCB 415 V AC ± 10% 50Hz ± 5% 3 – phase, 4 Wire	
6	Ampere Hour Capacity	Shall be in-line with applicable Battery System	
7	DC Output Voltage Settings Nominal Float	FC 24/27.25V (adj. By + 20%, - 5%)	BC 24/33.25V (adj. By + 2%, - 5%)
8	Output Current Limit	70 Amp	70 Amp
	Number of SMPS Modules	FC	FCB
		N+1	N+1
9	Power Conversion	AC to DC by means of three phase full wave, half controlled bridge rectifier consisting of thyristors and diodes.	
10	Voltage Regulation at Bridge output	+ 1% of set value for + 10% Input Voltage Variations, 0 - 100% Load Variation	
11	Ripple Voltage	Less than 3% RMS without battery connected, < 200 mV	
12	Efficiency	Better than 90% at full load	
	Power Factor at 50% and 100% Load	0.99 @ 50-100% Load	
	Load Regulation	±1%	
13	Protections		
a)	Input side	AC input MCCB & ELBS with input ON/OFF switch and fuses, contactor	
b)	Output side	DC output MCCB with output ON/OFF switch and fuses	
c)	Protection	Current limit protection, soft start features, surge suppressor. Fast semiconductor fuses for rectifier bridge.	
d)	Control Circuit	Fuses	
e)	Capacitor Circuit	Rectifier HRC fuses	
		Over-voltage cut-back	
		Charger over load / short circuit	
		Blocking diode	
f)	Mounting Type	Free standing floor mounting, Indoor & Outdoor application	
13	Controls & Switches	Followings Controls and Switches are required in the System: a. AC input source MCCBs with interlocking	

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		b. DC output MCCB c. Auto/Manual float/boost mode selector switch. d. Float and boost voltage variable potentiometers. e. Manual voltage adjustment Potentiometer f. Test push button g. Reset push button h. Battery current adjustment potentiometers i. Heater’s power supply switch j. Socket power supply switch	
14	Features	The following features are required in the systems: a. Soft start on DC side b. Class-F insulation for all magnetic. c. Automatic voltage regulation. d. Automatic changeover from float to boost and e. vice versa based on current, drawn by battery. f. Filter circuit to eliminate ripple. g. Charger current limit h. Separate battery path current limit. i. Built-in auto phase reversal of operation.	
15	METERS	F.C. (i) Input Voltmeter (ii) Input Ammeter (iii) Output Voltmeter (iv) Output Ammeter	B.C. i. Input Ammeter ii. Input Voltmeter iii. Output Voltmeter iv. Output Ammeter
		Battery volt meter Battery ammeter Earth leakage ammeter	
16	Indications	Phase ‘ON’ lamps Output ‘ON’ lamp	Phase ‘ON’ lamps Output ‘ON’ lamp Charger ‘ON’ float Charger ‘ON’ boost
17	Annunciation with audiovisual alarms	i. AC input mains failure ii. Input phase failure iii. AC under voltage iv. Input phase failure v. Rectifier fuse failure vi. Output fuse failure vii. Filter fuse failure viii. DC under voltage ix. DC over voltage	

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		<ul style="list-style-type: none"> <li>x. Charger trip</li> <li>xi. Capacitor fuse fail</li> <li>xii. Output MCCB tripped</li> <li>xiii. Charger over load</li> <li>xiv. Earth leakage</li> <li>xv. DC earth fault</li> <li>xvi. Alarm supply fuse failure</li> <li>xvii. failure</li> <li>xviii. Battery low condition.</li> </ul>		
<p><b>Note:</b> All the alarms shall be provided through electronic display module. Audio alarm through buzzer, visual indication through 10 mm LEDS &amp; Alarm Ack/Reset and LED provision is through push buttons.</p>				
18	Operating ambient temperature surrounding the panel	0° to 60° C		
19	Surrounding the panel Relative humidity	0-95% non-condensing		
20	<p>PANEL</p> <ul style="list-style-type: none"> <li>(i) Protective grade</li> <li>(ii) Cooling</li> <li>(iii) Paint Thickness</li> <li>(iv) Colour Shade</li> <li>(v) Thickness of CR Sheet</li> <li>(vi) Cable Entry</li> </ul>	<ul style="list-style-type: none"> <li>(i) IP – 42</li> <li>(ii) Natural air-cooled</li> <li>(iii) 80 - 100 Micron</li> <li>(iv) RAL 7032</li> <li>(v) 3 mm for load bearing parts &amp; 2 mm for others</li> <li>(vi) Bottom</li> </ul>		
21	<p>MAGNETICS</p> <ul style="list-style-type: none"> <li>a. Average winding temperature rise over ambient temperature</li> <li>b. Insulation class</li> <li>c. Insulation breakdown voltage</li> </ul>	As per relevant ISS. 'F', 3 kV for 1 min withstand.		
22	User interface with controller	<p><b>Local Monitoring:</b> Web browser via Ethernet or WLAN WEB server Web UI with configurable access rights, login control and user profiles</p> <p><b>Remote monitoring:</b> Web browser, REST, SNMP, Syslog, MODBUS, customer specific protocols via Ethernet, RS232, RS485</p> <p>Remote alarming: Dry contacts / SNMP traps / SMS; dial-out together with modems / RTU</p>		
23	CABLES	1100 V grade PVC insulated copper. Ferrules shall be provided for identification of connection.		

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N.B.: -Besides the above general technical requirements, all other stipulations, as enumerated in this technical specification shall be followed. Any deviation should be clearly brought out with clear explanation.

Any extra feature/ equipment / instrument as necessary for operation and performance of the battery charger for the 24V battery set as per this specification shall be provided without any extra cost to TPCODL.

Battery bank shall be connected to battery charger MCCB/CB, therefore MCCB/CB to be considered in Battery charger for battery bank connection for safe disconnection of battery bank in case of O&M activity.

#### 3.11.1 General Features

- a. The Float charger, Float cum Boost charger with other Components and Integral DCDB shall be housed in a common cubicle with separate compartments for float & boost charger and for DCDB. The Chargers shall be indoor, floor mounted, self-supporting sheet metal enclosed cubicle type. The Bidder shall supply all necessary base frames, anchor bolts and hardware. The Charger shall be fabricated using cold rolled sheet steel shall not less than 1.6 mm and shall have folded type of construction. The panel frame shall be fabricated using cold rolled sheet steel of thickness not less than 3.0 mm (for load bearing members). Removable undrilled gland plates of at least 3.0 mm sheet steel and lugs for all cables shall be supplied by the Bidder. The lugs for cables shall be made of electrolytic copper with tin coat. The Charger shall have sufficient vermin proof. Ventilation louvers shall be backed with fine brass wire mesh.
- b. All the door mounted equipment as well as equipment mounted inside the cabinet shall be provided with individual riveted /life lasting adhered labels with equipment description engraved.
- c. All doors and covers shall be fitted with EPDM gaskets. The Chargers shall have hinged double leaf doors provided on front and/or backside for adequate access to the Charger internals. All the Charger cubicle doors shall be properly earthed. The degree of protection of Charger enclosure shall be at least IP-42.
- d. Battery Charger shall be provided with earth bus bar of tinned copper flat, having minimum cross section 25x3 Sq. mm flat securely fixed along with base and provision on both the sides of earth bus for connecting purchaser's earthing grid.

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- e. Redundancy arrangement for input AC supply: Dual source provision to be considered in battery charger. MCCB for individual source to be considered
- f. Conformal coating on all electronics components to be considered.
- g. All indicating instruments, control & selector switches and indicating lamps shall be mounted on the front side of the Charger.
- h. Electronic equipment shall be of modular design consisting of plug in modules in standard 19 inches metallic racks with metallic card guides. The cards should be provided with proper handles. Card to card wiring should be preferably through a mother board. Unplanned jumping and track modifications are not permitted. Mechanical interlocks to prevent wrong insertion of cards should be provided. Each card shall have its junction and test points identified. Maintenance aids such as extension printed wiring boards and jumper leads shall be provided.
- i. The layout of Charger components shall be such that their heat losses do not give rise to excessive temperature within the Charger panel surface. Operating temperature range shall be minus 5°C to plus 60°C. Location of the electronic modules will be such that temperature rise of the location, in no case, will exceed 10 °C over ambient air temperature outside the Charger.
- j. The electronic control circuitry should have built in feature of soft start so that whenever the charger is switched on, the output voltage should increase gradually.
- k. The float section of the charger shall be compatible to operate in auto (fully automatic) as well as manual mode with a provision of selection through Auto/Manual switch and all related components & scheme
- l. Normally the float charger shall operate in parallel with the 24 V, battery set and the load. The float charger shall supply the DC loads of the sub-station and also provide the trickle charge for keeping the battery set floating totaling up to full capacity. For this condition, the float charger shall be designed to trickle charge all the cells between 21.7 V to 27 V and supply DC load of the sub-station, keeping the load bus-bar voltage approximately at rated voltage of DC load components by using dropper diodes.
- m. The boost charger and the float charger shall be so interlocked electrically that during boost charging of the battery, the float charger will supply the DC constant load without supplying to the battery, and at the same time will be in parallel with the battery through a reverse current blocking diode at a suitable tapping. One DC contactor may be incorporated which shall get

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engaged through N/C contact of the contactor on AC side of the boost charger. In case of failure of AC supply, this contactor shall connect the entire battery supply to the load through one of its N/O contacts automatically without any interruption of DC supply even of a momentary nature. Under no circumstances the voltage across lower tapped terminals shall exceed (+) 10% or fall below (-) 15% of the rated voltage.

- n. Suitable Surge Protection Devices must be used for voltage surge protection.
- o. Charger Output: Suitable ripple filtering circuits shall be provided to give a smooth DC output. The ripple content, without the battery connected shall be limited to less than 3% on resistive load. The DC output shall be free from switching surges, transients, etc.
- p. Locking facilities shall be provided as following:
  - For locking Trickle/Boost selector switch in the trickle position only. This would be used for having key mechanical interlock between Trickle/Boost selector switch and isolator in D.C. distribution board which is being procured separately by the Owner.
  - The Charger enclosure door locking requirements shall be met by the application of padlocks. Padlocking arrangement shall allow ready insertion of the padlock shackle but shall not permit excessive movement of the locked parts with the padlock in position.

### 3.11.2 Wiring

- Each Charger shall be furnished completely wired up to power cable lugs and terminal blocks ready for external connection. The power wiring shall be carried out with 1.1 KV grade PVC insulated copper cables conforming to IS:1554 (Part-I). The control wiring shall be of 1.1KV grade PVC insulated stranded copper conductors of 2.5sq.mm. Conforming to IS: 694. Control wiring terminating at electronic cards shall not be less than 1.0 sq. mm. Control terminal shall be suitable for connecting two wires with 2.5 sq.mm. Stranded copper conductors. All terminals shall be numbered for ease of connections and identification. At least 20% spare terminals shall be provided for circuits. The wiring shall have fire resistant (FRLSH) properties.
- Power and control wiring within panels shall be kept separate. Any terminal or metal work which remains alive at greater than 415 V, when panel door is opened, shall be fully protected by shrouding. All hardware such as screws nuts, studs, washers shall be of brass and no ferrous parts shall be used in electrical circuitry control / power.
- An air clearance of at least ten (10) mm shall be maintained throughout all circuits, except low

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voltage electronic circuits, right up to the terminal lugs. Whenever this clearance is not available, the live parts should be insulated or shrouded.

### 3.11.3 AC Terminations

- The input terminal should be single phase or three phases as the case may be cleared marked as R Y B and N and for AC three phase, L and N for AC single phase. AC input termination shall be suitably protected against the accidental touch/contact with the working staff for their protection and shall also have clear and prominent be “Danger” marking.
- Screening shall be provided between AC and DC components to prevent accidents. The AC input connection to the rectifier module shall be by means of locking type plug and socket arrangement.
- All the connection between distribution and modules shall be through proper rated cables only. Fuses and circuit breakers for each module shall be easily accessible and properly rated.

### 3.11.4 DC Terminations

- The output of each rectifier in the negative load shall be taken through full rated ISI marked MCBs. All the AC, DC control & alarm cabling shall be supplied with the rack. All DC +ve and - ve leads shall be clearly marked.

### 3.11.5 Battery Temperature Compensation

- The charger shall be provided with the appropriate circuitry to interface with the temperature probe assembly. With the probe, the charger shall automatically compensate gassing and constant voltage setting inversely proportional to the probe’s temp/ battery ambient temp., so that over charging at high temperature and under charging at low temperature can be prevented.

### 3.11.6 MCB

- Suitable rated MCBs are to be considered. MCB rating shall be chosen by the Bidder depending on the circuit requirement. All MCBs in the chargers shall be monitored. MCB OFF/failure annunciation shall be provided on the OFF/failure of any MCB.

### 3.11.7 Blocking Arrangements

- Blocking arrangement shall be provided in the positive pole of the output circuit of the charger to prevent current flow from the DC battery into the charger.

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### 3.11.8 Radio Interference

- The equipment shall be efficiently screened against interference to radio and also other communication equipment, which may be installed in the same building. All sources of noise shall be filtered if necessary, with suppressors generally in accordant with relevant standards.

### 3.11.9 Additional Features Required:

- The SMPS modules should be hot swappable modules.
- The spare modules should be easily replaced without any shut downs & there should be no downtime of the system.
- Despite a breakdown in the Monitoring unit or disturbances on bus, system stability should not affect.
- Less voltage drops in the output. (as per voltage regulation)
- Selective over voltage shut down
- Provision for Battery Capacity Test.
- No requirement of additional hardware for changing of parameters at site.
- Settable Time delay & hysteresis for each alarm
- Event history records (min. 100 records storage) with time stamp for fault analysis
- Remote monitoring of parameters
- DCDB feeder ON & OFF status monitoring through controller display feature should be available.
- DCDB individual feeder earth fault monitoring through controller display feature to be added

### 3.11.10 Following are the minimum Mandatory signal required for integration with SCADA/DMS/OMS System:

#### Measurement Signals

- DC load voltage
- Load current
- Float Current



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- Float cum Boost Current

**Alarm Signals**

- DC earth Leakage
- UV Alarm
- OV Alarm
- Main-1 Ac fail
- Main-2 AC fail
- FC Charger fail
- FCBC charger fail
- Major card/components failure

Battery Charger with DCDB shall be integrated with TPCODL SCADA over Modbus-RTU or TCP/IP protocol. If any kind of software required for configuration, then same to be supplied by the bidder. Kindly note that voltage exact value to be mapped in SCADA. No calculation formula is acceptable.

Vendor shall depute their service engineer during installation and commissioning stage for required checks and assist TPCODL in commissioning of Battery Charger.

**3.12 Battery Charger Controller**

This part of the specification covers the technical requirements of design, Engineering, manufacture, stage testing, inspection and testing before dispatch, packing, forwarding, delivery at site and integration of Battery Charger Controller with proposed RTU for remote monitoring and control of DCDB system from Purchaser’s Remote SCADA Systems, the same shall be based with suitable accessories for Indoor/Outdoor installation, complete with all fittings accessories and associated mandatory auxiliary equipment which are required for efficient and trouble-free operation.

The scope includes supply of hardware/software required for integration with existing Sub-Station Automation System for remote monitoring of proposed charger and battery system over Industry Standard Open protocols (e.g. IEC 61850, IEC104, Modbus (RTU/TCP) from Remote SCADA System of the Purchaser’s. The Scope also covers point to point testing of each

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site with SCADA System.

The proposed controller shall have adequate number of Digital Input / Output system, Analog Input / Output System as per the I/O list attached with this specification in Section E. Bidder shall consider suitable transducers as per the site requirement for taking Voltage and Current signals from battery charger.

Preferably the bidder shall consider the controller of the same family of RTU proposed under this RFP.

### 3.12.1 General Technical Requirements

3.12.1.1 The proposed controller shall be suitable for the harsh environment mentioned elsewhere in this RFP. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g. All the controller module shall be with conformal coating.

3.12.1.2 Controller should be robust and shall be mounted on Charger panel. If any mounting arrangement are required for proper fixing, same will be in bidder's scope. All the wiring inside charger and requirement of electrical accessories will be in the scope of the bidder. Any Hardware / Software required for integration of the controller with substation RTU will be in the scope of the bidder.

3.12.1.3 RS485 communication will be in scope of the Bidder. Bidder has to supply Serial Communication Cable (i.e. Armored twisted pair communication cable (4P X 0.36 mm<sup>2</sup>), for integration of the controller with RTU, the required length of the communication cable will be as per the site requirement.

All functional capability described herein shall be provided by the bidder even if a function is not initially implemented. As a minimum, the Controller shall be capable of performing the following functions:

3.12.1.4 The proposed Controller, I/O and Interfacing modules shall be of the same family of RTU or Embedded, industrial grade system with high availability & reliability. Controller hardware shall be easily scalable for expansion and to integrate IEDs in future on open protocols.

3.12.1.5 The controller shall have multi-protocol support capability, adaptable for customization and additional protocols and Multi master communication capability.

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- 3.12.1.6 The Controller shall support a wide range of Server/Client protocols including IEC61850 (ED1 & ED2 edition), IEC 60870-5-104 (Master/Slave), Modbus - RTU, Modbus - TCP/IP (Master).
- 3.12.1.7 The Controller shall support min 100 Physical I/O tags and shall support integration of IEDs on Open Protocols as mentioned above. Bidder to consider the hardware such as I/O peripheral, Serial Ports, Communication processors, Converters etc., in the Controller accordingly.
- 3.12.1.8 The proposed Controller shall be integrated with proposed RTU. The controller shall also support communication simultaneous with eight independent remote master (redundant) stations on IEC 60870-5-104 Protocol.
- 3.12.1.9 The Controller may be 19" Rack mounted / Din Rail Mounted.
- 3.12.1.10 Shall support IEC 61131 based programming.
- 3.12.1.11 Web Server functionality to monitor and configure the Controller by authorized users (AAA functionality).
- 3.12.1.12 Should provide latest Microsoft Windows based maintenance and configuration tools. The tools should have functionality of both remote and local access.
- 3.12.1.13 Time synchronization based on SNTP (Server/ Client) and Protocol specific synchronization (IEC 60870-5-104 etc.). The Controller shall accept minimum two independent sources for time synchronization over SNTP/Protocol specific Synchronization.
- 3.12.1.14 Controller shall support SNMP protocol for device monitoring and management from Purchaser's Network Management System.
- 3.12.1.15 Controller shall support configuration File Upload and Download from the Engineering Station (Configuration Laptop), functionality shall support both Local & Remote configuration.
- 3.12.1.16 RTU shall be capable of acquiring 32-bit analog and accumulator data from Multi-function meters on MODBUS (RTU & TCP/IP)/IEC61850/IEC60870-5-104.
- 3.12.1.17 Controller communication protocol shall be configured to report analog & Status changes by exception to master stations. However, Controller shall support periodic reporting of analog data and periodicity shall be configurable from 1 sec to 1 hour. Digital status shall have higher priority than the analog data. In addition, analog values shall also be reported to Master station by exception on violation of a defined threshold limit.

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- 3.12.1.18 The XML based Substation Configuration Description Language (SCL) of IEC 61850 configuration interfaces shall allow information to be shared between the various configuration tools, reducing the overall engineering time.
- 3.12.1.19 User friendly on-line health and data monitoring facility shall be provided to maintenance engineer for monitoring/analyzing the real time status of the process, program logic from the engineering station (Configuration tool – Laptop) from Local and Remote.
- 3.12.1.20 The system shall comprise of features namely failsafe control (i.e. check-before-execute, selection timeout etc.), Interlock & Sequential Logic Control system, Sequence of Event Recording (SER), time synchronization through SNTP server or through the Master (Main & Standby).
- 3.12.1.21 In case of power supply failure, auto start-up and restoration of the Controller shall be possible without manual intervention.
- 3.12.1.22 All the cards/modules of the Controller must have conformal coating for protection against harsh environments.
- 3.12.1.23 Internal battery backup to hold data in SOE buffer with time & date in case of failure of supply.
- 3.12.1.24 The proposed Controller shall be KEMA Certified or by equivalent certification body like NABL /CPRI/International Accredited Lab.
- 3.12.1.25 Continuous self-supervision function with self-diagnostic feature shall be included.
- 3.12.1.26 Controller & Communication Redundancy
- The Controller shall communicate to both Main and Standby Substation RTU. So that the Controller can exchange data with the Remote Control Centre, even when one of the RTU unit fails.
  - The failover process should cause the assignment of all the functions of the failed unit to the healthy unit. The changeover between the two redundant units shall be transparent and shall not require any manual intervention. The changeover process of the Controller shall be bump less and with no data loss.

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**3.12.1.27 Communication**

**3.12.1.27.1 Ports**

- Controller shall have number of ports as per the protocol proposed and providing data to both Main and Standby RTU or directly to SCADA Master System.

**3.12.1.27.2 Protocols**

- The communication protocol for Controller to Master Control Center must be IEC 60870-5-104.
- IEC 61850 Ed.1 & 2 (latest), IEC 60870-5-104, MODBUS (Serial and TCP/IP) shall be supported. The RTU shall meet the IEC 61850 standard in every respect and interoperability with other manufactures IEDs and tools shall be verified.
- Time synchronization over SNTP and Communication protocol from Master.
- SNMP (v1, v2c and v3) for Health monitoring of the Hardware.

**3.12.1.28 Input / Output Requirement**

Input / Output Requirement for each Substation: Typical Input/Outputs requirement

	Digital Inputs (DI)	Digital Output (DO)	Analog Input (AI)
Battery Charger Controller	16	8	6

The Input/Output requirement and technical specification of the Controller is same as of RTU.

**3.12.1.29 Algorithm and Logic**

- The Controller shall be based on advanced and proven algorithms and an easy and efficient upgrade of the Controller functionality shall be possible.
- The Controller shall support IEC61131.

**3.12.1.30 Self-Supervision**

- The Controller shall have extensive self-supervision including all functional module and communication channel.
- The Controller shall have LEDs for healthiness / error indication

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- Controller shall have the facility to generate & download the log files for maintenance and troubleshooting.
- In case of restoration of communication links, power supply after failure, the software along with hardware shall be capable of automatically synchronizing with the remaining system without any manual intervention.
- It shall be possible to re-boot the Controller through the LAN/WAN from a remote location.

#### 3.12.1.31 Event Recording pertaining to Controller

- The Controller shall support event recorder that can handle up to 500 time tagged events. Events shall be stored in non-volatile memory. In case of failure of Controller or communication channel, the recorded events shall be communicated to the master as soon as communication is restored after failure.
- The Controller shall have an internal clock with the stability of minimum 10 ppm or better. The RTU time shall be set from time synchronization messages received from GPS clock or Master station. SOE time resolution shall be 1ms or better.
- It shall be possible to retrieve the recorded event on the Purchaser's SCADA system.

#### 3.12.1.32 Power Supply

- The Controller shall be powered from the 24 V DC +/- 20% Power Supply. The Controller shall accept power from the DC system with the following characteristics:
- Nominal Voltage of 24V DC with operation between 18 and 30 VDC. The voltage may vary during normal operation between these limits with a duration not less than 1 msec.
- Reverse polarity protection.
- The Controller shall operate with grounded input power from purchaser
- The Controller shall have adequate protection against reversed polarity, over current and under voltage conditions.
- Each Input / Output Supply within the panel shall be through power supply distribution module with MCBs with NO contacts (for supply monitoring).

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### 3.12.1.33 Time Synchronization

- Controller time synchronization shall be through GPS clock via communication ports on SNTP or over the Communication protocol from master (IEC60870-5-104).
- Timing Accuracy: The Controller shall time-tag event reports to an absolute accuracy of 1ms or better.
- Controller shall generate an alarm if it gets drifted or loose the synchronization signal.
- Controller shall have min 2 (two) source input for Time synchronization with priority provision
- Bidder to propose the solution for time synchronization of the Controller, if the same drifts beyond specified limit (e.g. 30 minutes drift)
- With each power cycle the Controller shall synchronize with GPS receiver or with Master.

### 3.12.1.34 Cybersecurity

- Secure access- Level Wise enabling of settings with User Rights should be incorporated with Password protection in the Controller. Each User shall have his/her own User Id & Passwords.
- User Credentials to access Controller shall be authenticated through Purchaser's Active directory Server.
- All actions/modifications/deletions shall be logged in the Controller. These logs shall be pushed to Purchaser's Central Asset Management system/SOC.
- It shall be possible to access the Controller through a web browser (Https Support) anywhere from the LAN for configuration, diagnosis, monitoring, file upload & download, simulation and log retrieval by using appropriate user account management viz. Role based access control & password complexity
- The Controller should also support Authentication and Authorization of individual users, Security logging.
- Controller shall be NERC-CIP/NIST 7628, IEC62351, IEC 62443 and IEEE 1686 compliant.
- Controller shall be enabled with System hardening viz. disabling/removal of unused ports and services.
- Controller Should support System Audit Logs, SYS logs etc.

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### 3.12.1.35 Reliability

Reliability of the equipment's offered shall be better than 99.9999% per year availability for overall end equipment. RTU reliability and availability calculation shall be provided with engineering document for approval.

### 3.13 DC Distribution Board (DCDB)

The DCDB shall be floor mounting, integral to battery charger panel. Non compartmentalized, separate partition shall be provided between battery charger and DCDB. It shall have Moving coil DC voltmeter of size 96 sq.mm with HRC fuse 0-300V and Incoming Feeder 300A DC, Copper Bus-bar, MCCB: 2 Nos., Outgoing Feeder 25A DC MCB: 15 Nos. with Feeder 'ON' LED indication.

Sl. No.	Item Description	Functionality Expected	Bidder's Response
	<b>DC Distribution Board</b>		
a)	Feature of DCDB feeder ON/OFF status monitoring through controller display	Required	
b)	Feature of DCDB earth fault monitoring through controller display	Required	
c)	I/C feeder comprising of copper busbar double pole DC MCCB - 300 A	2 Nos.	
d)	O/G feeder comprising of double pole 25A MCB	15 Nos.	
e)	Moving coil DC voltmeter of size 96 sq. mm with HRC fuse 0-300 V	1 No.	
f)	Moving coil DC ammeter of size 96 sq. mm; 0-150 Amp	1 No.	
g)	24V/60A Copper bus bar (size to be mentioned by bidder)	Copper Bus Bar	
h)	Dropper Diode scheme	Required	
i)	Surge Protection device (SPD) class	Type # 1	
j)	Earthing bus bar	25 x 3 sq. mm tinned copper	
k)	Cooling	Speed Regulated Fan Cooled	
l)	Digital Leakage Current Indicator	Yes	
m)	Lamp indication to be provided whether battery charger is running on Float mode or Boost Mode	Yes	



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# **Chapter # 4**

## **Control Cables**

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## 4.0 Technical Specification for Control Cables

### 4.1 SCOPE

This part of the specification covers the technical requirements of design, Engineering, manufacture, stage testing, inspection and testing before dispatch, packing, forwarding, delivery at site the PVC, armoured, copper control cables for installation in substations

The material offered shall have been successfully type tested during last five years on the date of bid opening. The front page of type test report showing the evidence of successful type test of the items asked for in this Specification shall be uploaded with the signature of bidder. The full text of the type test report is to be submitted along with the technical proposal.

The control cables shall conform in all respects to highest standards of engineering, design, workmanship in accordance to this specification and the latest revisions of relevant standards, mentioned below.

### 4.2 STANDARDS IEC / ISO Indian Standard Title

Except where modified by this specification, the control cables shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

Sl. No.	Standard Code		Brief Description of the Codes
1	IEC 811	IS-18-10810:1982	Testing cables
2	IEC 502	IS - 1554:1988 (Part 1)	PVC Cables 1100V
3	IEC 227	IS - 5819:1970	Short circuit ratings for PVC cables
4	IEC 228	IS-8130:1984	Conductors for insulated cables
5	IEC 287		Calculation of the continuous current rating of cables.
6	IEC 540	IS - 5831: 1984	Test Methods for insulation and sheaths of electric cables and cords IEC 287
7		IS - 3975: 1979	Mild steel wires, strips and tapes for armouring of cables

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The Bidder may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. Acceptability of any alternative standard is at the discretion of the TPCODL. The Bidder shall furnish a copy of the alternative standard proposed along with technical proposal. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard.

In the case of conflict, the order of precedence shall be

- a. Indian Standards
- b. IEC

This list is not to be considered exhaustive and reference to a standard or recommendation in this Specification does not relieve the Bidder of the necessity of providing the goods complying with other relevant standards or recommendations.

#### 4.3 Technical Details

4.3.1 1.1 kV POLYVINYL CHLORIDE (PVC) INSULATED CABLES All control cables to be used shall be armored PVC type. The outer sheath of control cable shall be Polyvinyl chloride (PVC) type ST-2 of IS 5831.

4.3.2 Rated Voltage and Temperature Control and Panel Wiring Cables (PVC Insulated)

The conductor shall be of round stranded plain copper wires complying with IS - 8130:1984/ IEC 228.

N.B. - Conductor screening not required in this case.

#### 4.3.3 Insulation

The insulation shall be of Polyvinyl Chloride (PVC) compound. 'Heat Resisting' Type C for the Control and Panel Wiring cables. Both shall conform to the requirements of IS - 5831: 1984.

Type of Insulation	Normal Continuous Operation	Short Circuit Operation
General Purpose	70 <sup>o</sup> C	160 <sup>o</sup> C
Heat Resisting	85 <sup>o</sup> C	160 <sup>o</sup> C

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The PVC insulation shall be applied by extrusion and the average thickness of insulation as specified in IS – 1554 (part 1): 1988.

The insulation shall be applied so that it fits closely on to the conductor and it shall be possible to remove it without damage to the conductor.

Insulation Screening not required.

Core Identification and Laying up of Cores.

In multi-core cables, the cores shall be laid up together with a suitable lay as recommended in IS - 1554 (Part 1): 1988. The layers shall have successive right- and left-hand lays with the outermost layer having a right hand lay.

#### 4.3.4 Inner Sheath

The laid-up cables shall be covered with an inner sheath made of thermoplastic material (PVC) applied by extrusion. The thickness of the sheath shall conform to IEC 502/IS - 1554: 1988. Single core cables shall have no inner sheath.

The outer serving shall incorporate an effective anti-termite barrier and shall be capable of withstanding a 10 kV DC test voltage for five minutes after installation and annually thereafter.

Current ratings shall be calculated in accordance with IEC 287 "Calculation of the continuous current rating of cables with 100% load factor".

#### 4.3.5 Conductor Sizes

The following shall be used for Control and Panel Wiring:

The no. of Cores & Sizes of the Control Cable with flexible Copper Wires shall be 4 Core, 7 Core, 10 Core, 12 Core and 19 Core, 24 Core etc. There shall be one single core copper cable of 16 sq. mm size for earth wire. All panel wiring shall be done by 0.5 mm<sup>2</sup> for digital inputs, 1.5 mm<sup>2</sup> digital outputs, 1.0 mm<sup>2</sup> for Analog Inputs, 2.5 mm<sup>2</sup> for CT, 4 mm<sup>2</sup> for PT, CVT, AC & DC Supply connection.

4P X 0.36 mm<sup>2</sup> armoured, pair shielded, Overall shielded multistrand serial communication cable for Multi-Function Meters and Other Condition monitoring devices.

Bidder shall consider the cable size, number of conductors as per the site requirement and as mentioned in the indicative BOM.

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#### 4.3.6 Cable Drum Length

The cable shall be supplied in 500 meter lengths or more but with prior approval for the owner.

#### 4.3.7 Cable Identification

The manufacturer's and Owner's name or trade mark, the voltage grade, cable designation and year of manufacture shall be indented or embossed along the whole length of the cable. The indentation or embossing shall only do on the outer sheath. The alphanumerical character size shall be not less than 20% of the circumference of the cable and be legible.

#### 4.3.8 Sampling of Cables

##### 4.3.8.1 Lot

In any consignment the cables of the same size manufactured under essentially similar conditions of production shall be grouped together to constitute a lot.

##### 4.3.8.2 Scale of Sampling

Samples shall be taken and tested from each lot to ascertain the conformity of the lot to specification.

##### 4.3.8.3 Sampling Rates

The number of samples to be selected shall be as follows:

Number of Drums to be taken as samples	Number of Drums to be taken as samples
Up to 25	3
26 to 50	5
51 to 100	8
101 to 300	13
301 and above	20

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The samples shall be taken at random. In order to achieve random selection, the procedure for selection detailed in IS - 4905: 1968 shall be followed.

#### 4.3.9 Number of Tests and Criterion for Conformity

Suitable lengths of test samples shall be taken from each of the selected drums. These samples shall be subjected to each of the acceptance tests. A test sample shall be classed as defective if it fails any of the acceptance tests. If the number of defective samples is less than or equal to the corresponding number given in the lot shall be declared as conforming to the requirements of acceptance test.

#### 4.3.10 TESTS ON 1.1 KV PVC INSULATED Armored Control Cable

##### 4.3.10.1 Type Tests

Certification of type tests already completed by independent test laboratories shall be presented with the bid for each cable type. These tests shall be carried out in accordance with the requirements of IS -8130: 1984/IEC 502, IS - 5831:1984/IEC 540 and IEC 811 unless otherwise specified. Type testing of 1.1 kV cables shall include the following:

Test Requirement Reference Test Method as a Part of IS-10810/IEC 811

- |   |                        |
|---|------------------------|
| (a) Tests on conductor Annealing test (copper)                          | IS-8130: 1984/IEC 502  |
| (b) Resistance test   | IS-8130: 1984/IEC 502  |
| (c) Tests for thickness of insulation and sheath                        | IS-5831:1984/IEC 540   |
| (d) Physical tests of Insulation Tensile strength & elongation at break | IS-5831:1984/IEC 540   |
| Ageing in air oven  | IS-5831:1984/IEC 540   |
| Hot test  | IS-5831:1984/IEC 540   |
| Shrinkage test  | IS-5831:1984/IEC 540   |
| Water absorption (Gravimetric)  | IS-5831:1984/IEC 540   |
| (e) Physical tests for outer sheath                                     |                        |
| (f) Tensile strength and elongation at break                            | IS-5831: 1984/IEC 540  |
| (g) Ageing in air oven  | IS-5 831: 1984/IEC 540 |
| (h) Shrinkage test  | IS-5831: 1984/IEC 540  |

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(i) Hot deformation	IS-5831: 1984/IEC 540
(j) Loss of mass in air oven	IS-5831: 1984/IEC540
(k) Heat shock	IS-5831: 1984/IEC540
(l) Thermal stability	IS-5831: 1984/IEC540
	IS-5831: 1984
(m) Insulation resistance test	IS-8130:1984/IEC502
(n) Volume resistivity	As per IS / IEC
(o) High voltage test	As per IS / IEC
(p) Flammability test	As per IS / IEC

**4.4 Acceptance Tests**

The following shall constitute acceptance tests:

- Tensile test (Aluminum)
- Annealing test (copper)
- Wrapping test
- Conductor resistance test
- Test for thickness of insulation and sheath
- Hot set test for insulation\*
- Tensile strength and elongation at break test for insulation and outer sheath High voltage test
- Insulation resistance (volume resistivity) test
- PVC insulation only

\*\* Test to be completed on full drum of cable

**4.5 Routine Tests**

Routine tests shall be carried out on all the cable on a particular order. These tests shall be carried out in accordance with the requirements of IS - 8130: 1984/IEC 502 and IS - 5831:1984/IEC 540 unless otherwise specified.

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The following shall constitute routine tests.

- a. Conductor resistance test
- b. High voltage test
- c. Test to be completed on full drum of cable

#### 4.6 DETAILS OF TESTS

##### 4.7 General

Unless otherwise stated, the tests shall be carried out in accordance with the appropriate part of IS -10810/IEC 502: 1994 and the additional requirements as detailed in this specification.

##### 4.8 Bending Test

The diameter of the test cylinder shall be  $20 (d + D) \pm 5\%$  for single core cables and  $15 (d + D) \pm 5\%$  for multicores, where D is the overall diameter of the completed cable in millimeters and d is the diameter of the conductor.

After completing the bending operations, the test samples shall be subjected to partial discharge measurements in accordance with the requirements of this specification.

##### 4.9 Dielectric Power Factor Test

Tan  $\delta$  as a Function of Voltage

For cables of rated voltage 1.1 kV and above the measured value of tan  $\delta$  at up shall not exceed 0.004 and the increment of tan  $\delta$  between 0.5 up and 2 up shall not be more than 0.002.

##### 4.10 High Voltage Test

###### 4.10.1 For Type/ Acceptance Test

The cable shall withstand, without breakdown, at ambient temperature, an ac voltage equal to  $3U_0$ , when applied to the sample between the conductor and screen/ armour (and between conductors in the case of unscreened cable). The voltage shall be gradually increased to the specified value and maintained for a period of 4 hours. If while testing, interruption occurs during the 4 hour period the test shall be prolonged by the same extent. If the interruption period exceeds 30 minutes the test shall be repeated.



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#### 4.10.2 Routine Test

For Routine Test Single core screened cables, shall withstand, without any failure, the test voltages given in this specification for a period of five minutes between the conductor and metallic screen.

Single core unscreened cables shall be immersed in water at room temperature for one hour and the test voltage then applied for 5 minutes between the conductor and water.

Multicore cables with individually screened cores, the test voltage shall be applied for 5 minutes between each conductor and the metallic screen or covering.

Multicore cables without individually screened cores, the test voltage shall be applied for 5 minutes in succession between each insulated conductor and all the other conductors and metallic coverings, if any. When a DC voltage is used, the applied voltage shall be 2.4 times the power frequency test voltage.

In all instances no breakdown of the insulation shall occur.

#### 4.10.3 Flammability Test

The period for which the cable shall burn after the removal of the flame shall not exceed 60 seconds and the unaffected portion (uncharged) from the lower edge of the top clamp shall be at least 50mm.

#### 4.11 Control / LV Wiring Accessories

##### 4.11.1 Terminations

Control wire terminations shall be made with solder less crimping type and tinned copper lugs which firmly grip the conductor. Insulated sleeves shall be provided at all the wire termination. Engraved core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire and shall not fall off when the wire is disconnected from terminal blocks. All wires directly connected to trip circuit breaker or device shall be distinguished by the addition of red coloured unlettered ferrule. Numbers 6 and 9 shall not be included for ferrules purposes except where underlined and identified as 6 and 9.

Control cable terminals shall be provided with adequate size crimp type lugs. The lugs shall be applied with the correct tool, which shall be regularly checked for correct calibration. Bi-

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metallic joints between the terminals and lugs shall be provided where necessary Terminals shall be marked with the phase colour in a clear and permanent manner. A removable gland plate shall be provided by the contractor at every cable entry to mechanism boxes, cabinets and kiosks. The Contractor shall be responsible for drilling the cable gland plate to the required size.

#### 4.12 **General Particulars and Guarantees**

##### 4.12.1 **Compliance with Specification**

The control cables shall comply in all respects with the requirements of this specification. However, any departure from the provisions of the specification shall be disclosed at the time of bidding in the Deviation Schedule in this document.

##### 4.13 **Compliance with Regulations**

All the equipment shall comply in all respects with the Indian Regulations and Acts in force.

The equipment and connections shall be designed and arranged to minimize the risk of fire and any damage which might be caused in the event of fire.

##### 4.14 **Non-Conforming Product**

The Project Manager shall retain responsibility for decisions regarding acceptance, modification or rejection of non-conforming items.

##### 4.15 **Inspection and Testing**

The equipment shall successfully pass all the type tests, acceptance tests and routine tests referred to in the section on Tests and those listed in the most recent edition of the standards given in this specification.

TPCODL the right to reject an item of equipment if the test results do not comply with the values specified or with the data given in the technical data schedule.

Type tests shall be carried out at an independent testing laboratory or be witnessed by a representative of such laboratory or some other representative acceptable to the Project Manager. Routine and acceptance tests shall be carried out by the Bidder at no extra charge at the manufacturer's works.

Type Test certificates shall be submitted with the bid for evaluation. The requirement for additional type tests will be at the discretion of the TPCODL.

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All costs in connection with the testing, including any necessary re-testing, shall be borne by the Bidder, who shall provide the TPCODL with all the test facilities which the latter may require, free of charge.

#### 4.16 **Guarantee**

The Bidder shall guarantee the following:

- a. Quality and strength of materials used;
- b. Satisfactory operation during the guarantee period of one year from the date of commissioning, or 18 months from the date of acceptance of the equipment by the Project Manager following delivery, whichever is the earlier.
- c. Performance figures as supplied by the Bidder in the schedule of guaranteed particulars.

#### 4.17 **Packing and Shipping**

##### 4.17.1 **Packing**

The cable shall be wound on strong drums or reels capable of withstanding all normal transportation and handling. Each length of cable shall be durably sealed before shipment to prevent ingress of moisture. The drums, reels or coils shall be lagged or covered with suitable material to provide physical protection for the cable during transit and during storage and handling operations. In the case of steel drums adequate precautions shall be taken to prevent damage being caused by direct contact between the cable sheath and the steel. These precautions shall be subject to the approval of the Project Manager.

If wooden drums are used, then the wood shall be treated to prevent deterioration from attack by termites and fungi.

Each drum or reel shall carry or be marked with the following information:

- a. Individual serial number
- b. Owner's name
- c. Destination
- d. Contract Number
- e. Manufacturer's Name
- f. Year of Manufacture

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- g. Cable Size and Type
- h. Length of Conductor (meters)
- i. Net and Gross Mass of Conductor (kg)
- j. All necessary slinging and stacking instructions.
- k. Destination:
  - i. Contractor's name:
  - ii. Name and address of Contractor's agent in Orissa:
  - iii. Country of origin:

The direction of rolling as indicated by an arrow shall be marked on a flange.

**4.17.2 Storage**

The site selected for the storage of cable drums shall be well drained and preferably have a concrete/firm surface which will prevent the drums sinking into the ground or being subjected to excess water thus causing flange rot.

All drums shall be stood on battens, in the upright position, and in such a manner to allow enough space between them for adequate air circulation. During storage the drums shall be rotated 90° every three months. In no instances shall the drums be stored "flat" on their flanges or one on top of each other.

**4.18 Hazardous substances**

The Bidder shall submit safety data sheets in a form to be agreed for all hazardous substances used with the equipment. The Bidder shall give an assurance that there are no other substances classified as hazardous in the equipment supplied. The Bidder shall accept responsibility for the disposal of such hazardous substances, should any be found. The Bidder shall be responsible for any injuries resulting from hazardous substances due to noncompliance with these requirements.

**4.19 Spare Parts and Special Tools**

The Bidder shall provide prices for spare conductor, joints and termination equipment. The TPCODL may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works.

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A spare parts catalogue with price list shall be provided for the various cables, joints and termination equipment and this shall form part of the drawings and literature to be supplied. Any spare apparatus, parts or tools shall be subject to the same specification, tests and conditions as similar material supplied under the Contract.

They shall be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the equipment and must be suitably marked and numbered for identification. Spare parts shall be delivered suitably packed and treated for long periods in storage. Each pack shall be clearly and indelibly marked with its contents, including a designation number corresponding to the spare parts list in the installation and maintenance instructions.

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## **Chapter # 5**

# **Earthing and Earth Pit**

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## 5.0 Earthing and Earth Pit

5.1 Earthing of Panels, Equipment, Control cables etc.

5.2 All panels shall be equipped with an earth bus securely fixed. Location of earth bus shall ensure no radiation interference from earth systems under various switching conditions of isolators and breakers.

The material and the sizes of the bus bar shall be at least 25 X 6 sq.mm copper with threaded holes at a gap of 50 mm with provision of bolts and nuts for connection with cable armours and mounted equipment etc. for effective earthing.

When several panels are mounted adjoining each other, the earth bus shall be made continuous and necessary connectors and clamps for this purpose shall be included in the scope of supply of Contractor. Provision shall be made for extending the earth bus bars to future adjoining panels on either side.

5.3 Provision shall be made on each bus bar of the end panels for connecting Substation earthing pit done by the bidder. Necessary terminal clamps and connectors for this purpose shall be included in the scope of supply of Bidder.

5.4 All metallic cases of relays, instruments and other panel mounted equipment including gland plate, shall be connected to the earth bus by copper wires of size not less than 2.5sq. mm.

5.5 Looping of earth connections which would result in loss of earth connection to other devices when the loop is broken, shall not be permitted. However, looping of earth connections between equipment to provide alternative paths to earth bus shall be provided.

5.6 An electrostatic discharge arrangement shall be provided in each panel so as to discharge human body before he handles the equipment inside the panels.

The metal sheath and Armour should be efficiently bonded and earthed at all terminals to earth electrodes provided.

The cross-sectional area of the bond shall be such that the resistance of each bond connection shall not exceed the combined resistance of an equal length of the metal sheath and Armour of the cable.

Earthing connections shall be carried out with green wire and the earthing studs shall be identified as such by an earthing symbol.

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### 5.7 Earth Pit

Construction of unit earth pit:

- a. A hole of 100mm to 125mm dia shall be augured /dug to a depth of about 2.8 meters.
- b. The earth electrode shall be placed into this hole.
- c. It will be penetrated the soil by gently driving on the top of the rod. Here natural soil is assumed to be available at the bottom of the electrode so that min. 150 mm of the electrode shall be inserted in the natural soil.
- d. Earth enhancement material (minimum approx. 30-35 kg) shall be filled into the augured/dug hole in slurry form and allowed to set. After the material gets set, the diameter of the composite structure (earth electrode + earth enhancement material) shall be of minimum 100mm dia covering entire length of the hole.
- e. Remaining portion of the hole shall be covered by backfill soil, which is taken out during auguring /digging.
- f. A copper strip of 300mmX25mmX6mm shall be exothermically welded to main earth electrode for taking the connection to the main equi-potential earth busbar in the equipment room and to other earth pits, if any.
- g. Exothermic weld material shall be tested as per provisions of IEEE 837 by NABL/ILAC member labs.
- h. The main earth pit shall be located as near to the main equi-potential earth busbar in the equipment room as possible.

### 5.8 Earth Enhancement material

Earth enhancement material is a superior conductive material that improves earthing effectiveness, especially in areas of poor conductivity (rocky ground, areas of moisture variation, sandy soils etc.). It improves conductivity of the earth electrode and ground contact area. It shall be tested and confirm to the requirements of IEC 62561-7 having following characteristics:

- a. shall have high conductivity, improves earth's absorbing power and humidity retention capability.



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- b. shall be non-corrosive in nature having low water solubility but highly hygroscopic.
- c. shall have resistivity of less than 0.12 ohms -meter.
- d. shall be suitable for installation in dry form or in a slurry form.
- e. shall not depend on the continuous presence of water to maintain its conductivity.
- f. shall be permanent & maintenance free and in its “set form”, maintains constant earth resistance with time.
- g. shall be thermally stable between -100 C to +600 C ambient temperatures.
- h. shall not dissolve, decompose or leach out with time.
- i. shall not require periodic charging treatment nor replacement and maintenance.
- j. shall be suitable for soils of different resistivity.
- k. shall not pollute the soil or local water table and meets environmentally friendly requirements for landfill.
- l. shall not be explosive.

#### 5.9 **Earth Electrode**

The earth electrode shall be made of high tensile low carbon steel circular rods, molecularly bonded with copper on outer surface to meet the requirements of Underwriters Laboratories (UL) 467-2007 or latest or IEC 62561. Such copper bonded steel cored rod is preferred due to its overall combination of strength, corrosion resistance, low resistance path to earth and cost effectiveness.

The earth electrode shall be of minimum 17.0 mm diameter and minimum 3.0 mtrs. long.

Earth electrode can be visually inspected, checked for dimensions and thickness of copper coating using micron gauge. The supplier shall arrange for such inspection at the time of supply, if so desired.

**End of Section - B**

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## SECTION – C

## SCHEDULES



**TP CENTRAL ODISHA DISTRIBUTION LIMITED**  
**(A Tata Power & Odisha Govt. Joint Venture)**  
**2nd Floor, IDCO Tower, Janpath, Bhubaneswar, Odisha 751022**

Revision	Date	Description	Approvals		
			Prepared By	Checked By	Approved By
R0	10 <sup>th</sup> July 2021	Released for Procurement	Automation Team	TKB/GSB	AKA

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# **Section – C**

## **SCHEDULES**

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**C1 - SCHEDULE OF QUANTITIES AND PRICES**

**SUPPLY:**

Sr. No.	Description	Qty. Set / Nos.	Unit Price (Rs.)	Item Price (Rs.)

**SERVICES:**

Seal of the Company

Signature

Designation

**Note:** Please Refer Indicative Bill of Material for Schedule of Quantities and Prices attached in Excel Format with this Specification. However, bidder shall derive the detailed BOM

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based on the proposed solution in the same Excel format and submit along with the proposal.

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**C2- PROJECT TIME SCHEDULE**

Seal of the Company

Signature

Designation

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**Note:** The bidder shall indicate schedule of milestones and attach/furnish a detailed bar chart identifying Purchaser's inputs.



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**C3- SCHEDULE OF DRAWINGS & DOCUMENT SUBMISSION**

As part of the proposal, the BIDDER shall furnish the schedule of Drawing/Document submission

Sr. No.	Title of Drawing/Document	Target Date of submission	For Information/Review/Approval	Remarks
1.0				
1.1				
1.2				
2.0				
2.1				
2.2				
3.0				
3.1				
3.2				
4.0				
4.1				
4.2				
5.0				
5.1				
5.2				

Seal of the Company

Signature

Designation

**Note:** The bidder shall list out all relevant Drawings / Documents as mentioned in Section-D.



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**C5 - SCHEDULE OF SPECIAL ERECTION/MAINTENANCE TOOLS & TACKLES**

As part of the proposal, the BIDDER shall indicate below, the list of erection/maintenance tools & tackles offered by him.

Sr. No.	Description of Spare	Quantity recommended per unit of equipment	Unit Price	Total Price	Delivery period from Date of LOI	Remarks

Seal of the Company

Signature

Designation

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**C6 - SCHEDULE OF PLACES OF MANUFACTURE, TESTS & INSPECTION**

For major equipment / systems, the Bidder shall indicate the name of the Manufacturer / Subcontractor and place of test and inspection.

Item of Equipment	Manufacturer / Subcontractor	Place of Testing & Inspection

Seal of the Company

Signature

Designation

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**C7- SCHEDULE OF RECOMMENDED SPARES**

As part of the proposal, the BIDDER shall indicate below the list of recommended spares for Ten Years (10 Years) of trouble free operation of the equipment/system offered by him.

Sr. No.	Equipment Tag no.	Description of Spare	Material of Construction	Part No.	HSN Code	Quantity recommended per unit of equipment	Unit Price	Total Price	Delivery period from date of LOI	Remarks

Seal of the Company

Signature

Designation

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**C8 – Manufacturer’s Authorization**

**(To be obtained from all OEMs)**

Date: \_\_\_\_\_

Bid Reference No.: \_\_\_\_\_

To: \_\_\_\_\_

WHEREAS \_\_\_\_\_ who are official manufacturers of \_\_\_\_\_ having factories at \_\_\_\_\_ do hereby authorize \_\_\_\_\_ to submit a Bid in relation to the invitation for Bids indicated above, the purpose of which is to provide the following Goods, manufactured by us \_\_\_\_\_ and to subsequently negotiate and sign the Contract.

We hereby extend our full Guarantee and Warranty in accordance with relevant Clauses mentioned in the Bid document (**GCC, Section-A** of Technical Specification), with respect to the Goods offered by the above firm in reply to this invitation for Bids.

Name: \_\_\_\_\_

In the Capacity of: \_\_\_\_\_

Signed: \_\_\_\_\_

Duly Authorized to sign the Authorization for and behalf of \_\_\_\_\_

Date: \_\_\_\_\_

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**Note:** The bidder shall submit duly filled Manufacturer's Authorization letter from the respective OEMs for the Supply and Services rendered to meet the required functionalities mentioned in the RFP.

**C9 – Undertaking for Presence in India**

I hereby declare that <Name of the Bidder>, has Design/Engineering/Testing/Support and Service facility in India as on \_\_\_\_\_ (i.e., release date of Bid).

The address of the facilities is provided hereunder

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Signature of Authorized Signatory :  
 Full Name :  
 Address :  
 Phone Number :  
 Email Id :



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**Note:** Necessary proof of incorporation/registration shall be submitted along with the Bid.

**End of Section-C**

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**Document Title: RTU based Automation for Conventional Substations**

**Document No: A&T/2021/SPEC-02/CS-SAS-RTU**

## SECTION – D

## DRAWINGs & DOCUMENTs



**TP CENTRAL ODISHA DISTRIBUTION LIMITED**  
**(A Tata Power & Odisha Govt. Joint Venture)**  
**2nd Floor, IDCO Tower, Janpath, Bhubaneswar, Odisha 751022**

Revision	Date	Description	Approvals		
			Prepared By	Checked By	Approved By
R0	10 <sup>th</sup> July 2021	Released for Procurement	Automation Team	TKB/GSB	AKA

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# **Section – D**

## **Drawings & Documents**

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**1.0 Tender Purpose**

**1.1 Mandatory documents required along with the Bid**

1.1.1 Duly signed copy of TENDER as an acceptance to all terms and conditions as mentioned in this tender.

**1.1.2 Bidder and Sub-Vendors - Company Statistics**

Details	Bidder Response
Bidder’s Name	
Address	
Contact (s), Title (s), Telephone (s), E-mail id (s)	
Name of the Chairman/ MD/ CEO/ Partners	
Nature of Ownership	
Date of Incorporation of Company/Entity	
Headquarter Location	
Other Office Locations, Functions and Personnel Strength	
1) Number of Employees by Function 2) Implementation 3) Sales 4) Support 5) Quality Assurance 6) Administrative 7) Management	
Size of Team for the Proposed Solution	
Location of Support Centers for Proposed Solution	
Other Businesses	

**Table # 1: Bidder & Sub-Vendors – Company Statistics**

Similarly, Bidder to submit the above details of all sub-vendors.

1.1.3 Bidder should depict complete understanding of the as-is system of the Utility based on the information provided in the Bid Document. It should also require listing down all the deliverables that has been planned as a part of the overall project with timelines.

1.1.4 Submission of documents as mentioned in Pre-Qualification Requirement

1.1.5 Technical Literature / GTP / Type Test Reports etc.

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- 1.1.6 Details of all databases proposed and its relationship with application. Data flow diagram with entity relationship shall be submitted for all applications. Bidder shall clearly mention the list of application which are required to build data models manually.
- 1.1.7 GTP to be furnished about computing, network and integration interface infrastructure.
- 1.1.8 Submit details of methodology followed by the bidder and its sub-vendors in successfully implementing similar projects.
- 1.1.9 Schedule of Deviations if any from specification strictly following the prescribed format.
- 1.1.10 Commercial specification details as per attached sheet.
- 1.1.11 Proper authorization letter to sign the tender on behalf of bidder shall accompany the bid.
- 1.1.12 Compliance to the approved vendor list.
- 1.1.13 List of major relevant experiences of the Principal, Bidder, Sub-Vendors and the Product respectively.
- 1.1.14 Technical support facilities including qualified man-power, testing tools & instruments and integration facilities available within India.
- 1.1.15 Technical data sheet of all equipment including Sub-vendors systems, product brochure, white papers and case studies.
- 1.1.16 System Architecture drawings.
- 1.1.17 Detailed Bill of Material, covering all aspects of proposed System Architecture and functionality required by Purchaser as per the RFP.
- 1.1.18 Compliance to data sheets covered in the specification. ***(Refer Annexure E2 - Technical Requirement SAS System for Conventional Sub-stations)***
- 1.1.19 Product life cycle document of all equipment of Bidder's own and of Sub-Vendors.
- 1.1.20 Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP).
- 1.1.21 Testing facilities in India
- 1.1.22 Confirmation on lifetime, spares, manufacturing, onsite & Offsite technical support of the supplied equipment for the period of 10 years.

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### 1.1.23 Project Team Structure

Furnish the detail of the team that would be deployed by bidder to execute the project. Please provide details of the team structure in the following format:

Name of Staff	Position Assigned	International or Domestic	Firm	Employment status with the firm (Full time/ Associate)	Education (Degree, Year, Institution)	Area of Expertise and no. of years of relevant experience	Task Assigned
A. Professional Staff							
B. Support Staff							

**Table # 2: Proposed Project Team Structure**

Similarly, bidder shall arrange the team details of the Sub-vendors, that would be deployed to execute the project

### 1.1.24 Team details (CVs)

Use the following format for key personnel who would be involved in the project. Please include details of team members proposed to implement the project, install or manage hardware, install and manage Substation Automation System, LAN/WAN etc., please ensure that the CV covers all the required field and details.

1.	Proposed Position			
2.	Name of Firm and Role			
3.	Name of Staff			
4.	Date of Birth		Nationality	
5.	Education			
	Year	Degree/Examination	Institute/Board	
6.	Membership of Professional Associations			
7.	Other Training			
8.	Countries of Work Experience			
9.	Languages			
	Language	Speaking	Reading	Writing
10.	Employment Record			
	From	To	Employer	Positions Held

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11.	Detailed Tasks Assigned	12.	Work Undertaken that best illustrates capability to handle the tasks assigned:	
13.	Certification			
	I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any willful misstatement described herein may lead to my disqualification or dismissal, if engaged.			
	Signature of authorized representative of the staff		Date:	
	Full name of authorized representative:			

Table # 3: Format for CV Submission

Similarly, Bidder to submit the key personnel details of the Sub-Vendors, who would be involved in the project. Please include details of team members proposed to implement the project, install or manage hardware, install and manage Substation Automation System, LAN/WAN etc.

## 2.0 After Award of Contract

Documentation shall be provided by the bidder for all equipment and functions offered as part of this procurement including Sub-vendors equipment/systems and functions. All documentation shall be in English. The documentation shall cover all systems required by Purchaser, including all its hardware, software, and interfaces and shall cover functionality, testing, installation, system startup, operations, and maintenance.

### 2.1 General Requirement

- a. The Bidder shall furnish the following drawings/documents during detailed engineering as per schedule (**Refer Section-A, Item 9.0**) from date of PO Placement Bidder to submit all datasheets, detailed GTP of the proposed BOM items during detailed engineering for the approval and finalization by Purchaser.
- b. System Architecture Drawing and design documentation. This drawing should show in detail of the following:
  - i. Network connections
  - ii. Protocol used
  - iii. Type of interconnecting cable



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- iv. All equipment, systems, RTU, network switches etc. which are part of the complete proposed solution.
- c. Panel GA and Complete wiring diagram
- d. Functional Design Specification document
- e. Step by Step test procedures for Factory Acceptance Test (FAT) and Site Acceptance Test (SAT)
- f. SCADA I/O List with protocol details along with addresses
- g. Interconnection Schedule (ICS) for Automation, detailed drawing indicating interconnections between various components.
- h. Hardware, Software and Application manuals for all the equipment supplied including that of Third parties.
- i. All Software Licenses (both own & third party), key for Hardware Locks
- j. All interoperability tables
- k. Software matrix indicating the details regarding versions, current license, expandability, tags/license limitations (if any) etc. along with the offer.
- l. Guaranteed technical parameters & Guaranteed availability and reliability
- m. Calculation for power supply dimensioning
- n. Bill of Material listing equipment designation, make, type ratings, etc. of all the equipment's supplied
- o. Logic Diagram (Hardware & Software)
- p. Submit the details of all databases proposed and its relationship with application. Data flow diagram with entity relationship shall be submitted for key applications. The detail shall clearly mention the list of application which are required to build data models manually.
- q. Operator's Manual
- r. Complete documentation of implemented protocols between various elements
- s. IP addressing chart for all the systems, RTU, network switches and other components / equipment which are connected to the network

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- t. Other network diagram with all details pertaining to IP address and interfaces used to be provided as a controlled and restricted copy.
- u. Password management policy document to be provided with mechanism for storage and changing of password at specified interval clearly defined.
- v. Credentials created for all OEM systems for support to be provided as consolidated document stating clearly the SLA timelines agreed with each of the OEM.
- w. SLA signed document for system support and restoration in case of breakdown to be clearly document and provided as submission document.
- x. Bidder to provide recommendation on proposed network bandwidth required for smooth operation of the system in non-blocking mode. Diagnostic and performance evaluation software and hardware tools
- y. All tools and documents necessary to develop and maintain software such as complier, CASE tool-kits and version control software shall be delivered along with RTU Software.
- z. Details of software (Operating systems, application software, engineering tools, communication systems management software, license details, I/O distribution protocol-wise etc.) for all offered systems (including RTU and configuration laptop computers etc.) and loadable in CD/DVD ROM.
- aa. Final as built drawings of all automation and communication system as final documents in AutoCAD & PDF format
- bb. Other documents as may be required / applicable during detailed engineering
- cc. All drawings and data shall be annotated in English.
- dd. Bidder shall furnish Four (4) hardcopies and 3 soft copies on reliable media of all drawings, manuals (Administration, Operation & Maintenance, Configuration, Troubleshooting and Installation), Technical catalogues, Test Certificates and Acceptance Test Reports.
- ee. Two copies of the internal test report, FAT and SAT documents with test protocol formats shall be submitted for approval at least four (4) weeks before Factory Acceptance Test. Two copies of SAT protocol shall be submitted for approval at least four (4) weeks before Site Acceptance Test.

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- ff. Bidder shall also furnish Original plus one copy of all System Software (OS, Application and tools) along with delivery. Bidder shall submit two copies of all the configuration, application, display, database backup of all equipment on reliable secondary media.

**2.2 Definitions**

For the purposes of this project, the following definitions shall be used:

- a. **Documents or Documentation** – Textural and graphical information describing the offered equipment, systems, and other items peripheral for Substation Automation System, whether embodied in hardcopy or electronic form such as common word processor files. Documents may also be referred to as manuals, guides, books, drawings, transmittals, and specifications. Documents are further divided into standard, OEM, and custom documents.
- b. **Standard documents** – Documents produced by the Bidder and used prior to the award of this contract that are applicable to all users of the equipment and software, including Purchaser. It is expected that the Bidder will use a formal revision control scheme to maintain its standard documents. Documents not maintained under such a scheme shall be considered custom documents.
- c. **OEM documents** – OEM (Original Equipment Manufacturer) documents are those standard documents produced by Vendor, Sub-vendors. Documents produced by Vendor, Sub-vendors for customized elements of the System shall be deemed custom documents.
- d. **Custom documents** – All documents not categorized as standard or OEM documents including the Bidder’s standard documents that are modified to meet Purchaser’s specific requirements.
- e. **Project Documents** – Project documents are those documents produced for the conduct of the project, but which do not directly describe the Sub-Station Automation System. Examples of project documents include meeting minutes, action item lists, test plans and procedures, and transmittal and document lists.

**2.3 Project Planning Documentation**

**2.3.1 Documentation Plan**

Bidder to note that after the order acceptance, the project kick off meeting will be arranged by the Purchaser, in which MDL will also be finalized, Bidder shall furnish the schedule for submission of documents for the documents mentioned in the MDL and accordingly arrange submit the documents for Purchaser’s Review and Approval.

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It is expected that certain major documents, such as the detailed hardware and software design documentation, will consist of a series of submittals made over a period. The documentation plan shall address this by including a detailed list of all individual documentation submittals for the project.

Documents shall be submitted in a sequence as per the MDL, that allows Purchaser to have all the information necessary for reviewing or approving a document at the time of its submittal. The documentation plan shall be subject to Purchaser approval.

### 2.3.2 **Project Progress Reports**

A project progress report shall be prepared by the Bidder and sent to Purchaser every two weeks through the start of the warranty period. The report shall be submitted to Purchaser's Project Manager no later than the 10th calendar day of each month. The report shall cover the project from the start of the contract through the last working day of the month.

The progress report shall include a general assessment of the progress on the project. This assessment shall reference the latest implementation schedule, which shall be included in the report. The schedule shall show the baseline and the current schedule, progress on individual tasks, and the forecasted completion dates for upcoming tasks and the entire project. Updated training and documentation plans shall be included.

The report shall include an explanation of existing and forecast schedule variances, the cause or source of the variance, alternatives considered, solutions adopted or recommended, and the outcome achieved or anticipated. In particular, the report shall note the needed delivery date of Purchaser furnished information. The Bidder shall be responsible for any schedule delays due to insufficient notification to Purchaser of the need for such information.

The report shall identify unresolved contract issues. This shall include a description of the item and the current due date, the consequences of any delay in resolution, and any recommendations pertinent to the decision process. The report shall also include the following items:

- a. A list of action items, including the following information:
  - i. Action item number
  - ii. Date the item was opened
  - iii. References to the originating transmittal and any reference documents
  - iv. Action item status (Open, Closed)

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- v. Resolution due Date
- vi. Responsible Organization or Person
- vii. A description of the action required
- viii. The date of action completion (when each item is closed)
- ix. References to transmittals or other documents recording the resolution.
- b. Correspondence logs, one for transmittals to Purchaser from the Bidder and one for transmittals to the Bidder from Purchaser. Each log shall have the following information for each transmittal:
  - i. The transmittal numbers
  - ii. The date of transmission (not the date written)
  - iii. The date received
  - iv. The subject of the transmittal
  - v. Identification of any action items addressed by the transmittal
  - vi. A list of any documents attached to the transmittal.

### 2.3.3 **Project Meetings, Agendas, and Minutes**

Project meetings shall be held to review project progress, to ensure correct interpretation of the contract, to review technical and commercial issues, and to maintain co-ordination between Purchaser and Bidder. Meetings shall be scheduled at appropriate times. Purchaser prefer to schedule meeting every month on average. The meetings shall be divided between Purchaser's and Bidder's offices. The Bidder's project manager shall prepare a meeting agenda in time for review by Purchaser before the meeting.

The Bidder shall prepare minutes of each meeting. Both Purchaser and the Bidder shall review and approve the minutes. The approved minutes shall be considered binding agreements, subject to concordance with the contract. Where the approved minutes conflict with the contract, either the minutes shall be revised or a change order to the contract shall be generated. Where the minutes of a meeting conflict with the approved minutes of a previous meeting, the conflict shall be documented in the later minutes and those approved minutes shall have precedence.

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**2.3.4 Project Correspondence**

All requests and transfers of information between the parties shall be made in writing and shall be documented with letters of transmittal. All correspondence from each party shall be dated (with the date of transmittal, not the date of writing) and uniquely numbered. Except for the meeting minutes, each letter or other project correspondence shall be limited to a single topic to simplify correspondence management. Correspondence transmitted via mail shall be considered as binding if a printed copy of the correspondence is delivered within four weeks of the mail transmission.

Correspondence may be exchanged by electronic mail. Such correspondence shall not be considered a substitute for formal correspondence, however. Agreements established through e-mail transmittals must be recorded as formal correspondence before they become binding. A printed copy of e-mail attached to a transmittal cover sheet shall be considered a formal transmittal.

All project management documentation, such as, correspondence, memos, meeting minutes, and monthly progress reports, shall be maintained. A mutually agreeable file numbering scheme shall be developed and used to minimize file storage and retrieval efforts.

**2.3.5 Detailed Implementation Schedule**

The Bidder shall submit for Purchaser’s approval a detailed implementation schedule. This shall describe all the project activities of both the Bidder and Purchaser. As a minimum, this schedule shall include the following:

- a. Kickoff Meeting
- b. Preparation and finalization of MDL document
- c. Hardware procurement, integration, and testing
- d. Delivery dates for Purchaser furnished data, interface equipment, and software
- e. Subsystem integration and testing
- f. Interface testing
- g. Preparation of test plans and procedures
- h. Factory and Site tests
- i. Variance correction and retest

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- j. System disassembly, delivery, and installation
- k. Final system and user documentation
- l. Training
- m. Submittal dates, review cycles, and acceptance dates for the hardware, software, and interface requirements documents.

The training and documentation schedules may be maintained outside the implementation schedule. However, the implementation schedule shall include all the dependencies of tasks contingent on documentation and training tasks.

The Bidder shall use a commercially available project management application (for example, Microsoft Project) to maintain the project schedule. This project management application shall be used to track the progress of the project from start through completion. Schedule monitoring shall be based on a comparison of completed tasks versus scheduled tasks and estimation of the required effort to complete the remaining tasks. The schedule presented to Purchaser shall be that used by the Bidder to manage their internal resources.

#### **2.4 Document Format**

Documents shall be delivered in two phases:

- a. Approval documents, submitted for Purchaser's review and approval
- b. Final documents

Purchaser prefers that documents be delivered in both hard and soft form. Softcopy shall be delivered on magnetic media. Final documents shall be delivered on hardcopy, and on softcopy on Secondary Media. Any user shall be able to access on-line documentation on Engineering Laptop including functional design documents, user guides, maintenance manuals, on-line help, and operating procedures via a simple procedure involving a one-click operation.

Documents shall be supplied in a format that can be edited by Purchaser. Handwritten texts are not acceptable. Purchaser's standard word processing software is Microsoft Office. The Bidder is encouraged to use this software for documents. If the Bidder uses other word processing or document production software, four copies of the software, suitable for installation on a personal computer using the Windows10 operating system or newer versions, shall be provided.

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Drawings and diagrams may be supplied embedded in the document files or may be supplied as separate files. Purchaser's standard drawing software is AutoCAD. If the Bidder uses other drawing software, four copies of the software, suitable for installation on a personal computer using the Windows10 operating system or newer versions, shall be provided.

Documents delivered as hardcopy shall be printed on both sides of A4 size paper and bound in three-ring binders. Divider pages with appropriately labeled tabs shall separate chapters. The spine of each volume shall be labeled with the document title and volume number so it may be easily identified when shelved.

Documents delivered on softcopy media shall be formatted for printing on A4 size paper.

Each document shall include a title or information page showing the document number, title, and revision record. The document number shall be a unique number assigned in accordance with the Bidder's standard practice. The title page shall include a space into which Purchaser may enter a document number assigned from Purchaser's document management system. The revision record shall describe each new version of the document since its original production. The revision record shall include:

- i. The date of the change
- ii. A brief description of the change
- iii. An indication that the change has been reviewed and approved in accordance with the Bidder's quality assurance procedure
- iv. The version or release of the hardware or software to which the document applies.

Each document shall include a table of contents. If a document is divided into several physical volumes, each volume shall contain the complete table of contents of the whole document. Furthermore, each document shall have a cross-reference table, listing all topics of significance covered by the document, and giving the page or section references of all pages or sections with discussions of the topic.

Documents that describe generic or typical Substation Automation elements will not be acceptable to Purchaser unless the specific material applicable to this project can be readily identified and material not applicable to this project can be similarly identified. Custom documents shall not contain any material that is not pertinent to this project.

Where the phrase "on-line documentation" is used in these Specifications, it shall be interpreted to mean the ability to view the document from any workstation. The Bidder shall



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provide all software necessary to provide this capability. For non-OEM documentation (documentation produced by the Bidder), the Bidder shall also provide the capability to edit and annotate the document.

**2.5 Document Review and Approval**

All standard and OEM documents provided pursuant to this contract shall be subject to review by Purchaser. Custom documents provided pursuant to this contract shall be subject to approval by Purchaser.

**2.5.1 Document Review**

Purchaser’s review of documents shall be limited to determining that:

- a. The documents have been produced in accordance with the documentation standards of the Bidder or Sub-vendors
- b. All hardware and software are in full conformance with the contract
- c. The documents clearly and accurately describe the features and options of the hardware and software that pertain to the Substation Automation System and other applications
- d. The documents are written in English, and hard copies are printed legibly, and well bound.

Purchaser will review documents as per the schedule mentioned in the MDL. If Purchaser does not transmit comments on the documents within the review period, the Bidder shall discuss with the Purchaser.

If Purchaser transmits comments on any documents, the Bidder shall respond to the comments within seven working days or as per the MDL after receipt of the comments. If the comments address OEM documents, the Bidder shall act as an advocate of Purchaser to initiate and facilitate resolution of the comments with the Sub-vendor.

**2.5.2 Document Approval**

All custom documents shall be subject to a formal approval process. The review for approval performed by Purchaser will be similar to that for document review process but will more closely examine the functionality and design aspects of the hardware or software. Clarity and completeness of the presentation of the material within the documents will be a key element of the review for approval.

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The approval process shall proceed as follows:

- a. The Bidder shall transmit documents subject to the approval process to Purchaser as per MDL. This MDL time may be adjusted by mutual agreement to accommodate the other activities of Purchaser and the Bidder. Requests by either party to change the time shall be made within two working days of receipt of the documents by Purchaser.
- b. Purchaser shall return comments to the Bidder within the agreed time. The transmittal cover for the comments shall clearly indicate that the document is either:

**Approved** – If approved, the Bidder may proceed with the work covered by the document. No further approval action is required.

**Approved with Comments** – If approved with comments, the Bidder may proceed with the work covered by the document and the comments.

**Not Approved** – If not approved, the Bidder may proceed with the work covered by the document and the comments only at their risk. No schedule or cost relief will be granted for any work undertaken prior to approval of the appropriate documents.

- c. If desired by any party, the comments may be discussed to clarify Purchaser's intent.
- d. The Bidder shall then revise and resubmit the documents within five working days after receipt of the comments from Purchaser. This time may be adjusted by mutual agreement to accommodate the other activities of Purchaser and the Bidder. Requests by either party to change the time shall be made within two working days of receipt of the comments by the Bidder.

All changes made to documents to reflect approval comments shall be clearly highlighted and the revision record shall be updated to reflect the changes. Purchaser prefers the use of the change-tracking feature of the word processor used to produce the documents.

- e. The review and comment process shall be repeated until the document is accepted. After the document is accepted, Bidder shall deliver the required number of final copies free of highlighting due to tracking of changes.

All changes made to documents to reflect approval comments shall be clearly highlighted and the revision record shall be updated to reflect the changes. Purchaser prefers the use of the change-tracking feature of the word processor used to produce the documents.

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### 2.5.3 Scope of Reviews and Approvals

The acceptance or approval of any documents by Purchaser shall not relieve the Bidder of the responsibility to meet all the requirements of the contract or of the responsibility for the correction of the documents. The Bidder shall have no claim for additional costs or extension of time on account of delays due to revisions of the documents that may be necessary for ensuring compliance with the contract.

All deliverable documentation shall be revised by the Bidder to reflect the delivered System. Any modifications to the offered/installed system resulting from the factory and site acceptance tests shall be incorporated in this documentation. All previously submitted documents that have been changed because of engineering changes, contract changes, or errors or omissions shall be resubmitted for review and approval.

### 2.6 Deliverable Documentation

Two soft copy and three hard copies shall be provided for review and approval. Two soft copy and five hard copies shall be provided for all the final documentation for each site.

Document	Delivery Date
Basic hardware documents i. List of deliverables, configuration diagram ii. Network configuration, interconnection lists iii. Site installation drawings and procedures	As per MDL
Equipment manuals	With each hardware delivery
Hardware maintenance manual	With each hardware delivery
Software list of deliverables	As per MDL
Software development standards	As per MDL
Database definition	i. For standard software – As per MDL ii. For other software – with the software functional description
Interface Requirements Document	With the software functional description
Software functional description	As per the project schedule
Installation images and source code	With the System delivery
Detailed design document	As per the project schedule
System maintenance manual	With the System delivery

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**2.7 Document Standards**

The Bidder shall provide a document defining the standards used to create and maintain all documentation supplied by the Bidder. The standards shall define:

- a. The word processing or document production software used to create the documents
- b. Templates for each document type
- c. Definitions of the contents for each document type
- d. Drawing standards to be followed
- e. The approval process to be followed for document releases.

**2.8 Hardware Documentation**

The following documentation shall be provided for all hardware provided pursuant to this contract:

- a. List of deliverable hardware
- b. Equipment configuration diagram
- c. Network configuration diagram
- d. Interconnection list
- e. Site installation drawings and procedures.

The other hardware documentation to be supplied shall be commensurate with the hardware maintenance philosophy to be employed by Purchaser.

Equipment manuals shall be provided for all hardware to be maintained by the Bidder or a third-party maintenance Bidder. Equipment manuals and hardware maintenance manuals shall be provided for all hardware to be maintained by Purchaser.

**2.8.1 List of Deliverable Hardware**

The list shall itemize each hardware item and include equipment configuration information. The configuration information shall be enough so that Purchaser can procure an identical item from the manufacturer. The list shall also include network names and addresses (or these shall be included in the network configuration diagram) and shall include a space for Purchaser to enter equipment identification for their own purpose.

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#### 2.8.2 **Equipment Configuration Diagram**

The equipment configuration diagram shall depict the logical interconnection of all the Bidder- supplied equipment and its connection to Purchaser supplied equipment. The configuration diagram shall use the same terminology as the list of deliverable hardware so that the correspondence between the two can be readily determined.

#### 2.8.3 **Network Configuration Diagram**

This document shall show the design of the local and wide area networks supplied by the Bidder as well as the communications network supplied by Purchaser. Both logical and physical depictions shall be provided for the network supplied by the Bidder. Only a logical depiction is required for the network supplied by Purchaser.

#### 2.8.4 **Interconnection List**

The physical interconnections among the components, other than those shown on the network configuration diagram, shall be depicted. Each cable shall be identified, along with its terminations.

#### 2.8.5 **Site Installation Drawings and Procedures**

The site drawings shall depict the physical arrangement of the components. References to the appropriate equipment manuals are acceptable. The drawings and procedures shall include:

- a. Equipment physical drawings showing dimensions, cabinet internal arrangements, and the size and weight of each enclosure
- b. Unpacking, moving, handling, and other installation details
- c. The location of external connections including types and sizes of connectors
- d. Input power and grounding requirements
- e. Environmental requirements

#### 2.8.6 **Equipment Manuals**

Equipment manuals shall contain the following:

- a. A description of the function of the equipment
- b. Installation, setup, and operating instructions

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- c. A block diagram showing the logical and physical interconnections among the major components
- d. Expansion and upgrade capabilities and instructions
- e. Preventative maintenance instructions
- f. Detailed functional, logical, electrical, and mechanical characteristics of all interfaces to the device, including protocol descriptions
- g. Troubleshooting and repair guides including a description and instructions for the diagnostics furnished.

#### 2.8.7 **Hardware Maintenance Manuals**

The hardware maintenance manual shall describe the preventive maintenance and restorative procedures required to maintain the equipment in good operating condition. The information in the manuals shall include:

- a. Operating details – This information shall include a detailed description of how the equipment operates and a block diagram illustrating each major assembly in the equipment. Descriptions of external data transfers with other equipment, including data patterns, security check-codes, and transfer sequences shall be included. The operational sequence of major assemblies within the equipment shall be described and illustrated by functional block diagrams and timing diagrams. Detailed logic diagrams shall also be provided as necessary for troubleshooting analysis and field repair actions.
- b. Preventive maintenance instructions – These instructions shall include all applicable visual examinations, hardware testing and diagnostic routines, and the adjustments necessary for periodic preventive maintenance of the equipment. Instructions on how to load and use any test and diagnostic program and any special or standard test equipment shall be an integral part of these procedures.
- c. Corrective maintenance instructions – These instructions shall include procedures for locating malfunctions down to the field-replaceable module level. These guides shall include adequate details for quickly and efficiently locating the source of an equipment malfunction. The instructions shall also include explanations for the adjustment or replacement of all items, including printed circuit cards. Schematic diagrams of electrical, mechanical, and electronic circuits, parts-location illustrations, photographs, cable routing diagrams, and sectional views giving details of mechanical assemblies shall be provided as necessary to

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replace faulty equipment. For mechanical items requiring field repair, information on tolerances, clearances, wear limits, and maximum bolt-down torque shall be supplied. Information on the loading and use of special off-line diagnostic programs, tools, and test equipment, as well as any cautions or warnings that must be observed to protect personnel and equipment shall be included.

- d. Parts information – This information shall include the identification of each replaceable or field- repairable module. All other parts shall also be identified. The identification shall be of a level of detail enough for procuring any repairable or replaceable part. Cross-references between the Bidder's part numbers and the manufacturer's part numbers shall be provided.

2.8.8 Bidder shall submit equipment warranty details of all the supplied system/equipment with detailed inventory list with make, model, Serial number, Software versions.

## 2.9 Software Documentation

The following documents shall be provided for all software:

- a. List of Deliverable Software
- b. Software development standards

The Bidder or Sub-vendors shall provide the following documents for all software that has been produced for the offered solution. This shall include all the required OS and application software for the systems mentioned in the specification:

- a. Database definition and data flow, along with an explanation of stored procedures
- b. Interface Requirements Document
- c. Software functional description
- d. Installation images and source code
- e. Source code version control and revision control documentation.
- f. Software release / Patch details as consolidated document to be submitted by Bidder.
- g. Recommended update frequency of all the software should be submitted as consolidated document by bidder.

The following documents shall be produced for all software produced specifically for this contract:

- a. Software Requirements Matrix

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b. Detailed design documents

**2.9.1 List of Deliverable Software**

The list shall itemize each software item and include version and license information. The distribution media for each software item shall be identified. The list shall also indicate for each item whether source code is supplied.

**2.9.2 Software Development Standards**

The Bidder shall document the development standards used to develop the Substation Automation System and other systems software. Purchaser reserves the right to reject software that does not conform to the development standards. The standards shall define:

- a. Program design disciplines
- b. Cyber Security measures
- c. Resources under which the program must operate
- d. Basic services
- e. Interface definitions
- f. Linkage conventions
- g. Input and output specifications
- h. Database naming and access conventions
- i. Storage rules
- j. Quality assurance procedures
- k. Configuration design review methods
- l. Software configuration control schemes.

**2.9.3 Database Definition**

The database definition shall identify the characteristics of all systems databases. It shall include, but shall not be limited to, the following:

- a. The name or identification of the database
- b. A description of the intended use of the database. If the database is specific to a single application, the application shall be identified



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- c. A description of the organization of the database (the database schema or model)
- d. A description of each field of each data item
- e. Instructions for generating and populating the database
- f. Details of programming interfaces. This shall encompass access methods, address schemes, and read, write, and modify actions
- g. Initialization description – How or by what software is the data initialized & to what value(s)
- h. Details of maintenance actions.

Purchaser encourages the use of "self-documenting" database technology, where the database definition is developed and stored with the data. The resulting documentation should be printable.

**2.9.4 Interface Requirements Document**

The Interface Requirements Document shall describe in detail the interfaces between the offered systems and Purchaser provided/existing systems and networks. The Interface Requirements Document will be used by both the Bidder and Purchaser as the definition of the interface between the Substation Automation System, SCADA/ADMS and all other systems, so that each system can be designed or modified to meet its requirements. Purchaser will provide all required information to the Bidder so that it can prepare the document accordingly.

As a minimum, the Interface Requirements Document shall cover the following aspects:

- a. Description of the hardware interface
- b. Description of the communication protocols and the options and parameters selected
- c. Data exchange requirements including timing, priority, volume, and security requirements. A specific list of data to be exchanged during factory and site testing shall also be included.
- d. Description of the performance requirements
- e. Exception (for example, error) processing
- f. Failover/Backup processing
- g. Alarm conditions
- h. Archiving requirements.

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**2.9.5 Software Functional Description**

The intent of the software functional description shall be to describe the functions to be performed by each software module from the standpoint of a user. (Software functional descriptions are also referred to as user guides.) The functional operation of the Substation Automation System and other systems shall be clearly described so that it can be understood without understanding the detailed operation of each software module.

Software functional descriptions shall also be used as the first step in the design of a custom (for example, new functionality). Thus, it shall have enough information for Purchaser to determine that the new functionality will meet the requirements of the contract.

The software functional description shall include the following minimum content:

- a. Functional description – A narrative description of each program. Where appropriate, solution algorithms shall be described
- b. Performance requirements – The execution periodicity, processing capacity, and tuning and execution parameters that control or limit the capabilities of the software
- c. Resource requirement – The expected minimum requirements for main memory, auxiliary memory, processor capacity, and other resources required by the software
- d. User interface – A description of the interface used to control the software, including all user inputs and program responses
- e. Software interface requirements – A description of the logic interfaces with other programs
- f. Data requirements – A description of all data and databases accessed by the software, including execution parameters
- g. Error messages – A concise description of all error messages and possible corrective actions
- h. Diagnostic messages – Where the software generates a record of its internal operations, the messages shall be described
- i. Maintenance and expansion procedures – A description of either maintenance procedures or expansion procedures that is relevant to maintenance of the program or expansion of the program.

It is Purchaser's strong preference that software functional descriptions are provided as on-line documentation.

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**2.9.6 Installation Images and Source Code**

All software shall be delivered in three forms:

- a. As a fully operational system installed on auxiliary memory
- b. As distribution images suitable for installation on the system

The distribution images shall include all operating system, platform software, application software, and library of modifications incorporated into the delivered software. All standard software shall be supplied on the original installation media used by the Bidder to build the system. All customized software shall be supplied as part of the code management library along with the source code or other distribution image against which the code changes are to be applied.

It shall be possible for Purchaser to completely generate, build, install, and configure the entire System from the distribution images, source code, and software utilities provided with the System. To this end, "make files" or other compilation, generation, and installation tools, scripts, and directives shall be delivered.

For the purposes of this requirement, "software" shall specifically include the databases supplied with the System. That is, enough definition and content images shall be supplied such that the System databases can be created and installed on the Sub-Station Automation System and other offered systems.

**2.9.7 Software Requirements matrix**

The Bidder shall provide a list of all software requirements, cross-referenced to show where each requirement is discussed in the relevant software document.

The Software Requirements Matrix shall list each of the requirements for the Sub-Station Automation and other systems stated in this specification, in numerical order, referenced by chapter, section, and paragraph number. This list of specified requirements shall be supplemented by a list of all functions provided by the Bidder’s software system that go beyond the specified requirements.

For each requirement on the list, a reference shall be given to the chapter and section where the requirement is described or covered in each of the following of the Bidder’s documents:

- a. Item on the List of Software Deliverables
- b. Software Functional Description

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- c. Operations Manual
- d. Factory Acceptance Tests
- e. Site Acceptance Tests.

**2.9.8 Detailed Design Document**

The detailed design documents are intended as a second level of detail to the software functional descriptions. In general, a detailed design document shall relate to a single software functional description. It is expected that, for customized software, the Bidder will first deliver a software functional description for approval by Purchaser. After approval, the Bidder will then produce a detailed design document for approval. Production of the software will proceed after approval of the detailed design document.

The detailed software design documentation shall include, but shall not be limited to, the precise design information needed for planning, analysis, and implementation of the software. It shall include a show the divisions of the software design entities; a dependency description specifying the dependent entities, their coupling, and required resources, an interface description providing details of external and internal interfaces not provided in the software functional description; and a detailed design description containing the internal details of each design entity.

The detailed software design documentation shall provide a detailed description of how the software will support the functions described in the software functional description. Detailed software design documentation shall include a diagram of the software indicating major modules and an overview of the operation of each module. It shall describe data structures and flow, and a diagram or description of the way the modules interfaces with other modules.

**2.9.9 System Maintenance Manual**

The System Maintenance Manual shall describe all user procedures necessary to build and maintain the Sub-station Automation System and other supplied systems. It shall provide information on optimizing system performance.

It shall include details on Configuration upgrades, firmware and patch upgrades

The System Maintenance Manual shall also include documentation of the distributed system software supporting the configuration control function, data integrity, startup, restart, and the network management subsystem.

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The manual shall provide a list of the Internet Protocol (IP) addresses of all devices in a manner compatible with Purchaser's security standards and shall describe the procedures for upgrading or adding additional devices. The System Maintenance Manual shall provide detailed information on troubleshooting all processors of the Substation automation and other supplied systems. It shall describe the use of error logs, the meaning of all program-generated error or informational messages, and the recommended response to these messages. It shall explain what the user should do to save information after a processor failure and shall describe the procedures to gather this information to allow the user to communicate in an informed manner with maintenance personnel. It shall include a description of the procedures to restore normal operation after a failure of the offered systems.

#### **2.10 Operating Manual**

The Bidder shall submit, for review and approval, operating manuals for all Substation Automation functions. The operating instructions associated with all features shall be incorporated into these manuals. Context sensitivity shall be used to go directly to the appropriate place in the manual.

The manuals shall be organized for quick access to each detailed description of the user procedures that are used to interact with the Substation Automation functions. The manuals shall present in a clear and concise manner all information that a user needs to know to understand and operate satisfactorily. The manuals shall make abundant use of screen snapshots to illustrate the various procedures.

#### **2.11 System Administration Documentation**

The Bidder shall submit, for review and approval, the all system administration manuals. The system administration instructions associated with all features shall be incorporated into these manuals. Context sensitivity shall be used to go directly to the appropriate place in the manual.

#### **2.12 Database Editor's Manual**

The Database Editor's Manual shall describe the procedures to define, build, edit, archive, and expand all the databases of the delivered systems. It shall contain information describing how a user may define and add new attributes to an existing database entity. It shall also describe how to restore any database to a previously saved version if the database had been corrupted.

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**2.13 Acceptance Test Procedures**

Acceptance test procedures (FAT & SAT) designed to test the specified requirements shall be provided. The procedures will comprise step-by-step instructions to verify that:

- a. The system hardware and software are fully present and fully integrated, and its documentation is complete.
- b. All the functional and performance requirements of the contract are met.

The test procedures shall be organized in the order that they are to be performed. Tests that require collection of data under controlled conditions shall be carefully planned with data collection procedures scheduled, as needed, before the tests themselves.

The test procedure shall be prepared in the format of step-by-step guides. Test descriptions, initial conditions, functions to be tested, expected responses, and recording areas are contained in the acceptance test procedures. The steps to achieve these functions may be provided as references to the user manuals or maintenance manuals. An attempt shall be made to cover all normal and abnormal circumstances in the procedures. The goal is to be able to rigorously test the system by strictly following carefully pre-planned procedures with minimum reliance on unstructured testing.

**End of Section-D**

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## SECTION – E

## ANNEXURES



**TP CENTRAL ODISHA DISTRIBUTION LIMITED**  
**(A Tata Power & Odisha Govt. Joint Venture)**  
**2nd Floor, IDCO Tower, Janpath, Bhubaneswar, Odisha 751022**

Revision	Date	Description	Approvals		
			Prepared By	Checked By	Approved By
R0	10 <sup>th</sup> July 2021	Released for Procurement	Automation Team	TKB/GSB	AKA

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# **Section – E**

## **Annexures**



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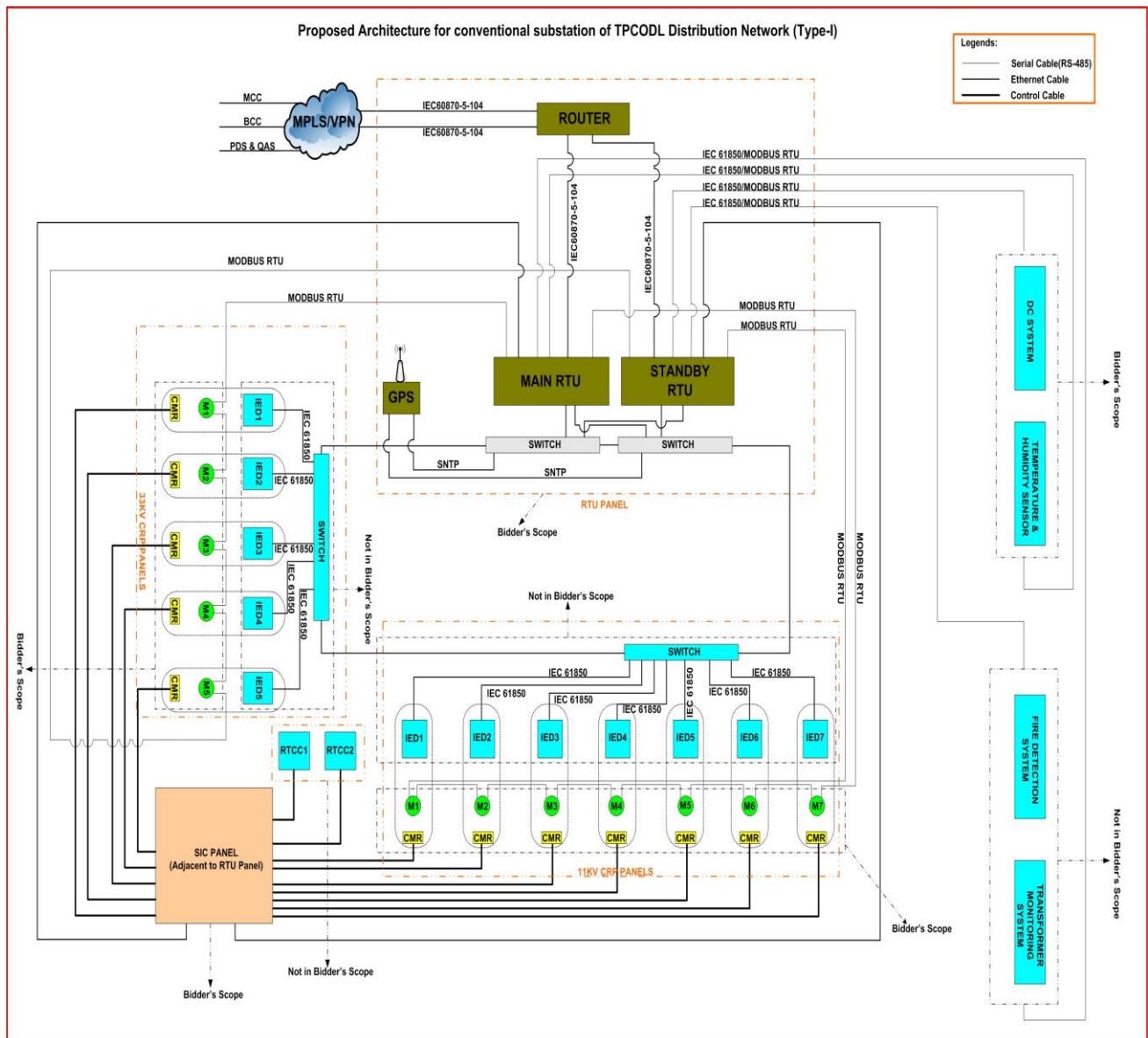
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The schematics, layouts, drawings in this section are indicative, bidder shall submit their best architecture, layout, drawings proposed as per specifications.

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**Annexure – 1 Indicative Proposed Sub-Station Automation System Architecture**

**Technical Type # 1**



**Note for Bidder:**

Bidder shall give more emphasis on the following aspects in the proposed architecture

- Reliability Centric
- High Availability

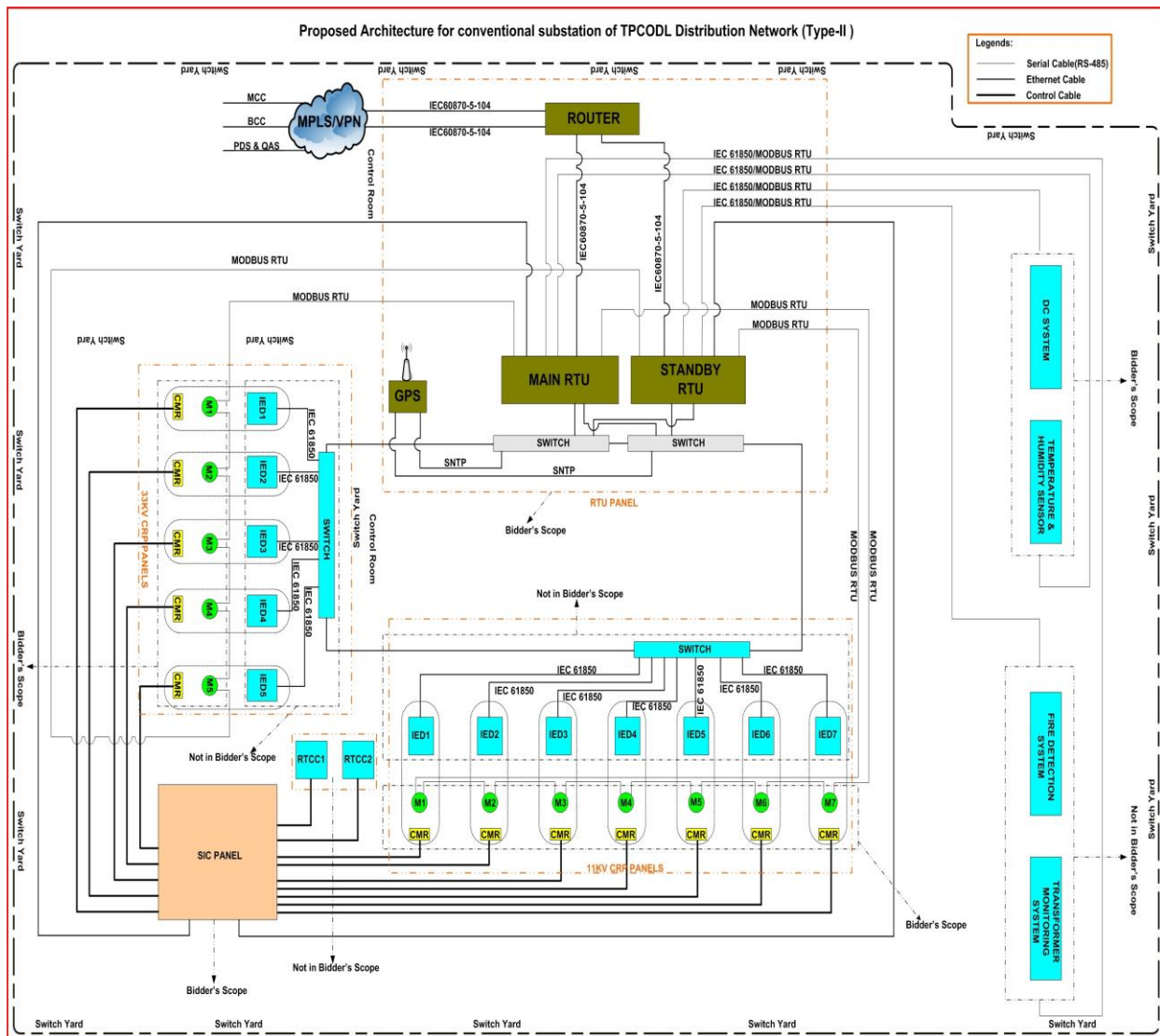
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- Cyber Security Resilience

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**Annexure – 1 Indicative Proposed Sub-Station Automation System Architecture**

**Technical Type # 2**



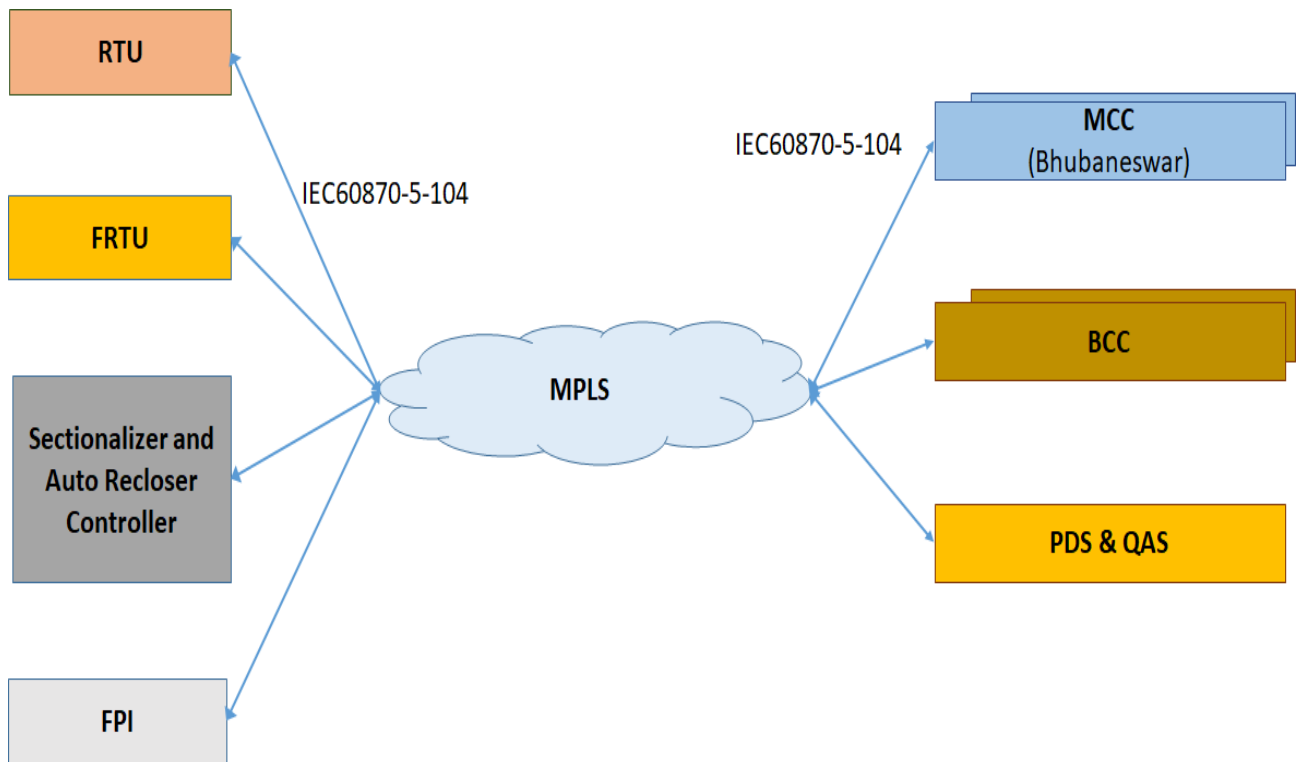
**Note for Bidder:**

Bidder shall give more emphasis on the following aspects in the proposed architecture

- Reliability Centric
- High Availability
- Cyber Security Resilience

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**Annexure – 2: Communication Architecture with Field Devices**



**Note for Bidder:**

Bidder shall give more emphasis on the following aspects in the proposed architecture

- Reliability Centric
- High Availability
- Cyber Security Resilience

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### Annexure – 3: Sub-Station Commissioning and Integration Plan

#### Phase # 1 (FY'21-22)

Sl. No.	Name of 33/11 kV Substation	Substation Type	Circle	Division Name		Plan	
1	Konark	Semi Urban	BBSR-I	NED	Nimapada	FY'21-22	Phase # 1
2	Pipili	Semi Urban	BBSR-I	NED	Nimapada	FY'21-22	Phase # 1
3	Nimapada	Semi Urban	BBSR-I	NED	Nimapada	FY'21-22	Phase # 1
4	ESIC	Urban	BBSR-I	NED	Khordha	FY'21-22	Phase # 1
5	Trisulia	Urban	BBSR-I	BCDD2	BBSR-I	FY'21-22	Phase # 1
6	10-Pole (Khorda Town)	Urban	BBSR-II	KHD	Khordha	FY'21-22	Phase # 1
7	Oil Mill, Khordha I.E.	Industrial	BBSR-II	KHD	Khordha	FY'21-22	Phase # 1
8	Janala	Semi Urban	BBSR-II	KHD	Khordha	FY'21-22	Phase # 1
9	Daspalla	Semi Urban	BBSR-II	NYD	Nayagarah	FY'21-22	Phase # 1
10	Nayagarh	Urban	BBSR-II	NYD	Nayagarah	FY'21-22	Phase # 1
11	Balugaon	Semi Urban	BBSR-II	BED	Balugaon	FY'21-22	Phase # 1
12	INS, Chillika	Industrial	BBSR-II	BED	Balugaon	FY'21-22	Phase # 1
13	Attharanala	Urban	BBSR-II	PED	Puri	FY'21-22	Phase # 1
14	Athagarh	Semi Urban	Cuttack	AED	Atthagarh	FY'21-22	Phase # 1
15	Choudwar	Semi Urban	Cuttack	CED	Cuttack	FY'21-22	Phase # 1
16	Chhatisha/Choudwar I.E	Industrial	Cuttack	CED	Cuttack	FY'21-22	Phase # 1
17	Tangi	Industrial	Cuttack	CED	Cuttack	FY'21-22	Phase # 1
18	Salipur	Semi Urban	Cuttack	SED	Salipur	FY'21-22	Phase # 1
19	Dakhinkali	Urban	Dhenkanal	DED	Dhenkanal	FY'21-22	Phase # 1
20	Industrial Estate	Industrial	Dhenkanal	AED	Angul	FY'21-22	Phase # 1
21	New RCMS	Urban	Dhenkanal	AED	Angul	FY'21-22	Phase # 1
22	Hemsarpada	Urban	Dhenkanal	AED	Angul	FY'21-22	Phase # 1

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**Phase # 2 (FY'22-23)**

Sl. No.	Name of 33/11 kV Substation	Substation Type	Circle	Division Name		Plan	Plan
1	Kakatpur	Rural	BBSR-I	NED	Nimapada	FY'22-23	Phase # 2
2	Astaranga	Rural	BBSR-I	NED	Nimapada	FY'22-23	Phase # 2
3	Chhaitana	Rural	BBSR-I	NED	Nimapada	FY'22-23	Phase # 2
4	Balakati	Rural	BBSR-I	NED	Nimapada	FY'22-23	Phase # 2
5	Balipatna	Rural	BBSR-I	NED	Nimapada	FY'22-23	Phase # 2
6	Bayakuda/GOP	Rural	BBSR-I	NED	Nimapada	FY'22-23	Phase # 2
7	Gurujanga	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
8	Harirajpur	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
9	Tirumala	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
10	Malipada	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
11	Naranagada	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
12	Jankia	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
13	Tulasipur	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
14	Chakapada	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
15	Sunadeimundia	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
16	Jatamundia	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
17	Kalapathar	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
18	Baghamari	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
19	Parichhala	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
20	Rajsunakhela	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
21	Begunia	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
22	Dadhimachagadia	Rural	BBSR-II	KHD	Khurda	FY'22-23	Phase # 2
23	Jatni	Urban	BBSR-II	KHD	Khordha	FY'22-23	Phase # 2
24	Khandapada	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2
25	Fategarh	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2
26	Kantilo	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2
27	Gania	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2
28	Nuagaon	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2
29	Mahipur	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2
30	Sarankula	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2
31	Odogaon	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2
32	Itamati	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2
33	Bologarh	Rural	BBSR-II	NYD	Nayagarah	FY'22-23	Phase # 2

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Sl. No.	Name of 33/11 kV Substation	Substation Type	Circle	Division Name		Plan	Plan
34	Sakhigopal	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
35	Chandanpur	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
36	Brahmagiri	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
37	Sunamuhi	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
38	Delanga	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
39	Kanasa	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
40	KUMARESWAR	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
41	Khajuria	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
42	Basudeipur	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
43	Khandisi	Rural	BBSR-II	PED	Puri	FY'22-23	Phase # 2
44	Tangi	Rural	BBSR-II	BED	Balugaon	FY'22-23	Phase # 2
45	Nachuni	Rural	BBSR-II	BED	Balugaon	FY'22-23	Phase # 2
46	Ranapur	Rural	BBSR-II	BED	Balugaon	FY'22-23	Phase # 2
47	Ankulapadar	Rural	BBSR-II	BED	Balugaon	FY'22-23	Phase # 2
48	Kuhudi	Rural	BBSR-II	BED	Balugaon	FY'22-23	Phase # 2
49	Chandpur	Rural	BBSR-II	BED	Balugaon	FY'22-23	Phase # 2
50	Bhusandpur	Rural	BBSR-II	BED	Balugaon	FY'22-23	Phase # 2
51	Gondia	Semi Urban	Dhenkanal	DED	Dhenkanal	FY'22-23	Phase # 2
52	Hindol Road	Semi Urban	Dhenkanal	DED	Dhenkanal	FY'22-23	Phase # 2
53	Kamakhyanagar	Semi Urban	Dhenkanal	DED	Dhenkanal	FY'22-23	Phase # 2
54	Bhuban	Semi Urban	Dhenkanal	DED	Dhenkanal	FY'22-23	Phase # 2
55	Athamallik	Semi Urban	Dhenkanal	AED	Angul	FY'22-23	Phase # 2
56	Banarpal	Semi Urban	Dhenkanal	TED	Chainpal	FY'22-23	Phase # 2
57	College Str	Urban	Dhenkanal	DED	Dhenkanal	FY'22-23	Phase # 2
58	Talcher-II	Urban	Dhenkanal	TED	Chainpal	FY'22-23	Phase # 2
59	Chainpal	Urban	Dhenkanal	TED	Chainpal	FY'22-23	Phase # 2
60	Talcher Town	Urban	Dhenkanal	TED	Chainpal	FY'22-23	Phase # 2
61	Pallahara	Semi Urban	Dhenkanal	TED	Chainpal	FY'22-23	Phase # 2
62	Jagatsinghpur	Urban	Paradeep	JED	Jagatsinghpur	FY'22-23	Phase # 2
63	Marshaghai	Semi Urban	Paradeep	KED-II	Marshaghai	FY'22-23	Phase # 2
64	Paradeep	Urban	Paradeep	PDP	Paradeep	FY'22-23	Phase # 2
65	Kendrapara	Urban	Paradeep	KED-I	Kendrapara	FY'22-23	Phase # 2
66	Pattamundai	Urban	Paradeep	KED-I	Kendrapara	FY'22-23	Phase # 2
67	Duhuria	Urban	Paradeep	KED-I	Kendrapara	FY'22-23	Phase # 2



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**Phase # 3 (FY'23-24)****This Phase will be taken up after completion of Phase # 1 & Phase # 2**

Sl. No.	Name of 33/11 kV Substation	Substation Type	Circle	Division Name		Plan	Plan
1	Darpanarayanpur	Rural	BBSR-II	BED	Balugaon	FY'23-24	Phase # 3
2	Kisan Nagar	Rural	Cuttack	CDD-II	Cuttack	FY'23-24	Phase # 3
3	Kandarpur	Rural	Cuttack	CDD-II	Cuttack	FY'23-24	Phase # 3
4	Narangabasta	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
5	Khuntuni	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
6	Tigiria	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
7	Nuapatna	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
8	Badamba	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
9	Kanpur	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
10	Narsinghpur	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
11	Gurudijhatia	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
12	Khuntakata	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
13	Sarpeswar	Rural	Cuttack	AED	Atthagarh	FY'23-24	Phase # 3
14	Niali	Rural	Cuttack	CED	Cuttack	FY'23-24	Phase # 3
15	Adaspur	Rural	Cuttack	CED	Cuttack	FY'23-24	Phase # 3
16	Kasarada	Rural	Cuttack	CED	Cuttack	FY'23-24	Phase # 3
17	Damodarpur	Rural	Cuttack	CED	Cuttack	FY'23-24	Phase # 3
18	Badachana	Rural	Cuttack	CED	Cuttack	FY'23-24	Phase # 3
19	Chhatia	Rural	Cuttack	CED	Cuttack	FY'23-24	Phase # 3
20	Balichandrapur	Rural	Cuttack	CED	Cuttack	FY'23-24	Phase # 3
21	Bahugram-I	Rural	Cuttack	SED	Salipur	FY'23-24	Phase # 3
22	Bahugram-II	Rural	Cuttack	SED	Salipur	FY'23-24	Phase # 3
23	Nischint.Koili	Rural	Cuttack	SED	Salipur	FY'23-24	Phase # 3
24	Paldhuapada	Rural	Cuttack	SED	Salipur	FY'23-24	Phase # 3
25	Orikanta	Rural	Cuttack	SED	Salipur	FY'23-24	Phase # 3
26	Mahanga	Rural	Cuttack	SED	Salipur	FY'23-24	Phase # 3
27	Kothpada	Rural	Cuttack	SED	Salipur	FY'23-24	Phase # 3
28	Bhapur	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
29	Gundichapada	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
30	Khajuriakata	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
31	Hindol	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
32	Badasuanlo	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3

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Sl. No.	Name of 33/11 kV Substation	Substation Type	Circle	Division Name		Plan	Plan
33	Mathakargola	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
34	Dahanbil	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
35	Goda	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
36	Joranda	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
37	Kankadahada	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
38	Kaliapani	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
39	Nihalprasad	Rural	Dhenkanal	DED	Dhenkanal	FY'23-24	Phase # 3
40	Bantala	Rural	Dhenkanal	AED	Angul	FY'23-24	Phase # 3
41	Jarapada	Rural	Dhenkanal	AED	Angul	FY'23-24	Phase # 3
42	Chhendipada	Rural	Dhenkanal	AED	Angul	FY'23-24	Phase # 3
43	Boinda	Rural	Dhenkanal	AED	Angul	FY'23-24	Phase # 3
44	Anandpur	Rural	Dhenkanal	AED	Angul	FY'23-24	Phase # 3
45	Madhapur	Rural	Dhenkanal	AED	Angul	FY'23-24	Phase # 3
46	Bamur	Rural	Dhenkanal	AED	Angul	FY'23-24	Phase # 3
47	Baruan	Rural	Dhenkanal	TED	Chainpal	FY'23-24	Phase # 3
48	Saranga	Rural	Dhenkanal	TED	Chainpal	FY'23-24	Phase # 3
49	Parjanga	Rural	Dhenkanal	TED	Chainpal	FY'23-24	Phase # 3
50	South Balanda	Rural	Dhenkanal	TED	Chainpal	FY'23-24	Phase # 3
51	Samal	Rural	Dhenkanal	TED	Chainpal	FY'23-24	Phase # 3
52	Kaniha	Rural	Dhenkanal	TED	Chainpal	FY'23-24	Phase # 3
53	Parabil	Rural	Dhenkanal	TED	Chainpal	FY'23-24	Phase # 3
54	Khamar	Rural	Dhenkanal	TED	Chainpal	FY'23-24	Phase # 3
55	Rengali	Rural	Dhenkanal	TED	Chainpal	FY'23-24	Phase # 3
56	Jogadhari	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
57	Biridi	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
58	Raghunathpur	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
59	Balikuda	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
60	Sova	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
61	Nabapatna	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
62	Naugaon	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
63	22Mouza	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
64	Nuapada	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
65	Sasanpada	Rural	Paradeep	JED	Jagatsinghpur	FY'23-24	Phase # 3
66	Garadpur	Rural	Paradeep	KED-II	Marshaghai	FY'23-24	Phase # 3
67	Korua	Rural	Paradeep	KED-II	Marshaghai	FY'23-24	Phase # 3

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Sl. No.	Name of 33/11 kV Substation	Substation Type	Circle	Division Name		Plan	Plan
68	Mahakalapara	Rural	Paradeep	KED-II	Marshaghai	FY'23-24	Phase # 3
69	Luna	Rural	Paradeep	KED-II	Marshaghai	FY'23-24	Phase # 3
70	Chhapali	Rural	Paradeep	KED-II	Marshaghai	FY'23-24	Phase # 3
71	Badhi	Rural	Paradeep	KED-II	Marshaghai	FY'23-24	Phase # 3
72	Kujanga	Rural	Paradeep	PDP	Paradeep	FY'23-24	Phase # 3
73	Tirtol	Rural	Paradeep	PDP	Paradeep	FY'23-24	Phase # 3
74	Ersama	Rural	Paradeep	PDP	Paradeep	FY'23-24	Phase # 3
75	Rahama	Rural	Paradeep	PDP	Paradeep	FY'23-24	Phase # 3
76	Paruna	Rural	Paradeep	PDP	Paradeep	FY'23-24	Phase # 3
77	Danpur	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
78	Indupur	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
79	Patrapur	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
80	Gogua	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
81	Dandisahi	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
82	Adhajori	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
83	Rajnagar (2)	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
84	Rajkanika	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
85	Aul	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
86	Balarampur	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
87	Sahupada	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
88	Chhata	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
89	Chhagadia	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3
90	Kandira	Rural	Paradeep	KED-I	Kendrapara	FY'23-24	Phase # 3

**Bidder to note that the above list (Phase#1, Phase#2, Phase#3) is tentative, preference of substation may change during detailed engineering as per the Operational Requirement.**

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### Annexure – 4: Indicative Signal List

Feeder Name	Description	I/O LIST FOR RTU CONFIGURATION				I/O List for As-Is Integration of Conventional Substation (With Reference to RFP)			
		DPI / SPI DPC / SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1	DPI/SPI DPC/SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1
33 kV INC Feeder	<b>Digital Inputs</b>								
	<b>Equipment and Protection Status</b>								
	Circuit Breaker	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Bus Side Isolator	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Line Side (Outdoor) Isolator	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Line Side (Indoor) Isolator	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Line Side (Outdoor) Earth Switch	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Line Side (Indoor) Earth Switch	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Circuit Breaker Spring	SPI	Soft	DISCHARGED	CHARGED	SPI	Hardwired	DISCHARGED	CHARGED
	Local / Remote Switch Position	SPI	Soft	ON LOCAL	ON REMOTE	SPI	-	ON LOCAL	ON REMOTE
	Circuit Breaker Position	SPI	Soft	IN TEST	IN SERVICE	SPI	Hardwired	IN TEST	IN SERVICE
	Master Trip Relay (86 L/O)	SPI	Soft	RESET	OPERATED	SPI	Hardwired	RESET	OPERATED
	Trip Circuit-1	SPI	Soft	FAILED	HEALTHY	SPI	Hardwired	FAILED	HEALTHY
	Trip Circuit-2	SPI	Soft	FAILED	HEALTHY	SPI	Hardwired	FAILED	HEALTHY
	Earth Fault Protection	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Over Current Protection R Ph	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Over Current Protection Y Ph	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Over Current Protection B Ph	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Breaker Closed from TNC Switch	SPI	Soft	-	Alarm	SPI	-	-	Alarm
	PT Fuse	SPI	Hardwired	NORMAL	FAILED	SPI	Hardwired	NORMAL	FAILED
	Bus PT MCB	SPI	Soft	OFF	ON	SPI	-	OFF	ON
	Gas Pressure (CB Compartment)	SPI	Soft	NORMAL	LOW	SPI	-	NORMAL	LOW
	Gas Pressure (CB Compartment)	SPI	Soft	RESET	TRIP	SPI	-	RESET	TRIP
	<b>Digital Outputs</b>								
	<b>Equipment Control</b>								
	Circuit Breaker	DPC	Soft	OPEN	CLOSE	DPC	Hardwired	OPEN	CLOSE
	Bus Side Isolator	DPC	Soft	OPEN	CLOSE	DPC	-	OPEN	CLOSE

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Feeder Name	Description	I/O LIST FOR RTU CONFIGURATION				I/O List for As-Is Integration of Conventional Substation (With Reference to RFP)			
		DPI / SPI DPC / SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1	DPI/SPI DPC/SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1
	Line Side (Outdoor) Isolator	DPC	Soft	OPEN	CLOSE	DPC	-	OPEN	CLOSE
	Line Side (Indoor) Isolator	DPC	Soft	OPEN	CLOSE	DPC	-	OPEN	CLOSE
	Master Trip Relay (86 L/O)	SPC	Soft		RESET	SPC	Hardwired		RESET
	<b>Analog Inputs</b>								
	<b>Equipment Analog Signals</b>								
	R Phase Current (Ampere)		Modbus RS485				Modbus RS485		
	Y Phase Current (Ampere)		Modbus RS485				Modbus RS485		
	B Phase Current (Ampere)		Modbus RS485				Modbus RS485		
	TOTAL Active Power (kW)		Modbus RS485				Modbus RS485		
	TOTAL Reactive Power (kVAR)		Modbus RS485				Modbus RS485		
	RY Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	YB Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	BR Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	Frequency (Hz)		Modbus RS485				Modbus RS485		
	Power Factor (Pf)		Modbus RS485				Modbus RS485		
	Apparent Power		Modbus RS485				Modbus RS485		
	Kwh Export	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	Kwh Import	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	KVarh Export	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	KVarh Import	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	<b>Digital Inputs</b>								
	<b>Equipment and Protection Status</b>								
33 kV TRF Feeder	Circuit Breaker	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Bus Side Isolator	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Bus Side Earth Switch	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Circuit Breaker Spring	SPI	Soft	DISCHARGED	CHARGED	SPI	Hardwired	DISCHARGED	CHARGED
	Local / Remote Switch Position	SPI	Soft	ON LOCAL	ON REMOTE	SPI	-	ON LOCAL	ON REMOTE

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Feeder Name	Description	I/O LIST FOR RTU CONFIGURATION				I/O List for As-Is Integration of Conventional Substation (With Reference to RFP)			
		DPI / SPI DPC / SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1	DPI/SPI DPC/SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1
	Circuit Breaker Position	SPI	Soft	IN TEST	IN SERVICE	SPI	Hardwired	IN TEST	IN SERVICE
	Master Trip Relay (86 L/O)	SPI	Soft	RESET	OPERATED	SPI	Hardwired	RESET	OPERATED
	Trip Circuit-1	SPI	Soft	FAILED	HEALTHY	SPI	Hardwired	FAILED	HEALTHY
	Trip Circuit-2	SPI	Soft	FAILED	HEALTHY	SPI	Hardwired	FAILED	HEALTHY
	Earth Fault Protection	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Over Current Protection R Ph	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Over Current Protection Y Ph	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Over Current Protection B Ph	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Oil Level (MOG)	SPI	Soft	NORMAL	LOW ALARM	SPI	-	NORMAL	LOW ALARM
	HV Winding Temperature	SPI	Soft	NORMAL	HIGH ALARM	SPI	-	NORMAL	HIGH ALARM
	LV Winding Temperature	SPI	Soft	NORMAL	HIGH ALARM	SPI	-	NORMAL	HIGH ALARM
	Oil Temperature	SPI	Soft	NORMAL	HIGH ALARM	SPI	-	NORMAL	HIGH ALARM
	Buchholz Relay	SPI	Soft	NORMAL	ALARM	SPI	-	NORMAL	ALARM
	Bus PT MCB	SPI	Soft	OFF	ON	SPI	-	OFF	ON
	RTCC SCADA Mode	SPI	Soft	OFF	ON	SPI	-	OFF	ON
	RTCC AUTO Mode	SPI	Soft	OFF	ON	SPI	-	OFF	ON
	RTCC MANUAL Mode	SPI	Soft	OFF	ON	SPI	-	OFF	ON
	RTCC IN OFF Mode	SPI	Soft	OFF	ON	SPI	-	OFF	ON
	RTCC Mode In	SPI	Soft	-	FOLLOWER	SPI	-	-	FOLLOWER
	RTCC Mode In	SPI	Soft	-	MASTER	SPI	-	-	MASTER
	RTCC Mode In	SPI	Soft	-	INDEPENDENT	SPI	-	-	INDEPENDENT
	RTCC Mode	SPI	Soft	OFF	ON	SPI	-	OFF	ON
	Over Fluxing Relay	SPI	Soft	NORMAL	OPERATED	SPI	-	NORMAL	OPERATED
	Differential Relay	SPI	Soft	NORMAL	OPERATED	SPI	Soft	NORMAL	OPERATED
	Restricted Earth Fault Relay	SPI	Soft	NORMAL	OPERATED	SPI	-	NORMAL	OPERATED
	HV Winding Temperature	SPI	Soft	NORMAL	HIGH-HIGH ALARM	SPI	-	NORMAL	HIGH-HIGH ALARM
	LV Winding Temperature	SPI	Soft	NORMAL	HIGH-HIGH ALARM	SPI	-	NORMAL	HIGH-HIGH ALARM
	Oil Temperature	SPI	Soft	NORMAL	HIGH-HIGH ALARM	SPI	-	NORMAL	HIGH-HIGH ALARM

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Feeder Name	Description	I/O LIST FOR RTU CONFIGURATION				I/O List for As-Is Integration of Conventional Substation (With Reference to RFP)			
		DPI / SPI DPC / SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1	DPI/SPI DPC/SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1
	Buchholz Relay	SPI	Soft	NORMAL	OPERATED	SPI	-	NORMAL	OPERATED
	Oil Surge Relay	SPI	Soft	NORMAL	OPERATED	SPI	-	NORMAL	OPERATED
	Pressure Relief Valve	SPI	Soft	NORMAL	OPERATED	SPI	-	NORMAL	OPERATED
	OLTC Mode	SPI	Soft	ON LOCAL	ON REMOTE	SPI	-	ON LOCAL	ON REMOTE
	Transformer TAP Position	SPI	Soft	NORMAL	OUT OF STEP	SPI	-	NORMAL	OUT OF STEP
	Breaker Closed from TNC Switch	SPI	Soft	-	Alarm	SPI	-	-	Alarm
	Gas Pressure (CB Compartment)	SPI	Soft	NORMAL	LOW	SPI	-	NORMAL	LOW
	Gas Pressure (CB Compartment)	SPI	Soft	RESET	TRIP	SPI	-	RESET	TRIP
	<b>Digital Outputs</b>								
	<b>Equipment Control</b>								
	Circuit Breaker	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Bus Side Isolator	DPI	Soft	OPEN	CLOSE	DPI	-	OPEN	CLOSE
	Master Trip Relay (86 L/O) / Over Current	SPC	Soft	-	RESET	SPC	Hardwired	-	RESET
	Master Trip Relay (86 L/O) / Differential Relay	SPC	Soft	-	RESET	SPC	Hardwired	-	RESET
	Transformer TAP Raise Command	SPC	Soft	-	RAISE	SPC	-	-	RAISE
	Transformer TAP Lower Command	SPC	Soft	-	LOWER	SPC	-	-	LOWER
	<b>Analog Inputs</b>								
	<b>Equipment Analog Signals</b>								
	R Phase Current (Ampere)		Modbus RS485				Modbus RS485		
	Y Phase Current (Ampere)		Modbus RS485				Modbus RS485		
	B Phase Current (Ampere)		Modbus RS485				Modbus RS485		
	TOTAL Active Power (kW)		Modbus RS485				Modbus RS485		
	TOTAL Reactive Power (kVAR)		Modbus RS485				Modbus RS485		
	RY Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	YB Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	BR Phase Voltage (kV)		Modbus RS485				Modbus RS485		





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Feeder Name	Description	I/O LIST FOR RTU CONFIGURATION				I/O List for As-Is Integration of Conventional Substation (With Reference to RFP)			
		DPI / SPI DPC / SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1	DPI/SPI DPC/SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1
	Circuit Breaker	DPC	Soft	OPEN	CLOSE	DPC	Hardwired	OPEN	CLOSE
	Master Trip Relay (86 L/O)	SPC	Soft	-	RESET	SPC	Hardwired	-	RESET
	<b>Analog Inputs</b>								
	<b>Equipment Analog Signals</b>								
	R Phase Current (Ampere)		Modbus RS485				Modbus RS485		
	Y Phase Current (Ampere)		Modbus RS485				Modbus RS485		
	B Phase Current (Ampere)		Modbus RS485				Modbus RS485		
	TOTAL Active Power (kW)		Modbus RS485				Modbus RS485		
	TOTAL Reactive Power (kVAR)		Modbus RS485				Modbus RS485		
	RY Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	YB Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	BR Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	Frequency (Hz)		Modbus RS485				Modbus RS485		
	Power Factor (Pf)		Modbus RS485				Modbus RS485		
	Apparent Power		Modbus RS485				Modbus RS485		
	Kwh Export	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	Kwh Import	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	KVarh Export	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	KVarh Import	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	<b>Digital Inputs</b>								
	<b>Equipment Status</b>								
11kV Bus Coupler	Circuit Breaker	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Circuit Breaker Spring	SPI	Soft	DISCHARGED	CHARGED	SPI	Hardwired	DISCHARGED	CHARGED
	Local / Remote Switch Position	SPI	Soft	ON LOCAL	ON REMOTE	SPI	-	ON LOCAL	ON REMOTE
	Circuit Breaker Position	SPI	Soft	IN TEST	IN SERVICE	SPI	Hardwired	IN TEST	IN SERVICE
	Trip Circuit-1	SPI	Soft	FAILED	HEALTHY	SPI	Hardwired	FAILED	HEALTHY
	Trip Circuit-2	SPI	Soft	FAILED	HEALTHY	SPI	Hardwired	FAILED	HEALTHY



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Feeder Name	Description	I/O LIST FOR RTU CONFIGURATION				I/O List for As-Is Integration of Conventional Substation (With Reference to RFP)			
		DPI / SPI DPC / SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1	DPI/SPI DPC/SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1
O/G Feeder	<b>Equipment and Protection Status</b>								
	Circuit Breaker	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Bus Side Isolator	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Line Side Isolator	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Outdoor Isolator	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Outdoor Earth Switch	DPI	Soft	OPEN	CLOSE	DPI	Hardwired	OPEN	CLOSE
	Circuit Breaker Spring	SPI	Soft	DISCHARGED	CHARGED	SPI	Hardwired	DISCHARGED	CHARGED
	Local / Remote Switch Position	SPI	Soft	ON LOCAL	ON REMOTE	SPI	-	ON LOCAL	ON REMOTE
	Circuit Breaker Position	SPI	Soft	IN TEST	IN SERVICE	SPI	Hardwired	IN TEST	IN SERVICE
	Master Trip Relay (86 L/O)	SPI	Soft	RESET	OPERATED	SPI	Hardwired	RESET	OPERATED
	Trip Circuit-1	SPI	Soft	FAILED	HEALTHY	SPI	Hardwired	FAILED	HEALTHY
	Trip Circuit-2	SPI	Soft	FAILED	HEALTHY	SPI	Hardwired	FAILED	HEALTHY
	Earth Fault Protection	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Over Current Protection R Ph	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Over Current Protection Y Ph	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Over Current Protection B Ph	SPI	Soft	RESET	OPERATED	SPI	Soft	RESET	OPERATED
	Breaker Closed from TNC Switch	SPI	Soft	-	Alarm	SPI	-	-	Alarm
	Bus PT MCB	SPI	Soft	OFF	ON	SPI	-	OFF	ON
	<b>Digital Outputs</b>								
	<b>Equipment Control</b>								
	Circuit Breaker	DPC	Soft	OPEN	CLOSE	DPC	Hardwired	OPEN	CLOSE
	Bus Side Isolator	DPC	Soft	OPEN	CLOSE	DPC	-	OPEN	CLOSE
	Line Side Isolator	DPC	Soft	OPEN	CLOSE	DPC	-	OPEN	CLOSE
	Outdoor Isolator	DPC	Soft	OPEN	CLOSE	DPC	-	OPEN	CLOSE
	Master Trip Relay (86 L/O)	SPC	Soft		RESET	SPC	Hardwired		RESET
	<b>Analog Inputs</b>								
<b>Equipment Analog Signals</b>									
R Phase Current (Ampere)		Modbus RS485				Modbus RS485			
Y Phase Current (Ampere)		Modbus RS485				Modbus RS485			
B Phase Current (Ampere)		Modbus RS485				Modbus RS485			

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Feeder Name	Description	I/O LIST FOR RTU CONFIGURATION				I/O List for As-Is Integration of Conventional Substation (With Reference to RFP)			
		DPI / SPI DPC / SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1	DPI/SPI DPC/SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1
	TOTAL Active Power (kW)		Modbus RS485				Modbus RS485		
	TOTAL Reactive Power (kVAR)		Modbus RS485				Modbus RS485		
	RY Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	YB Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	BR Phase Voltage (kV)		Modbus RS485				Modbus RS485		
	Frequency (Hz)		Modbus RS485				Modbus RS485		
	Power Factor (Pf)		Modbus RS485				Modbus RS485		
	Apparent Power		Modbus RS485				Modbus RS485		
	Kwh Export	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	Kwh Import	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	KVarh Export	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	KVarh Import	Accumulator	COUNTER RS485			Accumulator	COUNTER RS485		
	<b>Digital Inputs</b>								
	<b>Miscellaneous Station Alarms</b>								
Misc Alarms, Control & Analog	Dummy Breaker Status	DPI	HARDWIRED	OPEN	CLOSE	DPI	Soft	OPEN	CLOSE
	Battery Charger Input AC Supply	SPI	HARDWIRED	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	Battery Charger Failure	SPI	HARDWIRED	NORMAL	ALARM	SPI	Soft	NORMAL	ALARM
	DC System Earth Fault	SPI	HARDWIRED	NORMAL	OPERATED	SPI	Soft	NORMAL	OPERATED
	Battery Charger Group	SPI	HARDWIRED	NORMAL	ALARM	SPI	Soft	NORMAL	ALARM
	RTU Local / Remote Switch Position	SPI	HARDWIRED	ON LOCAL	ON REMOTE	SPI	HARDWIRED	ON LOCAL	ON REMOTE
	RTU - Power Supply	SPI	Soft	NORMAL	FAILED	SPI	Hardwired	NORMAL	FAILED
	Main RTU CPU Module	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	Slave RTU CPU Module	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	RIO RTU Rack	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	RTU Managed Ethernet Switch	SPI	Soft	UNHEALTHY	HEALTHY	SPI	Soft	UNHEALTHY	HEALTHY

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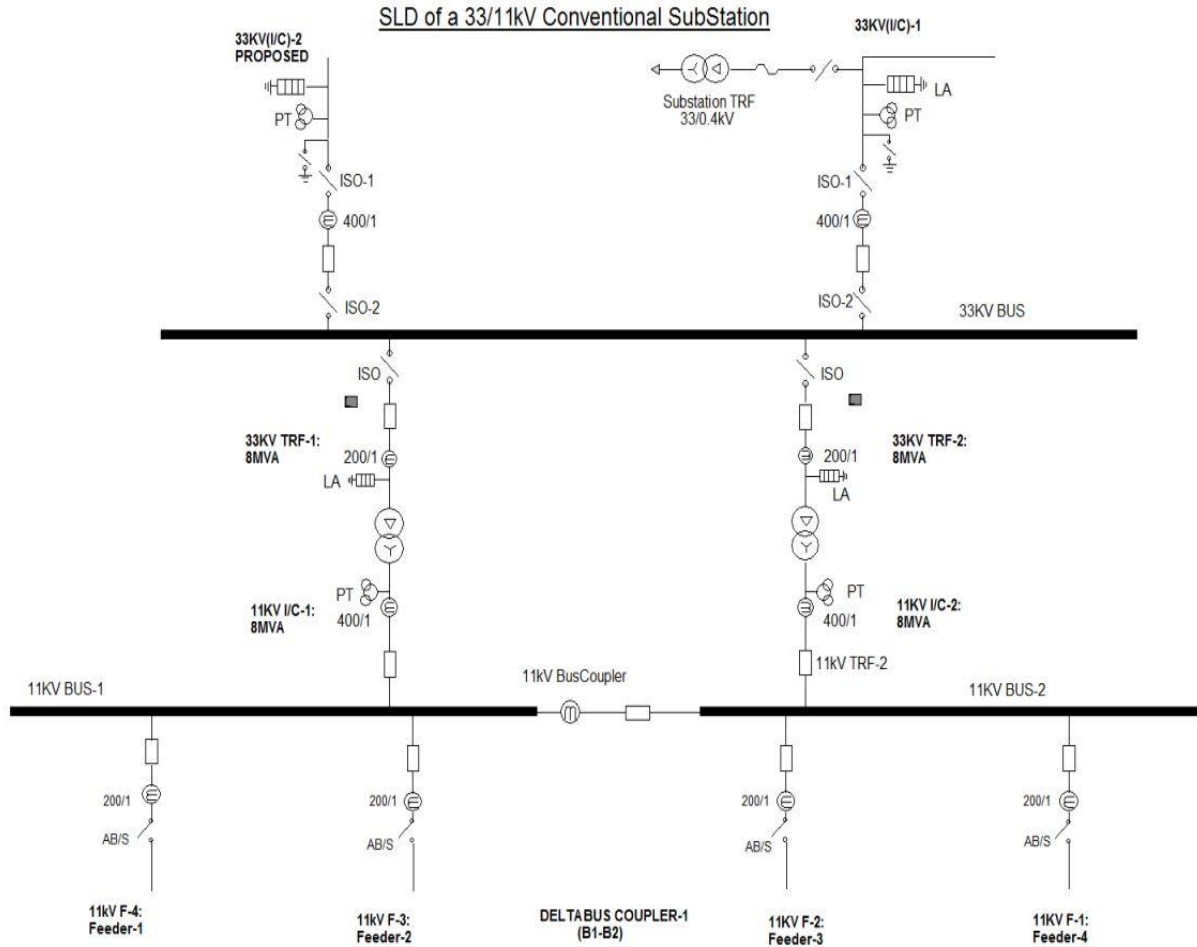
Feed er Nam e	Description	I/O LIST FOR RTU CONFIGURATION				I/O List for As-Is Integration of Conventional Substation (With Reference to RFP)			
		DPI / SPI DPC / SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1	DPI/SPI DPC/SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1
	Time Synchronization of RTU	SPI	Soft	UNHEALTHY	HEALTHY	SPI	Soft	UNHEALTHY	HEALTHY
	Time Synchronization of IEDs	SPI	Soft	UNHEALTHY	HEALTHY	SPI	Soft	UNHEALTHY	HEALTHY
	RTU - DI Module-1	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	RTU - DI Module-2	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	RTU - DI Module-3	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	RTU - DO Module-1	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	RTU - DO Module-2	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	RTU - AI Module-1	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	RTU - AI Module-2	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	33 kV Incomer-1 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	33 kV Incomer-2 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	33 kV Trf-1 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	33 kV Trf-2 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	11 kV Incomer-1 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	11 kV Incomer-2 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	11 kV Bus Coupler MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	11 kV Outgoing FDR-1 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	11 kV Outgoing FDR-2 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	11 kV Outgoing FDR-3 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	11 kV Outgoing FDR-4 MFM Communication	SPI	Soft	NORMAL	FAILED	SPI	Soft	NORMAL	FAILED
	33 kV Incomer-1 BCPU	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	33 kV Incomer-2 BCPU	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	33 kV Trf-1 BCPU-1	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	33 kV Trf-1 BCPU-2	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	33 kV Trf-2 BCPU-1	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED

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Feeder Name	Description	I/O LIST FOR RTU CONFIGURATION				I/O List for As-Is Integration of Conventional Substation (With Reference to RFP)			
		DPI / SPI DPC / SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1	DPI/SPI DPC/SPC	Type (Hardwired / Soft - IEC61850)	STATE 0	STATE 1
	33 kV Trf-2 BCPU-2	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	11 kV Incomer-1 BCPU	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	11 kV Incomer-2 BCPU	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	11 kV Outgoing FDR-1 BCPU	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	11 kV Outgoing FDR-2 BCPU	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	11 kV Outgoing FDR-3 BCPU	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	11 kV Outgoing FDR-4 BCPU	SPI	Soft	NORMAL	FAILED	SPI	-	NORMAL	FAILED
	Fire Protection System	SPI	Soft	NORMAL	OPERATED	SPI	Hardwired	NORMAL	OPERATED
	Fire Protection System	SPI	Soft	NORMAL	OPERATED	SPI	Soft	NORMAL	OPERATED
	<b>Digital Outputs</b>								
	<b>Equipment Control</b>								
	Dummy Breaker Control	DPC	HARDWIRED	OFF	ON	DPC	HARDWIRED	OFF	ON
	Fire Protection Alarm Hooter	SPC	HARDWIRED		Reset	SPC	HARDWIRED		Reset
	Fire Protection Alarm Hooter	SPC	Soft		Reset	SPC	Soft		Reset
	<b>Analog Inputs</b>								
	<b>Equipment Analog Signals</b>								
	Battery Charger Voltage (Volt)	Analog	HARDWIRED			Analog	HARDWIRED		
	Battery Charger Current (Ampere)	Analog	HARDWIRED			Analog	HARDWIRED		
	Substation Temperature	Analog	Soft			Analog	Soft		
	Substation Humidity	Analog	Soft			Analog	Soft		

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**Annexure – 5: Typical Single Line Substation Layout**





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**Annexure – 6: Approved Make of Equipment/System**

Sl. No.	Item Description	Approved Make / Model
1	RTU	ABB / SIEMENS / SCHNEIDER / GE
2	Engineering / Configuration Laptop	DELL / HP / LENOVO
3	Industrial Grade RTU Panels (42U)	RITTAL / SIEMENS / PYROTECH / PRESIDENT
4	Layer 2 Managed Ethernet Switch	RUGGEDCOM / HIRSCHMAN / MOXA
5	GPS Clock with SNTP Server	SERTEL / MASIBUS / SANDS / MEINBERG
6	LIU (Fiber Optic)	RAYCHEM / AFS / 3M
7	I/O Boxes	SYSTEMAX / COMMSCOPE / TYCO
8	Armored UTP CAT6 Cable	SYSTEMAX / COMMSCOPE / TYCO
9	Armored Fiber Optic Cable	FINOLEX / KEC / APAR
10	Unarmored UTP CAT6 Cable	SYSTEMAX / COMMSCOPE / TYCO
11	Patch Panel (RJ45) with Connectors, I/O boxes	SYSTEMAX / COMMSCOPE / TYCO
12	Fiber Optic Patch Chords	AFS / RAYCHEM / TYCO / 3M / PRESTON
13	CAT6 UTP Patch Chords	SYSTEMAX / COMMSCOPE / TYCO
14	4P X 0.36 Sq.mm. Armored Communication Cable (Multistrand, individual pair and overall shielded)	BELDEN / LAPP / SATYAM
15	4P X 0.36 Sq.mm. Unarmored Communication Cable (Multistrand, individual pair & overall shielded)	BELDEN / LAPP / SATYAM
16	Fiber Optic Transceiver	CTC UNION / MRO TEK / ALLIED TELESIS / MOXA
17	RS 232 / RS 485 converter	MOXA / ADVANTECH
18	DC-DC Converter	COSEL / PHOENIX / PARAMOUNT
19	Diode-Oring Unit	PARAMOUNT / PHOENIX
20	Droppable type Terminal Block for Digital Output, CT & PT	CONNECT WELL – CBT4U
21	Disconnecting type (Knife edge) Terminal Block for Digital Input	CONNECT WELL – CKT4U
22	Modbus TCP/IP converter	MOXA, ADVANTECH, RUGGEDCOM
23	Temperature & Humidity Sensor	KIMO / HONEYWELL / SUNPRO
24	Multi-mode, 12 core armored FO-cable	FINOLEX / KEC / APAR / BIRLA CABLES
25	DC System (24 V DC)	MASSTECH / DELTA / CHLORIDE / STATCON / VERTIVE
26	Multifunction Meter	SATEC, PM130EH+
27	Auxiliary Relays	OMRON / ABB / SULZER / OEN / PARAMOUNT
28	Control Cable	FINOLEX / POLYCAB / MESCAB
29	MCB	SIEMENS / SCHNEIDER / ANCHOR / HAVELLS
30	Instrumentation Cable (Status, Indications, Control and Analog Measurement)	CCI / FINOLEX / HAVELLS / UNIVERSAL CABLES / INCAB / ASIAN CABLE / KEI / POLYCAB / RUCHIKA

**Bidder proposing system/equipment not in the above list of approved make, shall be specified in the technical offer along with technical details for Purchaser’s review, approval and acceptance. The decision of Purchaser will be final.**

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**Annexure – 7: Indicative Bill of Material for Proposed Substation Automation System**

**Information to Bidder:**

1	2
Sl. No.	Information to Bidder
1	Bill of Quantity mentioned in the tables are indicative, this may vary to meet the functional or site requirement. It is the responsibility of the Bidder to include all Hardware, Software and Services as per functional requirement specified in the RFP and as per the phases mentioned.
2	Bidder to refer Preferred/Approved make and model of the equipment to be considered for this project. All bidder's own and bought out items shall be subject to Purchaser's prior approval.
3	The bidder shall propose and design the solution considering all the functional requirement stated in the RFP and shall submit the overall System Architecture considering current and phase wise implementation.
4	System shall be modular in such a way that it shall allow flexible configuration of the system, adding modules as and when required. The system shall facilitate a gradual growth of the system through phased implementation as the Power System Network operating requirements expand or change.
5	Bidder shall include license for redundant applications as applicable. Bidder shall also consider the enterprise version of software as feasible to meet the required functionality and to reduce the overall cost.
6	All the offered system will be with Operating System and shall be of latest version at the time of delivery and phase wise commissioning
7	All Systems Application, OS and configuration tools shall be kept current with latest OS version, Application Software, Configuration tools as and when the new system will be implemented/added in a phased manner.
8	Configuration of all RTU and other system shall be identical except IP Schema and specific requirement of the site.
9	The RTU should be modular to enhance the capacity and expected communication response speed are achieved with distributed system and final architecture frozen during detailed engineering.
10	The offered solution shall meet all the Cyber Security requirement as per the standards such as NERC_CIP, NISTR, ISO 27001 and NCIIPC guidelines. All the Cyber Security measures shall address Operational Technology requirement. Bidder shall ensure that the proposed architecture at Substation are certified by Cyber Security auditor for the compliance as per Industry standards. Bidder to demonstrate all the cyber security measures considered and implemented during FAT and SAT.
11	The proposed system will be integrated with other external systems and the required interfaces shall be considered accordingly. Since all external systems are different, special studies for interfaces shall be conducted for seamless integration.

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Sl. No.	Information to Bidder
12	The platform services shall be common to the whole family of products (Main & Standby RTU, Controller of DC System etc.); thus, integrated control of power system network is possible from one base platform. Allows data to be distributed across a number of sites and systems.
13	The bid shall include Unified data engineering environment for data take-on and data maintenance, facilitating a single point of entry for both data configuration and use for multiple application/calculation and data management.
14	Bidder to indicate clearly the no. of Software licenses (proprietary & third party) included taking into account no. of RTUs, Communication Equipment, Controller, redundant equipment, I/O Tags etc. Bidder shall also indicate the (slab-wise) incremental price for each of these licenses as applicable. It will be deemed to be nil if not indicated separately. Bidder shall consider enterprise license for common applications for proposed system.
15	Each selected application shall include necessary prerequisites, if any.
16	All cabling (Communication, Power Supply, Field, Interfaces) is in Bidder's scope. This includes supply, laying, termination and connection to supplied and Purchaser's equipment.
17	All Networking accessories and all types of Cables required for integration of other systems shall be considered by the bidder.
18	Necessary Communication equipment (Industrial grade) such as Layer2 switches, Router, Networking cables, patch cords etc. for integrating the Substation Automation System with Purchaser's SCADA System through NBSP Communication network shall be in the scope of the Bidder. All structure cabling at Sub-Stations (if any) is in Bidder scope. All the Communication equipment shall be DC Powered.
19	Bidder to ensure the deployment of the resources and service requirement during Standard and Post Warranty Support for all the supplied equipment (Bidder's Own and bought out items). SLA will be prepared with the successful bidder to achieve the 24X7 availability and reliability of the installed system
20	It is the responsibility of the bidder to provide Patch Management, Software upgradation, Firmware Upgradation for Bidder's Owned items, Sub-vendor items, Communication and Networking items during Standard and Post Warranty duration as per the SLA
21	Purchaser may procure any item from elsewhere. Integration of those with supplied system is in Bidder's scope.
22	All annual maintenance charges of supplied Hardware, OS & Software are inclusive in the Warranty and Post Warranty of Bidder's Owned items, Sub-vendor items, Communication and Networking items, software licenses their renewal, upgrades etc.
23	All the materials to be delivered should be F.O.R at TPCODL sites.
24	The bidders are advised to quote prices strictly in the format attached.
25	The bidder must fill each and every column of the format attached. Mentioning "extra/inclusive" in any of the column may lead for rejection of the price bid.
26	No cutting/ overwriting in the prices is permissible.

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1	2
Sl. No.	Information to Bidder
27	The unit price to be indicated in col. No. 8 should be exclusive of taxes & duties which are to be indicated in separate columns meant for the purpose.
28	The bids will be evaluated commercially on the overall all-inclusive lowest cost lowest for the individual LOT as defined in the tender BOQ as calculated in Schedule of Items TPCODL however, reserves right to split the order line item wise and/or quantity wise among more than one Bidder. Hence, all bidders are advised to quote their most competitive rates against each line item.
29	In case of increase in quantity for any item, the unit rate mentioned above shall be considered for the same.
30	HSN/SAC codes for respective line item must be mandatorily provided wherever applicable.
31	TPCODL reserve the right to split the order quantity to any extent amongst the bidders.

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**Breakup of Total Lump Sum Contract Price for Substation Automation System**

	Supply (INR)	Services (INR)	Standard & Extended Warranty (INR)	*Optional Item # 1 (Ph 1) (INR)	Mandatory Spares (Ph 2) (INR)	Training (INR)	Total (INR)
	All Inclusive	All Inclusive	All Inclusive	All Inclusive	All Inclusive	All Inclusive	All Inclusive
<b>Phase # 1</b>	0	0	0	0	-	0	0
<b>Phase # 2</b>	0	0	0	-	0	0	0
<b>Grand Total (Phase 1+ Phase 2) (INR)</b>	<b>0</b>						

\*Optional Item not included in total cost for Phase #1

**Note:**

- Bidder to note that the prices quoted for optional item will be used for any Addition/Deletion of module as per the site Requirement.
- The Modules shall be considered with all required software, Cables, Connectors etc.

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**Price Schedule for RTU System – Conventional Substation (Phase # 1)**

Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>Phase # 1</b>							
<b>A</b>		<b>RTU Based Substation Automation System (Indoor Type)</b>					
A1	Conventional Substations (22 Nos.)	RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	A1	RTU_CONV_SS_BOM_PH1	Lot	18	0
A2		RTU System Applications Software Licenses with OS	J.1 - J.5		Lot	18	0
A3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	18	0
A4		RTU System Engineering, Installation, Commissioning & Testing Services	K.1		Lumpsum	18	0
<b>Total of A</b>							<b>0</b>
<b>B</b>		<b>SIC System (Indoor Type)</b>					
B1	Conventional Substations (22 Nos.)	SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	C3	RTU_CONV_SS_BOM_PH1	Lot	18	0
B2		SIC System Applications Software Licenses with OS	J.6 - J.7		Lot	18	0

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
B3		SIC System Engineering, Installation, Commissioning & Testing Services	K.3		Lumpsum	18	0
<b>Total of B</b>							0
<b>C</b>		<b>RTU Based Substation Automation System (Outdoor Type)</b>					
C1	Conventional Substations (22 Nos.)	RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	B.2	RTU_CONV_SS_BOM_PH1	Lot	4	0
C2		RTU System Applications Software Licenses with OS	J.1 - J.5		Lot	4	0
C3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	4	0
C4		RTU System Engineering, Installation, Commissioning & Testing Services	K.2		Lumpsum	4	0
<b>Total of C</b>							0
<b>D</b>		<b>SIC System (Outdoor Type)</b>					
D1	Conventional Substations (22 Nos.)	SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	D.4	RTU_CONV_SS_BOM_PH1	Lot	4	0
D2		SIC System Applications Software Licenses with OS	J.6 - J.7		Lot	4	0

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
D3		SIC System Engineering, Installation, Commissioning & Testing Services	K.4		Lumpsum	4	0
<b>Total of D</b>							<b>0</b>
<b>E</b>		<b>Contact Multiplier Relay with Mounting Base</b>					
E1	Conventional Substations (22 Nos.)	Contact Multiplier Relay with Mounting Base	E.5	RTU_CONV_SS_BOM_PH1	Lot	1	0
E2		Installation and Commissioning of Contact Multiplier Relays with bases in CRP Panel	K.5		Lot	1	0
<b>Total of E</b>							<b>0</b>
<b>F</b>		<b>Interposing Relay with Mounting Base for Digital Output</b>					
F1	Conventional Substations (22 Nos.)	Interposing Relay with Mounting Base for Digital Output	F.6	RTU_CONV_SS_BOM_PH1	Lot	1	0
F2		Installation and Commissioning of Interposing Relays with bases in SIC Panel	K.6		Lot	1	0
<b>Total of F</b>							<b>0</b>
<b>G</b>		<b>Multi Function Meter</b>					
G1	Conventional Substations (22 Nos.)	Multi Function Meter for all 33, 11 KV Feeders and BUS PTs	21	RTU_CONV_SS_BOM_PH1	Lot	1	0



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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
G2		Installation and Commissioning of Multifunction Meters in CRP Panel an it integration with RTU	K.7		Lot	1	0
<b>Total of G</b>							<b>0</b>
<b>H</b>		<b>GPS Clock with NTP Server</b>					
H1	Conventional Substations (22 Nos.)	GPS Clock with NTP/SNTP Server	20	RTU_CONV_SS_BOM_PH1	Nos.	22	0
H2		Installation and Commissioning of GPS Receiver and its integration with site equipment	K.8		Nos.	22	0
<b>Total of H</b>							<b>0</b>
<b>I</b>		<b>Temperature &amp; Humidity Sensor</b>					
I1	Conventional Substations	Temperature & Humidity Sensor	24	RTU_CONV_SS_BOM_PH1	Nos.	15	0
I2		Installation and Commissioning of Temperature & Humidity Sensor and its Integration with RTU	K.9		Nos.	15	0
<b>Total of I</b>							<b>0</b>
<b>J</b>		<b>Instrumentation Cable for Status, Control &amp; Power Supply</b>					
J1	Conventional Substations (22 Nos.)	Instrumentation Cable for Status, Control & Power Supply	G.7- G.12	RTU_CONV_SS_BOM_PH1	Lot	1	0
J2		Laying and Termination of Instrumentation and Power Supply Cables	K.10		Lot	1	0

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>Total of J</b>							<b>0</b>
<b>K</b>		<b>Communication Cable for MFM, IEDs Integration</b>					
K1	Conventional Substations (22 Nos.)	Communication Cable for MFM, IEDs Integration	H.13-H.16	RTU_CONV_SS_BOM_PH1	Lot	1	0
K2		Laying and Termination of Instrumentation and Power Supply Cables	K.11		Lot	1	0
<b>Total of K</b>							<b>0</b>
<b>L</b>		<b>24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller</b>					
L1	Conventional Substations (22 Nos.)	24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller	I.17-I.19	RTU_CONV_SS_BOM_PH1	Nos.	22	0
L2		DC System Controller OS, Application Software Licenses	J.9-J.10		Nos.	22	0
L3		Decommissioning of existing DC System (Battery & Battery Charger) and Installation and Commissioning of New DC System (Battery & Battery Charger and DCDB) & restoration of DC supply to existing DCDB	K.12		Nos.	22	0
<b>Total of L</b>							<b>0</b>

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>M</b>		<b>Engineering Configuration Laptop</b>					
M1	Conventional Substations	Engineering Configuration Laptop	23	RTU_CONV_SS_BOM_PH1	Set	7	-
M2		Microsoft Windows compatible with latest version of configuration software, Microsoft Office License pack, Antivirus Symantec Endpoint protection small business edition with three year subscription, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU and Protection IEDs, Simulation Software, Applicable Software licenses for SIC System and shall be in-line with RTU Software. Proposed Licenses shall be independent of Engineering					0
<b>Total of M</b>							<b>0</b>
<b>N</b>		<b>Earthing and Earth Pit</b>					
N1	Conventional Substations (22 Nos.)	Earthing and Earth Pit	22	RTU_CONV_SS_BOM_PH1	Set	22	0
N2		Installation and Commissioning of Earth Pit and laying and termination of earthing cable for RTU, SIC and DC System	K.13				0
<b>Total of N</b>							<b>0</b>

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>TOTAL OF (A+B+C+D+E+F+G+H+I+J+K+L+M+N)</b>							0
<b>O</b>	<b>Standard and Extended Warranty</b>						
<b>O.1</b>	Standard Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty <b>period of 5 Years</b> from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.	L.1		Lumpsum	1	0
<b>Total of O.1</b>							0
<b>O.2</b>	Extended Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products <b>for next 5 years</b> over and above as mentioned in item O.1	L.2		Lumpsum	1	0
<b>Total of O.2</b>							0

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
O.3	Extended Warranty Support	Hardware & Software warranty support for next 5 years over and above as mentioned in clause O.1 and O.2 for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products.	L.3		Lumpsum	1	0
<b>Total of O.3</b>							0
<b>Total of O</b>							0
P	Training	<b>Training (50 Man-days)</b>			Man-days		
P.1		RTU based Automation System - On-site Training	M.1			50	0
<b>Total of P</b>							0
<b>Grand Total (Supply + Services + Warranty + Training) for Phase # 1</b>							<b>0</b>
Q	Optional Item #1	Optional item of RTU	N		Lumpsum	1	0
<b>Total of Q</b>							0

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sl. No.	Item	Description	Item	Reference	UOM	Qty							
<b>Phase # 1</b>													

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1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sl. No.	Item	Description	Item	Reference	UOM	Qty							
<b>A</b>	Conventional Substations (22 Nos.)	<b>RTU Based Substation Automation System (Indoor Type)</b>		RTU_CONV_SS_BOM_PH1			Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
A1		RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	A1		Lot	18							
A2		RTU System Applications Software Licenses with OS	J.1 - J.5		Lot	18							
A3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	18							
A4		RTU System Engineering, Installation, Commissioning & Testing Services	K.1		Lumpsum	18							
<b>Total of A</b>													
<b>B</b>	Conventional Substations (22 Nos.)	<b>SIC System (Indoor Type)</b>		RTU_CONV_SS_BOM_PH1			Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
B1		SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	C3		Lot	18							
B2		SIC System Applications Software Licenses with OS	J.6 - J.7		Lot	18							
B3	SIC System Engineering, Installation, Commissioning & Testing Services	K.3	Lumpsum	18									
<b>Total of B</b>													
<b>C</b>	Conventional Substations (22 Nos.)	<b>RTU Based Substation Automation System (Outdoor Type)</b>		RTU_CONV_SS_BOM_PH1			Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
C1		RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	B.2		Lot	4							
C2		RTU System Applications Software Licenses with OS	J.1 - J.5		Lot	4							
C3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	4							
C4	RTU System Engineering, Installation, Commissioning & Testing Services	K.2	Lumpsum	4									
<b>Total of C</b>													
<b>D</b>	Conventional Substations (22 Nos.)	<b>SIC System (Outdoor Type)</b>		RTU_CONV_SS_BOM_PH1			Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
D1		SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	D.4		Lot	4							
D2		SIC System Applications Software Licenses with OS	J.6 - J.7		Lot	4							
D3	SIC System Engineering, Installation, Commissioning & Testing Services	K.4	Lumpsum	4									

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Sl. No.	Item	Description	Item	Reference	UOM	Qty							
<b>Total of D</b>													
<b>E</b>	Conventional Substations (22 Nos.)	<b>Contact Multiplier Relay with Mounting Base</b>		RTU_CONV_SS_BOM_PH1			Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
E1		Contact Multiplier Relay with Mounting Base	E.5		Lot	1							
E2		Installation and Commissioning of Contact Multiplier Relays with bases in CRP Panel	K.5		Lot	1							
<b>Total of E</b>													
<b>F</b>	Conventional Substations (22 Nos.)	<b>Interposing Relay with Mounting Base for Digital Output</b>		RTU_CONV_SS_BOM_PH1			Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
F1		Interposing Relay with Mounting Base for Digital Output	F.6		Lot	1							
F2		Installation and Commissioning of Interposing Relays with bases in SIC Panel	K.6		Lot	1							
<b>Total of F</b>													
<b>G</b>	Conventional Substations (22 Nos.)	<b>Multi-Function Meter</b>		RTU_CONV_SS_BOM_PH1			Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
G1		Multi-Function Meter for all 33, 11 KV Feeders and BUS PTs	21		Lot	1							
G2		Installation and Commissioning of Multifunction Meters in CRP Panel and its integration with RTU	K.7		Lot	1							
<b>Total of G</b>													
<b>H</b>	Conventional Substations (22 Nos.)	<b>GPS Clock with NTP Server</b>		RTU_CONV_SS_BOM_PH1			Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
H1		GPS Clock with NTP/SNTP Server	20		Nos.	22							
H2		Installation and Commissioning of GPS Receiver and its integration with site equipment	K.8		Nos.	22							
<b>Total of H</b>													
<b>I</b>	Conventional Substations	<b>Temperature &amp; Humidity Sensor</b>		RTU_CONV_SS_BOM_PH1			Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
I1		Temperature & Humidity Sensor	24		Nos.	15							
I2		Installation and Commissioning of Temperature & Humidity Sensor and its Integration with RTU	K.9		Nos.	15							
<b>Total of I</b>													

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Sl. No.	Item	Description	Item	Reference	UOM	Qty							
<b>J</b>	Conventional Substations (22 Nos.)	<b>Instrumentation Cable for Status, Control &amp; Power Supply</b>					Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
J1		Instrumentation Cable for Status, Control & Power Supply	G.7-G.12	RTU_CONV_SS_BOM_PH1	Lot	1							
J2		Laying and Termination of Instrumentation and Power Supply Cables	K.10		Lot	1							
		<b>Total of J</b>											
<b>K</b>	Conventional Substations (22 Nos.)	<b>Communication Cable for MFM, IEDs Integration</b>					Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
K1		Communication Cable for MFM, IEDs Integration	H.13-H.16	RTU_CONV_SS_BOM_PH1	Lot	1							
K2		Laying and Termination of Instrumentation and Power Supply Cables	K.11		Lot	1							
		<b>Total of K</b>											
<b>L</b>	Conventional Substations (22 Nos.)	<b>24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller</b>					Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
L1		24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller	I.17-I.19	RTU_CONV_SS_BOM_PH1	Nos.	22							
L2		DC System Controller OS, Application Software Licenses	J.9-J.10		Nos.	22							
L3		Decommissioning of existing DC System (Battery & Battery Charger) and Installation and Commissioning of New DC System (Battery & Battery Charger and DCDB) & restoration of DC supply to existing DCDB	K.12		Nos.	22							
		<b>Total of L</b>											
<b>M</b>	Conventional Substations	<b>Engineering Configuration Laptop</b>					Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
M1		Engineering Configuration Laptop - Hardware		23	RTU_CONV_SS_BOM_PH1	Set							7
M2	Microsoft Windows compatible with latest version of configuration software, Microsoft Office License pack, Antivirus Symantec Endpoint protection small business edition with three year subscription, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU and Protection IEDs, Simulation Software, Applicable Software licenses for SIC System and shall be in-line with RTU Software. Proposed Licenses shall be independent of Engineering												



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Sl. No.	Item	Description	Item	Reference	UOM	Qty								
<b>Total of M</b>														
<b>N</b>	Conventional Substations (22 Nos.)	<b>Earthing and Earth Pit</b>												
N1		Earthing and Earth Pit	22	RTU_CONV_SS_BOM_PH1	Set	22	Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.							
N2		Installation and Commissioning of Earth Pit and laying and termination of earthing cable for RTU, SIC and DC System	K.13											
<b>Total of N</b>														
<b>TOTAL OF (A+B+C+D+E+F+G+H+I+J+K+L+M+N)</b>														
<b>O</b>	Standard Warranty	<b>Standard and Extended Warranty</b>												
O.1		Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.			Lumpsum	1	Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.							
<b>Total of O.1</b>														
O.2		Extended Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products for next 5 years over and above as mentioned in item O.1			Lumpsum	1	Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.						
<b>Total of O.2</b>														
O.3	Extended Warranty Support	Hardware & Software warranty support for next 5 years over and above as mentioned in clause O.1 and O.2 for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products.			Lumpsum	1	Unpriced Bid, Bidder to confirm the items are in-line with commercial proposal.							
<b>Total of O.3</b>														
<b>Total of O</b>														
<b>P</b>	Training	<b>Training (50 Man-days)</b>			Man-days	50	Unpriced Bid, Bidder to confirm							

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1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sl. No.	Item	Description	Item	Reference	UOM	Qty							
P.1		RTU based Automation System - On-site Training	-				the items are in-line with commercial proposal.						
<b>Total of P</b>													
<b>Total (Supply + Services) Project Cost for Phase # 1 (excluding Training)</b>													
<b>Grand Total (Supply + Services + Training) for Phase # 1</b>													

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**Price Schedule for RTU System – Conventional Substation (Phase # 2)**

Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>Phase # 2</b>							
<b>A</b>		<b>RTU Based Substation Automation System (Indoor Type)</b>					
A1	Conventional Substations (67 Nos.)	RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	A1	RTU_CONV_SS_BOM_PH2	Lot	50	0
A2		RTU System Applications Software Licenses with OS	J.1 - J.5		Lot	50	0
A3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	50	0
A4		RTU System Engineering, Installation, Commissioning & Testing Services	K.1		Lumpsum	50	0
<b>Total of A</b>							<b>0</b>
<b>B</b>		<b>SIC System (Indoor Type)</b>					
B1	Conventional Substations (67 Nos.)	SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	C3	RTU_CONV_SS_BOM_PH2	Lot	50	0
B2		SIC System Applications Software Licenses with OS	J.6-		Lot	50	0

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
			J.7				
B3		SIC System Engineering, Installation, Commissioning & Testing Services	K.3		Lumpsum	50	0
<b>Total of B</b>							<b>0</b>
<b>C</b>		<b>RTU Based Substation Automation System (Outdoor Type)</b>					
C1	Conventional Substations (67 Nos.)	RTU System Hardware inclusive of I/O Module, Ethernet Switches, Networking Accessories, Panel etc.	B.2	RTU_CONV_SS_BOM_PH2	Lot	17	0
C2		RTU System Applications Software Licenses with OS	J.1- J.5		Lot	17	0
C3		Software for Local and Remote configuration of Ethernet Switches	J.8		Lot	17	0
C4		RTU System Engineering, Installation, Commissioning & Testing Services	K.2		Lumpsum	17	0
<b>Total of C</b>							<b>0</b>
<b>D</b>		<b>SIC System (Outdoor Type)</b>					
D1	Conventional Substations (67 Nos.)	SIC System Hardware inclusive of I/O Module, networking accessories, Panel, etc.	D.4	RTU_CONV_SS_BOM_PH2	Lot	17	0
D2		SIC System Applications Software Licenses with OS	J.6-		Lot	17	0

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
			J.7				
D3		SIC System Engineering, Installation, Commissioning & Testing Services	K.4		Lumpsum	17	0
<b>Total of D</b>							<b>0</b>
<b>E</b>		<b>Contact Multiplier Relay with Mounting Base</b>					
E1	Conventional Substations (67 Nos.)	Contact Multiplier Relay with Mounting Base	E.5	RTU_CONV_SS_BOM_PH2	Lot	1	0
E2		Installation and Commissioning of Contact Multiplier Relays with bases in CRP Panel	K.5		Lot	1	0
<b>Total of E</b>							<b>0</b>
<b>F</b>		<b>Interposing Relay with Mounting Base for Digital Output</b>					
F1	Conventional Substations (67 Nos.)	Interposing Relay with Mounting Base for Digital Output	F.6	RTU_CONV_SS_BOM_PH2	Lot	1	0
F2		Installation and Commissioning of Interposing Relays with bases in SIC Panel	K.6		Lot	1	0
<b>Total of F</b>							<b>0</b>
<b>G</b>		<b>Multi Function Meter</b>					
G1	Conventional Substations (67 Nos.)	Multi Function Meter for all 33, 11 KV Feeders and BUS PTs	21	RTU_CONV_SS_BOM_PH2	Lot	1	0

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
G2		Installation and Commissioning of Multifunction Meters in CRP Panel an it integration with RTU	K.7		Lot	1	0
<b>Total of G</b>							<b>0</b>
<b>H</b>		<b>GPS Clock with NTP Server</b>					
H1	Conventional Substations (67 Nos.)	GPS Clock with NTP Server	20	RTU_CONV_SS_BOM_PH2	Nos.	67	0
H2		Installation and Commissioning of GPS Receiver and its integration with site equipment	K.8		Nos.	67	0
<b>Total of H</b>							<b>0</b>
<b>I</b>		<b>Temperature &amp; Humidity Sensor</b>					
I1	Conventional Substations (67 Nos.)	Temperature & Humidity Sensor	24	RTU_CONV_SS_BOM_PH2	Nos.	15	0
I2		Installation and Commissioning of Temperature & Humidity Sensor and its Integration with RTU	K.9		Nos.	15	0
<b>Total of I</b>							<b>0</b>
<b>J</b>		<b>Instrumentation Cable for Status, Control &amp; Power Supply</b>					
J1	Conventional Substations (67 Nos.)	Instrumentation Cable for Status, Control & Power Supply	G.7- G.12	RTU_CONV_SS_BOM_PH2	Lot	1	0
J2		Supply, Laying and Termination of Instrumentation and Power Supply Cables	K.10		Lot	1	0

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>Total of J</b>							<b>0</b>
<b>K</b>		<b>Communication Cable for MFM, IEDs Integration</b>					
K1	Conventional Substations (67 Nos.)	Communication Cable for MFM, IEDs Integration	H.13- H.16	RTU_CONV_SS_BOM_PH2	Lot	1	0
K2		Supply, Laying and Termination of Instrumentation and Power Supply Cables	K.11		Lot	1	0
<b>Total of K</b>							<b>0</b>
<b>L</b>		<b>24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller</b>					
L1	Conventional Substations (67 Nos.)	24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller	I.17- I.19	RTU_CONV_SS_BOM_PH2	Nos.	67	0
L2		DC System Controller OS, Application Software Licenses	J.9- J.10		Nos.	67	0
L3		Decommissioning of existing DC System (Battery & Battery Charger) and Installation and Commissioning of New DC System (Battery & Battery Charger and DCDB) & restoration of DC supply to existing DCDB	K.12		Nos.	67	0
<b>Total of L</b>							<b>0</b>

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>M</b>		<b>Engineering Configuration Laptop</b>					
M1		Engineering Configuration Laptop					
M2	Conventional Substations (67 Nos.)	Microsoft Windows compatible with latest version of configuration software, Microsoft Office License pack, Antivirus Symantec Endpoint protection small business edition with three year subscription, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU and Protection IEDs, Simulation Software, Applicable Software licenses for SIC System and shall be in-line with RTU Software. Proposed Licenses shall be independent of Engineering	23	RTU_CONV_SS_BOM_PH2	Set	8	0
<b>Total of M</b>							0
<b>N</b>		<b>Earthing and Earth Pit</b>					
N1	Conventional Substations (67 Nos.)	Earthing and Earth Pit	22				0
N2	Conventional Substations (67 Nos.)	Installation and Commissioning of Earth Pit and laying and termination of earthing cable for RTU, SIC and DC System	K.13	RTU_CONV_SS_BOM_PH2	Set	67	0
<b>Total of N</b>							0



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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>TOTAL OF (A+B+C+D+E+F+G+H+I+J+K+L+M+N)</b>							0
<b>O</b>	<b>Standard and Extended Warranty</b>						
<b>O.1</b>	Standard Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.	L.1		Lumpsum	1	0
<b>Total of O.1</b>							0
<b>O.2</b>	Extended Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products for next 5 years over and above as mentioned in item O.1	L.2		Lumpsum	1	0
<b>Total of O.2</b>							0

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Sl. No.	Item	Description	Item	Reference	UOM	Qty	Gross Price (INR)
<b>O.3</b>	Extended Warranty Support	Hardware & Software warranty support for next 5 years over and above as mentioned in clause O.1 and O.2 for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products.	L.3		Lumpsum	1	0
<b>Total of O.3</b>							0
<b>Total of O</b>							0
<b>P</b>	Spares	<b>Mandatory Spares</b>		Mandatory Spares	Lot	1	
P.1		Spares for RTU Based Automation System	M.1				0
<b>Total of P</b>							0
<b>Q</b>	Training	<b>Training (50 Man-days)</b>			Man-days	50	
Q.1		RTU based Automation System - On-site Training	N.1				0
<b>Total of Q</b>							0
<b>Grand Total (Supply + Services + Warranty + Spares + Training) for Phase # 2</b>							<b>0</b>

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**Indicative BOM for RTU System – Conventional Substation (Phase # 1)**

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
A	Pre-Wired RTU Panel	(Indoor Application)									

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
1	Pre-Wired RTU Panel	<p><b>Pre-Wired RTU Panel (Indoor Application)</b>  <b>RTU Redundancy :</b> Mandatory  <b>I/O Requirement:</b> with 96 DI, 48 DO, 16 AI with Auxiliary relay for each Digital Output  <b>Communication Ports:</b> RS-485 - Minimum 6 nos. ports, 4 nos. Ethernet ports (Independent Ethernet Port for Master and IED communication)  <b>Power supply:</b> Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact  <b>Protocols :</b> IEC104, IEC103, IEC61850 (ED1, ED2), MODBUS (Serial), MODBUS (TCP/IP) with Server and Client license, SNTP, SNMP, MQTT  <b>Software Licenses:</b> Application Software, Configuration tools, Diagnostic tools. Logic building Application-Interlock logic, Calculation Package, SMS Utility Software  <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.  <b>Other Accessories:</b> Pre-fabricated cables for I/O modules, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies</p>	Set		1	18		0	0	0	0

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
	<b>Managed Layer2 Ethernet Switch</b>	<b>Managed L2 Ethernet Switch for IED Communication &amp; for SCADA Integration</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (4 Nos., SM) & Copper Ports (8 Nos.) <b>Power Supply:</b> Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in RTU Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	18			0	0	0
	<b>Managed Layer2 Ethernet Switch</b>	<b>Managed L2 Ethernet Switch for 33 &amp; 11 kV IED Communication</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (2 Nos., MM) & Copper Ports (10 Nos.) <b>Power Supply:</b> Non-Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in CRP (33 & 11 kV) Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	18			0	0	0

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
	<b>Networking Accessories</b>	<b>Networking Accessories for Integration of IEDs, Ethernet Switches &amp; RTU</b> All required networking accessories like patch panel (for each ethernet switch), LIU, patch cords (Fibre Optic, UTP as per the Ethernet Switch Configuration) of suitable length, Conduits for all non-armored cables, RJ45 connectors, I/O boxes with Quad face plate and connectors etc.	Set		1	18			0	0	0
<b>Sub Total of RTU System for Indoor Application</b>											0
<b>B</b>	<b>Pre-Wired RTU Panel (Outdoor Application)</b>										

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
2	Pre-Wired RTU Panel	<p><b>Pre-Wired RTU Panel (Outdoor Application)</b>  <b>RTU Redundancy :</b> Mandatory  <b>I/O Requirement:</b> with 96 DI, 48 DO, 16 AI with Auxiliary relay for each Digital Output  <b>Communication Ports:</b> RS-485 - Minimum 6 nos. ports, 4 nos. Ethernet ports (Independent Ethernet Port for Master and IED communication)  <b>Power supply:</b> Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact  <b>Protocols :</b> IEC104, IEC103, IEC61850 (ED1, ED2), MODBUS (Serial), MODBUS (TCP/IP) with Server and Client license, SNTP, SNMP, MQTT  <b>Software Licenses:</b> Application Software, Configuration tools, Diagnostic tools. Logic building Application-Interlock logic, Calculation Package, SMS Utility Software  <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.  <b>Other Accessories:</b> Pre-fabricated cables for I/O modules, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies</p>	Set		1	4			0	0	0

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
	<b>Managed Layer2 Ethernet Switch</b>	<b>Managed L2 Ethernet Switch for IED Communication &amp; for SCADA Integration</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (4 Nos., SM) & Copper Ports (8 Nos.) <b>Power Supply:</b> Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in RTU Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	4			0	0	0
	<b>Managed Layer2 Ethernet Switch</b>	<b>Managed L2 Ethernet Switch for 33 &amp; 11 kV IED Communication</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (2 Nos., MM) & Copper Ports (10 Nos.) <b>Power Supply:</b> Non-Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in CRP (33 & 11 kV) Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	4			0	0	0





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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
3	Signal Interface Panel	<p><b>SIC- Panel for Termination of field cable and housing of interface and I/O modules (Indoor Application)</b>  <b>Input/Output Interface:</b> For integration of I/O modules, interface modules etc. These I/O, Interface modules shall communicate to both Main and Stand-by RTU as per Item no. 1.  <b>Communication Ports:</b> Interface modules shall have ports to communicate with Main &amp; Standby RTU  <b>Protocols :</b> Interface modules shall use Open Protocols, No proprietary protocols are envisaged  <b>Power supply:</b> Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact  <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.  <b>Other Accessories:</b> Pre-fabricated cables for I/Os cards, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies, Necessary TBs, Din rail channels and other accessories.</p>	Set		1	18		0	0	0	
<b>Sub Total of SIC Panel for Indoor Application</b>										0	

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
D	Pre-Wired SIC Panel (Outdoor Application)										
4	Signal Interface Panel	<p><b>SIC- Panel for Termination of field cable and housing of interface and I/O modules (Outdoor Application)</b>  <b>Input/Output Interface:</b> For integration of I/O modules, interface modules etc. These I/O, Interface modules shall communicate to both Main and Stand-by RTU as per Item no. 1.  <b>Communication Ports:</b> Interface modules shall have ports to communicate with Main &amp; Standby RTU  <b>Protocols :</b> Interface modules shall use Open Protocols, No proprietary protocols are envisaged  <b>Power supply:</b> Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact  <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.  <b>Other Accessories:</b> Pre-fabricated cables for I/Os cards, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies, Necessary TBs, Din rail channels and other accessories.</p>	Set		1	4		0	0	0	

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
<b>Sub Total of SIC Panel for Outdoor Application</b>											0
E		Contact Multiplier Relay with Mounting Base [Total Substations=22 (Indoor (18)+ Outdoor(4))]									

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5	<b>CMR with Mounting Base</b>	<b>Contact Multiplier Relay with Mounting Base:</b> 1. Contact Material : Silver Alloy 2. Contact Rating : 5 Amps. @ 24 V DC 3. Contact Resistance : 50 M ohms max. (Initial) 4. Dielectric Strength : i) Between open contacts : 500 V Rms ii) Between Contact and Coil : 2000 V Rms 5. Insulation Resistance : 500 M ohms @ 500 V DC, 250C 6. Operate time at Nominal Voltage : 20 milli seconds 7. Release time at nominal Voltage : 10 milli seconds 8. Ambient temperature : 0 to 70°C 9. Life expectancy : i. Mechanical : 106 operations. ii. Electrical : 105 operations at rated load 10. Coil Resistance at nominal Voltage (DC) : 30,000 ohms +10% at 250°C 11. Type of contact multiplier : 4R – 2 – 220 LD with DIN rail mounting with LED indicator 12. Type of mounting : Socket mounting. 13. No. of Poles. : 2 No. + 2 Nc. 14. Other Accessories: Necessary TB, Din rail channel and other accessories to mount in CRP	Nos./Substation		96	2112			0	0	0



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7	<b>Instrumentation Cable 12 Core Armored 0.5 mm<sup>2</sup> for Status and Indications</b>	<b>Instrumentation Cable for Status and Indications</b> 12 Core armored 0.5 sq.mm. 1100 V rated, annealed stranded copper, PVC insulated, individual and overall shielded, field cable <b>Preferred Make:</b> CCI / FINOLEX / HAVELLS / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		600	13200			0	0	0
8	<b>Instrumentation Cable 7 Core Armored 1.5 mm<sup>2</sup> for Control Output</b>	<b>Instrumentation Cable for Control Output</b> 7 Core armored 1.5 sq.mm. 1100V rated, annealed stranded copper, PVC insulated, individual and overall shielded, field cable <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		280	6160			0	0	0

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9	<b>Twisted Pair Shielded &amp; Over all shielded Instrumentation Cable 5 Pair Armored 1.0 mm2 for Analog Input</b>	<b>Twisted paired Shielded &amp; Overall Shielded Cable for Analog Inputs</b> 5 Pair armored 1.0 sq.mm copper twisted paired shielded and Overall shielded cable for Analog inputs from CRP panel to the RTU Preferred Make: CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		50	1100			0	0	0
10	<b>10C X 2.5 mm2 Copper cable for extension of CT</b>	<b>Control Cable for CT Extension</b> 10 core X 2.5 sq.mm. multistrand copper cable for extending CT & CVT inputs to the MFM in the CRP panel. Preferred Make: CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		20	440			0	0	0
11	<b>4C X 2.5 mm2 Copper cable for extension of PT</b>	<b>Control Cable for PT Extension</b> 4 core X 4 sq.mm. multistrand copper cable for extending PT inputs to the MFM in the CRP panel <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables /	Meters/ Substation		20	440			0	0	0



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		Incab / Asian Cable / KEI / Polycab / Ruchika									
12	<b>3C X 4 mm2 power Supply Cable for extension of DC Supply</b>	<b>Power Supply Cable from DCDB to RTU &amp; SIC Panel</b> 3 core X 4 sq.mm. Armored multistrand Power Supply cable for extending Power Supply from DCDB to RTU & SIC Panel <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/ Substation		100	2200			0	0	0
<b>Sub Total of Instrumentation Cable for Status, Control &amp; Power Supply</b>											0
<b>H</b>	<b>Communication Cable for MFM, IEDs Integration</b>										
13	<b>4P X 0.36 mm2 Armored Communication Cable for MFM</b>	<b>Communication Cable:</b> 4P X 0.36 Sq.mm Armored multistrand Pair and Overall shielded, for Multifunction Meter looping. <b>Preferred Make : Belden/LAPP/SATYAM</b>	Meters/ Substation		120	2640			0	0	0

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14	<b>Armored CAT6 UTP Cable</b>	Armored CAT6 UTP Cable <b>Preferred Make : Systemax</b>	Meters/ Substation		50	1100			0	0	0
15	<b>Un-Armored CAT6 UTP Cable</b>	Un-Armored CAT6 UTP Cable <b>Preferred Make : Systemax</b>	Meters/ Substation		100	2200			0	0	0
16	<b>Armored FO Cable 12 Core SM/MM</b>	Armored Fibre Optic Cable for SCADA 12 core, SM/MM <b>Preferred Make Finolex / KEC / Apar</b>	Meters/ Substation		100	2200			0	0	0
<b>Sub Total of Communication Cable for MFM, IEDs Integration</b>											0
I	<b>24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller</b>										
17	<b>24 V DC SYSTEM</b>	24V, 70 Amp Float Cum Boost Charger with Microprocessor based Controller (N+1)	No.		1	22			0	0	0
18		24V, 150 AH VRLA Type Storage Battery (Type-1)	Set		1	4			0	0	0
		24V, 200 AH VRLA Type Storage Battery ( Type-2)	Set		1	18			0	0	0
19		DCDB with 2 Incomers and 15 Outgoing Feeders	No.		1	22			0	0	0
<b>Sub Total of DC System</b>											0
<b>Grand Total Supply (A+B+C+D+E+F+G+H+I)</b>											0

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
20	GPS Clock with NTP Server	<b>GPS Clock with NTP Server</b> <b>GPS Receiver Clock:</b> 19" rack mountable chassis w/sliding Rapid/Versa rails and cable management arm, Size - 1U/2U, Front keyboard with status LEDs and LCD display, Battery Backup <b>Outputs:</b> TCP/IP (Redundant), Potential Free Pulse Contacts for 1 PPM, 1 PPS, 1 PPH, Potential free alarm contacts <b>Protocols:</b> NTP, SNTP, Pulse <b>Power Supply:</b> 24 V DC Power Supply, with battery backup <b>Antenna :</b> Helical, with connectors, min 50 mtrs Low loss cable, Lighting Arrester with wall mounting arrangement, Length of the Low Loss Antenna Cable will be as per site requirement <b>Mounting :</b> To be mounted in RTU Panel <b>Preferred make -</b> Sertel / Masibus/Sands	Nos.		1	22		0	0	0	
<b>Sub Total of GPS Clock with NTP Server</b>										0	

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21	Multifunction Meter	<p><b>Multi Function Meter</b> : For all 33 &amp; 11 KV Feeders Multifunctional 3-phase Power meter, four quadrant active and reactive energy polyphase static meter  <b>Accuracy Class:</b> 0.2 S as per IEC62053:22  <b>Voltage Inputs:</b> Operating range : 690 V AC line-to-line, 460 V AC line-to-neutral  <b>Current Inputs:</b> 1A / 5A (User selectable CT secondary 1A / 5A, PT Secondary)  <b>Wiring configurations:</b> 3OP2, 4LN3, 3DIR2, 4LL3, 3OP3, 3LN3, 3LL3, 3BLN3, 3BLL3 (All wiring configurations selected via the front panel)  <b>Communication Port:</b> RS 485 Serial Port with removable connector  <b>Protocols:</b> MODBUS RTU, Assignable Register map, Device Address (User Configurable - (1-247))  <b>Auxiliary Supplies:</b> 24 V DC  <b>Other Accessories:</b> Necessary TB, Din rail channel and other accessories for flash mounting in CRP  <b>Preferred Make:</b> SATEC PM130EH+</p>	Nos./Substation		10	220			0	0	0
<b>Sub Total of Multi Function Meter</b>											0

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22	Earthing and Earth Pit	<b>Earthing:</b> a) Earth Pit: Separate earth pits should be provisioned for attaining the resistance value of maximum 2 Ohms. b) Earthing Wires: RTU Panels, SIC Panel, DC Systems are to be wired with Earth Pit. Copper wires size would be minimum of 10 Sq.mm.	Set		-	22			0	0	0
<b>Sub Total of Earthing and Earth Pit</b>											0
<b>Grand Total Supply (A+B+C+D+E+F+G+H+I) + Item 20 + Item 21 + Item 22</b>											0
23	Engineering Configuration Laptop	<b>Configuration Laptop</b> <b>Hardware:</b> Laptop with latest processor, 1 TB SSD, 8 GB RAM, DVD RW, Ethernet Port, 4 USB Ports, 15" Display with 1 no. serial to USB converter <b>Software License:</b> Microsoft Windows compatible with latest version of configuration software, Microsoft Office License pack, Antivirus Symantec Endpoint protection small business edition with three year subscription, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU and Protection IEDs, Simulation Software, Applicable Software licenses for SIC System and shall be in-line with RTU Software. Proposed Licenses shall be independent of Engineering	Nos.		-	7			0	0	0

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		Configuration Laptop Hardware. <b>Preferred Make - "DELL/HP"</b>									
24	T&H Sensor	Temperature & Humidity Transmitter : for integration with RTU on RS485 MODBUS	Nos.		-	15			0	0	0
											0
<b>J</b>	<b>RTU and SIC System Software</b>										
J.1	RTU	RTU OS, Application Software Licenses (Main & Standby)	Lumpsum		1	22			0	0	0
J.2		5000 Physical I/O tags, 40 IEDs - IEC61850 (ED1, ED2), 25 IEDs - Serial Protocol	Lumpsum		1	22			0	0	0
J.3		RTU shall Communicate to Eight Independent Remote	Lumpsum		1	22			0	0	0

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		SCADA Master on IEC 60870-5-104									
J.4		SMS Utility Software				22			0	0	0
J.5		<b>Protocols</b> : IEC 60870-5-101, IEC 60870-5-104, IEC 61850 (ED1, ED2), MODBUS (Serial & TCP/IP), MQTT, SNMP (V1.0, V2.0, V3.0), NTP & SNTP, RSTP, PRP & HSR	Lumpsum		1	22			0	0	0
<b>Sub Total Software (J.1... J.5)</b>											0
J.6		Interface Module shall be in-line with RTU Application Software	Lumpsum		1	22			0	0	0
J.7	SIC	<b>Protocols</b> : Communication between SIC I/O interface modules shall be on Open Protocol, No proprietary protocol is envisaged, SNMP (V1.0, V2.0, V3.0), NTP & SNTP	Lumpsum		1	22			0	0	0
<b>Sub Total Software (J.6 + J.7)</b>											0
J.8	Ethernet Switch	Software for Local and Remote configuration of Ethernet Switches - Enabling Monitoring, Configuration, Maintenance and backup of configuration files	Lumpsum		1	22			0	0	0
<b>Sub Total Software Ethernet Switch</b>											0
J.9	DC System Controller	Controller OS, Application Software Licenses (Integration with Main & Standby RTU)	Lumpsum		1	22			0	0	0





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K.1	<b>Services of RTU based System for Indoor Application</b>	Integration and Commissioning RTU Based System for Indoor Application a) Site Survey, Design, Engineering, Finalization of BOM, FDS b) Transportation, Delivery, Unloading and Storage c) Installation and commissioning of Pre-wired RTU and Networking equipment d) Civil Activities for installation of RTU panel e) Cable laying, termination and continuity check of all cables f) Integration of all Protection, MFM, Condition Monitoring devices etc. g) Powering up of all supplied materials h) Configuration of RTU and its accessories i) Integrated testing with Purchaser's SCADA System j) I/O testing, Pre- SAT testing of Hardware and Software functionality k) Integrated FAT & SAT for Hardware and Software l) Demonstration of System Capacity and Performance Guarantee Test m) Submission of As-Built Drawings, RTU Backup	Lumpsum		1	18			0	0	0

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K.2	<b>Services of RTU based System for Outdoor Application</b>	Integration and Commissioning RTU Based System for Outdoor Application a) Site Survey, Design, Engineering, Finalization of BOM, FDS b) Transportation, Delivery, Unloading and Storage c) Installation and commissioning of Pre-wired RTU and Networking equipment d) Civil Activities for installation of RTU panel e) Cable laying, termination and continuity check of all cables f) Integration of all Protection, MFM, Condition Monitoring devices etc. g) Powering up of all supplied materials h) Configuration of RTU and its accessories i) Integrated testing with Purchaser's SCADA System j) I/O testing, Pre- SAT testing of Hardware and Software functionality k) Integrated FAT & SAT for Hardware and Software l) Demonstration of System Capacity and Performance Guarantee Test m) Submission of As-Built Drawings, RTU Backup	Lumpsum		1	10			0	0	0

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K.3	<b>Services of SIC based System for Indoor Application</b>	Integration and Commissioning SIC System for Indoor Application a) Design, Engineering, Finalization of BOM b) Transportation, Delivery, Unloading and Storage c) Civil Activities for installation of RTU panel d) Installation and commissioning of Pre-wired SIC and Networking equipment (if Any) e) Cable laying, termination and continuity check of all cables f) Powering up of all supplied materials g) Configuration of SIC Interface Module and its accessories h) Integrated testing with RTU System i) I/O testing, Pre- SAT testing of Hardware and Software functionality j) Integrated FAT & SAT for Hardware and Software k) Submission of As-Built Drawings	Lumpsum		1	12			0	0	0

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K.4	Services of SIC based System for Outdoor Application	Integration and Commissioning SIC System for Outdoor Application a) Design, Engineering, Finalization of BOM b) Transportation, Delivery, Unloading and Storage c) Civil Activities for installation of RTU panel d) Installation and commissioning of Pre-wired SIC and Networking equipment (if Any) e) Cable laying, termination and continuity check of all cables f) Powering up of all supplied materials g) Configuration of SIC Interface Module and its accessories h) Integrated testing with RTU System i) I/O testing, Pre- SAT testing of Hardware and Software functionality j) Integrated FAT & SAT for Hardware and Software k) Submission of As-Built Drawings	Lumpsum		1	4			0	0	0
K.5	Services for CMR	Installation and Commissioning of Contact Multiplier Relays with bases in CRP Panel	Lumpsum		1	22			0	0	0

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K.6	Services for Interposing Relays	Installation and Commissioning of Interposing Relays with bases in SIC Panel	Lumpsum		1	22			0	0	0
K.7	Services for MFM	Installation and Commissioning of Multifunction Meters in CRP Panel and its integration with RTU	Lumpsum		1	22			0	0	0
K.8	Services for GPS	Installation and Commissioning of GPS Receiver and its integration with site equipment	Lumpsum		1	22			0	0	0
K.9	Services for T&H	Installation and Commissioning of Temperature & Humidity Sensor and its Integration with RTU	Lumpsum		1	15			0	0	0
K.10	Services for Control Cable	Laying and Termination of Instrumentation and Power Supply Cables	Lumpsum		1	22			0	0	0
K.11	Services for Communication Cable	Laying and Termination of Communication Cables	Lumpsum		1	22			0	0	0
K.12	Services for DC System	Decommissioning of existing DC System (Battery & Battery Charger) and Installation and Commissioning of New DC System (Battery & Battery Charger and DCDB) & restoration of DC supply to existing DCDB	Lumpsum		1	22			0	0	0



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L.2	Extended Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products for next 5 years over and above as mentioned in item O.1	Lumpsum			1			0	0	0
<b>Total of L.2</b>											0
L.3	Extended Warranty Support	Hardware & Software warranty support for next 5 years over and above as mentioned in clause O.1 and O.2 for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products.	Lumpsum			1			0	0	0
<b>Total of L.3</b>											0
<b>Total of L</b>											0
M	Training	<b>Training (50 Man-days)</b>									
M.1		RTU based Automation System - On-site Training	Man-days			50			0	0	0
<b>Total of M</b>											0
N	<b>Optional Item : RTU</b>										
N.1	Optional Item	RTU Chassis	No.		-	1			0	0	0
N.2	#1	CPU Module of the RTU	No.		-	1			0	0	0

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N.3		Power Supply Module of the RTU	No.		-	1			0	0	0
N.4		Memory Module of the RTU	No.		-	1			0	0	0
N.5		Communication Module (Ethernet)	No.		-	1			0	0	0
N.6		Communication Module (Serial)	No.		-	1			0	0	0
N.7		DI Cards for Digital Inputs	No.		-	1			0	0	0
N.8		DO Cards for Digital Output	No.		-	1			0	0	0
N.9		AI Cards for Analog Inputs	No.		-	1			0	0	0
N.10		Bus Coupler Module (If Applicable)	No.		-	1			0	0	0
N.11		Remote I/O Rack with all accessories, cables etc. (if Applicable)	No.		-	1			0	0	0
N.12		Interface Module for Digital Inputs with FRC cable	No.		-	1			0	0	0
N.13		Interface Module for Digital Outputs with FRC cable	No.		-	1			0	0	0
N.14		Interface Module for Analog Inputs with FRC cable	No.		-	1			0	0	0
N.15		Any Other Modules Specific to OEM Solution	Lot		-	1			0	0	0





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**Indicative BOM for RTU System – Conventional Substation (Phase # 2)**

Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
A	Pre-Wired RTU Panel (Indoor Application)										
1	Pre-Wired RTU Panel	<p><b>Pre-Wired RTU Panel (Indoor Application)</b>  <b>RTU Redundancy :</b> Mandatory  <b>I/O Requirement:</b> with 96 DI, 48 DO, 16 AI with Auxiliary relay for each Digital Output  <b>Communication Ports:</b> RS-485 - Minimum 6 nos. ports, 4 nos. Ethernet ports (Independent Ethernet Port for Master and IED communication)  <b>Power supply:</b> Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact  <b>Protocols :</b> IEC104, IEC103, IEC61850 (ED1, ED2), MODBUS (Serial), MODBUS (TCP/IP) with Server and Client license, SNTP, SNMP, MQTT  <b>Software Licenses:</b> Application Software, Configuration tools, Diagnostic tools. Logic building Application-Interlock logic, Calculation Package, SMS Utility Software  <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for</p>	Set		1	50		0	0	0	



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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
	<b>Managed Layer2 Ethernet Switch</b>	<b>Managed L2 Ethernet Switch for IED Communication &amp; for SCADA Integration</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (4 Nos., SM) & Copper Ports (8 Nos.) <b>Power Supply:</b> Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in RTU Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	50			0	0	0
	<b>Managed Layer2 Ethernet Switch</b>	<b>Managed L2 Ethernet Switch for 33 &amp; 11 kV IED Communication</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (2 Nos., MM) & Copper Ports (10 Nos.) <b>Power Supply:</b> Non-Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in CRP (33 & 11 kV) Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	50			0	0	0



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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
2	Pre-Wired RTU Panel	<p><b>Pre-Wired RTU Panel (Outdoor Application)</b>  <b>RTU Redundancy :</b> Mandatory  <b>I/O Requirement:</b> with 96 DI, 48 DO, 16 AI with Auxiliary relay for each Digital Output  <b>Communication Ports:</b> RS-485 - Minimum 6 nos. ports, 4 nos. Ethernet ports (Independent Ethernet Port for Master and IED communication)  <b>Power supply:</b> Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact  <b>Protocols :</b> IEC104, IEC103, IEC61850 (ED1, ED2), MODBUS (Serial), MODBUS (TCP/IP) with Server and Client license, SNTP, SNMP, MQTT  <b>Software Licenses:</b> Application Software, Configuration tools, Diagnostic tools. Logic building Application-Interlock logic, Calculation Package, SMS Utility Software  <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.  <b>Other Accessories:</b> Pre-fabricated cables for I/O modules, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies</p>	Set		1	17			0	0	0

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
	<b>Managed Layer2 Ethernet Switch</b>	<b>Managed L2 Ethernet Switch for IED Communication &amp; for SCADA Integration</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (4 Nos., SM) & Copper Ports (8 Nos.) <b>Power Supply:</b> Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in RTU Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	17			0	0	0
	<b>Managed Layer2 Ethernet Switch</b>	<b>Managed L2 Ethernet Switch for 33 &amp; 11 kV IED Communication</b> <b>Communication Ports:</b> 12 PORT L2 W/100/1000 MBPS, Combination of FO (2 Nos., MM) & Copper Ports (10 Nos.) <b>Power Supply:</b> Non-Redundant 24 V DC through MCBs with add-on NO contact <b>Mounting Arrangement:</b> To be mounted in CRP (33 & 11 kV) Panel <b>Qty:</b> 2 nos. <b>Preferred Make:</b> Ruggedcom/Hirschman/MOXA	Set		1	17			0	0	0





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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
3	Signal Interface Panel	<p><b>SIC- Panel for Termination of field cable and housing of interface and I/O modules (Indoor Application)</b>  <b>Input/Output Interface:</b> For integration of I/O modules, interface modules etc. These I/O, Interface modules shall communicate to both Main and Stand-by RTU as per Item no. 1.  <b>Communication Ports:</b> Interface modules shall have ports to communicate with Main &amp; Standby RTU  <b>Protocols :</b> Interface modules shall use Open Protocols, No proprietary protocols are envisaged  <b>Power supply:</b> Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact  <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.  <b>Other Accessories:</b> Pre-fabricated cables for I/Os cards, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies, Necessary TBs, Din rail channels and other accessories.</p>	Set		1	50			0	0	0
<b>Sub Total of SIC Panel for Indoor Application</b>											0

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
D	Pre-Wired SIC Panel (Outdoor Application)										
4	Signal Interface Panel	<p><b>SIC- Panel for Termination of field cable and housing of interface and I/O modules (Outdoor Application)</b>  <b>Input/Output Interface:</b> For integration of I/O modules, interface modules etc. These I/O, Interface modules shall communicate to both Main and Stand-by RTU as per Item no. 1.  <b>Communication Ports:</b> Interface modules shall have ports to communicate with Main &amp; Standby RTU  <b>Protocols :</b> Interface modules shall use Open Protocols, No proprietary protocols are envisaged  <b>Power supply:</b> Redundant 24 V DC Supply with Diode Oring unit and MCBs with add-on NO contact  <b>Mounting:</b> To be supplied with prewired panel (Rittal or equivalent, size : 2300 mm x 800 mm x 800 mm, both side opening), IP54/55 for indoor and IP65/67 for outdoor application.  <b>Other Accessories:</b> Pre-fabricated cables for I/Os cards, Auxiliaries relays for power supply monitoring, MCBs for all type of Power Supplies, Necessary TBs, Din rail channels and other accessories.</p>	Set		1	17		0	0	0	

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
<b>Sub Total of SIC Panel for Outdoor Application</b>											0
E	<b>Contact Multiplier Relay with Mounting Base</b>										

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5	CMR with Mounting Base	<p><b>Contact Multiplier Relay with Mounting Base:</b></p> <p>1. Contact Material : Silver Alloy                      2. Contact Rating : 5 Amps. @ 24 V DC                      3. Contact Resistance : 50 M ohms max. (Initial)                      4. Dielectric Strength :                      i) Between open contacts : 500 V Rms                      ii) Between Contact and Coil : 2000 V Rms                      5. Insulation Resistance : 500 M ohms @ 500 V DC, 250C                      6. Operate time at Nominal Voltage : 20 milli seconds                      7. Release time at nominal Voltage : 10 milli seconds                      8. Ambient temperature : 0 to 70°C                      9. Life expectancy :                      i. Mechanical : 106 operations.                      ii. Electrical : 105 operations at rated load                      10. Coil Resistance at nominal Voltage (DC) : 30,000 ohms +10% at 250°C                      11. Type of contact multiplier : 4R – 2 – 220 LD with DIN rail mounting with LED indicator                      12. Type of mounting : Socket mounting.                      13. No. of Poles. : 2 No. + 2 Nc.                      14. Other Accessories: Necessary TB, Din rail channel and other accessories to mount in CRP</p>	Nos./Substation		96	6432			0	0	0



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7	<b>Instrumentation Cable 12 Core Armored 0.5 mm<sup>2</sup> for Status and Indications</b>	<b>Instrumentation Cable for Status and Indications</b> 12 Core armored 0.5 sq.mm. 1100 V rated, annealed stranded copper, PVC insulated, individual and overall shielded, field cable <b>Preferred Make:</b> CCI / FINOLEX / HAVELLS / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Substation		600	40200			0	0	0
8	<b>Instrumentation Cable 7 Core Armored 1.5 mm<sup>2</sup> for Control Output</b>	<b>Instrumentation Cable for Control Output</b> 7 Core armored 1.5 sq.mm. 1100V rated, annealed stranded copper, PVC insulated, individual and overall shielded, field cable <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Substation		280	18760			0	0	0

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9	<b>Twisted Pair Shielded &amp; Over all shielded Instrumentation Cable 5 Pair Armored 1.0 mm<sup>2</sup> for Analog Input</b>	<b>Twisted paired Shielded &amp; Overall Shielded Cable for Analog Inputs</b> 5 Pair armored 1.0 sq.mm copper twisted paired shielded and Overall shielded cable for Analog inputs from CRP panel to the RTU Preferred Make: CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Substation		50	3350			0	0	0
10	<b>10C X 2.5 mm<sup>2</sup> Copper cable for extension of CT</b>	<b>Control Cable for CT Extension</b> 10 core X 2.5 sq.mm. multistrand copper cable for extending CT & CVT inputs to the MFM in the CRP panel. Preferred Make: CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Substation		20	1340			0	0	0
11	<b>4C X 2.5 mm<sup>2</sup> Copper cable for extension of PT</b>	<b>Control Cable for PT Extension</b> 4 core X 4 sq.mm. multistrand copper cable for extending PT inputs to the MFM in the CRP panel <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables /	Meters/Substation		20	1340			0	0	0

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		Incab / Asian Cable / KEI / Polycab / Ruchika									
12	<b>3C X 4 mm2 power Supply Cable for extension of DC Supply</b>	<b>Power Supply Cable from DCDB to RTU &amp; SIC Panel</b> 3 core X 4 sq.mm. Armored multistrand Power Supply cable for extending Power Supply from DCDB to RTU & SIC Panel <b>Preferred Make:</b> CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika	Meters/Substation		100	6700			0	0	0
<b>Sub Total of Instrumentation Cable for Status, Control &amp; Power Supply</b>											0
<b>H</b>	<b>Communication Cable for MFM, IEDs Integration</b>										
13	<b>4P X 0.36 mm2 Armored Communication Cable for MFM</b>	<b>Communication Cable:</b> 4P X 0.36 Sq.mm Armored multistrand Pair and Overall shielded, for Multifunction Meter looping. <b>Preferred Make : Belden/LAPP/SATYAM</b>	Meters/Substation		120	8040			0	0	0



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14	<b>Armored CAT6 UTP Cable</b>	Armored CAT6 UTP Cable <b>Preferred Make : Systemax</b>	Meters/Substation		50	3350			0	0	0
15	<b>Un-Armored CAT6 UTP Cable</b>	Un-Armored CAT6 UTP Cable <b>Preferred Make : Systemax</b>	Meters/Substation		100	6700			0	0	0
16	<b>Armored FO Cable 12 Core SM/MM</b>	Armored Fibre Optic Cable for SCADA 12 core, SM/MM <b>Preferred Make Finolex / KEC / Apar</b>	Meters/Substation		100	6700			0	0	0
<b>Sub Total of Communication Cable for MFM, IEDs Integration</b>											0
I	<b>24 V DC System Battery, Battery Charger, DCDB and Microprocessor Based Controller</b>										
17	<b>24 V DC SYSTEM</b>	24V, 70 Amp Float Cum Boost Charger with Microprocessor based Controller (N+1)	No.		1	67			0	0	0
18		24V, 150 AH VRLA Type Storage Battery (Type-1)	Set		1	18			0	0	0
		24V, 200 AH VRLA Type Storage Battery ( Type-2)	Set		1	49			0	0	0
19		DCDB with 2 Incomers and 15 Outgoing Feeders	No.		1	67			0	0	0
<b>Sub Total of DC System</b>											0
<b>Grand Total Supply (A+B+C+D+E+F+G+H+I)</b>											0

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20	GPS Clock with NTP Server	<b>GPS Clock with NTP Server</b> <b>GPS Receiver Clock:</b> 19" rack mountable chassis w/sliding Rapid/Versa rails and cable management arm, Size - 1U/2U, Front keyboard with status LEDs and LCD display, Battery Backup <b>Outputs:</b> TCP/IP (Redundant), Potential Free Pulse Contacts for 1 PPM, 1 PPS, 1 PPH, Potential free alarm contacts <b>Protocols:</b> NTP, SNTP, Pulse <b>Power Supply:</b> 24 V DC Power Supply, with battery backup <b>Antenna :</b> Helical, with connectors, min 50 mtrs Low loss cable, Lighting Arrester with wall mounting arrangement, Length of the Low Loss Antenna Cable will be as per site requirement <b>Mounting :</b> To be mounted in RTU Panel <b>Preferred make -</b> Sertel / Masibus/Sands	Nos.		1	67			0	0	0
Sub Total of GPS Clock with NTP Server											0

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21	Multifunction Meter	<b>Multi Function Meter</b> : For all 33 & 11 KV Feeders Multifunctional 3-phase Power meter, four quadrant active and reactive energy polyphase static meter <b>Accuracy Class:</b> 0.2 S as per IEC62053:22 <b>Voltage Inputs:</b> Operating range : 690 V AC line-to-line, 460 V AC line-to-neutral <b>Current Inputs:</b> 1A / 5A (User selectable CT secondary 1A / 5A, PT Secondary) <b>Wiring configurations:</b> 3OP2, 4LN3, 3DIR2, 4LL3, 3OP3, 3LN3, 3LL3, 3BLN3, 3BLL3 (All wiring configurations selected via the front panel) <b>Communication Port:</b> RS 485 Serial Port with removable connector <b>Protocols:</b> MODBUS RTU, Assignable Register map, Device Address (User Configurable - (1-247)) <b>Auxiliary Supplies:</b> 24 V DC <b>Other Accessories:</b> Necessary TB, Din rail channel and other accessories for flash mounting in CRP <b>Preferred Make:</b> SATEC PM130EH+	Nos./Substation		10	670			0	0	0
<b>Sub Total of Multi Function Meter</b>											0

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22	Earthing and Earth Pit	<b>Earthing:</b> a) Earth Pit: Separate earth pits should be provisioned for attaining the resistance value of maximum 2 Ohms. b) Earthing Wires: RTU Panels, SIC Panel, DC Systems are to be wired with Earth Pit. Copper wires size would be minimum of 10 Sq.mm.	Set		-	67			0	0	0
<b>Sub Total of Earthing and Earth Pit</b>											0
<b>Grand Total Supply (A+B+C+D+E+F+G+H+I) + Item 20 + Item 21 + Item 22</b>											0
23	Engineering Configuration Laptop	<b>Configuration Laptop</b> <b>Hardware:</b> Laptop with latest processor, 1 TB SSD, 8 GB RAM, DVD RW, Ethernet Port, 4 USB Ports, 15" Display with 1 no. serial to USB converter <b>Software License:</b> Microsoft Windows compatible with latest version of configuration software, Microsoft Office License pack, Antivirus Symantec Endpoint protection small business edition with three year subscription, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU and Protection IEDs, Simulation Software, Applicable Software licenses for SIC System and shall be in-line with RTU Software. Proposed Licenses shall be independent of Engineering	Nos.		-	8			0	0	0

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		Configuration Laptop Hardware. <b>Preferred Make - "DELL/HP"</b>									
24	T&H Sensor	Temperature & Humidity Transmitter : for integration with RTU on RS485 MODBUS	Nos.			15			0	0	0
											0
<b>J</b>	<b>RTU and SIC System Software</b>										
J.1	RTU	RTU OS, Application Software Licenses (Main & Standby)	Lumpsum		1	67			0	0	0
J.2		5000 Physical I/O tags, 40 IEDs - IEC61850 (ED1, ED2), 25 IEDs - Serial Protocol	Lumpsum		1	67			0	0	0
J.3		RTU shall Communicate to Eight Independent Remote	Lumpsum		1	67			0	0	0

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		SCADA Master on IEC 60870-5-104									
J.4		SMS Utility Software				67			0	0	0
J.5		<b>Protocols</b> : IEC 60870-5-101, IEC 60870-5-104, IEC 61850 (ED1, ED2), MODBUS (Serial & TCP/IP), MQTT, SNMP (V1.0, V2.0, V3.0), NTP & SNTP, RSTP, PRP & HSR	Lumpsum		1	67			0	0	0
<b>Sub Total Software (J.1... J.5)</b>											0
J.6		Interface Module shall be in-line with RTU Application Software	Lumpsum		1	67			0	0	0
J.7	SIC	<b>Protocols</b> : Communication between SIC I/O interface modules shall be on Open Protocol, No proprietary protocol is envisaged, SNMP (V1.0, V2.0, V3.0), NTP & SNTP	Lumpsum		1	67			0	0	0
<b>Sub Total Software (J.6 + J.7)</b>											0
J.8	Ethernet Switch	Software for Local and Remote configuration of Ethernet Switches - Enabling Monitoring, Configuration, Maintenance and backup of configuration files	Lumpsum		1	67			0	0	0
<b>Sub Total Software Ethernet Switch</b>											0
J.9	DC System Controller	Controller OS, Application Software Licenses (Integration with Main & Standby RTU)	Lumpsum		1	67			0	0	0

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J.10		Protocols : IEC 60870-5-104, IEC 61850 (ED1, ED2), MODBUS (Serial & TCP/IP), SNMP (V1.0, V2.0, V3.0), NTP & SNTP	Lumpsum		1	67			0	0	0
<b>Sub Total Software (J.9 + J.10)</b>											
K	<b>Services</b>										

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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
K.1	<b>Services of RTU based System for Indoor Application</b>	Integration and Commissioning RTU Based System for Indoor Application a) Site Survey, Design, Engineering, Finalization of BOM, FDS b) Transportation, Delivery, Unloading and Storage c) Installation and commissioning of Pre-wired RTU and Networking equipment d) Civil Activities for installation of RTU panel e) Cable laying, termination and continuity check of all cables f) Integration of all Protection, MFM, Condition Monitoring devices etc. g) Powering up of all supplied materials h) Configuration of RTU and its accessories i) Integrated testing with Purchaser's SCADA System j) I/O testing, Pre- SAT testing of Hardware and Software functionality k) Integrated FAT & SAT for Hardware and Software l) Demonstration of System Capacity and Performance Guarantee Test m) Submission of As-Built Drawings, RTU Backup	Lumpsum		1	50			0	0	0



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Sl. No.	Item	Description	UOM	HSN/SAC Code	Qty	Total Required Quantity (A)	Unit Rate (B)	GST (%)	GST (INR) (C)	Gross Unit Rate (D=B+C)	Gross Price (E=A*D)
K.2	<b>Services of RTU based System for Outdoor Application</b>	Integration and Commissioning RTU Based System for Outdoor Application a) Site Survey, Design, Engineering, Finalization of BOM, FDS b) Transportation, Delivery, Unloading and Storage c) Installation and commissioning of Pre-wired RTU and Networking equipment d) Civil Activities for installation of RTU panel e) Cable laying, termination and continuity check of all cables f) Integration of all Protection, MFM, Condition Monitoring devices etc. g) Powering up of all supplied materials h) Configuration of RTU and its accessories i) Integrated testing with Purchaser's SCADA System j) I/O testing, Pre- SAT testing of Hardware and Software functionality k) Integrated FAT & SAT for Hardware and Software l) Demonstration of System Capacity and Performance Guarantee Test m) Submission of As-Built Drawings, RTU Backup	Lumpsum		1	17			0	0	0

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K.3	<b>Services of SIC based System for Indoor Application</b>	Integration and Commissioning SIC System for Indoor Application a) Design, Engineering, Finalization of BOM b) Transportation, Delivery, Unloading and Storage c) Civil Activities for installation of RTU panel d) Installation and commissioning of Pre-wired SIC and Networking equipment (if Any) e) Cable laying, termination and continuity check of all cables f) Powering up of all supplied materials g) Configuration of SIC Interface Module and its accessories h) Integrated testing with RTU System i) I/O testing, Pre- SAT testing of Hardware and Software functionality j) Integrated FAT & SAT for Hardware and Software k) Submission of As-Built Drawings	Lumpsum		1	50			0	0	0

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K.4	<b>Services of SIC based System for Outdoor Application</b>	Integration and Commissioning SIC System for Outdoor Application a) Design, Engineering, Finalization of BOM b) Transportation, Delivery, Unloading and Storage c) Civil Activities for installation of RTU panel d) Installation and commissioning of Pre-wired SIC and Networking equipment (if Any) e) Cable laying, termination and continuity check of all cables f) Powering up of all supplied materials g) Configuration of SIC Interface Module and its accessories h) Integrated testing with RTU System i) I/O testing, Pre- SAT testing of Hardware and Software functionality j) Integrated FAT & SAT for Hardware and Software k) Submission of As-Built Drawings	Lumpsum		1	17			0	0	0
K.5	<b>Services for CMR</b>	Installation and Commissioning of Contact Multiplier Relays with bases in CRP Panel	Lumpsum		1	67			0	0	0

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K.6	<b>Services for Interposing Relays</b>	Installation and Commissioning of Interposing Relays with bases in SIC Panel	Lumpsum		1	67			0	0	0
K.7	<b>Services for MFM</b>	Installation and Commissioning of Multifunction Meters in CRP Panel an it integration with RTU	Lumpsum		1	67			0	0	0
K.8	<b>Services for GPS</b>	Installation and Commissioning of GPS Receiver and its integration with site equipment	Lumpsum		1	67			0	0	0
K.9	<b>Services for T&amp;H</b>	Installation and Commissioning of Temperature & Humidity Sensor and its Integration with RTU	Lumpsum		1	15			0	0	0
K.10	<b>Services for Control Cable</b>	Laying and Termination of Instrumentation and Power Supply Cables	Lumpsum		1	67			0	0	0
K.11	<b>Services for Communication Cable</b>	Laying and Termination of Communication Cables	Lumpsum		1	67			0	0	0
K.12	<b>Services for DC System</b>	Decommissioning of existing DC System (Battery & Battery Charger) and Installation and Commissioning of New DC System (Battery & Battery Charger and DCDB) & restoration of DC supply to existing DCDB	Lumpsum		1	67			0	0	0

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K.13	Services for Earthing & Earth Pit	Installation and Commissioning of Earth Pit and laying and termination of earthing cable for RTU, SIC and DC System	Lumpsum		1	67			0	0	0
<b>Sub Total T = (K.5 + K.6 + K.7 +K.8+K.9+ K.10 + K.11 + K.12 + K.13)</b>										0	0
<b>Total Services for Indoor Application (K.1 + K.3)</b>										0	0
<b>Total Services for Outdoor Application (K.2 + K.4)</b>										0	0
<b>Grand Total Services for Indoor Application [(K.1 + K.3) +(50/67) * T]</b>										0	0
<b>Total Services for Outdoor Application [(K.2 + K.4) +(17/67) *T]</b>										0	0
L		<b>Standard and Extended Warranty</b>									
L.1	Standard Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.	Lumpsum		-	1			0	0	0
<b>Total of L.1</b>											0

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L.2	Extended Warranty	Maintenance Services for the supplied Hardware, System and Application Software up-gradation, Patch Management services including sub-vendor products for next 5 years over and above as mentioned in item O.1	Lumpsum		-	1			0	0	0
<b>Total of L.2</b>											0
L.3	Extended Warranty Support	Hardware & Software warranty support for next 5 years over and above as mentioned in clause O.1 and O.2 for the supplied Hardware, Software package, Software up-gradation, Patch Management services including sub-vendor products.	Lumpsum		-	1			0	0	0
<b>Total of L.3</b>											0
<b>Total of L</b>											0
<b>M</b>	Spares	<b>Mandatory Spares</b>									
M.1		RTU with all accessories, cables etc. except I/O modules	Sets			5			0	0	0
M.2		CPU Module of the RTU	Nos.			10			0	0	0
M.3		Power Supply module of the RTU	Nos.			10			0	0	0
M.4		Memory Module of the RTU	Nos.			10			0	0	0
M.5		Communication Module (Ethernet) - As per the proposed Solution	Nos.			10			0	0	0

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M.6		Communication Module (Serial) - As per the proposed Solution	Nos.			10			0	0	0
M.7		DI Cards for Digital Inputs (DI Channels/Module = 16 DI)	Nos.			10			0	0	0
M.8		DO Cards for Digital Output (DO Channels/Module = 8 DO)	Nos.			10			0	0	0
M.9		AI Cards for Analog Inputs (AI Channels/Module = 4 AI)	Nos.			15			0	0	0
M.10		Bus Coupler Module (If Applicable)	Nos.			5			0	0	0
M.11		Remote I/O Rack with all accessories, cables etc. (if Applicable)	Sets			5			0	0	0
M.12		Interface Module for Digital Inputs with FRC cable	Sets			10			0	0	0
M.13		Interface Module for Digital Outputs with FRC cable	Sets			10			0	0	0
M.14		Interface Module for Analog Inputs with FRC cable	Sets			15			0	0	0
M.15		CMR with Base	Sets			150			0	0	0
M.16		Interposing Relay with Base	Sets			75			0	0	0

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M.17		Armored FO Cable	meter			1000			0	0	0
M.18		Communication Cable – CAT6 Patch Cord of 2 Meter length	Nos.			50			0	0	0
M.19		Communication Cable – CAT6 Patch Cord of 5 Meter length	Nos.			100			0	0	0
M.20		Communication Cable – CAT6 Patch Cord of 10 Meter length	Nos.			100			0	0	0
M.21		Communication Cable - FO Patch Cord (SM) of 2 Meter length (Connector shall be as per the proposed FO port considered in the Ethernet Switch)	Nos.			20			0	0	0
M.22		Communication Cable - FO Patch Cord (MM) of 10 Meter length (Connector shall be as per the proposed FO port considered in the Ethernet Switch)	Nos.			20			0	0	0
M.23		Multifunction Meter	Nos.			25			0	0	0
M.24		IEC 61850 complied L2 Managed Ethernet Switch (RTU Panel)	Nos.			10			0	0	0
M.25		IEC 61850 complied L2 Managed Ethernet Switch (CRP Panel)	Nos.			10			0	0	0
M.2		Fully Loaded LIU Boxes (If Applicable)	Nos.			10			0	0	0



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6											
M.27		Diode OR-ing Unit (If Applicable)	Nos.			10			0	0	0
M.28		Battery Charger - Rectifier Unit	Sets			10			0	0	0
M.29		DC MCB (10 nos. of Each Type)	Nos.			10			0	0	0
M.30		DC System Controller	Sets			5			0	0	0
<b>Total of M</b>											<b>0</b>
<b>N</b>	Training	<b>Training (50 Man-days)</b>									
N.1		RTU based Automation System - On-site Training	Man-Days			50			0	0	0
<b>Total of N</b>											<b>0</b>

End of Section-E

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## 1.0 ORGANIZATIONAL VALUES

The Tata Group has always been a value driven organization. These values continue to direct the Group's growth and businesses. The Six core Tata Values underpinning the way we do business are:

**Integrity** - We must conduct our business fairly, with honesty and transparency. Everything we do must stand the test of public scrutiny.

**Understanding** - We must be caring, respectful, compassionate and humanitarian towards our colleagues and customers around the world and always work for the benefit of India.

**Excellence** - We must constantly strive to achieve the highest possible standards in our day to day work and in the quality of goods and services we provide.

**Unity** - We must work cohesively with our colleagues across the group and with our customers and partners around the world to build strong relationships based on tolerance, understanding and mutual co-operation.

**Responsibility** - We must continue to be responsible and sensitive to the countries, communities and environments in which we work, always ensuring that what comes from the people goes back to the people many times over.

**Agility** - We must work in a speedy and responsive manner and be proactive and innovative in our approach.

## 2.0 ETHICS

In our effort towards Excellence and in Management of Business Ethics at TPCODL, an Ethics Management Team is constituted.

The main objective of the Ethics Management Team is to:

1. Record, address and allay the issues and concerns on ethics raised by different stakeholders like employees, consumers, vendors, Associates etc. by initiating immediate corrective actions.
2. Ensure proper communication of the ethics policies and guidelines through prominent displays at all offices of TPCODL and through printed declarations in all concerned documents where external stakeholders are involved.
3. Ensure proper framework of policies as preventive measures against any ethics violation recorded by them.
4. Prepare and submit MIS of all issues and concerns, corrective and preventive actions on monthly basis to the top management for their information.

All members of Team TPCODL, Associates and Stakeholders are requested to register any grievance on ethics violation on Central Control Telephone No. 011-66404040.

## 3.0 CONTRACT PARAMETERS

### 3.1 Issue/Award of Contract

TPCODL awards the contract to the Associate in writing in the form of Purchase order or Rate Contract (RC) hereafter referred as Contract, through in any or all of following modes- physical handover / post / e-mail / web document / fax with all the attachments/enclosures which shall be part of the contract document

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On receipt of the contract, the associate shall return to TPCODL copy of the contract document duly signed by legally authorized representative of associate, within two days of Effective Date of Contract for contracts having contract execution time less than 30 days and within five days for all other contracts.

### **3.2 Contract Commencement Date**

The date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

### **3.3 Contract Completion Date**

The date of expiry of Guarantee Period (detailed in section 12 of this document) shall be deemed as the Contract Completion Date.

### **3.4 Contract Period/Time**

The period from Contract Commencement Date to Contract Completion Date shall be deemed as the Contract Period/Time.

### **3.5 Contract Execution Completion Date**

The stipulated date for completing the execution of all items in the schedule of quantities (Supply, Service and or both as applicable) shall be deemed as the Contract Execution Completion Date.

### **3.6 Contract Execution Period/Time**

The Period from Contract Commencement Date to Contract Execution Completion Date shall be the Contract Execution Period/Time. Timely Completion of Works/Timely Delivery of Materials is the essence of the contract. The period from effective date of contract to the date stipulated for completion of delivery of all items/completion of all the works/services, as per schedule of quantities of the contract is defined as contract execution completion time. The Delivery of Materials /The Completion of Works, as applicable, should be achieved in all respects as per schedules of quantities and all the terms and conditions of the contract, in the contract execution time.

Any revision/amendment in the originally stipulated contract execution time has to be approved by authorized representative of TPCODL.

### **3.7 Contract Price /Value**

The total all inclusive price/value mentioned in the LOI/PO/RC of the contract document is the Contract Price/Value and is based on the quantity, unit rates and prices quoted and awarded and shall be subject to adjustment based on actual quantities supplied/actual measurement of work done and accepted and certified by the authorized representative of the company unless otherwise specified in schedule of quantities or in contract documents.

### **3.8 Contract Document**

The Contract Document shall mean and include but not limited to the following:

- NIT/Tender Enquiry, QR, Instruction to Bidders, Special Condition of Contract (SCC) of tender, GCC, Technical & Commercial Specifications including relevant annexure and attachments).
- Bids & Proposals Received from Associate including relevant annexure/attachments.

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- Letter of Intent (LOI/RC/PO) with agreed deviations from the tender/bid documents.
- All the Inspection and Test reports, Detailed Engineering Drawings.
- Material Dispatch Clearance Certificate (MDCC).
- Minutes of Meeting (MoM)

### 3.9 Contract Language

All documents, instructions, catalogues, brochures, pamphlets, design data, norms and calculations, drawings, operation, maintenance and safety manuals, reports, labels, on deliveries and any other data shall be in English Language.

The Contract documents and all correspondence between the TPCODL, Third Parties associated with the contract, and the Associate shall be in English language.

However, all signboards required indicating "Danger" and/or security at site and otherwise statutory required shall be in English, Hindi, and local languages.

### 3.10 Reverse Auction

TPCODL reserves the right to conduct the reverse auction (instead of public opening of price bids) for the products / services being asked for in the tender. The terms and conditions for such reverse auction events shall be as per the Acceptance Form attached in Annexure J. The bidders along with the tender document shall mandatorily submit a duly signed copy of the Acceptance Form as mentioned in the Annexure J as a token of acceptance for the same.

### 4.0 SCOPE OF WORK

All the activities that are to be undertaken by the Associate to realize the contractual deliverables in completeness form Scope of Work. Following clauses list, but not limited to, major requirements of the scope of work.

The associate shall satisfy himself and undertake fully the technical/commercial requirements of items to be supplied as listed in the Schedule of Quantities together with the tests to be performed /test reports to be furnished before dispatch, arrangement of stage and final inspections during manufacturing as per terms and conditions of contract, technical parameters & delivery terms and conditions including transit insurance to be met in order to fully meet TPCODL's requirements.

Completeness: Any supplies and services which might have not been specifically mentioned in the Contract but are necessary for the scope mentioned in Special Terms & Conditions and/or completeness of the works at the highest possible level, including any royalties, licence fees & compensation to be paid, whether incurred by the associates or by a third party for the work covered in the scope, regardless of when incurred, shall be supplied/provided by the associate without any extra cost and within the time schedule for efficient , smooth and satisfactory operation and maintenance of the works at the highest possible level under Indian conditions (but according to international standards for facility of this type), unless expressly excluded from the scope of supplies and services in this Contract.

TPCODL have the right, during the performance of the Contract, to change the scope and/or technical character of the Project and/or of the supplies and services stipulated in the



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Contract by submitting a request in writing to the Associate. The Associate shall, within fifteen days of receipt of such request from the TPCODL, provide Purchaser with a reasonably detailed estimate of the cost of the change outlined in the request.

In the event, TPCODL requests a change, the Contract price and time shall be adjusted upwards or downwards, as the case may be and shall be mutually agreed to. The associate shall not be entitled to any extension of time unless such changes adversely affect the time schedule.

The Associate shall not proceed with the changes as requested till adjustment of contract price and time schedule where so applicable in terms of or otherwise directed by the TPCODL.

#### 4.1 Technical Evaluation

TPCODL reserves the right to assign scores to different parameters including but not limited to the following while evaluating the bids. TPCODL reserves the right to change the parameters and score without prior information to the associates:

S. No.	Evaluation Parameter	Max. Score
<b>A</b>	<b>Bidders already Registered with TPCODL</b>	<b>100</b>
<b>A.1.</b>	<b>Quality of the Products &amp; Services</b>	
	a. <u>For Supply Part:</u> No Material Rejections in last 2 years Deduction of 3 marks for each PO/ RO (for same product category) with major rejections in last 2 years. (Major rejection shall be considered when material is taken back by the vendor for rectification and the quantity of rejected material is more than 10%).	12
	b. <u>For Service Part:</u> No violation of statutory compliances in last 1 year. Deduction of 2 marks for each instance of violation in last 1 year.	12
	c. <u>Safety</u> Deduction of 2 marks for each instance of safety violation in last 1 year. Deduction of 4 marks for each reported Non-Fatal Accident in last 1 year. In case of any reported fatal accident: <i>ZERO MARKS</i>	16
<b>A.2.</b>	<b>Timely Execution of Contracts</b> Total Achieved Score = {30 – 3 x (Avg. %age LD deductions in last 2 years)}	30
<b>A.3.</b>	<b>Legal Issues with TPCODL</b> Zero instances of Arbitration procedures / Court Cases / PBG forfeitures in last 2 years: 30 marks else 'Zero' marks	30
<b>B</b>	<b>Bidders new to TPCODL</b>	<b>100</b>
<b>B.1.</b>	<b>Visits</b> <u>For Supply Part:</u> Factory Visit and Evaluation. <u>For Service Part:</u> Client Site Visit where the bidder is providing similar services. The visits as above shall be arranged by the bidder. However all costs towards conveyance, lodging, boarding etc. shall be borne by TPCODL. The score assigned by TPCODL based on the above visits shall be final and binding on the bidder.	30
	<b>Safety:</b>	20

S. No.	Evaluation Parameter	Max. Score
	Score achieved against the BA safety Management System questionnaire.	
B.2.	<p><b>Client Referrals</b></p> <p>At least 3 nos. Customer References for similar products/ services in last 3 years. All customer references shall be either of the following:</p> <ul style="list-style-type: none"> <li>▪ Govt. Organizations/ PSUs/ Power Distribution Utilities.</li> <li>▪ Private Organizations with an annual turnover of <math>\geq</math> 500 cr.</li> </ul> <p>PO copies or Completion Certificates are admissible. Each reference: 10 marks</p>	30
B.3.	<p><b>Blacklisting Information</b></p> <p>Not blacklisted by any reputed organization / utility in last 2 years: 20 marks else 'Zero' marks.</p>	20

- Bidder shall be considered as technically qualified if they are able to achieve a technical score of  $>70$  marks on the above parameters. 'A' or 'B'.
- The bidder must have the PF and ESI registration. In case it is not there (provided the bidder is not exempted from the PF and ESI), bidder shall not be evaluated on the above parameters and will be considered as disqualified.

#### 4.2 Indemnity

Associates shall undertake to fully indemnify TPCODL (also referred to as the Company in the GCC) against all kinds of liabilities or damages, of whatsoever nature, including compensation arising from any accident to the person or property of those in Associate's employment or to any other person or properties including those of TPCODL, arising due to reasons attributable to any, act, omission or negligence of the Associate the Associates, for the entire period of contract including period of guarantee.

Within 7 days of award of work, the Associates shall submit Indemnity Bond in the format as per Annexure-E to Order Issuing Authority.

Contract having value more than Rs 2 Cr per Annum, Associates shall submit Indemnity Bond on Rs 100/- Non Judicial Stamp Paper in the format as per Annexure- E to Order Issuing Authority.

#### 4.3 Display of Notice Boards at Work Sites

The Associate shall put up display notice board at each project site where the works are in progress indicating the information given below:

- Name of the Project.
- Estimated Cost of Project.
- Date of Commencement.
- Expected date of completion.
- Name of Associate and his telephone number.
- Name of Engineer-in-Charge and his telephone number.

#### 4.4 Disposal of Waste at Site

Significant quantities of waste are generated during the execution of project and an integrated approach for effective handling, storage, transportation and disposal of the same shall be adopted. This would ensure the minimization of environmental and social impact in order to combat the climate change.

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The associates shall follow the below criteria for disposal of waste at site during the execution of project.

- Associate shall ensure that the detailed project plan include the waste management, segregation of all designated waste material (Recyclable/ Non-Recyclable), collecting, storing, disposing and transferring the same to pre-arranged facility/destination in timely and safe manner as per environmental legislations during the execution of project. The project plan shall also include the innovative construction practice to eliminate or minimize waste, protect surface/ground water, control dust and other emissions to air and control noise during the execution of project. The copy of same shall be given to EIC before the commencement of project.
- The purchase policy of BA shall encourage the procurement of material with recycled and minimum packaging of goods during delivery. Associate shall provide the appropriate means for site to site transportation of materials to avoid damage and litter generation.
- Associate shall educate and inform to its project team about the requirement and responsibilities for waste minimization and disposal in general and provide training of practices that support this. Waste management should be treated like a safety program.
- In the event that area of contaminated or biological hazard is identified, Associate shall ensure that plant, equipment, personnel and any activity associated with the work is carried out in consultation with EIC of TPCODL.
- Associate shall ensure that the residents living near the site are kept informed about proposed working schedule and shall informed timings and duration of any abnormal noise full activity that is likely to happen.
- Associate shall ensure the regular maintenance and monitoring of vehicles and equipment for efficient fuel use so that emissions and noise are within acceptable limits to avoid air pollution.

#### **4.5 Deployment of Work Force**

Associate shall deploy adequate labour, as considered necessary by TPCODL for execution of the contract including Sundays and Holidays whenever required to do so with no extra cost to TPCODL. However, prior permission shall be taken from the site Engineer to carry out the work beyond normal working hours or on Sundays and Holidays. Female employees shall not be deployed beyond normal working hours/days and no child labour shall ever be deployed. Associate shall depute full time qualified and experienced engineers to supervise the work at site. All such staff shall be maintained from commencement to completion of all works to the entire satisfaction of the Engineer-in-Charge. Associate's employees deployed for the works under this contract will not be considered in Company's employment at any time. Associate shall continue to be responsible for all such employees, their safety, all types of statutory compliances related thereto and in any other manner whatsoever. The company will stand indemnified by the Associate in respect of all the above. At the same time Company upon noticing any breach or default on any statutory compliances, may at their sole discretion, decide to act in a manner as deemed fit at the risks and costs of the Associate.

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TPCODL shall have the right to instruct the Associate to change the Sub- Associates or skilled /unskilled workers in case the conduct, the workmanship or speed of the work is not satisfactory.

Associates shall submit duly signed undertaking regarding engagement of competent staff / employee commensurate to the nature of job to Engineer-in-charge in the format attached as Annexure – H.

#### **4.6 Damages to Properties**

The Associates shall take necessary steps to ensure that the equipment and installations of the Company, Third parties, including other utility services like water supply pipelines; open drains telephone cables etc. are not damaged during execution of the works. The Associates shall be responsible for all such damages and shall have to repair/ replace and/or compensate for the entire claims in respect of such damages at its own cost.

#### **4.7 Issuance of Material**

The material issued to the Associate shall be in the custody of the Associates who shall be fully responsible for the same. After completion of the works, the Associates will reconcile the material. Any cost of material which is short or damaged/lost will be deducted from Associate bill/ deposits.

#### **4.8 Company's Right To Use Works**

If Taking Over Certificate is delayed for any reason, for which TPCODL's decision shall be final and binding upon the Associate, the Company shall be entitled to use the works or portion thereof without affecting Associate's responsibility and liability to complete the balance works as per company's directives from time to time, though Associate shall be afforded reasonable opportunity by the company to enable Associates to complete all balance works required for issuance of 'Taking Over Certificate' by the company.

#### **4.9 Rights of TPCODL to vary the scope work**

TPCODL shall have the right, during the performance of the Contract, to change the scope and/or technical character of the Project and/or of the supplies and services stipulated in the Contract by communicating the intent to do so in writing to the Associate. On receipt of such communication the Associate shall, within the time frame specified in the contract shall provide TPCODL with a reasonably detailed estimate of the cost of the change in scope outlined in the TPCODL communication. The change in the Contract price and time shall be revised upwards or downwards, as the case may be, and shall be mutually agreed to. The Associate shall not be entitled to any extension of time unless such changes adversely affect the time schedule.

The Associate shall not proceed with the changes in the scope of work till such time revision of Contract price and time schedule are approved and communicated to the associate by TPCODL.

Any change in the Scope of Work and/or Terms & Conditions of the order shall be intimated by TPCODL through an amendment to the contract. The amendment shall be treated valid only if signed by the authorized signatory of the original contract.

### **5.0 PRICES/ RATES/ TAXES**

#### **5.1 For Supply part of Contract**

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Unless specified elsewhere in the contract document, the prices/rates are inclusive of cost of finished product for which MDCC will be issued by TPCODL, packaging and forwarding charges, freight and transit insurance charges covering loading at Associate's works, transportation to TPCODL store/site & unloading & delivery at TPCODL stores/TPCODL site, cost of documentation including all the relevant test certificates and other supportive documents to be furnished.

The Prices/Rates are inclusive of all taxes, levies, cesses and duties, particularly Goods and Services Tax as applicable. All government levy / taxes shall be paid only when the invoice is submitted according to the relevant act.

The prices/rates shall remain firm till actual completion of entire supply of goods/material/equipment as per contract is achieved and shall remain valid till the completion of the contract.

The prices shall remain unchanged irrespective of TPCODL making changes in quantum in all or any of the schedules of items of contract.

### **5.2 For Service part of Contract**

The Prices and Rates are inclusive of cost of materials supplied as per contract terms and for which MDCC is issued by TPCODL and to the extent required for completion of works, cost of service executed as per schedule of quantities, cost of testing as per contract terms, cost of documentations including all relevant test certificates and other supportive documents to be furnished as per contract terms. The rates shall remain firm till actual completion of contract.

The Prices/Rates are inclusive of all taxes, levies, cesses and duties, particularly Goods and Services Tax as applicable. All government levy / taxes shall be paid only when the invoice is submitted according to the relevant act.

The prices shall remain unchanged irrespective of TPCODL making changes in quantum in all or any of the schedules of items of contract.

### **5.3 Changes in Statutory Tax Structure**

If rate of any or all of the statutory taxes and duties applicable to the contract changes, such changes shall be incorporated by default if the changes occur within the contract execution time and shall be applicable if the contract is executed by the Associate within the Contract Execution Time.

For execution of contracts beyond contract execution time, where the delay is not attributable to TPCODL no upward revision in tax /duties shall be considered irrespective of changes in the statutory tax structure either within the contract execution time or beyond. However, in such cases, benefits due to any downward revisions in statutory tax rates shall be passed on to TPCODL.

## **6.0 TERMS OF PAYMENT**

- A. 5% of the Release Order/ Purchase Order price shall be paid as initial interest free advance on fulfillment of the following by the Associate:
  - a) Acceptance of PO/ LOI.
  - b) Submission of advance payment BG of 15% of the Release Order/ Purchase Order price which shall remain valid till the advance is fully adjusted.

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- c) Submission of Contract Performance Bank Guarantee of 5/10% of the RC/ PO price valid till 30 days after taking over of the works.
- B. 10% of the Release Order/ Purchase Order price shall be paid as interest free advance against approval of drawings under Category-1 of major drawings, Quality Plans, Pert Chart, Field Quality Plan, posting of Project Manager and commencement of the first mile stone of the work mutually agreed including C-3 Form, and submission of a true copy of 'Erection All Risk Insurance Policy' taken for the awarded jobs. The drawing list shall be mutually agreed at the time of award of work.
- C. 50% on account payment of the total of item wise cost of material Release Order/ Purchase Order shall be paid against receipt of material at site in good condition and certification by TPCODL along with bills complete in all respects viz. MDCCs etc.
- D. 20% on account payment of the actual executed value shall be paid against mechanical completion of erection on prorata basis against monthly bills and 70% on account of the actual executed value shall be paid against the service line item including composite line item. In case this milestone is not completed beyond 120 days for reasons attributable to TPCODL, the payment corresponding to supply part shall be released subject to submission of BG of equivalent amount by the BA valid for a period of further 12 months. If required, it shall be extended by the BA on request of TPCODL.
- E. 15% payment of the actual executed Release Order/ Purchase Order shall be paid after completion of acceptance test and Taking Over of the complete systems specified in the enquiry, including clearance of Electrical Inspection, compliance of final punch point and after reconciliation & adjustment of payments, if any, towards Quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job. In case this milestone is not completed beyond 120 days beyond schedule for reasons attributable to TPCODL, the payment corresponding to supply part shall be released subject to submission of BG of equivalent amount by the BA valid for a period of further 12 months. If required, it shall be extended by the BA on request of TPCODL.

The Contractor shall submit all Operation & Maintenance manuals and "As Built Drawings" etc. and shall also submit Equipment Warranty Bank Guarantee (EWBG) equivalent to 5/10% of actual executed contract price before the release of this last payment and return of CPBG. The validity of EWBG shall be for a period of 15 months from the date of taking over of the works or specified guarantee period in drawing/tender/technical specification documents etc. whichever is later. The associate shall also submit 'No Demand Certificate' at the time of receipt of full and final payment.

### 6.1 Pre-Requisites for Payment

- Associate should have completed execution of that part of contract, for which payment is sought, to the satisfaction of TPCODL's Engineer-in-Charge responsible for the contract and obtained certification for execution of the work.
- Associate has undertaken joint measurement of the work executed along with TPCODL's Engineer-in-charge

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- Associate's bills/invoices submitted have been certified by Engineer-In-Charge.

## 6.2 Bills & Invoices

Unless specified otherwise in the special conditions of contract, Associate shall raise not more than one invoice/contract per month for the services rendered in the prescribed Tax Format and the invoice shall be submitted within 15 days of the following month at Bill Inward Receipt Desk (BIRD) located at Civil Lines III Office, TPCODL.

All Bills shall be supported by joint measurement of work done, quality test report and a copy of wage sheet, if applicable (showing proof of having disbursed wages as per applicable law) and a copy of statement substantiating that statutory payments having been affected.

Bills/ invoices shall mention Associate's 'Sales, Service, WCT Tax Registration Number, PAN number as applicable.

Final bill submission after completion of project or execution of job must be within 30 days from the actual date of completion/execution of work awarded.

## 6.3 Payment & Statutory Deductions

Payment shall be released within 30 days from the submission of the bills. The associate shall submit "No Demand Certificate" in the format as per Annexure-D at the time of receipt of full and final payment. In case any non-compliance to contract conditions comes to TPCODL's notice, TPCODL will be entitled to deduct 30% of estimated wages plus 20% of wages as TPCODL's overheads. Associates would be obliged to provide the copy of monthly wage sheet in any case, failing which no payment shall be made. TPCODL at their sole discretion may deposit the PF etc. with statutory authorities. TPCODL will deduct the amounts of TDS as per statutory requirement under the income tax act and the DVAT Act and certificates (wherever applicable) will be issued to associate accordingly.

In case of non-submission of PAN No TDS @ 20% shall be deducted from all payable amounts for which no TDS certificate shall be issued. TDS once deducted as above shall not be revised in any condition.

### 6.3.1 Statutory Deductions

TPCODL will deduct the amounts of TDS, TCS as per statutory requirement under the income tax act, the Goods and Services tax act, BOCW Act, or any other applicable tax act and certificates (wherever applicable) will be issued to associate accordingly. For consumption of TPCODL's Water and Electricity by Associate for execution of Contract, Associate shall pay 0.5% & 1.0% respectively of contract value and it shall be deducted from the running bills. The Engineer-in-Charge as stated in the Order shall be responsible for certification of the work executed and the bills. Bills (including original) shall be submitted in triplicate at Bill Inward Receipt Desk (BIRD) located at Civil lines-III, Near Vidhan Sabha, TPCODL.

## 6.4 Guidelines for Raising Running/Final Bills

Contract Value Up to 5 Lakhs	One Final Bill
Contract Value More than 5 lakhs	Monthly Running Bill & One Final Bill

All Bills shall be processed only when all bank Guarantees are in place and before payments of Final Bill Associate have to furnish NDC.

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## 6.5 Quantity Variation

Payment will be made on the basis of actual quantity of supplies/actual measurement of works accepted by TPCODL and not on the basis of contract quantity.

## 6.6 Full and Final Payment

Full & Final Payment in all contracts shall be made subject to the associate submitting "No Demand Certificate" in the format as per Annexure-D.

## 7.0 MODE OF PAYMENT

Payment shall be made through RTGS mode for which Business Associated shall submit the details of Bank Account and other details as per annexure K. Further, for any payments made, TPCODL is not responsible for any consequences/disputes Associate have among the owners channel partners, sub-Associates and all such dispute/concerns shall be settled solely by the Associate.

The quantities of items indicated are estimated and preliminary. However, payments shall be made on the basis of actual quantity of work carried out and measured jointly by the Company and the Associate. Associates shall be responsible to organize joint measurements of works with TPCODL Engineer-in-Charge before raising any bill of work done. In the event Associate fails to do so, TPCODL at their sole discretion, may take measurements of work done and proceed as deemed fit and in such an event Associate's right to lodge any subsequent claim shall stand forfeited.

## 8.0 SECURITY CUM PERFORMANCE DEPOSIT

Associates shall submit within 15 days from the effective date of issue of PO/RC, Security cum Performance Guarantee (SPBG) in the format as per Annexure B of this document from banks acceptable to TPCODL for:

- (a) 5% of the PO value if purchase order value is more than Rs 5 Crores.
- (b) 10% of the PO value if purchase order value is less than Rs 5 Crores.

This shall remain valid till the end of the Guarantee Period of contract, plus one month.

- (c) 5% of the RC value in case of Rate Contract. This shall remain valid till the Guarantee period plus one month.

- For PO/RC values less than Rs. 5 lacs, Associate may request for deduction of amount equivalent to SPBG value from their first invoice. Such amount shall be withheld by TPCODL while processing the invoice and shall be released after completion of Guarantee Period plus one month.
- For PO/RC values less than Rs. 3 lacs, the clause (8.0) for Security cum Performance Bank Guarantee (SPBG) shall not be applicable..
- In case of RC (Rate Contract) after the expiry of RC validity, Associate shall have to submit SPBG. However, the Associate has the option to re-submit the SPBG as per actual RO (Release Order) value issued against the RC, valid for Guarantee Period plus one month. The Guarantee Period shall be considered as per the last RO issued against the said RC. The original SPBG as submitted against the RC shall be released on submission of the new SPBG to TPCODL. Alternatively, Associate may extend the



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validity of original SPBG only till the requisite period, i.e. Guarantee Period plus one month.

## 9.0 STATUTORY COMPLIANCE

### 9.1 Compliance to Various Acts

Associate should ensure adherence to all applicable laws, rules and regulation applicable under this contract from time to time. In case of violation any risk, costs etc shall be in associates account and keep TPCODL indemnified always till completion of contracts.

### 9.2 SA 8000

Further being TPCODL is SA 8000 complied and expects its Associates to follow guidelines of SA8000: 2014 on the following aspects

1. Child Labour
2. Forced or Compulsory Labour
3. Health & Safety
4. Freedom of Association & Right to Collective Bargaining
5. Discrimination
6. Disciplinary Practices
7. Working Hours
8. Remuneration
9. Management System

### 9.3 Affirmative Action

TPCODL appreciate and welcome the engagement/employment of persons from SC/ST community or any other deprived section of society by their business associates.

#### Relaxation in Contract Clauses under Affirmative Action for SC/ ST Business Associates\*\*

TPCODL believes that inclusive growth is the key to sustainable development, and to promote the same Policy on Affirmative Action for Scheduled Caste & Scheduled Tribe Communities has been adopted across the company.

Under the same pre-text, and to promote entrepreneurship among SC/ST community TPCODL has taken initiative by proposing relaxations in contract clauses as per below:

S. No.	Initiative	for SC/ ST BA's	Guideline Document
1	Tender Fees	100% waiver for SC/ST community	All Open Tenders
2	Earnest Money Deposit	50 % relaxation of estimated EMD value	All limited and Open Tenders
3	Performance Bank Guarantee	25% relaxation in PBG for order value above 50 lacs else 50% relaxation	All limited and Open tenders
4	Turnover	25% relaxation in company turnover under qualifying requirement criteria	All Open Tenders

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**\*\*Classification of BAs under SC/ST shall be governed under following guidelines:**

- Proprietorship/ Single Ownership Firm: Proprietor of the firm should be from SC/ST community. Governing document shall be duly audited balance Sheet for the last FY bearing the name of proprietor.
- Partnership Firm: Only such firms shall qualify which have SC/ST partners holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Partnership Deed and audited balance sheet/ ITR for last FY.
- Private limited company: Only such firms shall qualify which have SC/ST directors holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Memorandum of Understanding (MoU) and/or Article of Association (AoA).

*## Certification from SC/ST commission shall be required for deciding upon SC/ST status of a person.*

**9.4 Compliance to Labour Laws**

Bidder needs to ensure compliance to applicable labour laws including timely disbursement of wages. In case wages are not disbursed as per the stipulated timelines, then TPCODL shall pay the wages to BA employees on behalf of BA. Apart from deducting the amount of wages paid, TPCODL shall deduct an additional service charge equivalent to 25% of the wages paid from the payment due to BA.

**9.5 Compliance to Construction and Demolition Waste Management Rules & Environment (Protection) Amendment Rules**

BA is liable to follow the Construction and Demolition Waste Management Rules- 2016, Environment (Protection) Amendment Rules- 2018 and Guidelines on dust mitigation measures in handling construction material and C&D wastes issued by CPCB.

Following are some main points of above Rules/Guidelines for Construction work, cable laying jobs etc.

1. Barricading to be provided at site to cover complete area.
2. Construction material and waste should be inside the closed area made by using barricading.
3. Water sprinkling/fine spray from nozzles to be done to suppress the dust.
4. The board of Dust mitigation measures shall be displayed at site for public viewing with required details.
5. Loose sand or soil and construction material that causes dust shall be covered.
6. Transport material that are easily wind borne need to be covered by a sheet made of either jute, tarpaulin, plastic or any other effective material.
7. All areas for storing C&D waste/construction material to be demarcated and preferably barricaded particularly those materials that have potential to be dust borne.
8. Grinding and cutting of building materials in open area shall be prohibited.
9. Construction material and waste should be stored only within earmarked area and road side storage of construction material and waste shall be prohibited.
10. No uncovered vehicles carrying construction material and waste shall be permitted.
11. Construction and demolition waste processing and disposal site shall be identified and required dust mitigation measures to be notified at the site.

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## **10.0 QUALITY**

### **10.1 Knowledge of Requirements**

The Associate shall be deemed to have carefully examined and to have knowledge of the equipment, the general and other conditions, specifications, schedules, drawings, etc. forming part of the Contract and also to have satisfied himself as to the nature and character of the work to be executed and the type of the equipment and duties required including wherever necessary of the site conditions and relevant matters and details. Any information thus procured or otherwise obtained from TPCODL/Consultants shall not in any way relieve the Associate from his responsibility and executing the works in accordance with the terms of contract.

### **10.2 Material/Equipment/Works Quality**

The items / works under the scope of the Associate shall be of the best quality and workmanship according to the latest engineering practice and shall be manufactured from materials of best quality considering strength and durability for their best performance and, in any case, in accordance with the specifications set forth in this Contract. All material shall be new. Substitution of specified material or variation from the process of fabrication/construction/manufacture may be permitted but only with the prior written approval of the TPCODL.

### **10.3 Adherence to Rules & Regulations**

The Associate shall procure and/or fabricate/erect all materials and equipment in accordance with all requirements of Central and State enactment, rules and regulations governing such work in India and at site. This shall not be construed as relieving the Associate from complying with any requirement of TPCODL as enumerated in the Contract which may be more rigid than and not contrary to the above mentioned rules, nor providing such construction as may be required by the above mentioned rules and regulations. In case of variance of the Technical Specification from the laws, ordinance, rules and regulations governing the work, the Associate shall immediately notify the same to the TPCODL. It is the sole responsibility of the Associate, however, to determine that such variance exists. Wherever required by rules and regulations, the Associate shall also obtain the statutory authorities' approval for the plant, machinery and equipment to be supplied by the Associate.

### **10.4 Specifications and Standards**

The Associate shall follow all codes and standards referred in the Contract Document. Codes and standards of other may be followed by the Associate with the prior written approval of TPCODL, provided materials, supplies and equipment according to the standard are equal to or better than the corresponding standards specified in the Contract.

Brand names mentioned in the Contract documents are for the purpose of establishing the type and quality of products to be used. The Associate shall not change the brand name and qualities of the bought out items without the prior written approval of the TPCODL. All such products and equipment shall be used or installed in strict accordance with original manufacturer's recommendations, unless otherwise directed by the TPCODL. In any

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circumstances the codes, specimen and standards prescribed by any government agency should not be violated.

## 11.0 SAFETY

All Associates shall strictly abide by the guidelines provided in TPCODL's Contractor Safety Management System (CSMS) as applicable at all stages during the contract period. Associate shall execute the contracts ensuring the following in and as order of priority:

- Safety of Human Beings.
- Safety of equipment/Assets.
- Timely Completion of Contract.

Safety related requirements as mentioned in our Contractor Safety Management System is attached as annexure L and is an integral part of this GCC.

## 12.0 INSPECTION/PARTICIPATION

### 12.1 Right to Carry Out Inspection

TPCODL reserves the right to send its representatives for inspection or participation at various stages of contract execution listed below, applicable as per contract construction.

- During basic design and detail engineering of material/ Equipment carried out by Associate /Outsourced Agencies.
- During manufacturing stages of the product at Associate's/Associate's Outsourced Agency's Plant/Facility.
- During Pre-dispatch Inspection and Testing of finished/manufactured product at Associate's/Associate's outsourced Agency's Plant/Facility.
- During Installation & Commissioning Activities/Stages.
- Prior to Clearing of the completed installation for commissioning.
- Any other stage as find appropriate by TPCODL during contract execution time.

All inspections and participations shall be carried out within maximum of two weeks of TPCODL giving written intimation to the Associate or receiving appropriate advance written inspection call from the Associate, unless otherwise specified elsewhere in the contract document.

### 12.2 Facilitating Inspection

The Associate shall provide all opportunities and information to TPCODL's engineers to get acquainted with the technical know-how and the methods and practices adopted by the Associate in basic and detail engineering. The Associate shall provide documents, drawings, calculations etc. as may be required by TPCODL's Engineers.

The Associate shall provide free of charge office accommodation, office facilities, secretarial services, communication facilities, general and drawing office stationary, etc. as may be reasonably required by the TPCODL's engineers. Similarly, facilities shall also be provided by Associate's outsource agencies/partners/authorized dealers (collectively termed as sub-associates) if such basic and detail engineering activities are carried out in the design offices of sub-Associates.

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The Associate shall be responsible for the safety of employees of TPCODL/Third Party Agency when they are at the Associate's /Associate's outsource agency's plant or facility for carrying out/witnessing inspection/testing. All statutory safety precautions as applicable shall be followed by the Associate during Inspection Testing. If TPCODL inspectors are not satisfied with the safety arrangements at the plant, TPCODL have the right to call off inspection till such time corrective action is taken by the Associate.

Before raising the call for pre-dispatch final inspection and testing, the Associate shall conduct all the tests—type tests, routine tests etc-as specified in the contract document and submit copies of the test certificates to TPCODL along with the inspection call, for scrutiny of TPCODL.

The Associate and TPCODL shall jointly document all the observations, comments and action points after completion of inspection and it shall be binding on the Associate to provide compliance on all the points requiring compliance and furnish the compliance report to the designated authority of TPCODL for receiving clearance for dispatch of materials.

### **12.3 Third Party Nomination**

TPCODL also may nominate a third party for the purpose of carrying out the inspection and such an agency shall be entitled to all the rights and privileges of TPCODL as far as conducting the inspection.

### **12.4 Waiver of Inspections**

TPCODL on its own discretion shall chose to waive off any inspection and ask the Associate to submit all the test reports as applicable as per contract specifications, related to inspection and testing of the goods ordered for scrutiny and clearance for dispatch.

### **12.5 Incorrect Inspection Call**

In case it is observed that the material offered for inspection is not ready at the time of TPCODL inspection visit rendering it as futile, all costs towards such inspection shall be recovered from the BA. Taxes as applicable on such recoveries shall be borne by the BA.

## **13.0 MDCC & DELIVERY OF MATERIALS**

### **13.1 Material Dispatch Clearance Certificate**

Associate shall deliver material/goods/equipment against Supply Contracts or Supply Part of Composite/Service Contracts only after receiving Material Dispatch Clearance Certificate (hereafter termed as MDCC) issued by designated authority of TPCODL. Material delivered at TPCODL stores or at project site without a valid MDCC issued by the designated official of TPCODL shall be rejected. MDCC shall be issued to associate furnishing compliance report on the action points documented during pre-dispatch inspection and testing at Associate's/ Sub-Associate's plant/ facility. In case Pre-dispatch inspection is waived at the discretion of TPCODL, then, MDCC shall be issued on receiving all the test reports-routine& type-from the Associate and finding them in order.

The associate shall include and provide for securely protecting and packing the materials so as to avoid loss or damage during handling and transport by air, sea, rail and road or any other means.

All such packing shall allow to the extent possible for easy removal and checking at Site. The associate shall take special precautions to prevent rusting of steel and iron parts during

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transit by sea. Gas seals or other materials shall be utilised by the associate for protection against moisture during transit of all Plant and Equipment.

Each Equipment or parts of Equipment shall be tagged with reference to the assembly drawings and corresponding part numbers. Each bale or package shall contain a packing note quoting specifically the name of the associate, item description, quantity, item / package identification.

All packing cases, containers, packing and other similar materials shall be new and supplied free by the associate and it shall not be required to be returned to the associate.

Notwithstanding anything stated in this clause, the associate shall be entirely responsible for loss, damage or depreciation or deterioration to the materials and supplies due to faulty and/or insecure packing or otherwise during transportation to the Site until otherwise provided herein.

In case of the consignments dispatched by road, the associate shall ensure that it or its sub-contractors:

- i) Identify and obtain the correct type of trucks/trailers, keeping in view the nature of consignments to be dispatched.
- ii) Take such actions as may be necessary to avoid all possible chances of damages during transit and to ensure that all packages are firmly secured.

Timelines for inspection and MDCC is as below:

S. No.	Inspection	MDCC issuance time including inspection time (max.)
1	Outside Bhubaneswar	12 days
2	Within Bhubaneswar	5 days
3	Waiver*	3 working days

\* Associate is expected to raise the inspection call assuming that Inspection shall be carried out by TPCODL. The decision for waiver of inspection shall be on sole discretion of TPCODL.

### 13.2 Right to Rejection on Receipt

Goods/Material/Equipment delivered in condition physically damaged & incomplete as a product ordered, or not packed and transported as per the terms and conditions of the contract is liable to be rejected. Such item shall be lifted back by Associates within 15 days from receipt of rejection note from TPCODL and have to supply back the material within next 30 days or within the timeframe mutually decided by Associate and TPCODL.

If delivery of the material is beyond the agreed time, Liquidated damage clause, mentioned in this GCC separately shall be applicable; but the period for levy of LD shall be considered as per the original delivery schedule and not from the agreed timelines for material rectification.

### 13.3 Consignee

Unless otherwise specified in the Contract Document, Materials/Goods/Equipment shall be consigned to "Stores-In-Charge", TPCODL Bhubaneswar.

### 13.4 Submission of mandatory documents on Delivery

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Following documents shall be mandatorily submitted by BA along with supply of material to TPCODL stores/site:

S. No.	Documents	Requisite
1	Invoice copy in original	With all consignments
2	LR copy	Wherever required
3	Packing list	With all consignments
4	MDCC	With all consignments
5	Purchase order / Release order	Signed copy
6	Test certificates	With all consignments
7	Inspection/JVR report	In case pre-dispatch inspection is conducted
8	Device data in CD as per template for metering items	Wherever applicable

### 13.5 Dispatch and Delivery Instructions

S. No.	Instructions
1	Purchase order/ Release order no. shall be mentioned on invoice and on material
2	TPCODL material code and material description shall be mentioned in invoice and on material.
3	"Property of TPCODL" shall be embossed on material.
4	The material shall be properly sealed and packed in standard packing as per purchase order terms & conditions.
5	The weight and quantity of material shall be mentioned wherever applicable
6	The material supplied shall be co-related with the packing list.
7	The name plate detail on equipment shall include Material code, Material description, specification detail of material [as applicable], Serial No. Year of manufacturing, PO/RO no. and date, "PROPERTY OF TPCODL, Bhubaneswar", Guarantee period and Associate's name.
8	In case of manual unloading, supplier / transporter shall deploy sufficient Labour for unloading the material at TPCODL central store. For heavy item(s), crane will be provided by TPCODL [unloading cost will be recovered from the associate].
9	The driver should have valid License and one helper in truck. All the documents of truck like registration papers, PUC etc should be available in Truck.
10	BA representative should accompany the material and get it unloaded / stacked in his presence wherever possible.

### 14.0 GUARANTEE

#### 14.1 Guarantee of Performance

Associates shall stand guarantee that the equipment and material supplied/service or work rendered under the contract is free from design, manufacturing, material, construction, erection & installation and workmanship & quality defects and is capable of its due, rated and intended quality performance, as an integrated product delivered under the contract. for a specific period termed as Guarantee Period(as elaborated elsewhere in this clause) The

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Associate should also guarantee that the equipment/material is new and unused except for the usage required for the tests and checks required as part of quality assurance.

#### **14.2 Guarantee Period**

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Standard Specifications of TPCODL for the equipment/material/service/work and where standard specifications are not part of contract documents or guarantee period is not specified in the standard specifications,, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in standard specifications or SCC Guarantee Period will be 15 Months from the Date of Commissioning or 24 months from the date of delivery of final lot of supplies made, whichever is earlier.

#### **14.3 Failure in Guarantee Period (GP)**

If the equipment and material supplied/service or work rendered under the contract fails to perform its due, rated & intended quality performance, during the Guarantee period, the associate is liable to undertake repair/rectify/replace the equipment and material supplied/service or work rendered under the contract within time frame specified in the SCC or elsewhere in the contract documents at associate's cost to make the equipment and material supplied/service or work rendered under the contract of performing its due, rated and intended quality performance. If Associate fails to repair/rectify/replace the equipment or material supplied/service or work rendered under the contract, failed in Guarantee Period, TPCODL will be at liberty to get the same done at Associate's risks and costs and recover all such expenses plus the TPCODL's own charges (@ 20% of expenses incurred), from the Associate or from the "Security cum Performance Deposit" as the case may be.

If during the Warranty/ Guarantee period some parts of the supplies are replaced owing to the defects/ damages under the Warranty, the Warranty period for such replaced parts shall be until the expiry of twelve months from the date of such replacement or renewal or until the end of original Guarantee period, whichever is later.

Any repairs during the Guarantee Period shall be carried out by the Associate within 30 days of reporting the issue to Associate by TPCODL. However, if replacement of the Equipment is required, Associate shall notify the same to TPCODL within 7 days of reporting the issue by TPCODL. Thereafter, the total time for supply of new equipment/ material shall be equal to the original delivery period of that equipment/ material as specified in the Contract. In case the Associate is not able to rectify/ replace the faulty equipment/ material within the stipulated timelines as mentioned above, penalty shall be levied as per the Liquidated Damages clause mentioned in this document. The penalty amount shall be recovered from the payment due to the vendor or by encashment of the SPBG as the case may be.

#### **14.4 Cost of repairs on failure in GP**

The cost of repairs/rectification /replacement, apart from the actual cost of repairs/rectification/replacement is also inclusive of all associate costs of required transportation, site inspection /mobilization/dismantling and re-installation costs as applicable, to be borne by the Associate. The Associate has to ensure that the interruption in the usage of intended purpose of the equipment is minimized to the maximum extent In lieu of the time taken for repairs/rectification/replacement.



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#### **14.5 Guarantee period for Goods Outsourced**

If the Associate outsources partly equipment/materials/services from third party as mutually agreed upon at the pre award stage of contract, TPCODL shall have the benefit of any additional guarantee period if provided by the third party for the part supplied/executed by them.

#### **14.6 Latent Defect**

Hidden defects in manufacturing or design of the product supplied and which could not be identified by the tests conducted but later manifested during operation of the equipment are termed as latent defects. Associates shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company.

#### **14.7 Support beyond the Guarantee Period**

The Associate shall ensure availability of spares and necessary support for a period of at least 10 years post completion of guarantee period of equipment supplied against the contract.

#### **15.0 LIQUIDATED DAMAGES**

Liquidated damages @1% of the total executed contract value per week or part thereof, for the period of delay in integrated completion, subject to maximum 10% of the value of the contract shall become leviable without prejudice to other rights of the TPCODL. This amount shall be recoverable from any amount due or becoming due to the Business Associates under this or any other contract. In specific cases, TPCODL reserves the right to apply LD only on the unexecuted portion of the supply and works for standalone use, provided full quantity is executed within a maximum 30% additional time. Deduction of LD shall be on landed cost i.e contract value inclusive of taxes and in pursuant statutory compliance GST would be applicable at the stipulated rate and the same shall be borne by Business Associate. In case of LD deduction, a GST invoice shall be issued by TPCODL as a proof of deduction/ recovery.

#### **15.1 LD Waiver Request**

Any request of LD waiver shall be submitted within thirty (30) days of deducting LD. Request submitted beyond the timeline shall not be entertained.

#### **15.2 Material Recovery**

In case of any recoveries for materials or services (for material free issued by TPCODL and not reconciled by BA or for services claimed and paid in excess at the time of running bills), the total cost which shall be recovered from the BA, shall be the gross amount of material or services (i.e. including taxes) plus applicable taxes as prevailing at the time of such recoveries.

#### **16.0 ASSIGNMENT OR SUBCONTRACTING**

Associates shall not assign/subcontract/outsourced the schedule of activities of contract TPCODL enters with the associate, in part or full, without TPCODL's prior written approval.

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However outsourcing of materials/equipment/services by Associate to make the integrated product for which TPCODL's has placed the contract with the associate from suppliers, makes and agencies which have been mutually agreed upon during contract pre-award stage is permitted subject to following conditions.

In such cases where outsourcing is done by the Associate

- Shall ensure that outsourced suppliers comply with the technical and financial qualification requirements specified by TPCODL in the contract document
- Shall furnish all particulars about the proposed outsourcing agencies and the details of the goods/services/work outsourced to the Associate while seeking approval of TPCODL for inclusion for outsourcing. The Associate shall give approval or shall refuse approval in writing within thirty (30) days of receipt of such request. However the Associate shall not be entitled for any additional contract execution time whatsoever in lieu of the process for approval for outsourcing agencies, and shall be held responsible for any delay in the project execution time.
- Shall remain jointly and severally liable for any action, deficiency, and/or negligence on the part of his outsourcing agencies. The approval extended by the Associate to outsourcing agencies recommended by the Associate shall not discharge the later from his Contract obligations.

Shall submit to the Associate unpriced copies of purchase orders with technical specifications included in the orders, placed on outsourcing agencies as soon as the respective orders have been placed by the Associate.

## **17.0 UNLAWFUL ACTIVITIES**

The Associate shall have to ensure that none of its employees are engaged in any unlawful activities (whether covered under the scope of the present GCC or not) subversive of the TPCODL's interest failing which appropriate action (legal or otherwise) may be taken against the Associate by the TPCODL, in accordance with the terms of the present GCC.

## **18.0 CONFIDENTIALITY**

Associate and its employees or representatives thereof shall strictly maintain the confidentiality of various information they come across while executing the contract as detailed below.

### **18.1 Documents**

All maps, plans, drawings, specifications, schemes and other documents or information related to the Contract/Project and the subject matter contained therein and all other information given to the Associate by the TPCODL in connection with the performance of the contract shall be held confidential by the Associate and shall remain the property of the TPCODL and shall not be used or disclosed to third parties by the Associate for any purpose other than for which they have been supplied or prepared. The Associate may disclose to third parties, upon execution of confidentiality agreements, such part of the drawings, specifications or information if such disclosure is necessary for the performance of the Work provided such third parties agree in writing to keep such information confidential to the same extent and degree as provided herein, for the benefit of the TPCODL.

### **18.2 Geographical Data**

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Maps, layouts and photographs of the unit/plant including its surrounding regions showing vital installation for national security of country or those of TPCODL shall not be published or disclosed to the third parties or taken out of the country without prior written approval of the TPCODL and upon execution of confidentiality agreements satisfactory to the TPCODL with such third parties prior to disclosure.

### **18.3 Associate's Processes**

Title to secret processes if any developed by the Associate on an exclusive basis and employed in the design of the equipment shall remain with the Associate. TPCODL shall hold in confidence such processes and shall not disclose such processes to the third parties without prior approval of the Associate and execution by such third parties of secrecy agreements satisfactory to the Associate prior to disclosure. Upon completion of contract, such processes shall become the property of the TPCODL. Title to technical specifications, drawings, flow sheets, norms, calculations, diagrams, interpretations of test results, schematics, layouts and such other information, which the Associate has supplied to the TPCODL under the Contract shall be passed on to the TPCODL. The TPCODL shall have the right to use these for construction, erection, start-up, Trial Run, operation, maintenance, modifications and/or expansion of the works including for the manufacture of spare parts.

### **18.4 Exclusions**

The provision of Clauses 16.1 to 16.3 shall not apply to information:

- Which at the time of disclosure are in the public domain which later on become part of public domain through no fault of the party concerned, or
- Which were in the possession of the party concerned prior to disclosure to him by the other party, or
- Which were received by the party concerned after the time of disclosure without restriction on disclosure or use, from a third party who did not acquire such information directly or indirectly from the other party or has no obligation of confidentiality for such information.

### **18.5 Violation**

In case of violation of this clause, the Associate is liable to pay compensation and damages as may be determined by the competent authority of TPCODL.

## **19.0 INTELLECTUAL PROPERTY RIGHTS**

If, in the course of performance of its functions and duties as envisaged by the scope of the present GCC, the Associate acquires or develops, any unique knowledge or information which would be covered, or, is likely to be covered within the definition of a trademark, copyright, patent, business secret, geographical indication or any other form of intellectual property right, it shall be obliged, under the terms of this present GCC, to share such knowledge or information with the TPCODL. All rights, with respect to, or arising from such intellectual property, as afore mentioned, shall solely vest in TPCODL.

Moreover, the Associate undertakes not to breach any intellectual property right vesting in a third party/parties, whether by breach of statutory provision, passing off, or otherwise. In the event of any such breach, the Associate shall be wholly liable to compensate, indemnify or make good any loss suffered by such third party/parties, or any compensation/damages

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arising from any legal proceeding/s, or otherwise. No liability of TPCODL shall arise in this respect, and any costs, damages, expenses, compensation payable by TPCODL in this regard to a third party/parties, arising from a legal proceeding/s or otherwise, shall be recoverable from the Associate.

## 20.0 INDEMNITY

The Associate shall at all times indemnify, keep indemnified and hold harmless the TPCODL and its officers, directors, employees, affiliates, agents, successors and assigns against all actions, claims, demands, costs, charges and expenses arising from or incurred by reason of any infringement of patent, trade mark, registered design, copy rights and/or industrial property rights by manufacture, sale or use of the equipment supplied by the Associate whether or not the TPCODL is held liable for by any court judgement. In this connection, the TPCODL shall pass on all claims made against him to the Associate for settlement.

The Associate assumes responsibility for and shall indemnify and save harmless the TPCODL from all liability, claims, costs, expenses, taxes and assessments including penalties, punitive damages, attorney's fees and court costs which are or may be required to be paid by the TPCODL and its officers, directors, employees, affiliates, agents, successors and assigns arising from any breach of the Associate's obligations under the Contract or for which the Associate has assumed responsibilities under the Contract including those imposed under any local or national law or laws, or in respect to all salaries, wages or other compensation for all persons employed by the Associate or his Sub-Associates or suppliers in connection with the performance of any work covered by the Contract. The Associate shall execute, deliver and shall cause his Sub-Associate and suppliers to execute and deliver, such other further instruments and to comply with all the requirements of such laws and regulation as may be necessary there under to conform and effectuate the Contract and to protect the TPCODL.

The TPCODL shall not be held responsible for any accident or damages incurred or claims arising, due to the Associate's error there from prior to completion of work. The Associate shall be liable for such accidents and after completion of work for such accidents as the case may be due to negligence on his part to carry out Work in accordance with Indian laws and regulations and the specifications set forth herein.

## 21.0 LIABILITY & LIMITATIONS

### 21.1 Liability

Except for any specific liability which may be identified in the Contract and which may be payable hereunder, Associate shall not be liable for any special, incidental, indirect, or consequential Damages or any loss of business Contracts, revenues or other financial loss (or equivalents thereof no matter how claimed, computed or characterized) arising out of or in connection with the Performance of the Work or supply of Goods ***unless caused by Associate's negligence, willful misconduct or breach of contract.***

TPCODL shall have no liability or any special, incidental, indirect or consequential Damages for any loss of Business Contracts, revenues or other financial loss arising out of this Contract.

### 21.2 Limitation of Liability

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The total liability of Associate against any contract shall be limited to the Total All Inclusive Contract Value.

## 22.0 FORCE MAJEURE

Force Majeure applies if the performance by either Party ("the Affected Party") of its obligations under Contract is materially and adversely affected.

"Force Majeure" shall mean any event or circumstance or combination of events or circumstances referred below and their consequences that wholly or partly prevents or unavoidably delays any Party in the performance of its obligations under this Agreement, but only and to the extent that such events and circumstances are not within the reasonable control, directly or indirectly, of the Affected Party and could not have been avoided even if the Affected Party had taken reasonable care:

- Act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, embargo, blockade, revolution, riot, bombs, religious strife or civil commotion, etc.
- Politically motivated sabotage, or terrorism, etc.
- Action or Act of Government or Governmental agency for which remedy is beyond the control of the affected parties.
- Any act of God.

Note: Causes like power breakdown/ shortages/fire/strikes, accidents etc do not fall under Force Majeure.

Time being the essence of the Contract, if either party is prevented from the performance of its obligations in whole or in part due to an event of Force Majeure, then provided Notice of happening of any event by the Affected Party is given to the other party within seven (7) days from the date of occurrence of such event, which DIRECTLY has impact on works and submitted details and quantum of resulting effect, but at the same time had made all possible efforts to mitigate and overcome effects thereof, the Affected Party's performance under this Contract shall be suspended until such event ceases and the Scheduled Completion shall be delayed accordingly.

If Force Majeure event(s) continue for a period of more than three months, the parties shall hold consultation to discuss the further course of action.

Neither party shall be considered to be in default or in breach of its obligation under the Contract to the extent that performance of such obligation by either party is prevented by any circumstances of Force Majeure which arise after effective date of Contract.

Neither party can claim any compensation from the other party on account of Force Majeure.

## 23.0 SUSPENSION Of CONTRACT

### 23.1 Suspension for Convenience

TPCODL may, at any time and at its sole option, suspend execution of all or any portions of the schedule of items of contract to be supplied/work to executed by Associate under the contract by providing to the Associate atleast two business days written notice for contracts having contract completion period less than sixty days and atleast seven business days' notice for all other contracts.

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Upon receipt of any such notice, the Associate shall respond as follows as applicable as per contract construction.

- Immediately discontinue further supply of material/goods specified in the suspension notice for supply contracts
- Immediately discontinue further service/work and supply of materials of those services/materials/work specified in the suspension notice for service /composite contract
- Promptly make every reasonable effort to obtain suspension, upon terms satisfactory to TPCODL, of all orders, outsourcing arrangements, and rental Contracts to the extent that they relate to performance of the portion of Work suspended by the notice.
- Protect and maintain the portion of the service/Work already completed, including the portion of the Work suspended hereunder, unless otherwise specifically stated in the notice.
- Continue delivering/carrying out the supply/service/work items as per contract conditions, which do not fall under purview of the suspension notice.

On receipt of resumption notice from TPCODL, the Associate shall resume execution of contract as specified in the resumption notice, within the time frame specified in the resumption notice,

### **23.2 Suspension for Breach of Contract conditions.**

TPCODL shall suspend execution of whole/or part thereof the contract till such time Associate complies with the conditions stipulated under section clause 27 for breach/default of contract conditions.

### **23.3 Compensation in lieu of Suspension**

If the suspension of the contract in whole or in part is for convenience of TPCODL and not due to any breach of contract conditions by the associate, TPCODL at its discretion shall consider compensating all reasonable additional costs incurred by Associate in lieu of suspension of whole or part of contract, on representation of the Associate providing justified estimates of such additional costs and such estimates are found acceptable and approved by competent authority of TPCODL.

If the suspension of contract in whole or part thereof is due to breach of contract conditions (refer clause 24.3) by the Associate, Associate shall not be entitled for any compensation for any cost incurred in lieu of suspension of whole or part of contract and also shall be liable for compensating all the losses arising to TPCODL in lieu of suspension of contract. Resumption notice shall be subject to the Associate taking corrective action for the breach of contract conditions within the time frame and as per the terms specified in the suspension notice.

## **24 TERMINATION OF CONTRACTS**

### **24.1 Termination for Default/Breach of Contract**

The contract / PO shall be subject to termination by TPCODL in case of breach of the contract by the Associate which shall include but not be limited to the following:

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- a. Withdrawal or intimation by the Associate of its intent to withdraw or surrender the execution / completion of the contracted work /PO or failure in ensuring adherence to any delivery schedules, in deviation of the contract/ PO.
- b. Refusal or neglect on the part of the Associate to supply material/equipment of quantity or quality as specified by TPCODL and within the timeframe as specified in the contract document or refusal or neglect to execute the services/work in terms of the agreed standards of quantity or quality and/or within the timeframe specified in the contract/PO.
- c. Failure in any respect to perform any portion of the Work contracted with promptness, diligence, or in accordance with the terms of the contract.
- d. Failure to furnish guarantees as specified and /or failure to comply with the terms thereof.
- e. Failure to furnish such relevant documents or information within the time specified which may be necessary for due execution / completion of the works and documentation.
- f. Liquidation, bankruptcy either voluntary or involuntary OR entering into any composition or compromise with its creditors, or Insolvency.
- g. In case any reasonable information has been received by TPCODL that Associate has adopted/ or attempted to adopt any unethical conduct, action in award of the contract /PO or at any time thereafter.
- h. Failure to comply with applicable statutory provisions as contained in the contract or failure to comply with the applicable laws.
- i. Failure to comply with safety regulations/clauses stipulated in the contract or as may be generally instructed by TPCODL.

If the default or breach as specified under clause 24 (except sub clause g thereof) be committed by the associate for the first time, TPCODL shall issue, along the with notice of default or breach, a warning notice instructing the associate to take remedial/corrective action within the time frame stipulated in the warning notice and not to repeat the same in future. The timeframe for corrective action by the associate shall be specific to the nature of breach of contract and the same shall not be objected to by the Associate. If the Associate fails to comply with the instructions in the warning notice or in taking corrective action to the satisfaction of TPCODL then TPCODL may terminate the entire or part of contract at its discretion by issuing termination notice without incurring any liability on this ground.

In case the contract is terminated for any breach of the nature specified in clause 24 g stated above, TPCODL shall have the right to terminate all the contracts TPCODL is having with the Associate by issuing termination notice which shall be without prejudice to the other rights of TPCODL available to it under law.

Without prejudice to its right to terminate for breach of contract, TPCODL may, without assigning any reason, terminate the Contract in whole or in part at any time at its discretion while the contract is in force by serving a written notice of two weeks to the Associate.

In the event of TPCODL having proceeded with termination of the contract the associate shall comply and proceed further in the following manner:

- i) Associate shall discontinue the supply, on the expiry of the said period of two weeks.

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ii) Associate shall ensure that no further steps are being taken towards discharge of the obligations, terms and conditions as contained in the contract/PO. This shall include initiation of actions not limited to discontinuation of other allied and associated arrangements which the associate might have entered into with third parties for due discharge of its obligations under the contract with TPCODL.

iii) The Associate shall perform thereafter such tasks as may be necessary to preserve and protect the terminated portion of the material/service/work in progress and the materials and equipment at TPCODL sites or in transit thereto. However the associate shall continue to fulfill its contractual obligations with regard to the part of contract not terminated.

iv) It shall be open for TPCODL to conduct a joint assessment with the associate of the material ,supplies, equipment ,works or in general as to the subject matter of the contract in regard to which the associate claims having completed its obligations before or during such termination.

v) It shall be open to TPCODL to seek invocation of the performance bank guarantee or any other guarantee or other security deposit by whatever name called submitted by the associate, which shall not be objected to or protested against by the associate.

In case of termination of the contract the parties agree to be governed inter alia by the following:

a) In case TPCODL exercises its right of termination as stated above the associate shall not dispute or object to the same.

b) The Associate shall be entitled to receive and claim only such payments OR sums of money from TPCODL as may be found payable to it in regard to works executed by it under the terms of the contract and no other claim of any nature whatsoever shall be made by the Associate.

c) All such provisions which the parties have agreed to survive and prevail even after termination of the contract shall remain effective despite the termination.

In the event of such termination, TPCODL may finish the Work by whatever method it may deem expedient, including the hiring of services and /or purchase of material equipment from such third parties as TPCODL may deem fit or may itself provide any labor or materials and perform any part of the Work. The associate undertakes to bear the incremental costs if any paid by TPCODL in such a case attributable to failure on the part of the associate. The Associate in such a case shall not be entitled to receive any further payments and any sums found payable to it may be adjusted by TPCODL against the amount recoverable from him on this ground. The same shall be without prejudice to other rights available to TPCODL under law against the associate.

Upon the termination of any of the contract due to occurrence of any circumstances provided in clauses stated above and constituting repeated breach or misconduct , TPCODL shall be entitled to bar the associates its agents , affiliates from undertaking any negotiation / tendering, bidding, participation activities concerning TPCODL for a period of two years from date of such termination. The same shall be without prejudice to other rights available to TPCODL.

## **24.2 Termination for convenience of Associate**



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Associate at its convenience may request for termination of contract, clearly assigning the reason for such request. TPCODL has full right to accept, reject or partially accept such request. This convenience will be available to associate only after one year from the contract effective date. For this purpose, associate will provide a notice period of 90 days to TPCODL, Associate will have to pay TPCODL a 'termination convenience fee' equivalent to 5% of unexecuted contract value.

### **24.3 Termination for Convenience of TPCODL**

TPCODL at its sole discretion may terminate the contract by giving 30 days prior notice in writing or through email to the Associate. TPCODL shall pay the Associate for all the supplies/ services rendered till the actual date of contract termination against submission of invoice by the Associate to that effect.

### **25.0 DISPUTE RESOLUTION & ARBITRATION**

In case of any dispute or difference the parties shall endeavor to resolve the same through conciliatory and amicable measures within 15 Days failing which the matter may be referred by either party for resolution by the sole arbitrator to be appointed mutually by both the parties. The arbitral proceedings shall be conducted in accordance with Arbitration and Conciliation Act 1996 and the place of arbitration shall be Bhubaneswar. The language to be used at proceedings shall be English and the award of the arbitrator shall be final and binding on the parties. The parties shall bear their respective costs of arbitration. The associate shall continue to discharge its obligations towards due performance of the works as per the terms of the contract during the arbitration proceedings unless otherwise directed in writing by TPCODL or suspended by the arbitrator. Further, TPCODL shall continue making such payments as may be found due and payable to the associate for such works.

#### **25.1 Governing law and jurisdiction**

The parties shall be subject to the jurisdiction of the courts of law in Bhubaneswar and any matter arising here from shall be subject to applicable law in force in India.

### **26.0 ATTRIBUTES OF GCC**

#### **26.1 Cancellation**

The Company reserves the right to cancel, add, delete at its sole discretion, all or any terms of this GCC or any contract, order or terms agreed between the parties in pursuance without assigning any reasons and without any compensation to the Associates.

#### **26.2 Severability**

If any portion of this GCC is held to be void, invalid, or otherwise unenforceable, in whole or part, the remaining portions of this GCC shall remain in effect.

#### **26.3 Order of Priority**

In case of any discrepancies between the stipulations in General Conditions of the Contract (GCC) and Special Conditions of Contract (SCC), the GCC shall stand superseded by the SCC to the extent stipulated hereinabove while balance portion of respective clauses of GCC shall continue to be applicable.

### **27.0 INSURANCE**

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The Associate shall arrange accident insurance policy for his foreign experts/specialists/personnel deputed to Site and Associate's/his sub-Associates' manufacturing works as well as for his Indian engineers and supervisory staff. The Associate shall also take out for his Indian workmen, where applicable, a separate policy as required under Workmen's Compensation Act.

Associates shall be responsible to suitably insure their entire work-force (to the extent of at least meeting requirements under Workmen Compensation Act) Tools, Plant, Third party liability at the project site, All Risk comprehensive insurance for the entire works (insurance for free issue items will be in TPCODL scope) for total contract (PO/RO) value or any other such risks during execution of works, till the works are handed over to the company, in consultation with TPCODL and shall submit copies of such insurances to the Engineer-in-Charge for review / acceptance before commencing the work. Engineer-in-charge must ensure compliance to insurance requirement by Associate before commencement of works. TPCODL shall stand fully indemnified in this respect.

### **28.0 ERRORS AND OMISSIONS**

The Associate shall be responsible for all discrepancies, errors and omissions in the drawings, documents or other information submitted by him, irrespective of whether these have been approved, reviewed or otherwise accepted by the TPCODL or not. However any error in design/drawing arising out of any incorrect data/written information from TPCODL will not be considered as error and omissions on part of the Associate.

### **29.0 TRANSFER OF TITLES**

The title of ownership and property to all equipment, installations, erections, constructions materials, drawings & documents shall pass to the TPCODL after Commissioning and complete handing over-taking over.

However, such passing of title of ownership and property to the TPCODL shall not in any way absolve, dilute or diminish the responsibility and obligations of the Associate under this Contract including loss or damages and all risks, which shall vest with the Associate.

The Associate shall take all corrective measures arising out of discrepancies, errors and omissions in drawings and other information within the time schedule and without extra cost to the TPCODL.

The Associate shall also be responsible for any delay and/or extra cost if any, in carrying out engineering, and site works by other agencies arising out of discrepancies, errors and omissions stated in as well as of any late revision/s of drawings and information submitted by the Associate.

### **30.0 SUGGESTIONS & FEEDBACK**

We welcome all our Business Associates to write to us about their experience with TPCODL; be it our Company, our services or our people. Each and every concern, issue, query and suggestion from you will help us to become a better company to work with and shall help us develop a strong bonding of trust and a long term relationship with you.

You may send your feedback by filling up our Business Associate Feedback Form enclosed herewith as Annexure-I. You can also log on to our website [www.tpcentralodisha.com](http://www.tpcentralodisha.com) to provide your feedback according to the guidelines mentioned below:

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### 31.0 CONTACT POINTS

In case Business Associate needs information with respect to payments or has any grievances, same may be lodged by log on to our website [www.tpcentralodisha.com](http://www.tpcentralodisha.com)

### 32.0 LIST OF ANNEXURES

S. No.	Subject	Annexure
1.	Performa for Bid Security Bank Guarantee	A
2.	Performa for Advance Payment Bank Guarantee	B
3.	Performa for Performance Bank Guarantee (CP cum EP)	C
4.	Performa for No Demand Certificate by Associate	D
5.	Performa for Indemnification on Statutory Compliance	E
6.	Performa For Application For Issuance of Consolidated TDS Certificate	F
7.	HR Service Level Agreement	G
8.	Under taking for competence of workmen	H
9.	Business Associate Feedback Form	I
10.	Acceptance Form For Participation In Reverse Auction Event	J
11.	NEFT or RTGS payment request form	K
12	Contractor Safety Management System	L
13	Vendor Appraisal Form	M
14	Manufacturers Authorization Form	N



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**ANNEXURE-B**

**PROFORMA FOR ADVANCE PAYMENT BANK GUARANTEE**

**(On Rs.100/- Stamp Paper)**

**Note:**

- (a) Format shall be followed in toto
- (b) Claim period of six months must be kept up
- (c) The guarantee to be accompanied by the covering letter from the bank confirming the signature to the guarantee

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**TP Central Odisha Distribution Limited**

**Bhubaneswar**

**Advance Payment B.G.No.....**

**Contract No.....dated.....**

1. You have entered into a Contract with No \_\_\_\_\_ M/s. \_\_\_\_\_ (hereinafter referred to as "the Vendor") for the supply and delivery of \_\_\_\_\_ (hereinafter referred to as" the said Equipment") for the price and on the terms and conditions contained in the said contract.
2. In accordance with the terms of the said contract, you have agreed to make an advance payment of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) being \_\_\_\_\_% (\_\_\_\_\_percent) of the total value of the contract on "the Vendor" furnishing you with an irrevocable, unconditional and acceptable bank guarantee to be valid till the date of receipt of "the said equipment" covered by your above mentioned contract. For this purpose you have agreed to accept our guarantee.
3. In consideration thereof, we, \_\_\_\_\_ hereby irrevocably and unconditionally guarantee to pay to you on demand but in any case before the end of five working days from the date of the claim and without demur and without reference to "the Vendor" such amount or amounts not exceeding the sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) being \_\_\_\_\_% (\_\_\_\_\_percent) of the total value of the contract on receipt of your intimating that "the Vendor" has not fulfilled his contractual obligations. You shall be the sole judge for such non-fulfillment and "the Vendor" shall have no right to question such judgment.
4. You shall have the right to file / make your claim on us under the guarantee for a further period of one months from the date of expiry.
5. This guarantee shall not be revoked without express consent and shall not be affected by your granting time or any other indulgence to "the Vendor", which shall include but

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not be limited to, postponement from time to time of the exercise the same in you or any right which you may have against "the Vendor" and to exercise the same in any covenant contained or implied in the said contract or any other course or remedy or security available to you, and our Bank shall not be released from its obligations under this guarantee by your exercising any of your rights with reference to matters aforesaid or any of them or by reasons of any other act or forbearance or other acts of omission or commission on your part or any other indulgence shown by you or by any other matter or thing whatsoever which under the law would, but for this provision have the effect of relieving our bank from its obligation under this guarantee.

6. We also agree that you shall be entitled at your option to enforce this guarantee against our bank as a principal debtor, in the first instance, notwithstanding any other security or guarantee that you may have in relation to "the Vendor's" liabilities in respect of the premises
7. This guarantee shall not be affected by any change in the constitution of our Bank or "the Vendor" or for any other reason whatsoever.
8. Any claim / extension under the guarantee can be lodge-able at outstation banks or at Bhubaneswar branch and claim will also be payable at Bhubaneswar Branch **(to be confirmed by Bhubaneswar Branch by a letter to that effect)**
9. Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) and the guarantee will remain in force upto and including \_\_\_\_\_ (Date) and shall be extended from time to time for such period or period as may be desired by "the Vendor".
10. Unless a demand or claim under this guarantee is received by us in writing within one month from \_\_\_\_\_ (expiry date) i.e. on or before \_\_\_\_\_ (claim period end date), we shall be discharged from all liabilities under this guarantee thereafter.

Dated at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ 200\_\_\_\_\_

**Witness**

1. \_\_\_\_\_

Bank's rubber stamp

Banks full address

2. \_\_\_\_\_

Designation of Signatory

Bank official number

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**ANNEXURE- C**

**PROFORMA FOR PERFORMANCE BANK GUARANTEE (CP cum EP)**

**(On Rs.100/- Stamp Paper)**

**Note:**

- (a) Format shall be followed in toto
- (b) Claim period of one month must be kept up
- (c) The guarantee to be accompanied by the covering letter from the bank confirming the signature to the guarantee

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**TP Central Odisha Distribution Limited**

**Bhubaneswar**

**CP cum EP BG No.....**

**Order/Contract No.....dated.....**

1. You have entered into a Contract No \_\_\_\_\_ with M/s. \_\_\_\_\_ (hereinafter referred to as "the Vendor") for the supply cum erection / civil work of \_\_\_\_\_ (hereinafter referred to as "the said Equipment") for the price and on the terms and conditions contained in the said contract.
2. In accordance with the terms of the said contract, "the Vendor" agreed to furnish you with an irrevocable, unconditional and acceptable bank guarantee for 10% of the value of contract and to be valid till the end of Guarantee period plus one month towards "Contract cum Equipment performance". For this purpose you have agreed to accept the guarantee.
3. In consideration thereof, we, \_\_\_\_\_ hereby irrevocably and unconditionally guarantee to pay to you on demand but in any case before the end of five working days from the date of the claim and without demur and without reference to "the Vendor" such amount or amounts not exceeding the sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) being \_\_\_\_\_ % ( \_\_\_\_\_ percent) of the total value of the contract on receipt of your intimating that "the Vendor" has not fulfilled his contractual obligations. You shall be the sole judge for such non-fulfillment and "the Vendor" shall have no right to question such judgment.
4. You shall have the right to file / make your claim on us under the guarantee for a **further period of one month** from the date of expiry.
5. This guarantee shall not be revoked without express consent and shall not be affected by your granting time or any other indulgence to "the Vendor", which shall include but not be limited to, postponement from time to time of the exercise the same in you or any right which you may have against "the Vendor" and to exercise the same in any covenant contained or implied in the said contract or any other course or remedy or security

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available to you, and our Bank shall not be released from its obligations under this guarantee by your exercising any of your rights with reference to matters aforesaid or any of them or by reasons of any other act or forbearance or other acts of omission or commission on your part or any other indulgence shown by you or by any other matter or thing whatsoever which under the law would, but for this provision have the effect of relieving our bank from its obligation under this guarantee.

6. We also agree that you shall be entitled at your option to enforce this guarantee against our bank as a principal debtor, in the first instance, notwithstanding any other security or guarantee that you may have in relation to "the Vendor's" liabilities in respect of the premises
7. This guarantee shall not be affected by any change in the constitution of our Bank or "the Vendor" or for any other reason whatsoever.
8. Any claim / extension under the guarantee can be lodge-able at outstation banks or at Bhubaneswar branch and claim will also be payable at Bhubaneswar Branch (to be confirmed by Bhubaneswar Branch by a letter to that effect in case BG is from the branch outside Bhubaneswar)
9. Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) only and the guarantee will remain in force upto and including \_\_\_\_\_ (Date) and shall be extended from time to time for such period or period as may be desired by "the Vendor".
10. Unless a demand or claim under this guarantee is received by us in writing within one months from \_\_\_\_\_ (expiry date) i.e. on or before \_\_\_\_\_ (claim period end date), we shall be discharged from all liabilities under this guarantee thereafter.

Dated at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ 200\_\_

**Witness**

- |    |  |                          |
|----|--|--------------------------|
| 1. |  | Bank's rubber stamp      |
|    |  | Banks full address       |
| 2. |  | Designation of Signatory |
|    |  | Bank official number     |



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**ANNEXURE-D**

**PROFORMA FOR “NO DEMAND CERTIFICATE” BY ASSOCIATE**

(On Company’s Letter head or with Company Seal)

(To be submitted by the Associate to TPCODL Accounts Department at the time of receipt of full and final payment)

**(Certificate No. CCP/002)**

Name of the Project

Order/ Contract No.

Dated

Name of the Associate

Scheme No. / Job No.

We, M/s. \_\_\_\_\_ (Associate) do hereby acknowledge and confirm that we have received the full and final payment due and payable to us from TPCODL, in respect of our aforesaid Order No \_\_\_\_\_ dated \_\_\_\_\_ including amendments, if any, issued by TPCODL to our entire satisfaction and we further confirm that we have no claim whatsoever pending with TPCODL under the said contract / W.O.

Notwithstanding any protest recorded by us in any correspondence, documents, measurement books and / or final bills etc., we waive all our rights to lodge any claim or protest in future under this contract.

We are issuing this “NO DEMAND CERTIFICATE” in favour of TPCODL, with full knowledge and with our free consent without any undue influence, misrepresentation, coercion etc.

**Dated**

**Signature**

**Place**

**Name**

**Designation**

**(Company Seal)**

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**ANNEXURE – E**

**PROFORMA FOR “INDEMNIFICATION ON STATUTORY COMPLIANCES”**

(To be submitted by the successful Bidder within seven days of award of work)

**(Certificate No. CCP/001)**

Name of the Project

Letter of Award / Contract No.

Dated

Name of the Associate

Scheme No. / Job No.

By this confirmation we, \_\_\_\_\_  
(Associate) are formally bound to M/s. TPCODL towards any sum which may be imposed, levied or hereinafter recovered by the Provident Fund Organization under the provisions of the Employees of the Provident Fund and Miscellaneous Provisions Act 1952 in respect of employees employed by us.

We well and truly bind ourselves and our heirs executors administrators and representatives jointly severally and respectively for the above payment only to be paid to M/s. TPCODL.

AND WHEREAS we, \_\_\_\_\_ (Associate)  
is making compliance of the Employees Provident Fund and Miscellaneous Provisions Act 1952, have entered into the above written bond for the indemnity to M/s. TPCODL against all losses from the acts or default of the said Associate in respect of compliance of the Provident Fund Act.

Similarly we hereby confirm that we have complied with all statutory and local laws and nothing is outstanding with regard to Local Sales Tax, Labour Laws, Local Municipal dues, Electricity dues etc. We have entered into the above written bond for the indemnity to M/s. TPCODL against all losses from the acts or default of the said Associate in respect of compliance of the Local Sales Tax Laws, Local Laws, Labour Laws, Local Municipal Dues, Electricity dues etc.

NOW THE CONDITION, of the above written bond is as such that if the Associate during the period of this contract commits any default or fails to make payment of Contributions in respect of his employees to the Employees Provident Fund Organization, he shall indemnify the Principal Employer M/s. TPCODL from all and every loss and damage caused to them from any act, omissions or negligence of the said Associate in respect of compliances under the Employees Provident Fund and Miscellaneous Provisions Act, 1952.

IN WITNESS to the above written bond we have here to set our hands, with our free consent.

**Dated**

**Signature**

**Place**

**Name**

**Designation (Company Seal)**

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**ANNEXURE-F**

**PROFORMA FOR APPLICATION FOR ISSUANCE OF CONSOLIDATED TDS  
CERTIFICATE**

To be printed on the letterhead

To,

TP Central Odisha Distribution Limited,

Bhubaneswar

**Sub: Application for issuance of Consolidated TDS Certificate for the FY \_\_\_\_\_**

Dear Sir,

I / we hereby request / authorize you to issue me / us a consolidate TDS Certificate for the financial year \_\_\_\_\_ against tax deducted at source by you from my / our payments / bills during the said year from time to time under Chapter XVII – B of the Income Tax Act, 1961.

For and on behalf of

Signature

Name

Address

Contact No. (Land Line)

(Mobile)

PAN #

Assessing authority

**ATTACH THE COPY OF PAN CARD**

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## **ANNEXURE - G**

### **SERVICE LEVEL AGREEMENT**

(To be adhered to by Business Associates (BAs) in TPCODL on Human Resource Issues)

**1.0 The following shall be adhered to by the Business Associates during his / its association with TPCODL:**

**Shall Abide by TPCODL Core Values:**

- a) **Integrity** – We must conduct our business fairly, with honesty and transparency. Everything we do must stand the test of public scrutiny.
- b) **Understanding** – We must be caring, show respect, compassion and humanity to our colleagues and customers and always work for the benefit of the communities we serve.
- c) **Excellence** – We must constantly strive to achieve the highest possible standards in our day to day work and in the quality of services we provide.
- d) **Unity** – We must work cohesively with our colleagues across the group and with our customers and partners to build strong relationships based on tolerance, understanding and mutual co-operation.
- e) **Responsibility** – We must continue to be responsible and sensitive to the communities and environments in which we work and always ensuring that what comes from the people; goes back to the people many times over.
- f) **Agility**- We must work in a speedy and responsive manner and be proactive and innovative in our approach.

**2.0 The Business Associate / his manager / supervisor who is responsible for managing the project site / performance contract etc. in TPCODL would also ensure adherence of these values by his employees / persons deployed by him in connection with his works undertaken in TPCODL.**

**3.0 TPCODL is a signatory to the United Nation Global Compact as an integral part of its Governance principles / business. The Business Associates are required to:**

- a) Support and respect the protection of human rights and make sure that they are not complicit in human right abuses.
- b) Respect freedom of association and effective recognition of the right to collective bargaining.
- c) Not to resort to any form of forced and compulsory labour.
- d) Shall ensure abolition of child labour in his area of work.
- e) There is no discrimination in respect of employment and occupation in respect of his employees.
- f) Support precautionary approach to environmental challenges.
- g) Promote greater environmental responsibility by himself and his employees in his areas of work.
- h) Deploy and defuse environmental friendly technologies while carrying out the works.
- i) Work against corruptions in all its form including extortion and bribery by himself and his employees.

**4.0 The Business Associates are required to adhere to all applicable Labour Laws with special reference to the following:**

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- a) No person below the age of 18 years and no child labour will be engaged directly or indirectly for executing the work connected with the business of TPCODL.
- b) Minimum wages along with other statutory dues like PF, ESI, etc. as applicable to the workers shall be made within the prescribed period of 7<sup>th</sup> / 10<sup>th</sup> day of the following month.
- c) Deduction / deposit / record keeping and all other requirements under Employees PF Act 1952, Employees State Insurance Act 1948 and other applicable acts (if any) shall be adhered to.
- d) Only statutorily authorized deductions (if any) shall be made in accordance with the relevant statutes.
- e) All the provisions of Contract Labour (R&A) Act 1970 shall be complied with in respect of the workers engaged for TPCODL work. The work will be commenced only after completing necessary formalities for obtaining Labour License (if applicable).
- f) Necessary registers / records, filing of returns etc. shall be maintained for verification by Statutory / TPCODL authorities.
- g) Payment of wages shall be made only in presence of and with certification of authorized representative of TPCODL or shall be made in the form of cheque / bank transfer to the employee.
- h) During the period of contract, the Business Associate will arrange for deployment of his supervisor / manager for total supervision and control of the work and their manpower. All the activities related to their manpower e.g. attendance, leave, wage disbursement etc. will be done under the supervision & control of Business Associates, While adhering to the prescribed standard / norms of production / productivity & quality. During execution of the work, Business Associate shall engage only such qualified / skilled manpower as may be envisaged / required for ensuring level of production / service into the contract / work order.
- i) Clearances as follows shall be obtained from IR & Welfare Group:
  - i. Clearance for commencement (before start of the work).
  - ii. No Objection Certificate (after completion / before final settlement).
  - iii. Copies of PF / ESI Challans shall be deposited with IR & Welfare Group every month
- j) The Business Associate shall indemnify TPCODL from any liabilities under applicable Labour Statutes.
- k) The Business Associate shall ensure safety and health of his employees and shall also maintain hygienic working environment / condition in his area of work.
- l) The Business Associate and his employee shall abide by Laws of Land and shall not violate any applicable provisions.
- m) The Business Associate appreciates with and acquiesces to the right of TPCODL as principal employer to fulfil any of his legal obligations, if he fails to do so under applicable labour laws and deduct the same from his running bills / final payments / encashing security deposit / Bank Guarantee as the case may be. If there is any further shortfall TPCODL has the right to recover the same from the Business Associate.
- n) The Business Associate ensures that person employed by him adhere to the moral and legal conduct and shall not violate any standard conduct envisaged in the premise of

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TPCODL by all such as, Transparency, Safety, Discipline, Integrity etc. The Business Associate or his employees should refrain from corrupt practices, giving or taking bribe in connection with any TPCODL business.

**5.0 The 'Statutory Compliance Enforcement System' in TPCODL is detailed below for adherence by all concerned. Corporate IR & Welfare Group will be the process owner for implementation of the system with the help of concerned Engineer I/c or Officer I/c.**

- a) Statutory Compliance being a professed value in TPCODL Code of Conduct, the concerned Engineer / Officer in charges are requested to adhere to the provisions and advise respective Business Associates in their domain to comply in letter and spirit.
- b) Immediately after issuance of letter of intent, the authorized representative of the Business Associate will report to Corporate IR & Welfare group for completion of statutory requirements.
- c) Normally, the work will be started only after 'Clearance for Commencement of Work (CCW)' is issued by IR & W group to the Business associate. However in exceptional exigencies in engineer I/c / Officer I/c may direct the Business Associate to start the work and inform IR & W group about the same. Statutory requirements in this case may be completed parallelly.
- d) First monthly bill will be released only after producing CCW to the finance department. Similarly closure of work and final settlement will be affected after issuance of no objection certificate from IR & W group.

**6.0 Requirements for 'Clearance for Commencement of Work' (CCW):**

- a) Submission of filled up Form 'A' for database (Annexure-1).
- b) Copy of PF Code allocation letter.
- c) Copy of ESI Code allocation letter.
- d) Submission of duly filled up Form IV CL(R&A) act (In case more than or equals to 20 workers during the period of contract).
- e) Submission of duly filled up Form VI A (Notice of Commencement).
- f) Copy of insurance cover note under WC Act 1923 (if applicable).
- g) Copy of Contract Agreement.
- h) Copy of indemnity bond (if applicable).
- i) Affidavit with regard to payment of wages through cheque / bank transfer only.

**7.0 Requirements during execution of work:**

- a) Copy of receipt of application for license / license (if applicable).
- b) Copy of PF Challan (latest by 26<sup>th</sup> day of every Month).
- c) Copy of ESI Challan (latest by 26<sup>th</sup> day of every Month).
- d) Copy of Wage disbursement sheet / Bank statement.
- e) Filing / Maintenance of all statutory registers / reports / returns for inspection by Statutory/ TPCODL authorities.
- f) Certification of wage disbursement by authorized representative of TPCODL.
- g) Copy of 'Labour Welfare Fund' deposit certificate / Challan.
- h) Insuring safe working practices at the work place.

**8.0 Requirements for 'No Objection Certificate' (NOC) for closure of work:**

- a) Submission of duly filled up Form VI A (Notice of Completion).

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- b) Copy of Half yearly / Annual return for ESI / PF / CL(R&A).
- c) Consolidated copy of wage sheet of last month indicating full & final settlement of all dues like retrenchment benefit, bonus, leave encashment etc. Copy of individual declaration by employees in Form X regarding termination of employment.
- d) Confirmation certificate regarding filling up of form for transfer / withdrawal of PF by the concerned workers.

**In case any of the above are deviated / not complied with the Letter of Award/Order shall be liable to be withdrawn / cancelled.**

**Enclosure:**

- 1) Form A
- 2) Form X
- 3) Form XI
- 4) Form VI A
- 5) Form XXIV

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**FORM (A)**

[To be submitted by the Business Associate to the Principal Employer within a week from LoA issuance]

**A. Details of the Agency**

1. Name of Agency :
2. Nature of work :
3. Local Address with Ph.No. :  
(With Father's name) :
4. Permanent Address (Full) :
5. PF code no. & Place :
6. ESI Code no. & Place :
7. Name and address of :  
Sub-contractor (if any)

**B. Details of Work**

8. Name of work (as specified in LOI/LOA) :
9. LOI/LOA Nos. & Dates :
10. Period of contract (Specify Dates) :  
[Including Extension period, if any] :
11. Work Area [Department / Location] :
12. Name / Cell no. of Officer I/c :
13. Maximum No. of workers and staff to be engaged on any day during the year.
  - Supervisory Staff :
  - Workers :
14. Do you have any other contract in TPCODL : Yes/No  
If yes, furnish details:



15. Details of Workmen's compensation Policy, if applicable

Name of Insurance Company .....  
 .....Policy No ..... Number of persons covered .....  
 Period of coverage: From ..... To .....

If no, I hereby undertake the liability arising out of Workmen's Compensation Act and Rules made there under.

**C. Details of workers to be engaged**

**No. of Workers**

S. No.	Unskilled*	Semi-skilled*	Skilled*	Clerical / Supervisory

**\* Number to be indicated**

I/We shall fulfill all obligations arising from and under all relevant law in force from time to time. I/We undertake to keep the TPCODL indemnified against any loss or liability arising out of failure of my / our abiding the relevant laws.

The name of my / our representatives is ..... to enter the TPCODL Premises on my behalf.

**Date:**

**(Signature of the Business Associate  
 or his Authorized Representative)**

**This Business Associate is / will be engaged in TPCODL.**

**(Signature and seal of  
 Officer I/c of the Work)**

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**Form X**

**Undertaking**

I \_\_\_\_\_ hereby undertake that all the dues in respect of my employment with M/s \_\_\_\_\_ for the period of \_\_\_\_\_ to \_\_\_\_\_ have been settled and final payments including retrenchment benefit have been made to me in full.

( \_\_\_\_\_ )

\_\_\_\_\_

Date:

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**Form XI**

**Undertaking**

With reference to the contract job awarded by M/s TP Central Odisha Company Limited to M/s \_\_\_\_\_ vide work order No. \_\_\_\_\_ dated \_\_\_\_\_

I \_\_\_\_\_ on behalf of

M/s \_\_\_\_\_ hereby undertake:

1. that the dues in respect of the workmen/ employee(s) engaged by us for the said contract, payable as per the provisions of relevant statute pertaining to
  - i. wages/ salary
  - ii. PF & ESI, Bhubaneswar Labour Fund
  - iii. All other statutory obligation
 has been paid /settled in full and no amount/ compliance is due/ pending.
  
2. That in case any dispute / claim is raised by the concerned workers i.r.o. any dues / payments, M/s \_\_\_\_\_ will settle the same on it's own and such liability will be borne by M/s \_\_\_\_\_
  
3. That M/s \_\_\_\_\_ hereby indemnify M/s TPCODL from any future liability i.r.o. any statutory obligation in respect of said contract.

Date:

\_\_\_\_\_  
( \_\_\_\_\_ )

Authorized Signatory

For M/s \_\_\_\_\_

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**FORM- VLA**

**Notice for Commencement /Completion of contract work**

I/We, Sh. / M/s \_\_\_\_\_ (Name and Address of the Contractor) hereby intimate that the contract work \_\_\_\_\_ (name of work) in establishment of the \_\_\_\_\_ (name and address of the Principal Employer) for \_\_\_\_\_ which License No. \_\_\_\_\_ dated \_\_\_\_\_ has been issued to me/us by the Licensing Officer \_\_\_\_\_ (name of the Headquarters), has been commenced / completed with effect from \_\_\_\_\_ date / on date.

**Signature of Contractor**

**With Office Seal**

**The Inspector**

\_\_\_\_\_  
\_\_\_\_\_

**FORM XXIV**

[See Rule 82(1)]

***Return to be sent by the Contractor to the licensing Officer (in duplicate)***

Half -Yearly Ending \_\_\_\_\_

1. Name and address of the Contractor
2. Name and address of the Establishment
3. Name and address of the Principal Employer
4. Duration of Contract: From \_\_\_\_\_ to \_\_\_\_\_
5. No. of days during the half year on which
  - (a) the establishment of the principal employer had worked
  - (b) the contractor's establishment had worked
6. Maximum No. of contract labour employed on any day during the half –year:

Men	Women	Children	Total

7.
  - (i) Daily hours of work and spread over
  - (ii) (a) whether weekly holiday observed and on what day  
(b) if so, whether it was paid for
  - (iii) No. of man – hours of overtime worked

8. No. of man days worked by

Men	Women	Children	Total

9. Amount of wages paid

Men	Women	Children	Total

10. Amount of deductions from wages, if any

Men	Women	Children	Total

Whether the following have been provided –

(i) Canteen : \_\_\_\_\_

(ii) Rest rooms : \_\_\_\_\_

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(iii) Drinking water : \_\_\_\_\_

(iv) Crèches : \_\_\_\_\_

(v) First Aid : \_\_\_\_\_

**Signature of contractor**

Place \_\_\_\_\_

Date \_\_\_\_\_

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**ANNEXURE – H**

**UNDERTAKING FOR COMPETENCE OF WORKMEN**

Name of Associate :

Tender No. :

Item :

With reference to the tender mentioned above, I/We \_\_\_\_\_,  
hereby undertake that the workmen/ employee(s) engaged by M/s  
\_\_\_\_\_ for the job against said tender shall be competent in all  
respect, commensurate to the nature of job.

Date:

\_\_\_\_\_  
( )

Authorized Signatory

For M/s

Seal

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**ANNEXURE-I**

**BUSINESS ASSOCIATE FEEDBACK FORM**

With an objective to improve our internal processes and systems, and serve you better, we solicit your valuable feedback & suggestions. It is estimated that it will take about 10 minutes to complete this survey. We assure you that your feedback shall be kept confidential. Please send the duly filled feedback form in the "TPCODL addressed - attached envelop"

**You are associated with us as**

- OEMs       Service Contractor       Material Suppliers       Material & Manpower Supplier

**You are associated with us for**

- Less than 1 year       More than 1 year but less than 3 years       More than 3 years

**Your office is located at**

- Bhubaneswar / NCR       Within 200 kms from Bhubaneswar       More than 200 kms from Bhubaneswar

**Your nearly turnover with TPCODL**

- Less than 25 Lacs       25 Lacs to 1 Crore       More than 1 Cr.

**Additional information**

<b>Your Name</b>	
<b>Your Designation</b>	
<b>Your Organization</b>	
<b>Contact Nos.</b>	
<b>Email</b>	

*We once again thank you for your participation in this survey. Please spare 10 minutes to give your feedback on following pages (Section A to E)*



### SECTION - A

(Please ✓ mark in the relevant box and give your remarks / suggestions / information for our improvement.).

S. No.	Parameters	1	2	3	4	5	Remarks/ Suggestion
		Do Not Agree	Slightly in Agreement	In Fair Agreement	Mostly in Agreement	Fully Agree	
1	You receive all relevant queries / tenders from us in timely manner.						
2	We provide you enough lead time to respond to our queries / tenders.						
3	We provide you adequate support (drawings, documents, clarifications, briefing etc.) to enable you meet our requirements.						
4	All following elements of our contract / purchase order are rational :						
4.1	Scope of Work						
4.2	Delivery / Execution Schedule						
4.3	Payment Terms						
4.4	Liquidated Damages						
4.5	Performance Guarantee						
5	Our purchase orders / contracts are simple, specific & easy to understand						
6	TPCODL demonstrate willingness to be flexible in administration of Contract / Purchase Order						
7	We provide timely responses / clarifications to your queries						
8	TPCODL representative you interact / coordinate with is adequately empowered to support you in meeting contractual obligations						
9	TPCODL provide you all necessary infrastructure support for timely and quality completion of work (including AMC)						
10	TPCODL Engineer-in-Charge timely certifies the jobs executed/ material supplied						

S. No.	Parameters	1	2	3	4	5	Remarks/ Suggestion
		Do Not Agree	Slightly in Agreement	In Fair Agreement	Mostly in Agreement	Fully Agree	
11	TPCODL Engineer-in-Charge efficiently supervises the job execution for timely completion of job						
12	BIRD (Bill Inward Receipt Desk) initiative has improved payment disbursement process						
13	Our approach for Inspection and Quality Assurance effective to expedite project completion?						
14	TPCODL never defaults on contractual terms						
15	In TPCODL Contracts closure is done within set time limit						
16	Our material receiving procedures are well defined and efficiently deployed to reduce mutual inconvenience						
17	Bank Guarantees are released in time bound manner						
18	Our processes related to payment / account settlement are effective.						
19	You get payments on time						
20	TPCODL Employees follow Ethical behaviour						

**SECTION - B**

(Please rate the following parameters on a scale of 1 to 5, where 1 - Minimum; 5 - Maximum)

SN	Parameters	1	2	3	4	5	Remarks/ Suggestion
1	How do you rate courtesy/ empathy/ attitude level and warmth of TPCODL employees you interact with from following team?						
1.1	Project Engineering						
1.2	District / Zones						
1.3	Projects/HOG (TS &P)						
1.4	Inspection & Quality Assurance						
1.5	Stores						
1.6	Metering & Billing						
1.7	Accounts / Finance						
1.8	Administration						
1.9	IT & Automation						
2	How would you rate TPCODL in comparison to your other clients in terms of <b>fairness of treatment and transparency</b> with its Business Associates?						
3	How would you rate TPCODL in comparison to your other clients in terms of <b>processes and systems to manage partnership</b> with its Business Associates						
4	How would you rate TPCODL in comparison to your other clients in terms of <b>building long term &amp; mutually relationship</b> with its Business Associates						

**SECTION-C**

Please ✓ mark in the relevant box and give your remarks / suggestions / information for our improvement.

SNo	Parameters	Certainly NO	Probably NO	Probably YES	Certainly YES	Remarks/ Suggestion
1	Based on your experience with TPCODL, would you like to continue your relationship with TPCODL?					
2	If someone asks you about TPCODL, would you talk "positively" about TPCODL?					
3	Would you refer TPCODL name to others in your community, fraternity and society as a professional & dynamic organization?					

**SECTION - D**

**If we ask you to rate us on a scale of 1 to 10, how will you rate TPCODL, that truly represents your overall satisfaction with us (please tick appropriate box) -**

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

### **SECTION – E**

Please ✓ mark in the relevant box and give your remarks / suggestions / information for our improvement.

Please spare your thoughts for TPCODL's improvement in particular areas of weaknesses, particularly relating to some great practices, attitudes that you have seen elsewhere in Indian and International Organizations, which you recommend TPCODL to adopt. Please give your valuable salient recommendations.

Please spare your thoughts for TPCODL's improvement in particular areas of major concerns for you. We also welcome your suggestions to adopt any best practices, altitudes that you have observed / experienced elsewhere in Indian/ International organization.

Recommendation	<i>Please tick (✓) your top 5 expectations out of the following 10 points listed below -</i>	
(Please list down improvement you expect from TPCODL)	<i>Timely payment</i>	
1	<i>Flexibility in Contracts/PO</i>	
	<i>Clarity in PO,s &amp; Contracts</i>	
2	<i>Timely response to quarries</i>	
	<i>Timely certification of works executed</i>	
3	<i>Clarity in Specs, drawings, other docs etc</i>	
	<i>Adequate information provided on website for tender notification, parties qualified etc.</i>	
4	<i>Timely receipt of material at site for execution</i>	
	<i>Performance Guarantee/EMD released in time</i>	
5	<i>Inspection &amp; quality assurance support for timely job completion</i>	

We thank you for your time and courtesy!!

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## **ANNEXURE-J**

### **ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT**

***(To be signed and stamped by the bidder prior to participation in the auction event)***

In a bid to make our entire procurement process more fair and transparent, TPCODL intends to use the reverse auctions through SAP-SRM tool as an integral part of the entire tendering process. All the bidders who are found as technically qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

**The following terms and conditions are deemed as accepted by the bidder on participation in the bid event:**

1. TPCODL shall provide the user id and password to the authorized representative of the bidder. *(Authorization Letter in lieu of the same shall be submitted along with the signed and stamped Acceptance Form).*
2. TPCODL will make every effort to make the bid process transparent. However, the award decision by TPCODL would be final and binding on the supplier.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of TPCODL, bid process, bid technology, bid documentation and bid details.
4. The bidder is advised to understand the auto bid process to safeguard themselves against any possibility of non-participation in the auction event.
5. In case of bidding through Internet medium, bidders are further advised to ensure availability of the entire infrastructure as required at their end to participate in the auction event. Inability to bid due to telephone line glitch, internet response issues, software or hardware hangs, power failure or any other reason shall not be the responsibility of TPCODL.
6. In case of intranet medium, TPCODL shall provide the infrastructure to bidders. Further, TPCODL has sole discretion to extend or restart the auction event in case of any glitches in infrastructure observed which has restricted the bidders to submit the bids to ensure fair & transparent competitive bidding. In case an auction event is restarted, the best bid as already available in the system shall become the start price for the new auction.
7. In case the bidder fails to participate in the auction event due any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid as submitted by the bidder as a part of the tender shall be considered as the bidder's final no regret offer. Any offline price bids received from a bidder in lieu of non-participation in the auction event shall be outrightly rejected by TPCODL.
8. The bidder shall be prepared with competitive price quotes on the day of the bidding event.
9. The prices as quoted by the bidder during the auction event shall be inclusive of all the applicable taxes, duties and levies and shall be FOR at TPCODL site.
10. The prices submitted by a bidder during the auction event shall be binding on the bidder.
11. No requests for time extension of the auction event shall be considered by TPCODL.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all inclusive prices offered during conclusion of the auction event for arriving at Contract amount.

**Signature & Seal of the Bidder**



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send payment information)

Name of the Authorized Signatory :

Contact Person's Name :

Official Correspondence Address :

We confirm that we will bear the charges, if any, levied by our bank for the credit of NEFT/RTGS amounts in our account. Any change in above furnished information shall be informed to TPCODL well in time at our own. Further, we kept TPCODL indemnified for any loss incurred due to wrong furnishing of above information.

Thanking you,

For \_\_\_\_\_

**(Authorized Signatory)**

**(Signature with Rubber Stamp)**

**Certification from Bank:**

We confirm that we are enabled for receiving NEFT/RTGS credits and we further confirm that the account number (specify Bank a/c no.) of (Please mention here name of the account holder), the signature of the authorized signatory and the MICR and IFSC Code of our branch mentioned above are correct.

This also is certified that the above information is correct as per Bank record

**(Manager's/ Officers Signature under Bank Stamp)**



**ANNEXURE-L**  
**CONTRACTOR SAFETY MANAGEMENT SYSTEM**

**1. OBJECTIVE**

The objective of the Contractor Safety Management System is to lay down clear guidelines for all Business Associates (including their associates, staff and agents) which would facilitate them to observe all statutory rules and regulations, comply with applicable standards of Central Electricity Authority (Measures relating to safety and electric supply) Regulations, 2010 & (safety requirements for construction, operation and maintenance of electrical plants and electric lines) Regulations, 2011, TPCODL Safety Manual and Guidelines and thus, ensure creation of safe working environment for all stakeholders of our network.

**2. SCOPE**

All contracts (minor and major) will be subject to the provisions of this document.

**Minor Contracts:** Contracts which satisfy all the criteria listed under the head “Minor Contracts”.

**Major Contracts:** Contracts which satisfy any two or more criteria listed under the head “Major Contracts”

Criteria	Minor Contracts	Major Contracts
Value of Contract	< Rs. 1500000/- (less than Rs. Fifteen Lac)	>= Rs. 1500000/- (Equal or more than Rs. Fifteen Lac)
Period	Period less than 1 year	Any period
Working on energized electrical equipment	No	Yes
Working on height (above 1.8 Mtrs from ground)	No	Yes
Work involving construction activity	No	Yes
Working with hazardous goods or chemicals	No	Yes
Work involving danger to general public	No	Yes

**Note:** Exceptions for major and minor contract are – in house software development, supply of material or equipment but no direct or indirect installation of the same material, administration contracts (courier, water supply, printing, security, transport, etc.), minor civil work like plastering at ground level or flooring, etc. The facility management (housekeeping) contract will always be treated as a minor contract.

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### 3. INFORMATION REQUIRED AT TIME OF VENDOR REGISTRATION OR BEFORE COMMENCEMENT OF CONTRACT

- 3.1 Business Associate is required to fill the Safety Management System Questionnaire as per *annexure 1* and submit along with the vendor registration process / bid / tender document. The filled questionnaire will be scrutinized by Engineer In-charge / indenting group and recommend suitability of the BA with respect to safety requirements. The fulfilment of statutory requirements for vendor registration pertaining to labour laws etc. shall be done by BA Cell on being referred to it.
- 3.2 Business Associate is required to take suitable risk control measures mentioned against the identified Hazards and Risk document provided for all contracts as per *annexure 2*. The primary objective of this is to evaluate the understanding of the BA towards risk mitigation and employment of safe work procedures. BA is required to conduct the Hazard identification and Risk Assessment study as per the procedure and deploy more or other measures if deemed necessary.
- 3.3 Business Associate shall comply with **Statutory Requirements related to Safety and Occupational Health** and submit the "Safety Undertaking" as per *annexure 4*.

### 4. GENERAL SAFETY CONDITIONS REQUIRED TO BE FULFILLED BY BUSINESS ASSOCIATES

The requirements of the contractor safety management system applicable to the minor or major contracts related to various groups are as following –

- 4.1 Maintenance of Distribution Network – *Annexure 3.1*
- 4.2 Distribution Projects – *Annexure 3.2*
- 4.3 EHV Projects – *Annexure 3.3*
- 4.4 Maintenance of Sub transmission network – *Annexure 3.4*
- 4.5 Civil / Generation Projects – *Annexure 3.5*
- 4.6 Meter Management Group (MMG), Revenue Recovery Group (RRG), Energy Auditing Group, AMI, MRG, etc. – *Annex3.6*
- 4.7 Maintenance and Operation of Street Light. – *Annexure 3.7*

1. Please note that hydra cranes used by any dept should be ACE Model No. FX 150 ACE SX 150, Escorts Model No. TRX 1550 or contemporary. Use of old generation hydra cranes like ACE 14XW or ACE 12 XW, etc are prohibited.

**(Details as per Annexure attached)**

**Note:** For minor contracts, the BA shall assign the duties of Safety Representative to the Work Supervisor. Work Supervisor will deliver all duties and responsibilities of Safety Supervisor as detailed in this document.

The Business Associate (BA) having major contract will appointing Safety supervisor, engineer / manager for the TPCODL work. The BA shall make all necessary arrangements for getting their workforce safety trained and competency checked from the concerned official of TPCODL before deployment in the field. BA Cell shall recommend the suitability after competency checked by Engineer In-charge and SAFETY group (or his representative) of TPCODL. After getting the clearance from concerned official, BA cell and receiving temporary I-card issued by TPCODL, Business Associate shall commence the working.

Safety Representative of Business Associates will formally become the nodal point for safety concerns for TPCODL. **BA shall not frequently transfer or terminate the services of any of the safety representatives appointed for TPCODL work site. BA needs to ensure**

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**that Safety representative is available at all points of time; failing which the work being carried out in the interim (period when Safety representative is not available) shall be treated as working under improper supervision and due penal provisions shall be initiated against the BA.** BA will be required to provide all applicable infrastructure and power to ensure smooth working of the safety representative to maintain a sound safety management system. **In all contracts safety representative will not be assigned any other activity at site apart from the works related to safety management. The duties are detailed in clause 5.5 of this document.** TPCODL will be auditing the facilities provided to the BA's safety team time to time.

The Safety Representative of the BA shall be required to meet and follow the instructions of the Engineer In-charge and SAFETY Group of TPCODL. He shall be responsible for providing the MIS and/or any other relevant information, as and when desired, within the stipulated time frame as per the requirements of TPCODL. Any non-conformance to safety will lead to the negative marking or issue of safety violation challan/ tokens which shall affect the monthly evaluation and performance of BA.

All contracts where BA has to depute vehicle for their staff and equipment to move from one location to other, the BA shall ensure that vehicle complies all required statutory clearances and requirement as per The Motor Vehicle Act, 1988 as well as TPCODL Road Safety Policy and are in good & safe state of working.

## **5. QUALIFICATION AND EXPERIENCE OF THE SAFETY AND SITE PERSONNEL**

Qualification and experience required for the safety and site personnel are as following:

**5.1 Safety Supervisor:** It is mandatory that educational qualification of safety supervisor be ITI (of relevant trade) / Diploma (Any branch of engineering) and he has a working experience on electrical system / relevant field of work at least 5 yrs for ITI and 3 years for Diploma holder. Having formal experience of the safety systems will be an added advantage

**5.2 Safety Engineer:** It is mandatory that educational qualification of safety engineer be at least Diploma (relevant branch) and he has working experience on electrical system of at least 3 yrs. Having the formal experience of the safety systems will be an added advantage.

**5.3 Safety Manager:** The educational qualification of safety manager should be graduate engineer with working experience on electrical system / network of at least 3 yrs. OR Diploma in Industrial Safety with working experience of 05 years including at least 02 years on electrical network.

However, clause 5.1, 5.2 and 5.3 are not applicable for minor contracts. In such cases, BA shall assign the duties of Safety Representative to the Work Supervisor. Work Supervisor will deliver required duties of Safety Representative (as per clause 5.5) in addition to other duties without diluting the importance of safety.

**5.4 Site Skilled Personnel:** For all responsibility related to site activities and operations, the BA shall employ only qualified and skilled persons and shall comply the provisions of section 19 & 29 of Central Electricity Authority (Measures relating to safety and electric supply) Regulations, 2010. Persons holding valid approvals only by any Government approved agency or a competency assessment panel or a team set up by TPCODL

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shall be allowed to perform the High Risk / High Hazard activities (refer page 1). The skill / qualification required for the electrician and electrical supervisor are given in *annexure 5*. The contracts related to maintenance of Distribution Network, Distribution Projects, EHV Projects, maintenance of Sub-Transmission Network, MMG & EAG, maintenance and operation of street lights, shall preferably have at least 20 per cent of ITI qualified electricians in the first year of the contract. This figure shall preferably be incremented by 15 per cent every subsequent year.

*Note: For the competency assessment may please refer the work instructions. An employee shall have to necessarily undergo the competency assessment check once in every eighteen months.*

#### **5.5 Requirements from the Safety Representative(s) of the Business Associate:**

- 5.5.1 Safety training of 2 hrs/employee/month and one day of safety induction training to all new employees joining the BA will be conducted by the BA as per Safety training modules of TPCODL.
- 5.5.2 Safety Talk / tool box talk before start of shift to BA employees.
- 5.5.3 Ensuring the availability & proper usage of the standard safety equipment (PPE)
- 5.5.4 Periodic inspection of PPE to ensure their serviceability and maintaining the 10% buffer stock of standard PPEs.
- 5.5.5 Ensuring the adherence to standard operating procedures of TPCODL as mentioned in TPCODL Safety standard and O & M and concerned function's manual.
- 5.5.6 Safety inspections / audits as per the process of TPCODL
- 5.5.7 Working in close coordination SAFETY Group of TPCODL.
- 5.5.8 Reporting of unsafe acts, unsafe conditions, near miss, incident or accident to Engineer In-Charge and SAFETY Group of TPCODL immediately after its occurrence.
- 5.5.9 Regular HIRA at site and comply the control measures as stated in the detailed HIRA as per the *annexure 2*. Also deployment of JSA based checklist shall be ensured.
- 5.5.10 Ensuring compliance with safety and other laws as may be applicable and providing for safety assurance.

#### **5.6 Training and Syllabus:** The BA shall not deploy any person at work place / site or send newly recruited personnel directly to concerned official for competency assessment without Safety Induction Training.

5.6.1 All new BA employees have to necessarily undergo one and half days Safety training and Competency assessment at training centre of BA cell. This training will be conducted once in a week. After the completion of Safety training & Competency assessment I-card will be issued to all competent BA employees

5.6.2 BA is expected to initially train and judge the capability of the workman at his own end before further recommending the workmen for Competency assessment. If any BA workman sent for competency assessment. In case any BA workman fails in the Competency test at concerned official, it will be deemed that BA has not imparted sufficient training at his end and actual cost of training ₹ 7500/ BA employee/ failed attempt will be recovered.

5.6.3 The workers who have imparted Safety Training and issued I-Cards of TPCODL, are not deployed at TPCODL worksites/ voluntarily left the job by workers/ used somewhere else other than TPCODL by the BA, in that case Management reserves the rights to intervene and recover the actual cost of training i.e. ₹ 7500/BA employee. (*Exempted for attrition rate of BA workers less than or equal to 10% of total workforce deployed at TPCODL*)

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**5.7** It is desired that Safety representative of the BA to impart the general safety training to each employee of duration 2 hrs per month. The training will be organized at BA level and the record to be sent to engineer in-charge and SAFETY group of TPCODL every month. Please refer schedule and syllabus in *annexure 6*.

**List of Personal Protective Equipment (PPE) and Maintenance schedule:** BA shall commence the project or any work only when the required PPE are made available to the team of employees involved in the work. Each PPE of BA shall be checked / inspected by the safety representative / supervisor at zone before the work start or as prescribed in the list. Safety representative shall regularly check the healthiness of each PPE allocated to lineman. Suitable record shall be maintained at zone. Defective PPE shall be immediately replaced or within 24 hours by the BA. In no case linemen or any other official of BA may be allowed to work with defective PPE. It is preferred that BA ensures minimum stock of each PPE at zone for immediate replacement with defective one. The PPE shall be IS / BS / CE marked and exactly as per the standard or specification mentioned in the *annexure 7*. Working without PPE / non-standard PPE shall be treated as safety violation and penalty as stated in section 6.0 of this document. If TPCODL finds that BA has not provided the adequate / appropriate PPE to their staff, TPCODL reserves the rights to stop the work and call the BA to provide appropriate PPEs at the risk. If the BA fails to provide the required PPEs at the risk then the same shall be provided by TPCODL at the actual cost of the PPE. The amount shall be charged to BA and same shall be first recovered from the current bill of BA or any future payment to be made to BA. In the event of any balance amount still left for recovery, the same shall be adjusted against retention amount or by invoking bank guarantee submitted by BA.

**5.8 Safety Audit / Inspection & HIRA:** The BA shall get the required safety inspection / audit conducted by his technical team comprising of safety representative as per the *annexure 8*. The safety representative will be required to conduct the HIRA (Hazard Identification and Risk Assessment) as per *annexure 2* of the process and work undertaken at least two times in a year or every time if a new process / activity / machine is introduced or whenever an accident take place. The risk identified to be addressed suitably with –

- Engineering Control
- Management Control, and
- Personal Protective Equipment.

The safety representative of BA shall inform and educate for the identified risk and hazard control methods to employees, supervisor and engineer as well as the engineer in-charge and SAFETY group of TPCODL.

**5.9 Safety Performance and Safety MIS:** The BA shall maintain good practice of safety all through the contract duration. Safety shall always be of paramount importance during the contract period. Safety performance will be monitored on yearly basis throughout the period and no relaxation will be given for bad performance. BA with good track record and excellent performance will be rewarded suitably as per clause 6.0 of this document. The BA has to provide monthly “Performance Report – Safety” to engineer in-charge and SAFETY group TPCODL this shall be part of monthly bill along with training details. Performa of the report is enclosed as *annexure 9*.

**5.10 Pre – Employment Medical Check-up and Fitness of employees engaged for the critical works:** The BA shall submit the health fitness certificate for all those workers involved in climbing the pole or working at height for following diseases:

5.10.2 Epilepsy

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- 5.10.3 Colour blindness
- 5.10.4 Deafness
- 5.10.5 Vertigo & height phobia

Every year BA will give an undertaking stating that all the employees are fit to work and have not developed aforesaid diseases. The Record of such medical check-ups shall be submitted to BA Cell before issue of temporary identity card. The records shall be maintained at BA Cell. All such medical check-ups shall be repeated once in a year for all workers involved in climbing the pole or working on electrical network.

## 6. REWARD AND PUNITIVE MEASURES

**6.1** To support the enforcement of good SHE & DM practices by the Business Associate and to eliminate repeated or continuing safety violations, use of appropriate reward and punitive measures shall be made. Each unsafe act or violation of the safety guidelines as described in the Safety Manual of the TPCODL will be audit criteria of this system. Broadly the measures identified are following:

- 6.1.1 Working without PPE/ Safety Gadgets
- 6.1.2 Working without proper tools and tackles, barricading, Poor condition of Crane / Hydra / Vehicle, using without certification / Licence, Incompetent driver/ Helper
- 6.1.3 Working without creation of effective safety zone
- 6.1.4 Improper Supervision at worksite, Lineman/ Supervisor working without competency
- 6.1.5 Working without adherence to PTW process or authorization/ not adherence to SOPs / W.I. of TPCODL.
- 6.1.6 Improper Working at height equal to or above 1.8 mtrs without taking proper fall protection measures/ Poor condition of Ladder

### 6.2 Measures of Reward and Punitive Measures

The Engineer In-Charge, NSO, SC, ASOs, CSI / SIs and SHE &DM group will conduct the surprise audits of the work / project and if any non-conformance is found the same will be booked and entered in the format "Safety Violation Record" *annexure 10*. The flow of the information is given below:

Safety Violation Escalation & Monitoring process	
Action	Responsibility
Safety Violation form has been filled and counter foil sent to SAFETY team for information. The main form is to be given to BA supervisor / Engineer in-charge. <i>(Automatically generated if Site audit done through Mobile App.)</i>	Engineer In-charge/ NSO / SC / SAFETY Group /CSI/ ASO/ Any authorised TPCODL official.
↓	
Entry of the violation in the master record and sending the information to concerned Manager, HoG, HoD, Head and Chief (O &S). <i>(Automatically generated if Site audit done through Mobile App.)</i>	SAFETY Group
↓	
Forwarding the information Centralized Account Payable (CAPS) for amount deduction from the current bill of the BA,	Engineer In-charge

<i>if any.</i>	
↓	
HoG (Safety – II) & HoG (Safety & Quality – Commercial) and CAPS to generate the MIS of the violations and the amount deducted.	SAFETY Group
↓	
The pool of the amount generated after the deduction to be utilized in safety welfare of BA employees.	SAFETY Group with approval of CFO/Chief (O & S) /CEO&MD

The safety violations have been rated from 1 to 5 (figure 6.3) as per the gravity of the violation. If the same violation is repeated it may escalate into a higher penalty. If a particular Business Associate employee violates safety norms three times, he shall not be allowed to work in TPCODL for a period of one year from the date of the 3<sup>rd</sup> violation.

### 6.3 Safety Violation Escalation Matrix

#### 6.3.1

Consequence of Safety Violation Observed (Not related to Incident/ Accident)		Violation				Subsequent Violations
S.No.	Safety Violation	1st	2nd	3rd	4th	
1	Working without PPE (Helmet/Gloves/Safety Harness/ Safety Shoes etc.)	A	B	C	D	Will attract the same penalty as applicable in the 4th violation.
2	Improper Working at Height	A	B	C	D	
3	Working without proper tools and tackles	A	B	C	D	
4	Poor condition of Crane/Hydra/ Vehicle/Incompetent driver/ Helper	A	B	C	D	
5	Violation of SOP/ WI	B	C	D	E	
6	Working without adherence to PTW process or authorization/ Safety Zone	C	D	E		
Legend	Action to be taken	Responsibility		Penalty Amount (in Rs.)		The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.
A	Warning letter	Engineer Incharge		Nil		
B	Levy of Penalty	Engineer Incharge		2,000		
C	Memo to BA & Levy of Penalty	Head of Group		4,000		
D	Memo to BA & Levy of Penalty	Head of Department		10,000		
E	Memo to BA, Levy of Penalty and termination of Contract	Head of Department		1,00,000		

Figure 6.3 (1a)-Penalty Matrix for Safety violation (Applicable for Minor Contracts)

Consequence of Safety Violation Observed (Not related to Incident/ Accident)		Violation				Subsequent Violations
S.No.	Safety Violation	1st	2nd	3rd	4th	
1	Working without PPE (Helmet/Gloves/Safety Harness/ Safety Shoes etc.)	B	C	D	D	Will attract the same penalty as applicable in the 4th violation.
2	Improper Working at Height	B	C	D	D	
3	Working without proper tools and tackles	A	B	C	D	
4	Poor condition of Crane/Hydra/ Vehicle/Incompetent driver/ Helper	B	C	D	E	
5	Violation of SOP/ WI	C	D	E		
6	Working without adherence to PTW process or authorization/ Safety Zone	C	D	E		
Legend	Action to be taken	Responsibility		Penalty Amount (in Rs.)		The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.
A	Levy of Penalty	Engineer Incharge		5,000		
B	Memo to BA & Levy of Penalty	Engineer Incharge		10,000		
C	Memo to BA & Levy of Penalty	Head of Group		25,000		
D	Memo to BA & Levy of Penalty	Head of Department		50,000		
E	Memo to BA, Levy of Penalty and termination of Contract	Head of Department		1,00,000		

Figure 6.3 (1b)-Penalty Matrix for Safety violation (Applicable for Major Contracts)

Once the BA reaches the “BLACK” (color – “5”) category, i.e. highest level of safety violation, “Termination” notice to BA will be issued from the office of the Head of Department (equivalent to Addl GM/ GM/ Sr. GM level) and further, *if required*, continuation / extension of contract will only be initiated by Functional Head of the department (equivalent to Sr. GM / VP level) and approved by CEO & MD. Till the extension, the contract will remain suspended.

TPCODL encourages the reportage of the safety violation during the contract work by BA. Any TPCODL employee can register a safety violation against the BA in the “Safety Violation Form” *annexure 10*. Initially the observer has to fill the form and handover the counterfoil (lower portion) of the document to the supervisor of the BA, inform the site engineer of TPCODL and send the top portion of the Safety Violation Form to SAFETY group for the further necessary action against the BA. **The cumulative nos. of Safety Violations pertaining to any particular BA shall be calculated on yearly basis.**

Safety violations resulting in incident / accident will be treated as per gravity of the injury / fatality and its impact as well as type i.e. minor or Major. Consequences of incident / accident are shown in the matrix (figure 6.3(2) for major and 6.3(3) for minor) below. In case of any accident, findings and recommendations of Accident Enquiry Committee will be final and binding and will supersede the arbitration clause of GCC.

Consequence Of an Incident / Accident (In case of <b>MAJOR</b> contract)		Incident / Accident				Action Required
Sl. No	Type of the injury	1st	2nd	3rd	4th	
1	Slight injury (First Aid Case)	<b>F</b> (Strengthening of process through continuous improvement in the work procedure)				Take risk reduction measures
2	Minor injury (No or Hospitalization less than 48 Hrs)	<b>F</b>	<b>G</b>	<b>G</b>	<b>H</b>	
3	Major injury (Bone injury or burn or Hospitalization more than 48 Hrs)	<b>G</b>	<b>G</b>	<b>H</b>	<b>I</b>	
4	Single fatality	<b>J</b>	<b>K</b>			Intolerable
5	Multiple fatalities (Two or more fatalities during one event)	<b>K</b>				
<b>Legend</b>	<b>Action to be taken</b>	<b>Responsibility</b>		<b>Penalty (in Rs.)</b>		<i>The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.</i>
<b>F</b>	Memo to BA and levy of penalty	Engineer Incharge		5,000/-		
<b>G</b>	Memo to BA and levy of penalty	Head of Group		20,000/-		
<b>H</b>	Memo to BA and levy of penalty	Head of Group		50,000/-		
<b>I</b>	Memo to BA and levy of penalty	Head of Department		2,00,000/-		
<b>J</b>	Memo to BA and levy of penalty	Head of Department		5,00,000/-		
<b>K</b>	Memo to BA, levy of penalty, termination of contract and black listing of BA	Functional Head		10,00,000/-		
<b>Figure 6.3 (2) - Penalty Matrix for Incident / Accident in Major Contracts</b>						

(For example: In major contracts, if there is first incidence of major injury say bone injury (Cat. 3) where worker was hospitalized for more than 48 hrs then a penalty of amount Rs.20000/- will be deducted from the current bill produced for the payment. This penalty will be similar for first two incidents. However, it will increment to next higher category i.e. Rs. 50,000/- on subsequent incidents as per the above matrix)



Consequence Of an Incident / Accident (In case of <b>MINOR</b> contract)		Incident / Accident				Action Required
Sl. No	Type of the injury	1st	2nd	3rd	4th	
1	Slight injury (First Aid Case)	<b>L</b> (Strengthening of process through continuous improvement in the work procedure)				Take risk reduction measures
2	Minor injury (No or Hospitalization less than 48 Hrs)	<b>L</b>	<b>M</b>	<b>M</b>	<b>N</b>	
3	Major injury (Bone injury or burn or Hospitalization more than 48 Hrs)	<b>M</b>	<b>M</b>	<b>N</b>	<b>O</b>	Intolerable
4	Single fatality	<b>P</b>	<b>Q</b>			
5	Multiple fatalities (Two or more fatalities during one event)	<b>Q</b>				
Legend	Action to be taken	Responsibility		Penalty (in Rs.)		<i>The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.</i>
<b>L</b>	Memo to BA and levy of penalty	Engineer Incharge		5,000/-		
<b>M</b>	Memo to BA and levy of penalty	Engineer Incharge		10,000/-		
<b>N</b>	Memo to BA and levy of penalty	Head of Group		25,000/-		
<b>O</b>	Memo to BA and levy of penalty	Head of Department		1,00,000/-		
<b>P</b>	Memo to BA and levy of penalty	Head of Department		3,00,000/-		
<b>Q</b>	Memo to BA, levy of penalty, termination of contract and black listing of the BA	Functional Head		5,00,000/-		

Figure 6.3 (3) - Penalty Matrix for Incident / Accident in Minor Contracts

(For example: In minor contracts, if a worker meets with a non-fatal accident say bone injury (Cat. 3) where he was hospitalized for more than 48 hrs then a penalty of amount Rs. 10,000/-, will be charged from the current bill produced for the payment. This penalty will be similar for first two incidents. However, it will increment to next higher category i.e. Rs. 25,000/- on subsequent incidents as per the above matrix.)

In case of single or multiple fatalities described under legends J&K of 6.3(2) and P&Q of 6.3(3), the concerned BA may be debarred from extension of contract or participate in new contract. In such event the approval of Chief (O & S) will be necessary for extension or award of new contract to concerned BA.

### 6.3.2 COMPENSATION FOR BA PERSONNEL

In the event of any untoward incident/ accident, the Business Associate shall ensure prompt medical assistance such as treatment, sickness benefit, etc. is provided to the victim(s) as per the Employees' Compensation Act, 1923 or Employees' State Insurance Act, 1948, as applicable. Also, the BA will be required to take adequate measures for compensating the victim(s) or his/her/their kin as follows:

#### I. For Death or Permanent / Total Disablement

The BA shall take an insurance coverage of at least Rs. 10 lakhs for each engaged employee, to cover any incidence of Death or Permanent / Total Disablement (Permanent/Total Disability shall be considered as defined under Employees' Compensation Act, 1923). In the event of any such unfortunate incident, the BA would ensure that adequate compensation is paid immediately to the family of the victim(s) from his own resources. This compensation shall be covered under the insurance policy subscribed by the BA mentioned earlier and the arrangement should be such that it would get reimbursed to the BA by the insurance agency subsequently.

## II. For Permanent Partial Disablement and Temporary Total Disablement

The compensation in this case will be as per provisions of the Employees' Compensation Act, 1923 or Employees' State Insurance Act, 1948, as applicable.

Accordingly, the BA shall obtain a suitable Insurance Policy on award of Contract and submit documentary evidence of the policy to the BA Cell before commencement of work. The BA shall ensure that the Insurance policy is active at all times and all employees are covered in all respects till the conclusion of contract period or till working with TPCODL. The BA shall submit a copy of the policy after periodic renewals to the BA Cell.

However, on occurrence of such unfortunate incident, if it is found that the victim(s) is/are not covered under any insurance policy, the BA shall be liable to pay the entire sum of Rs. 10 lakhs from his own resources.

Further, in case of an accident resulting in Death or Permanent / Total Disablement while on duty, the appointed BA Nodal Officer will ensure that the BA complies with all statutory provisions and benefits i.e. PF, Compensation, Gratuity etc., and that all these are made available to the employees' nominee(s) as per the stipulated timelines.

**6.3.3** TPCODL rewards the BA with good track record of safety management. It is proposed that BA complying with Contractors Safety Management, Safety Manual and Safety process will be rewarded suitably as per the procedure, rule and regulations of the TPCODL. In any case major accident is reported during an assessment period BA will not be eligible for this reward scheme. Assessment of contracts will be once in year. Generally the assessment cycle is calendar year and guidelines will be declared time to time.

### Abbreviations Used in the Document

TPCODL	TP Central Odisha Distribution Limited
BA	Business Associate
HIRA	Hazard Identification & Risk Assessment
JSA	Job Safety Analysis
EHV	Extra High Voltage
SAFETY	Safety, Occupation Health, Environment & Disaster Management
MMG	Meter Management Group
EAG	Energy Audit Group
PPE	Personal Protective Equipment
SOP	Standard Operating Procedures
CSI/SI	Circle Safety In-charge / Safety In-charge
ASO	Area Safety Officer
NSO	Nodal Safety Officer
SC	Safety Coordinator
HoG / HoD	Head of Group / Head of Department
AGM / GM / VP	Assistant General Manager / General Manager / Vice President

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CFO / Chief (O & S)/ CEO & MD	Chief Finance Officer / Chief (Operating & Safety) / Chief Executive Officer & Managing Director
COS	Corporate Operation Services
CAP	Centralized Account Payable System
PTW	Permit To Work
GCC	General Conditions of Contract.

- END -

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**Annexure 1 (Refer Para 3.1)**

***Business Associate Safety Management System Questionnaire***

Certification					
The information provided in this questionnaire is a summary of the company's occupational health and safety management system.					
Company Name:					
Turnover and experience:		Name of top officer:			
Date:		Position			
Contract Details					
Contract Name		Contract Number:			
Business Associates Safety Management System Questionnaire		Marks	Yes	No	Score achieved
<i>Safety Policy and Management</i>					
- <b>Is there a written company Safety policy?</b>		1			
- If yes provide a copy of the policy, if No please refer Note 1.					
- <b>Does the company have an Safety Management system</b>		1			
- If yes provide details, if No please refer Note 1.					
- <b>Is there a company Safety Management System manual or plan?</b>		2			
- If yes provide a copy of the content page(s), if No please refer Note 1.					
- <b>Are Safety and occupational health responsibilities clearly identified for all levels of Management and staff?</b>		2			
- If yes provide details, if No please refer Note 1.					
<i>Safe Work Practices and Procedures</i>					
- <b>Has the company prepared safe operating procedures or specific safety instructions relevant to its operations and relevant work as per contract?</b>		1			
- If yes provide a summary listing of procedures or instructions, if No please refer Note 2.					

Certification				
- Comments				
- <b>Is there a register of injury or accident?</b> - If yes provide a copy (format)	1			
- <b>Is there a documented incident or accident investigation procedure?</b>  - If yes provide a copy of a standard incident report form, if No please refer Note 2.  - Comments	1			
<i>Safety Training</i>				
- <b>Describe how occupational health and safety training is conducted in your company</b>  If No please refer Note 1.	2			
- <b>Is a record maintained of all training and induction programs undertaken for employees in your company?</b>  - If yes provide examples of safety training records, if No please refer Note 2.	1			
- <b>Are regular safety inspections / audits are undertaken at worksites?</b>  -If yes provide details (formats), if No please refer Note 3.	1			
- <b>Is there a procedure by which employees can report hazards at workplaces?</b>  - If yes provide details if No please refer Note 1.	1			
<i>Safety Monitoring</i>				
- <b>Is there an officer / supervisor responsible for monitoring workplace / worksite safety?</b>	1			

Certification				
- If yes provide details				
<i>Safety Performance Monitoring</i>				
- <b>Are employees regularly provided with information on company health and safety performance?</b> - If yes provide details	1			
- <b>Has the company ever been convicted of an occupational health and safety offence?</b> - If yes provide details	NO Marks (Negative mark ONE for each case)			
- Has there been any major accident of employee at TPCODL site in past	NO Marks (Negative mark ONE for each case)			
- Has there been any fatal accident of employee at TPCODL site in past. - (Note: Bid evaluation committee has to take cognizance of the incident and shall evaluate the bid only after formal approval of competent authority i.e. CTO. - In case of yes please refer Note 4.	NO Mark (Negative mark FIVE for each case)			
Minimum of 75% marks is required for qualification.		Total Marks achieved		
<i>Company Reference</i>				
1. <i>Name of company</i> 2. <i>Name of company</i>				

**Note**

1: If company does not have formal procedure on Safety Management System than vendor may submit proposed Safety road map along with safety action plan and brief safety policy on his letter head signed by head of the organization.

2: The vendor may submit the same in the Safety Action Plan.

3: The vendor may utilize the same format of TPCODL or on request SAFETY group will assist the vendor in developing the audit system. For other points also vendor may take the assistance of SAFETY group for development of Safety management system.

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*4: The vendor may submit the Safety Improvement Plan and Safety Action Plan for his employees based on following points.*

- i. Action plan for enhancing safety awareness*
- ii. Action plan for safety training of employee*
- iii. Action plan for increasing safety audit in field*
- iv. Action plan for provision and utilization of safety PPE.*
- v. Action plan for fatality reduction.*
- vi. Action plan for enhanced supervision at site*
- vii. Action plan for making employee more responsible and accountable for safety.*
- viii. Action plan for availability and utilization of all required tool and equipment.*
- ix. Safety Improvement done in last two years, specially highlighting those which have been taken after the fatal accident along with results.*
- x. Safety initiatives planed or started recently.*
- xi. Any other point.*

*Based on above points and documentary evidences vendor will be required to submit a detailed report in support of his bid. The bid evaluation committee and competent authority will scrutinize the facts and the evidence submitted. If found satisfactory competent authority i.e. CTO may accord his approval for bid opening otherwise his tender shall be disqualified.*

**Annexure 2 (Refer Para 3.2 and 5.8)**

***Risk Assessment Form***

Business Associate:
Scope of the work:
BA's Representative:
Telephone:
Signature:
Date:

Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures
Working at Height	Fall from height	2	<ol style="list-style-type: none"> <li>1. Mandatory usage of JSA checklist prior to start of work</li> <li>2. Use appropriate ladder</li> <li>3. Use full body safety harness having double lanyard.</li> <li>4. Use Electrical Safety Shoes if working on electrical network otherwise use safety shoes.</li> <li>5. Use Safety helmet.</li> <li>6. Use PPE as per the annexure 7 of this CSM document</li> <li>7. Refer Work instruction related to Working at Height for other details</li> <li>8. Use of metal scaffold to be ensured in height work (cup lock type)</li> <li>9. Deploy competent workforce who are medically fit</li> </ol>

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Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures
Working on electrical equipment / network	Electric flash / electrocution	3	<ol style="list-style-type: none"> <li>1. Mandatory usage of JSA checklist prior to start of work</li> <li>2. Use Electrical Safety Shoes while working on electrical network.</li> <li>3. Use Electrical Safety gloves of appropriate voltage rating.</li> <li>4. Use face shield / visor attached with helmet.</li> <li>5. Use Safety helmet.</li> <li>6. Use PPE as per the annexure 7 of this CSM document</li> <li>7. Mandatory usage of Insulated tools &amp; tackles on electrical system</li> <li>8. Mandatory compliance for Lock Out &amp; Tag out system. Refer Work instruction related to Working on electrical equipment / network for other details</li> </ol>
Excavation / Civil work	Collapse of soil, Fall in excavated pit leading to Injury	2	<ol style="list-style-type: none"> <li>1. Use safety shoes.</li> <li>2. Use Safety helmet.</li> <li>3. Use PPE as per the annexure 7 of this CSM document</li> <li>4. Hard Barricading of the worksite.</li> <li>5. Refer Work instruction related to excavation / civil work for other details</li> </ol>
Material lifting & Mechanical Erection work	Fall of material/object, Topple of crane,	2	<ol style="list-style-type: none"> <li>1. Mandatory compliance of crane checklist</li> <li>2. Visual condition check of lifting tools and tackles such as wire rope sling, belt sling, chain, pulley block, D-shackles, etc. shall be ensured.</li> <li>3. The operator's physical fitness and alertness should be judged by sup. / EIC.</li> <li>4. Use PPE as per the annexure 7 of this CSM document</li> <li>5. Refer Work instruction related to Material lifting &amp; Mechanical Erection work</li> </ol>
Road Safety	Road Accidents	3	<ol style="list-style-type: none"> <li>1. Mandatory compliance of TPCODL Road Safety policy W07(COR-P-12)</li> </ol>

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Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures
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*Note: This information for the general indication purpose. The detailed risk assessment shall be conducted before start of the work by the authorized representative of the BA. The report of same shall be submitted to engineer in-charge along with annexure 4 of the CSM document.*

### Guidelines for filling the Risk Assessment Form

- *Specific Task/Activity* - The documentation of each major task associated with the contract.
- *Potential Hazards* - The identification of hazards associated with each activity or task to be carried out.
- *Class of Risk* - Each hazard should be evaluated as a level of risk, described as Risk Class 1, 2 or 3 defined above.
- *Control Measure* - The identification and documentation of actions required to eliminate or reduce the hazards that could lead to accident or injury.

Hazard / Risks shall be classified according to the following schedule:

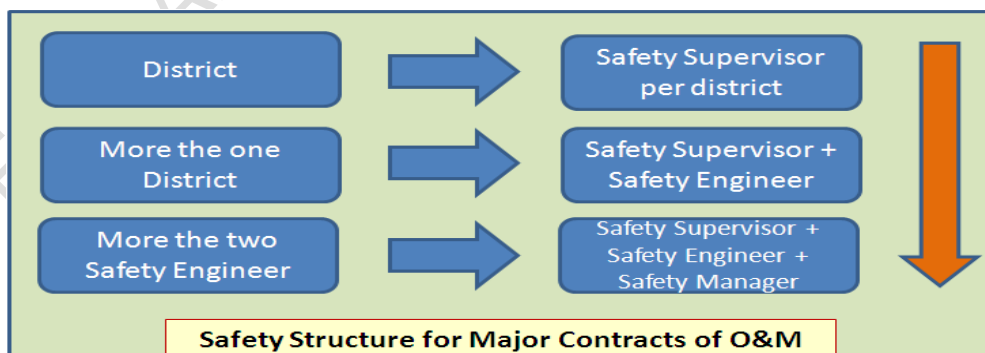
- Class 1: Potential to cause injury treatable with first aid
- Class 2: Potential to cause death or permanent injury
- Class 3: Potential to cause more than one or more lost time injuries.

### Annexure 3.1 (Refer Para 4.0)

#### **General Safety Conditions for the Maintenance of Distribution Network Contracts:**

A BA awarded a contract (O&M) work of maintenance of distribution network will be required to fulfil the following conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in *annexure 7*.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- BA shall provide safety performance and Safety MIS (*annexure 9*) to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor for managing a complete safety management system in a district. In case the BA has been awarded work in more than one district, then the following safety structure will be adopted.



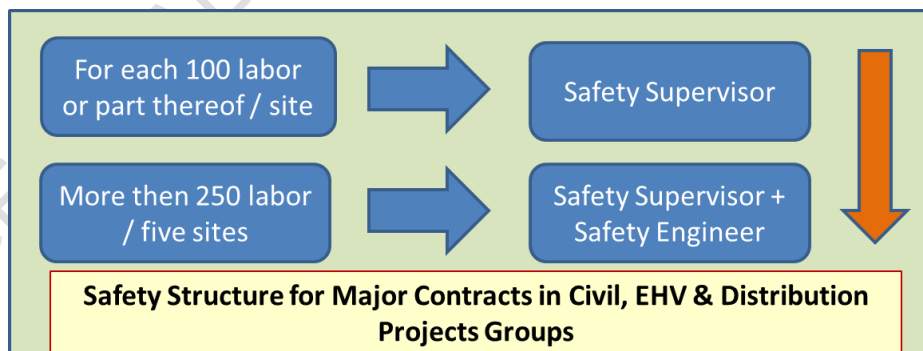
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### Annexure 3.2 (Refer Para 4.0)

#### **General Safety Conditions for the Distribution Projects Major Contracts:**

A BA awarded a major contract work of TS&P in area of a circle will be required to fulfil the following conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1.
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- BA shall provide safety performance and Safety MIS (*annexure 9*) to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor for managing a complete safety management system in the area. In case the BA has been awarded work in more than one circle, then the following safety structure will be adopted.

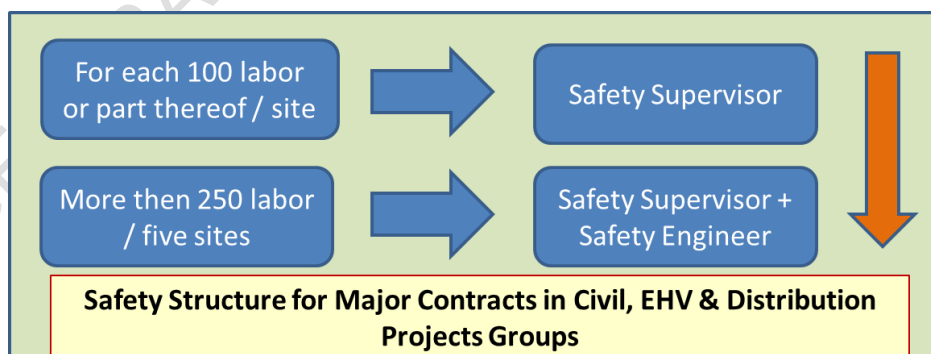


### Annexure 3.3 (Refer Para 4.0)

#### **General Safety Conditions for the major EHV Projects Contracts:**

A BA awarded a major contract work of EHV projects will be required to fulfil the following conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- BA shall provide safety performance and Safety MIS (*annexure 9*) to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor for managing a complete safety management system in the area. In case the BA has been awarded work in more than one circle, then the following safety structure will be adopted.
- BA shall refer Construction Safety Manual in TPCODL Safety Manual for details.



### Annexure 3.4 (Refer Para 4.0)

#### **General Safety Conditions for the Maintenance of Sub – Transmission Network**

##### **Contracts:**

A BA awarded a major contract work of maintenance of sub – transmission network in area of a power system will be required to fulfil the following conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- BA shall provide safety performance and Safety MIS (*annexure 9*) to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Coordinator for managing a complete safety management system in the area. In case the BA has been awarded work in more than one area power system, then the following safety structure will be adopted.



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### Annexure 3.5 (Refer Para 4.0)

#### **General Safety Conditions for the major contract work in Civil / Generation Projects:**

A BA awarded a major contract work of / in civil or Generation project will be required to fulfil the following safety conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- BA shall provide safety performance and Safety MIS (*annexure 9*) to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor (for workforce upto 100 at site) / a safety engineer (for workforce upto 250 at site) / safety manager (for more than two safety engineers) for managing a complete safety management system at the project site. In case the BA has been awarded more than one major contracts, then the following safety structure will be adopted.
- BA shall refer Construction Safety Manual in TPCODL Safety Manual for details.





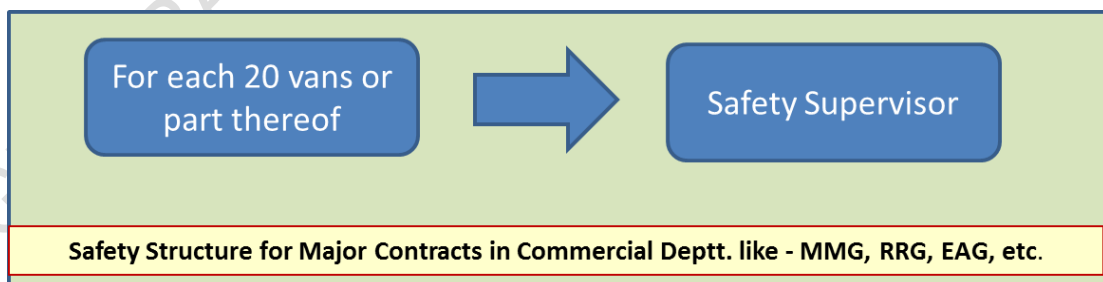
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**Annexure 3.6 (Refer Para 4.0)**

**General Safety Conditions for the major contract work in Commercial Department like - MMG, RRG, EAG, etc.:**

A BA awarded a major contract work in meter management group & energy auditing group will be required to fulfil the following safety conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- BA shall provide safety performance and Safety MIS (*annexure 9*) to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor for managing a complete safety management system for the work as per the following safety structure.
- The BA for the RRG work shall depute one Safety supervisor.





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**Annexure 3.7 (Refer Para 4.0)**

**General Safety Conditions for the major contract work in O&M of street light group:**

A BA awarded a major contract work in operation and maintenance of street light group will be required to fulfil the following safety conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment PPE as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- BA shall provide safety performance and Safety MIS (*annexure 9*) to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- Each BA shall ensure to depute a Safety Supervisor for managing a complete safety management system for the work awarded as per the below structure.



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**Annexure 4 (Refer Para 3.3)**

**Safety Undertaking by way of Affidavit**

I \_\_\_\_\_ s/o \_\_\_\_\_ R/o \_\_\_\_\_ (AUTHORIZED REPRESENTATIVE/PARTNER/DIRECTOR/PROPRIETOR ) of M/S \_\_\_\_\_ (name of company/firm) having its office at (Complete address of Company), authorized vide power of attorney dated -----/Board resolution dated----/letter of authority dated----, hereinafter referred to as **Contractor [or Business Associate (BA)]** which expression shall, unless it be repugnant to or inconsistent with the meaning or context thereof, be deemed to include its heirs, executors, administrators, and assigns do hereby affirm and undertake as under :

1. The present undertaking shall remain in force from the date of execution of contract awarded by TPCODL and shall be valid till the date of termination of the said contract by either parties. The undertaking is binding on me (contractor) as well as my sub-contractor and its employees, representatives etc.
2. That I(the contractor) will be responsible and liable to comply and abide by all the safety rules, instructions and regulations as may be specified and laid down by The TP Central Odisha Distribution Limited (TPCODL) so as enable TPCODL to achieve its goal of Zero On site incidences.
3. That the Contractor shall be fully responsible for ensuring occupational health and safety of its employees, representatives, agents as well as of its subcontractor's employees, at all times during the discharge of their respective obligations under the contract including any methods adopted for performance of their tasks / work.
4. That Contractor shall ensure ,at its own expense to arrange for and procure, implement all requisite accident prevention tools, first aid boxes, personal protective equipment, fire extinguisher, safety training, Material Safety Data Sheet, pre-employment medical test, etc. for operations & activities including as & when so specified by TPCODL specifically. , failing which TPCODL shall be entitled, but not obliged, to provide the same and recover the actual cost thereof from the Contractor's payments.
5. That the Contractor shall engage adequate and competent Safety – Supervisor / Engineer / Manager / Skilled persons at site as per the Para 5 (Qualification and experience of safety personnel) and Annexure 3 of Contract Safety Management.
6. That the Contractor shall engage the competent Site – Supervisor with each group of workers for safe and correct workmanship, proper co-ordination of material and site work as per contract.

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7. That the Contractor shall immediately replace supervisor in case it is found to be not up to the level of skill and experience required as in skill and experience required in *annexure 5* of this document, but any such replacement shall be only with the prior concurrence of TPCODL .
8. That the Contractor and its subcontractors shall abide by all the safety guidelines as per Safety Manual, Contract Safety Management and other guidelines issued from time to time by TPCODL during the contract period.
9. That in case the Contractor and/or any of its Subcontractor fail to ensure the compliance as required in terms of this undertaking the Contractor shall keep and hold TPCODL / its directors / officers / employees indemnified against any / all losses / damage / expense / liability / fines / compensation / claims / action / prosecutions or the like which might be suffered by TPCODL or to which TPCODL might get exposed to as a result of any breach /wilful negligence /deliberate default on the part of the Contractor /Subcontractor in complying with the same. Contractor shall also furnish any press release, clarification etc. if sought by TPCODL for any near miss or safety violations, accidents, which are attributable to fault of Contractor.

DEPONENT

VERIFICATION

Verified at Bhubaneswar on this \_Day of \_\_\_\_\_20\_\_ that the contents of the above affidavit are true and correct and nothing material has been concealed therefrom

DEPONENT

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**Annexure 5 (Refer Para 5.4)**

**SKILL / QUALIFICATION REQUIRED FOR ELECTRICIAN AND ELECTRICAL SUPERVISOR**

**Skill / Qualifications Required for Electrician (*Certificate of Competency Class-II*):**

1. Formal education in ITI – Wireman/ Electrician trade.

OR

2. Working experience of minimum three years of practical wiring.

OR

3. Have completed three years apprenticeship course through Apprenticeship Advisor, Govt. of Odisha / other state Govt. in the trade of Lineman / Wireman / Electrician.
4. A candidate must have attained the age of Eighteen years.

**Skill / Qualifications Required for Electrical Supervisor (*Certificate of Competency Class-I*):**

1. Have at least five years' experience of practical wiring after passing the certificate of competency class-II i.e. electrician.

OR

2. Recognized Degree or Diploma or equivalent qualification in Electrical Engineering from any Technical institute / College or University recognized by the Board.

AND

Must have completed the training/job in rectifying the common defects in electrical line and power installation for a period of one and three years after passing Degree or Diploma respectively

OR

3. Possessing the valid certificate of certificate of competency class – 1 (Electrical Supervisor)

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**Annexure 6 (Refer Para 5.6)**

**Training Module for BAs Worker & Supervisor**

**Training for BA Supervisor**

**Duration – 02 Hrs / Month**

**Methodology:** Lecture and Practical Demonstration of Safety Zone Creation

**Session: 1**

**Topic:** Electrical Safety Aspects

**Sub Topics:**

1. Learning specifics of HT & LT Network of zone
2. Major type of HT / LT / service lines / street light maintenance works
3. Understanding the need of Safety
4. Understanding the safe process of maintenance :
  - Planning of the maintenance job
  - Availability of men, material & machine, PPEs, Safety gear and approved PTW
  - Briefing of the job by the supervisor of the TPCODL
  - Identification of Risks associated with the maintenance work and planning for controlling measures by TPCODL supervisor
  - Creation of safety zone by TPCODL supervisor and satisfying that the network is dead – Use of Neon Tester, Shorting Chain and Safety Tagging
  - Start of the work – Right person for the right job
  - Alert supervision
  - Completion of the job – Check points
  - Energization of network
  - Actions to be taken in case of some accident

**Session: 2**

**Topic:** Use of Electrical Testing Equipment

**Methodology:** Lecture and Practical Demonstration

**Sub Topics:**

1. Meggar, Hi Pot, Clamp On Meter, Neon Tester, Discharge Rod, Line tester etc.

**Session: 3**

**Topic:** Awareness of Electrical Safety Aspects

- A. Understanding the need of this Training and Safety
- B. Learning specifics of HT & LT Network
- C. Major type of work to be carried out in zones
- D. Switching Operations (Do's & Don'ts) including Street Light Switching
- E. Working on Height (*practical demo also*)
- F. Understanding the Safe Process of Maintenance / Working:
  - Planning of the job
  - Availability of men, material & machine, PPEs, Safety gear and approved PTW
  - Briefing of the job by the supervisor
  - Permit to Work
  - Safety Tagging and Lock Out Tag out

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- Identification of Risks associated with the work to be carried out and planning for controlling measures by proper supervision
- Concept of “**Safety Zone**”
- Identification and use of Neon Tester, Shorting Chain, Clamp On Meter, Hi Pot, Meggar etc.
- Completion of the job – Check points
- Accident Theory & Incident Reporting
- Actions to be taken in case of some accident

**Session: 4**

**Topic: Identification, Demonstration and Usages of Tools, PPEs and other Safety Gears and demonstration of working on HT pole**

**Session: 5**

**Topic: Practical demonstration of Safety Zone creation**

**FREQUENCY**

**Regular Safety Training Program**

- It will be conducted for all field & supervisor staff of BA in such a manner that all BA Personnel attend at least two hours safety training during every month.

**One Day Induction Safety Training Programs:**

- This training will be for the new BA's personnel, who have been cleared by the Cross Functional Panel to undergo Safety training and who are likely to be deployed at various work sites of TPCODL by the BA, as a part of AMC / Work Contract.

**Duration / Periodicity:**

- Duration and periodicity has been defined above. However, this is subject to change at the discretion of TPCODL.

**Annexure 7 (Refer Para 5.7)**


**LIST OF PERSONAL PROTECTIVE EQUIPMENT AND TESTING FREQUENCY**

Sl. No.	Name of PPE	IS / EN Standard	Testing Frequency	Remarks	Ref Brand & Model
01	Leather Safety Shoes (Color – Black) with PU toe cap.	IS:15298 (Part-2)	Monthly and visual check every day for any crack or damage in the leather or sole.		BATA (Model No.- Endura L/C)  Liberty (Model No. – 7198-01 HT Barton Black – Warrior)
02	HDPE Safety helmet with chin strap and ratchet type for adjustment.	IS:2925-1984	Monthly and visual check every day for any crack in shell.		Karam (PN Safetech )  Joseph Leslie  Accent Industries  Honeywell
03	Full body harness (Safety belt)	EN 361	Monthly and visual check every day of the bends and the harness.		Karam (PN Safetech )  Joseph Leslie  Accent Industries
04	Electrical Safety Gloves	EN: 60903 CE marked	Weekly and visual check for any crack and blow test before every work.	Manufactured not beyond 12 months.	Make Sparian / Sumitech / CATU supplied with inner cotton glove with over glove of split leather.
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	Monthly and visual check every day for any crack in shell.	Clear acrylic visor attached with safety helmet.	Karam (PN Safetech )  Joseph Leslie  Accent Industries  Honeywell
06	Fire Proof jacket for chest protection		Monthly and visual check every day.		
07	Safety Chain for shorting cum earthing.	As per TPCODL standard	Weekly and visual check before every work.	Made of brass, Total length – 5.5 meters and made of 12 SWG.	

Note:

1. Any other Personal Protection Equipment required beyond above list will be according to BIS or EN Standards.
2. All Personal Protection Equipment will be checked by the engineer in-charge or SAFETY group of TPCODL.
3. Safety Representative of the BA has to maintain the record of the availability, condition and checking of the PPEs.
4. All tools required as per the contract must be according to respective IS / EN standards.
5. TPCODL may revise or add the above list of PPE and their specifications as and when feel necessary. The information about new specifications /models will be circulated by the Engineer In-charge (EIC), which shall adhere by the business associated in the shortest possible time. The EIC shall issue a memo / instruction to BA with timeline for implementation. Any delay will be treated as non- compliance / safety violations. Refer picture of each PPE given in next page.

**Pictures of PPE for reference purpose.**

Sl. No.	Name of PPE	IS / EN Standard	Picture
01	Leather Safety Shoes (Color – Black) with PU toe cap.	IS:15298(Part-2) and with test report of electrical resistance.	
02	HDPE Safety helmet with chin strap and ratchet type for adjustment.	IS:2925-1984	
03	Full body harness (Safety belt)  The straps at shoulder and thigh shall have full pad for comfort. The back shall be so designed that harness straps do not tangle with each other.	EN 361:2002 EN 358 : 2000 IS: 3521:1991/2002	



04	Electrical Safety Gloves – Composite type Soft electrical gloves as per size of individual.	EN: 60903 CE marked	
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	
06	Fire Proof jacket for chest protection		
07	Safety Chain for shorting cum earthing.	As per TPCODL standard	
08	Reflective jacket to each workmen	As per TPCODL standard	

*Note : Picture shown are for indicative purpose only. Actual product may differ.*

**Annexure 8 (Refer Para 5.8) LIST OF AUDITS TO BE CONDUCTED**

Audits	Responsibility	Freq.	Ref. Doc.
Permit to Work & Field Audit	BA Safety Representative	Weekly	F04 (COR P - 12)
Tool Bag & PPE's Audit		Weekly	F06 (COR P - 12)
First Aid Box Maintenance Record		Fortnightly	F08 (COR P - 12)
Fire Extinguisher Record <i>(Applicable for the BA involved in major construction works and have storage of flammable material at worksite)</i>		Monthly	F09 (COR P - 12)
Safety Talk Register		Weekly	F18 (COR P - 12)
Site Safety Audit		Daily	F29A (COR P - 12)

Note:

1. (BA Safety Representative has to use the formats as per Safety process COR – P – 12 of TPCODL)

**Annexure 9 (Refer Para 5.9)**

**PERFORMANCE REPORT – SAFETY**

**FOR THE MONTH OF.....**

Name of BA : .....

Name of the Project and Purchase order No: .....

Date of commencement of work: .....

Man Hour Worked in this month (No. of employees X 8 Hrs + Overtime): .....

Cumulative Man Hour worked: .....

Total Number of Minor Injury (this month): ..... Minor Injury (Total).....

Major Injury (this month): ..... Major Injury (Total): .....

Detail of the Incident / Sub Standard Acts and Condition

Activity	This Month	Cumulative (Total)	Day Lost (this month)	Days Lost (Cumulative)
No. of the Incident				
No. of lost time injuries				
No. of dangerous occurrences				
No. of near miss reported				
Substandard Act/Conditions observed			Attach details of observation of this month	
Safety Violation Notice received (from TPCODL) (both in numbers and in Rs.)	No.	No.	No. of violation letter received and compliance report for the TPCODL.	
	Rs.	Rs.		

*Note: Cumulative means total from date of commencement of work according to the contract.*

Detail of the Accident / Near Miss Incidents:

Date and Time	Type of the incident	Name of Employee	Brief Description	Corrective and Preventive actions recommended

Details of the Safety Violations:

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Date and Location	Brief Description	Name of employee involved	Action Taken

Detail of the Safety Talk / Tool Box Talk / Safety Training

Date and Location	Topic (s)	Total Number of employees (Worker / Supervisor)	Number of participants (Worker / Supervisor)

Detail of the Safety Meeting

Date and Location	Number of participants	Topics discussed	Major Observations / Innovation

Detail of the Safety Inspection /Audit: (as per TPCODL site audit checklist F29A(COR-P-12)

Date	Area / Location	Major Observations	Recommendations	Action Taken

Any other Safety, Occupational Health, Environment & Disaster Management Promotional Activity (During this month):

Date	Location	Activity	Level of Participation	Number of participation

Signature of the BA Safety Representative  
HoG

Signature of ZM /

Name, E. No. and Date

Name, E. No. Date.

*Note: The original form to be deposited with Engineer in-charge and a copy to SAFETY group on or before 5<sup>th</sup> of every month along with bill. List of training of the current month and status of PPE to be also mentioned individual wise.*

*BA may include additional lines if required. The TPCODL may revise the format as and when deemed required.*

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**ANNEXURE-M**  
**VENDOR APPRAISAL FORM**

<b>TO BE SUBMITTED BY VENDOR (To be filled as applicable)</b>		
<b>VENDOR:</b>		
<b>1.0</b>	<b>DETAILS OF THE FIRM</b>	
	1.1	NAME (IN CAPITAL LETTERS) :
	1.2	TYPE OF CONCERN (PROPRIETARY) Partnership, Pvt. Ltd., Public Ltd. etc. :
	1.3	YEAR OF ESTABLISHMENT :
	1.4	LOCATION OF OFFICE POSTAL ADDRESS TELEGRAPHIC ADDRESSES, TELEX NO. FAX NO. :
	1.5	LOCATION OF MANUFACTURING UNITS :
	i)	UNITS 1 :
	ii)	OTHER UNITS :
<b>2.0</b>	<b>PRODUCTS MANUFACTURED</b> :	
<b>3.0</b>	<b>TURNOVER DURING THE LAST 3 YEARS (TO BE VERIFIED WITH THE LATEST PROFIT &amp; LOSS STATEMENT).</b> :	
<b>4.0</b>	<b>VALUE OF FIXED ASSETS</b> :	
<b>5.0</b>	<b>NAME &amp; ADDRESS OF THE BANKERS</b> :	
<b>6.0</b>	<b>BANK GUARANTEE LIMIT</b> :	
<b>7.0</b>	<b>CREDIT LIMIT</b> :	
<b>8.0</b>	<b>TECHNICAL</b>	
	8.1	NO.OF DESIGN ENGINEERS (INDICATE NO.OF YEARS EXPERIENCE IN RELATED FIELDS) :
	8.2	NO.OF DRAUGHTSMEN :
	8.3	COLLABORATION DETAILS (IF ANY) :
	8.3.1	DATE OF COLLABORATION :
	8.3.2	NAME OF COLLABORATOR :

		8.3.3 RBI APPROVAL DETAILS	:
		8.3.4 EXPERIENCE LIST OF COLLABORATOR	:
		8.3.5 DURATION OF AGREEMENT	:
	8.4	AVAILABILITY OF STANDARDS / DESIGN PROCEDURES / COLLABORATOR'S / DOCUMENTS (CHECK WHETHER THESE ARE LATEST/CURRENT)	:
	8.5	TECHNICAL SUPPORT, BACK-UP GUARANTEE, SUPERVISION, QUALITY CONTROL BY COLLABORATOR (WHEREVER ESSENTIAL). (THIS CLAUSE IS RELEVANT WHEN VENDOR'S EXPERIENCE IS INADEQUATE)	:
	8.6	QUALITY OF DRAWINGS	:
<b>9.0</b>	<b>MANUFACTURE</b>		
	9.1	SHOP SPACE, LAYOUT LIGHTING, VENTILATION, ETC.	:
	9.2	POWER (KVA)	:
		MAINS INSTALLED	:
		UTILISED	:
		STANDBY POWER SOURCE	:
	9.3	MANUFACTURING FACILITIES (ATTACH LIST OF EQUIPMENT AS APPLICABLE)	:
		9.3.1 MATERIAL HANDLING	:
		9.3.2 MACHINING	:
		9.3.3 FABRICATION	:
		9.3.4 HEAT TREATMENT	:
		9.3.5 BALANCING FACILITY	:
		9.3.6 SURFACE TREATMENT PRIOR TO PAINTING/ COATING, POLISHING, PICKLING, PASSIVATION, PAINTING, ETC.	:
	9.4	SUPERVISORY STAFF	:
	9.5	ADEQUACY OF SKILLED LABOURS (MACHINISTS, WELDERS, ETC.)	:
	9.6	NO. OF SHIFTS	:
	9.7	TYPE OF MATERIAL HANDLED (SUCH AS CS, SS, ETC.)	:

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	9.8	WORKMANSHIP	:
	9.9	MATERIAL IN STOCK AND VALUE	:
	9.10	TRANSPORT FACILITIES	:
	9.11	CARE IN HANDLING	:
<b>10.0</b>	<b>INSPECTION / QC / QA / TESTING</b>		
	10.1	NUMBER OF PERSONNEL (INDICATE NO.OF YEARS OF EXPERIENCE)	:
	10.2	INDEPENDENCE FROM PRODUCTION	:
	10.3	AVAILABILITY OF PROCEDURAL WRITE UP/QUALITY PLAN	:
	10.4	INCOMING MATERIAL CONTROL AND DOCUMENTATION	:
	10.5	RELIABILITY/REPUTATION OF SUPPLY SOURCES	:
	10.6	STAGE INSPECTION AND DOCUMENTATION	:
	10.7	SUB-ASSEMBLY & DOCUMENTATION	:
	10.8	FINAL INSPECTION AND DOCUMENTATION	:
	10.9	PREPARATION OF FINAL DOCUMENTATION PACKAGE	:
	10.10	TYPE TEST FACILITIES	:
	10.11	ACCEPTANCE TEST FACILITIES	:
	10.12	CALIBRATION OF INSTRUMENTS AND GAUGES (WITH TRACEABILITY TO NATIONAL STANDARDS) (ATTACH LIST)	:
	10.13	STATUTORY APPROVALS LIKE BIS, IBR, ETC.(AS APPLICABLE)	:
	10.14	SUB-VENDOR APPROVAL SYSTEM AND QUALITY CONTROL	:
	10.15	DETAILS OF TESTS CARRIED OUT AT INDEPENDENT RECOGNISED LABORATORIES	:
		i) FURNISH LIST OF TESTS CARRIED OUT AND THE NAME OF THE LABORATORY WHERE THE TESTS WERE CONDUCTED	:
		ii) CHECK AVAILABILITY OF CERTIFICATES AND REVIEW THESE WHEREVER POSSIBLE	:
<b>11.0</b>	<b>EXPERIENCE (INCLUDING CONSTRUCTION / ERECTION / COMMISSIONING) TO BE FURNISHED IN THE FORMAT INDICATED IN APPENDIX)</b>		
<b>12.0</b>	<b>SALES, SERVICE AND SITE ORANISATIONAL DETAILS</b>		

13.0	<b>CERTIFICATE FROM CUSTOMERS (ATTACH COPIES OF DOCUMENTS)</b>	:
14.0	<b>POWER SITUATION</b>	:
15.0	<b>LABOUR SITUATION</b>	:
16.0 *	<b>APPLICABILITY OF SC/ST RELAXATION (Y/N) IF YES, SUPPORTING DOCUMENTS TO BE ATTACHED</b>	
17.0	<b>ORGANIZATIONAL DETAILS</b> 1. PF NO 2. ESI NO 3. INSURANCE FOR WORK MAN COMPENSATION ACT NO 4. ELECTRICAL CONTRACT LIC NO 5. ITCC / PAN NO 6. SALES TAX NO 7. WC TAX REG. NO	:
18.0	<b>DOCUMENTS TO BE ENCLOSED:</b> 1. FACTORY LICENSE 2. ANNUAL REPORT FOR LAST THREE YEARS 3. TYPE TEST REPORT FOR THE ITEM 4. PAST EXPERIENCE REPORTS 5. ISO CERTIFICATE –QMS, EMS, OHAS, SA 6. REGISTRATION OF SALES TAX 7. COPY OF TIN NO. 8. COPY OF SERVICE TAX NO. 9. REGISTRATION OF CENTRAL EXCISE 10. COPY OF INCOME TAX CLEARANCE. 11. COPY OF PF REGISTRATION 12. COPY OF ESI REGISTRATION 13. COPY OF INSURANCE FOR WORK MAN COMPENSATION ACT NO 14. COPY OF ELECTRICAL CONTRACT LIC NO 15. COPY OF PAN NO 16. COPY OF WC TAX REGISTRATION 17. DOCUMENTS IN SUPPORT OF SC/ST RELAXATION AT S.NO.16.0 18. GST Registration No	

\* Classification of BA s under SC/ST shall be governed under following guidelines:

- **Proprietorship/ Single Ownership Firm:** Proprietor of the firm should be from SC/ST community. Governing document shall be Proprietorship Deed.
- **Partnership Firm:** Only such firms shall qualify which have SC/ST partners holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Partnership Deed.
- **Private Limited Company:** Only such firms shall qualify which have SC/ST directors holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Memorandum of Understanding (MoU) and/or Article of Association (AoA).

**NOTE: Certification from SC/ST Commission shall be required for deciding upon SC/ST status of a person.**



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**ANNEXURE-N**

**MANUFACTURER AUTHORIZATION FORM**

*(To be submitted on OEM's Letter Head)*

Date: .....

Tender Enquiry No.: .....

To,

Chief (Procurement & Stores)

TP Central Odisha Distribution Limited,

Bhubaneswar

Sir,

WHEREAS M/s. [name of OEM], who are official manufacturers of ..... having factories at [address of OEM] do hereby authorize M/s [name of bidder] to submit a Bid in relation to the Invitation for Bids indicated above, the purpose of which is to provide the following Goods, manufactured by us

.....

and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty in accordance with the Special Conditions of Contract or as mentioned elsewhere in the Tender Document, with respect to the Goods offered by the above firm in reply to this Invitation for Bids.

We hereby confirm that in case, the channel partner fails to provide the necessary services as per the Tender Document referred above, M/s [name of OEM] shall provide standard warranty on the materials supplied against the contract. The warranty period and inclusion / exclusion of parts in the warranty shall remain same as defined in the contract issued to their channel partner against this tender enquiry.

Yours Sincerely,

For .....

Authorized Signatory

GENERAL CONDITIONS OF CONTRACT