

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

Tender Reference: CC25NP019

Document Date: 27th June 2024

OPEN TENDER NOTIFICATION

FOR

Supply and Services of 33KV GIS along associated equipment at Kalyan, Vikhroli and Saki Receiving station in Mumbai.

Tender Enquiry No: CC25NP019

(Please note this reference number must be quoted in all submission pertaining to this tender)

**The Tata Power Company Limited (Tata Power)
Corporate Contracts,**

**Smart Center of Procurement Excellence,
2nd Floor, Sahar Receiving Station, Near Hotel Leela,
Sahar Airport Road, Andheri (E), Mumbai 400 059**

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Procedure for Participating in Tender

Tender Enquiry No.	Work Description	EMD (Rs.)	Tender Participation Fee	Last date and time for Payment of Tender Participation Fee*	Last date and time for bid submission
CC25NP019	Supply and Services of 33KV GIS along associated equipment at Kalyan, Vikhroli and Saki Receiving station in Mumbai.	23,00,000/-	Rs. 2000/-	05 th July 2024 1500 Hrs	19 th July 2024 1500 Hrs

***Interested bidders are strongly advised not to wait by above time and purchase the tender immediately to get the link for bid submission. This will enable them to communicate/raise queries against the subject tender in time.**

Procedure for Participating in Tender. Following steps to be done before last date for purchase of tender,

1. Interested Vendors to refer to the Section C of the tender (Prequalification criteria).
2. Eligible and Interested Bidders to submit duly signed and stamped letter on Bidder's letterhead indicating.
 - a. Tender Enquiry number
 - b. Name of authorized person
 - c. Contact number
 - d. e-mail id
 - e. Details of submission of Tender Participation Fee
3. Non-Refundable Tender Participation 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 number –

Beneficiary Name – The Tata Power Co. Ltd.

Bank Name – HDFC Bank Ltd.

Branch Name – Fort Branch, Mumbai

Address – Maneckji Wadia Building, Nanik Motwani Marg, Fort, Mumbai 400023.

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Branch Code – 60
Bank & Branch Code – 400240015
Account No – 00600110000763
Account type – CC
IFSC Code – HDFC0000060

E-mail with necessary attachment of 1 and 2 above to be send to naman.patel@tatapower.com with copy to vivek.mittal@tatapower.com before “Last date and time for Payment of Tender Participation Fee”

Interested bidders to submit Tender Participation Fee and Authorization Letter before Last date and time as indicated above after which link from Tata Power 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 only through Tata Power E-Tender system (Ariba). User manual to guide the bidders to submit the bid through e-Tender system (Ariba) is also enclosed.

No e-mail or verbal correspondence will be responded. All communication will be done strictly with the bidder who have done the above steps (Payment of tender fee and submission of letter with requisite details) 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 Tata Power 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 acknowledged.

Any payment of Tender Participation Fee / EMD by Bidder who have not done the pre-requisite within stipulated timeline will not be refunded.

Also, all future corrigendum’s to the said tender, if any, will be informed on Tender section on website <https://www.tatapower.com>

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*** To be submitted in editable excel format**

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Section A: Tender Notice including Instruction to Bidders

1. Tender Details

1.1 Key Tender Specific Details

Reference Number	CC25NP019
Description	Supply and Services of 33KV GIS along associated equipment at Kalyan, Vikhroli and Saki Receiving station in Mumbai.
Type of Tender	Firm Order
Period	Till the completion of Contract
Tender Fee	Rs 2,000/-
Earnest Money Deposit (EMD)	Rs 23,00,000 /- Rs Twenty-three lakhs Only PLEASE NOTE THAT IT IS MANDATORY TO SUBMIT EMD IN THE FORM.
Price Basis	Firm Price
Executive Handling this Tender	Name: Mr. Naman Patel Contact No.: 9029001594 E-Mail ID: naman.patel@tatapower.com

Note: This tender consists of 03 different lots (33kV GIS at Kalyan, 33KV GIS at Vikhroli and 33KV GIS at Saki).

Technical and Commercial evaluation of each Lot (Kalyan, Vikhroli and Saki) shall be done independently. Accordingly, award decision shall be made for each lot.

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1.2 Calendar of Events

(a)	Access to Tender Documents through Tata Power website	27 th June' 2024 onwards
(b)	Last date and time for Payment of Tender Participation Fee to get e-tender link for bid submission*	Till 05 th July' 2024 1500 Hrs.
(c)	Date & Time of Site visit.	09 th July 2024 @ 11:00 Hrs at Kalyan 10 th July 2024 @ 11:00 Hrs at Saki and 14:00 Hrs at Vikhroli.
(d)	Last Date of receipt of pre-bid queries, if any.	By 12 th July 2024 1500 Hrs
(e)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	By 15 th July 2024 1500 Hrs.
(f)	Last date and time of receipt of Bids	By 19 th July 2024 1500 Hrs.

Note: - * Interested bidders are strongly advised not to wait by above time and purchase the tender immediately to get the link for bid submission. This will enable them to communicate/raise queries against the subject tender in time.

These date and time in above calendar of events are as planned and tentative. In case of change the same shall be intimated to Authorized Person of Interested Bidder through E-Tender System.

Please note post submission of Bids relevant communication will be done with Authorized Person of Interested Bidder through E-Tender System.

1.3 Mandatory documents required along with the Bid

- 1.3.1 Bid Guarantee Fee (EMD) of requisite value and validity. PLEASE NOTE THAT BID GUARANTEE ONLY IN FORM OF BANK GUARANTEE WILL BE ACCEPTED.
- 1.3.2 Requisite Documents to ascertain fulfilling of Technical and Commercial Pre-Qualification Requirement as detailed in Tender Enquiry.
- 1.3.3 Technical Submission including Drawings, Type Test details etc. as detailed in Technical Specification.
- 1.3.4 Required Commercial Submission as detailed in Tender Document
- 1.3.5 Technical and Commercial Clarification and Deviations as per the format attached in the Tender Enquiry
- 1.3.6 Proper authorization letter to sign the tender and participate in Tata Power E-Tender system on the behalf of bidder.

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

Also please note that whenever editable format are shared it is requested that data be filled in relevant cells. No formatting or addition / deletion of rows / columns to be done. Wherever editable Excel submission are requested the file should be free from references, macros etc.

Checklist of Document Submission

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Stage of Tendering	Document	Type of Format	Mode of submission
Before last date of Pre-Bid Query	Query / Clarification / Deviation (QCD) Format. (F1) Separate Excel sheet to be used for Technical and Commercial Pre-Bid Query	Editable Excel Format	Through message in E-tender system
Bid Submission Envelope 1 (First Part)	Earnest Money Deposit	Original Bank Guarantee	In Sealed Envelope
Bid Submission Envelope 2 (Second Part)	Documents to be uploaded in Ariba only. In case of multiple files, a zipped folder can be attached for the same (size limit of 100 MB per zipped file)		
To be submitted Under Tab 2 in Ariba	Duly filled PQR and supporting documents		
	Duly filled PQR format	Editable Excel Format	E-Tender System
	Backup documents for Technical PQR	Signed and Scanned documents	E-Tender System
To be submitted in Ariba	Duly Filled Vendor Registration Form (for unregistered vendor) and supporting documents. Registered vendor to submit letter indicating Vendor Code in Tata Power and factory/supply address to be used.		
	Duly filled Vendor Registration Form (if vendor is not registered with Tata Power)	Signed and Scanned documents	E-Tender System
	Backup document for Vendor Registration Form (if vendor is not registered with Tata Power)	Signed and Scanned documents	E-Tender System

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To be submitted in Ariba	Technical Submission and Supporting Documents		
	Duly filled Technical Submission Format	Editable Excel Format	E-Tender System
	Technical Submission as required for Technical Specifications	Signed and Scanned documents	E-Tender System
	Duly filled Technical Submission- Type test verification sheet Format	Editable Excel Format	E-Tender System
	Backup documents for Type Test verification	Signed and Scanned documents/ reports	E-Tender System
	Query / Clarification / Deviation (QCD) Format for Deviation if any	Editable Excel Format	E-Tender System
	Duly filled Unpriced Bid Format	Signed and scanned copy of document	E-Tender System
To be submitted in Ariba	Commercial Submission and supporting document		
	Letter of Undertaking (FOR VENDORS NOT REGISTERED WITH TATA POWER)	Scanned Copy of letter of undertaking duly filled, stamped and signed	E-Tender System
	E-auction Undertaking form	Scanned Copy of letter of undertaking duly filled, stamped and signed	E-Tender System
Bid Submission Envelope 3 (Third Part)	Duly filled Priced Bid Format	Duly signed and stamped scanned copy of document. To be entered in E-Tender System	E-Tender System

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1.4 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 Query / Clarification / Deviation (QCD) Format. Deviations have to be mandatorily submitted in editable Excel sheet Technical and Commercial deviation have to be submitted separately.

Technical or Commercial Deviation should be mentioned in Deviation Format only. Deviation in any other document or Format will not be considered.

1.5 Right of Acceptance/Rejection

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

1.5.2 Mandatory Documents as listed in 1.3 above

1.5.3 Price Bid as per the Price Schedule mentioned in Tender Document

1.5.4 Receipt of Bid and Response to queries within the due date and time

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

1.6 Qualification Criteria

Qualification Requirement expectation and document are detailed in documents in Section C

1.7 Pre-Bid Queries

Pre-Bid Queries if any has to be sent through message in E-Tender System. Pre-Bid Query has to be sent only in the Query / Clarification / Deviation (QCD) Format. Technical Pre-Bid Query and Commercial Pre-Bid Query have to be submitted in Separate Editable Excel File in Prescribed Format. Pre-Bid Queries sent in any other format or send through any other communication channel will not be accepted and answered. Pre-Bid Query have to be sent in the stipulated timeline as defined in the Tender Document. No Pre-Bid Query will be accepted after the due time and date as specified as "Last Date of receipt of pre-bid queries, if any"

1.8 Marketing Integrity

We have a fair and competitive marketplace. The rules for bidders are outlined in the General Condition of Contracts and other parts of Tender Documents. Bidders must agree to these rules prior to participating. In addition to other remedies available, Tata Power 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 or other part of the Tender Documents. A bidder who violates the marketplace 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
- Submit irrelevant documents or frequently cases of missing documents as part of compliance to Qualifying, Technical or Commercial Requirements causing unnecessary delay in Tender Evaluation

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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 Tata Power. This includes all bidding information submitted to Tata Power. All tender documents remain the property of Tata Power and all suppliers are required to return these documents to Tata Power upon request. Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

2. Evaluation Criteria

- The bids will be evaluated technically on the compliance to tender terms and conditions.
- The bids will be evaluated commercially on the overall all-inclusive lowest cost for the complete tender BOQ / each line item as calculated in Schedule of Items. Tata Power, 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 must mandatorily quote against each item of Schedule of Items. Failing to do so, Tata Power may reject the bids.

NOTE: In case of a new bidder not registered with Tata Power, factory inspection and evaluation shall be carried out to ascertain bidder's manufacturing capability and quality procedures. However, Tata Power 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 Tata Power shall be final and binding on the bidder in this regard.

2.1 Price Variation Clause and Cap:

The prices shall remain firm during the entire contract period and no price variation is applicable.

3. Submission of Bid Documents

3.1 Bid Submission

Bidders are requested to submit their offer in line with this Tender document. Bids shall be submitted in 3 (three) parts:

FIRST PART: "EMD – BANK GUARANTEE" of Value detailed in 1.1 valid for 180 days from the due date of bid submission in the form of Bank Guarantee favoring 'The Tata Power Company Limited'. The EMD must be strictly in the format as mentioned in Tender Document, failing which it shall not be accepted by Tata Power and the bid as submitted shall be liable for rejection.

Note: BG of 180 days validity and further claim period of 180 days is needed. In case the same cannot be issued by your bank then BG valid for 365 days can be provided.

Note: At times bidders have sought Tata Power bank details which is needed by them to make BG. Hence the same is reproduced below. These details are only provided to facilitate making of BG if needed

Tata Power's Bank Details for submitting EMD BG:
 Bank Name & Address – ICICI Bank, 163 HT Marg,
 Backbay Reclamation, Churchgate, Mumbai 400 020.

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A/c no. - 000451000293
IFSC Code – ICIC0000393

The hard copy of EMD in a sealed envelope should be sent on address mentioned in Tender document.

First Part must be submitted in Sealed Envelope.

SECOND PART: “TECHNICAL / UN-PRICED COMMERCIAL BID” shall contain the following documents:

- a) Documentary evidence in support of Technical, Commercial qualifying criteria
- b) Technical literature/GTP/Type test report/Details of Qualified Manpower Available/ Testing Facility available etc. *(complete in all respect as desired and detailed in Technical Specification and Technical Requirement Section)*
- c) Duly filled Technical and Commercial Deviation Sheets
- d) Duly filled formats like Authorization affidavit form
- e) *Unpriced Commercial Bid*

The technical / un-priced commercial bid shall be properly indexed and is to be submitted in Soft Copy though E-Tender system of Tata Power. Hard Copy of Technical Bids need not be submitted.

Second Part must be submitted through E-Tender System Only.

THIRD PART: “PRICE BID” shall contain only the price details and strictly in Price Bid format along with explicit break up of basic prices and applicable GST. Basic price should include packaging forwarding, freight, transit insurance and any other cost envisaged by the bidder.

Third part must be submitted through E-Tender System Only.

FOR BIDS INVITED THROUGH E-TENDER SYSTEM (TECHNICAL AND UN-PRICED COMMERCIAL BID):

In response to advertisement Bidder has to provide details of person authorized to Bid on behalf of the Bidder. An e-mail will be generated by E-Tender System and the authorized person can download the Tender Documents from the system.

Bidders have to mandatorily submit SECOND and THIRD PART (Technical and Price Bid) only through E-Tender system of Tata Power. Bids submitted through any other form (hard copy) / route shall not be admissible.

FOR BIDS INVITED IN SEALED ENVELOPE PROCESS (FIRST PART):

First Part of the bid shall be sealed in envelope which shall be clearly marked as below:

**EMD BID –
“Please mention Tender Reference No”**

Please mention our Tender Reference No on the Tender and drop the same in our Tender Box located at The Tata Power Company Limited (Tata Power), Corporate Contracts, Smart Center of Procurement Excellence, 2nd Floor, Sahar Receiving Station, Near Hotel Leela, Sahar Airport Road, Andheri (E), Mumbai 400 059.

The bid shall be addressed to:

Head - Procurement
The Tata Power Company Limited (Tata Power),

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Smart Center of Procurement Excellence, 2nd Floor, Sahar Receiving Station,
Near Hotel Leela, Sahar Airport Road, Andheri (E), Mumbai 400 059.

The envelope shall also bear the Name and Address of the Bidder along with our Tender No. and subject.

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and Tata Power, 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.

Bids submitted by Email/Telex/Telegram /Fax will be rejected. No request from any Bidder to Tata Power to collect the proposals from Courier/Airlines/Cargo Agents etc. shall be entertained.

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 the 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

Communication Details: Detailed in 1.1

3.3 Bid Prices

Bidders shall quote for the entire Scope of Supply/ work with a breakup 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 Tata Power. 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.

The quantity breakup 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.

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3.4 Bid Currencies

Prices shall be quoted in Indian Rupees Only. It also may be noted that the denomination of Purchase Order / Outline Agreement / Rate Contract and associated Payment to Successful Bidder shall also be in Indian Rupees Only. In case Bidder intends to import any equipment, part etc and supply to Tata Power then all liability and costs related to import will rest with the Bidder. All statutory compliances, payments, expenditure etc. related to importing of equipment will be responsibility of the bidder.

3.5 Period of Validity of Bids

Bids shall remain valid for **180 days** from the due date of submission of the bid. Price submitted as part of E-auction / Negotiation shall remain valid for **90 days** from date of E-auction / Negotiation. Notwithstanding clause above, Tata Power 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 the Tata Power against the risk of bidder's conduct which would warrant forfeiture.

The EMD shall be in following form:

- Bank Guarantee valid for 180 days after due date of submission with an additional claim period of 180 days from the date of expiry of BG.

The EMD shall be forfeited in case of:

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

Or

- b) In case of a successful bidder, if the Bidder, within 15 days, does not
- i) accept the purchase order, or
 - ii) furnish the required Contract Performance Bank Guarantee (CPBG)

Original Bank Guarantee submitted as EMD shall be returned only after completion of award process for unsuccessful bidders and issue of Contract Performance Bank Guarantee (CPBG) for successful bidder.

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 Tata Powers processing of Bids or award decisions may result in the rejection of the Bidder's Bid.

4.2 Technical Bid Opening

Bids will be opened at Corporate Office of Tata Power as per our standard Process. The bids shall be opened internally by Tata Power. Technical bid must not contain any cost information whatsoever.

First the envelope marked "EMD" will be opened. Bids without EMD 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 in E-Tender system.

4.3 Preliminary Examination of Bids/Responsiveness

Tata Power 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. Tata Power may ask for submission of original documents in order to verify the documents submitted in support of qualification criteria.

Prior to the detailed evaluation, Tata Power 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 Tata Power and/or the Tata Power 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, Tata Power may, at its discretion, ask the Bidder for a clarification on its Bid for any deviations with respect to the Tata Power 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 Tata Power.

4.5 Price Bid Opening

Price Bid of only Technically and / or Safety Qualified Bidders shall be considered and open internally by TPC. Bidders will get mail intimation from Tata Power E-Tender system (Ariba) when their Price Bids are opened.

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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 Tata Power without any further correspondence in this regard.

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.

4.6 Reverse Auction and Price Matching Option

Tata Power reserves the right to conduct the reverse auction AND / OR Manual Negotiations for the products/ services being asked for in the tender. Only Technical Qualified Bids will be allowed to participate in e-auction. Date and time of e-auction will be intimated through E-Tender system to Authorized Person of Interested Bidder.

For case where more than one bidder has to be awarded (including Rate Contract / Outline Agreement) Price Matching Option will be exercised. Volume of job allocated to original competitive bidder will be more than bidder who is chosen through Price Matching Option. Tata Power decision regarding work sharing shall be final and no explanation OR clarification shall be given regarding the same.

Tata Power reserves the right to go for Reverse Auction (RA) for price negotiation and discover the most competitive price on ARIBA portal, Tata Power’s official e-tendering platform. This will be decided after techno-commercial evaluation of the bids. Bidders need to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case Tata Power decides to go for RA.

Only those bidders who are techno-commercially qualified shall be eligible to participate further in RA process. However, the original H1 bidder (whose price bid is the highest post techno-commercial evaluation) shall not be allowed to participate in further RA process provided minimum three techno-commercially qualified bids are available.

5.0 Award Decision

Tata Power 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 Priced Bid Format subject to any corrections required in line with Clause 4.3 above. The decision to place purchase order/Outline Agreement/ Rate Contract solely depends on Tata Power on the cost competitiveness across multiple lots, quality, delivery and bidder’s capacity, in addition to other factors that Tata Power may deem relevant.

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

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

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5.1 Rate Contract / Outline Agreement

Rate Contract / Outline Agreement does not guarantee any assured business volume in Rupees or Quantity. Quantities are only indicative and specified for the purpose of readiness as per the request from Purchaser. Supplies shall be only against Firm Purchase Orders placed as per the agreed terms and conditions of Rate Contract / Outline Agreement. Purchaser shall be entitled at its discretion to place firm order for such supplies on "As and When Required Basis" without minimum take-off guarantee.

Rate Contract / Outline Agreement will have list of Items with Unit Rate and applicable Taxes and Duties. There will be a cap on value for which order which can be placed against the Rate Contract / Outline Agreement. Actual quantity ordered for each line item may differ significantly from the tentative quantity indicated in the Tender Document. One / few / all items of Rate Contract / Outline Agreement can be ordered till the Cap Value is reached.

6.0 Order of Preference/Contradiction:

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

1. Outline Agreement/Purchase Order (with Commercial conditions)
2. Special Terms and conditions (if applicable)
3. General Terms and conditions
4. Technical Specifications

In case there is a discrepancy in the BOQ mentioned in tender (to the extent modified through subsequent Corrigendum, if any) and the bid submitted by any bidder, the description as mentioned in the tender (to the extent modified through subsequent Corrigendum, if any) shall prevail.

7.0 Ethics

Tata Power is an ethical organization and as a policy Tata Power 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.

Tata Power work practices are governed by the Tata Code of Conduct. Bidder is requested to refer Tata Code of Conduct Clause in General Terms and Conditions.

8.0 General Condition of Contract and Special Condition of Contracts

Any condition not mentioned above shall be applicable as per General Terms and Conditions and Special Condition of Contracts attached along with this tender.

---XXX---

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

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Document Date: 27th June 2024

Section B: Format of Technical & Commercial Pre bid Queries

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FORMAT B.1

Format for Technical Pre-Bid Queries

Tender No

Package Name

Bidder :

Note : The said format to be used only for Technical Pre-Bid Query. Any Commercial Query has to be strictly in Format B2 Format for Commercial Pre-Bid Query and sent seperately
Format to be used for query regarding Technical Pre-Qualification Requirement, Safety Pre-Qualification Requirement, Technical Set of Documnt

Pre-Bid Query has to be sent in editable Excel file fomart only
Pre-Bid Query has to be sent through e-mail in Tata Power E-Tender System

Sr. No.	Detailed Reference to Tata Power Technical Document. Please specify Document No / Clause No / Page No	Description as per Bid Document	Remarks - Query / Clarification	Tata Power Response
1	2	3	4	5

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OPEN TENDER NOTIFICATION

Tender Reference: CC25NP019

Document Date: 27th June 2024

Section C.1: Pre-Qualification requirement

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C.1 Bidders Pre-qualifying Requirements for MV GIS			
S No	Parameter	Tata Power Requirement	Documents To be submitted by Vendor to ascertain meeting of Pre-qualification requirement
1	2	3	4
1	Infrastructure	Bidder must be an OEM of MV GIS (including Protection & Automation) OR must have sourced MV GIS (including Protection & Automation) with manufacturing facility / assembly in India.	Self-undertaking to be submitted in this regard. Tata Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.
2	Supply and Experience	<p>Bidder shall have supplied 300 nos of 33kV GIS bays in last 5 years. Out of this 50 quantity of 33kV GIS panels shall be in satisfactory service for last 2 years.</p> <p>"In case the bidder has a previous association with Tata Power for similar products and services, the performance feedback for that bidder by Tata Power shall only be considered irrespective of performance certificates issued by any third organization. Technical performance, delivery timelines, service and support records of past executed projects in Tata Power will be considered for technical evaluation of bidder."</p> <p>Indian Subsidiaries of global companies having plant in India are also eligible to bid if the qualification requirements stated above are met independently or in combination with the parent company. Declaration from parent company needs to be submitted.</p>	<p>Supply List & Performance Certificates from the utilities / clients</p> <p>Self-undertaking to be submitted in this regard. TATA Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.</p>
3	Type Test	<p>The bidder shall submit Type test reports obtained from NABL/ International Accredited Lab for the equipment / material offered. The type tests should have been conducted on the equipment / material of the same design.</p> <p>The type tests should have been conducted within 5 years prior to the date of bid opening. Time period for type test may be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC).</p> <p>In case the type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, then 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 despatch of the equipment / material.</p>	<p>Type Test Report.</p> <p>Undertaking that there is no change in design / material of construction (MOC) if Type Test Report older than 5 years but less than 10 years prior to date of bid opening has to be considered (if applicable)</p> <p>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 despatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity. (if applicable)</p>
4	Commercial Capability	Average Annual turnover of the bidder for last three years shall not be less than Rs 100 Crs	Copy of audited Balance Sheet and P&L Account to be submitted in this regard.
5	Services Experience	In case the package involves installation & commissioning of the equipment / material, then the bidder shall have installed and commissioned 60 nos Bays, of MV GIS during last 5 years, and 30 Nos MV GIS bays shall be in satisfactory commercial operation for at least last 3 years as on the date of bid submission.	<p>Services List / Performance Certificates from the utilities / clients</p> <p>Self-undertaking to be submitted in this regard. TATA Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.</p>
Note		The Prequalification Criteria published along with the tender "In Section C.1 Pre-Qualification requirement" is the total & complete pre-qualification requirement for the tender and shall prevail over any other/additional pre-qualification requirement mentioned elsewhere in the tender.	

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Section C.2: Safety Bid document

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The Tata Power Company Ltd	TPCØDL TPSØDL		TPNØDL TPWØDL	Contractor's Safety Code of Conduct
Document no TPSMS/GSP/ CSM/015/REV 07				Date of Issue: 01/08/2023

Appendix 6: CSM F6 - Safety Competency Assessment 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 :-

Type of manpower	Qualification	Experience	Month 1	Month 2	Month 3
<u>Project /AMC Manager(R7)</u>						
Site In Charge						
Safety Manager						
Safety Officer						
Supervisors						
Technicians						
High Skilled workmen						
Skilled workmen						
Semiskilled workmen						
Lineman						
Helpers						
Drivers						
Unskilled						
<u>Others(R7)</u>						

Instruction to Bidders:

- i. Indicate the overall site manpower deployment schedule as above
- ii. Indicate direct or subcontracted employees by using color code given below:
 - Direct Bidder Employee – Green**
 - Partly Direct / partly Subcontracted – Yellow**
 - 4.3.5 **Subcontracted – Red** *If subcontractor detail is not available at stage of Bid evaluation, then this can be agreed with Order manager or Engineer in charge before deployment Ensure that all sub-contractors follow the Tata Power Safety Procedure and agreed CSM F9 Site Safety Management Plan.R7*

iii. Against each category, indicate minimum educational qualification and work experience

The Tata Power Company Ltd	TPC ODL TPS ODL	 TATA TATA POWER	TPN ODL TPW ODL	Contractor's Safety Code of Conduct
Document no TPSMS/GSP/ CSM/015/REV 07				Date of Issue: 01/08/2023

- iv. Add rows to include other specialized manpower, if any.
- v. Extend columns to cover the entire duration of the proposed contract.
- vi. If the operation is in shifts, then indicate shift in charge and / or safety officers required for each shift 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	Year of manufacture	Remarks
1						
2						
3						
4						
5						
.....						

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 current and Last 3 Years			
	Current Year	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.

The Tata Power Company Ltd	TPC ODL TPS ODL	 TATA TATA POWER	TPN ODL TPW ODL	Contractor's Safety Code of Conduct
Document no TPSMS/GSP/ CSM/015/REV 07				Date of Issue: 01/08/2023

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 Appendix 9)

5. PPE Requirement -R7

Division/DISCOM Requirement	Bidders Response
The Bidder/Vendor shall ensure that all PPE of Approved standards as per CSM F8 – PPE Requirements shall be always available and shall be used by his employees with no exception whatsoever. Bidders to also ensure Standard PPE matrix of Tata Power to be followed for all activities.	
10% Buffer stock of PPEs to be provided by bidders at each circle to meet any contingency	
Bidder will ensure that sample PPEs to be submitted/approved by Safety Department along with EIC at the time of submission of Safety bids for evaluation In case bidder manpower found using substandard or any PPEs which are not approved by the Tata Power-Division /DISCOM representative, then Tata Power-Division /DISCOM will provide the same to manpower deployed at the cost of bidders.	

6. Vehicle Deployment: Bidders to provide details of all vehicles deployed during execution of work-(R7)

S. No.	Vehicle No.	Vehicle Type	Location	EV/CNG/Diesel/Petrol	Year	Whether CNG endorsed on RC

The Tata Power Company Ltd	TPCODL TPSODL	 TATA TATA POWER	TPNODL TPWODL	Contractor's Safety Code of Conduct
Document no TPSMS/GSP/ CSM/015/REV 07				Date of Issue: 01/08/2023

7. **Crane Deployment**-(R7): Bidders to provide details of crane to be deployed during the execution of work as and when required. Bidders to provide approved new gen crane ACE Model SX150, ACE FX150 and Escorts Model TRX 1550.

SI No	Crane No	Location	Year

8. **Training Records**-(R7): Bidders to provide training records of employees deployed for the execution of work during last one year. These training includes OHS (Occupational Health and Safety) Training, Training on SOP/Work Procedures and Medical Emergency trainings imparted at their own facility, cost, and expenses. Bidders to provide the following details:

Tata Power-Division /DISCOM Requirement	Bidders Response
Training records of employees at their own facility, cost, and expenses for last one year	
Training facility available with Bidders	
Future road map for enhancing the competency of workforce	

9. **Rewards and Recognition**-(R7): Bidders to provide the details of process deployed in their organization for sharing and resolution of safety concerns raised by their employees. Also, bidders to provide the details of Rewards and Recognition process in their organization for safety to encourage the morale of their workforce.

10. **Management System Certification: -**

Sr.No	Certification	Yes / No	If Yes, Year of Certification	If No, Target date for Certification
1	ISO 9001			
2	ISO 14001			
3	ISO 45001			
4	Any other (Specify....)			

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

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

Tender Reference: CC25NP019

Document Date: 27th June 2024

Section D.1: Scope of Work/Technical Specification

CONFIDENTIAL

THE TATA POWER COMPANY LIMITED

INSTALLATION OF NEW 33 kV GIS BAYS AT KALYAN, VIKHROLI AND SAKI RSS

TECHNICAL SPECIFICATIONS FOR

33 kV GIS Package for Kalyan, Vikhroli and Saki

(DOCUMENT NO – TE/SP/0006/FY25)



TATA POWER

The Tata Power Company Limited

Engineering (T&D), The Tata Power Company Limited, Powai Receiving Station, Near Kailash Complex, Park Site Road,
Vikhroli West, Mumbai-400079.

Registered Office Bombay House 24 Homi Mody Street Mumbai 400 001

Revision	Date	Description	Approvals		
			Prepared By	Checked By	Approved By
A	12-06-2024	First Issue	SB	VVK	SKV

Snehal

VishalK

Shubhash

170624

Doc.No.: TE/SP/0006/FY25 Rev: A Date:12.06.2024	INSTALLATION OF NEW 33 kV GIS BAYS AT KALYAN, VIKHROLI AND SAKI RSS	Section-Contents Page 2 of 21
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CHECK LIST FOR DOCUMENTS TO BE SUBMITTED ALONG WITH THE BID

S No	Document Name	Submitted by Bidder Yes / No
1	Signed copy of bid document as a token of acceptance	
2	Dully filled in schedules, listed in section 'C'. i.e. Schedule C1 to C9 – Attached	
3	Qualifying Requirement in Format C1 – Attached as Annexure 1	
4	Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP) as applicable.	
5	General Arrangement Drawings for equipment offered	
6	Filled up Data Sheets in Format E2 – Attached as Annexure	
7	Type Test Reports as applicable.	

Name of Bidder:**Signature & Stamp:****Date:**

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A2	<u>PROJECT INFORMATION</u>
A3	<u>SCOPE OF WORK</u>
A4	<u>TERMINAL POINTS</u>
A5	<u>EXCLUSIONS</u>
A6	<u>CODES AND STANDARDS</u>
A7	<u>BIDDER'S QUALIFICATION REQUIREMENT</u>
A8	<u>PROJECT SCHEDULE / MILE STONES</u>
A9	<u>SUBMISSIONS BY BIDDERS</u>
A10	<u>DETAILED TECHNICAL SPECIFICATION</u>
A10.1	<u>MECHANICAL</u>
A10.2	<u>CIVIL AND ARCHITECTURAL</u>
A10.3	<u>CONTROL INSTRUMENTATION AND AUTOMATION</u>
A10.4	<u>ELECTRICAL</u>
A11	<u>LAYOUT REQUIREMENT</u>
A12	<u>QUALITY REQUIREMENT</u>
A13	<u>PERFORMANCE REQUIREMENTS</u>
A13.1	<u>TEST PROCEDURE</u>
A13.2	<u>PERFORMANCE GUARRANTEE PARAMETRS AND LD CLAUSES FOR NON PERFORMANCE</u>
A14	<u>MAINTAINANCE REQUIREMENTS</u>
A15	<u>TOOLS TACKLES FOR ERECTION AND COMMISSIONING</u>
A15	<u>SPARES</u>
B	STANDARD SPECIFICATION
B1	<u>DATA SHEETS</u>
B2	<u>STANDARD SPECIFICATIONS</u>
C	SCHEDULES
C1	<u>Schedule Of Quantities and Prices</u>

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C2	<u>Time Schedule for the project</u>
C3	<u>Schedule Of Deviations From Technical Specifications</u>
C4	<u>Schedule Of Deviations from General & Special conditions of contract</u>
C5	<u>Schedule of Drawings/ Document submission</u>
C6	<u>Schedule Of Mandatory Spares</u>
C7	<u>Schedule of special erection, maintenance tools & tackles</u>
C8	<u>Schedule of places of tests & inspection</u>
C9	<u>Schedule Of Recommended Spares</u>
D	<u>DRAWINGS AND DOCUMENTS</u>
D1	<u>TENDER PURPOSE</u>
D2	<u>AFTER AWARD OF CONTRACT</u>
E	<u>ANNEXURES</u>

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A1 INTENT OF SPECIFICATION

Tata Power Company Limited (Tata Power) hereinafter called the "OWNER" or "PURCHASER", proposes requirement for system and services required for installation of new MV gas insulated switchgear at Kalyan, Vikhroli and Saki RSS.

The document covers the scope and requirements for design, engineering, manufacturing, assembly, testing at works, packaging, transport, delivery and supervisory services during shifting from place of storage and during erection, site testing and commissioning, of 33kV GIS (operated at 22kV level) at Kalyan, Vikhroli and Saki RSS.

All equipment, system and services covered under this specification shall comply with all current applicable statutory regulations and safety codes in the locality where the equipment is proposed to be installed. The equipment and systems shall also conform to the latest version of applicable codes and standards on the date of offer made by the bidder unless otherwise indicated.

The specification is covered by two sections viz. Section-A & Section-B. The Section-A covers the specific requirement to the station while Section-B is the Standard specification of the equipment. Bidder shall consider the scope combining both the sections. In case of conflict between Section-A & B, the Section-A will supersede.

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A2 PROJECT INFORMATION

1.0	Owner	The Tata Power Company Limited
2.0	Consultant	Nil
3.0	Location of site	Tata Power Kalyan RSS Tata Power Vikhroli RSS Tata Power Saki RSS
4.0	Nearest Rail head	Site is connected by rail at Mumbai
5.0	Transport	Access roads are available for movement of materials to site. Movement of heavy materials would be through existing roads/rail up to site.
6.0	Plant Elevation	About 6 m above mean sea level
7.0	Climatic conditions	
7.1	Temperatures	
	(a) Maximum dry bulb temperature	36.7 °C
	(b) Minimum dry bulb temperature	18.3 °C
	(c) Design temperature for electrical equipment / devices	50 °C
	(d) Design humidity	95%
7.2	Relative humidity	
	(a) Maximum during monsoon	100%
	(b) Minimum during December to January	22%
8.0	Rainfall	Annual average rainfall is about 2500 to 3100 mm (most of which occurs during the monsoon season from June to September)
9.0	Wind data	

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Calculations for wind effect shall be in accordance with IS: 875 (Part-3) taking into account the following:

- (i) Basic wind speed = 44 m/sec
- (ii) Factor K1, K2, K3 = as per IS 875 Part-3
- (iii) Category of terrain = as per IS 875

- 10.0 Seismic conditions The proposed site is located in seismic zone III as per the Indian Standard IS 1893 and importance factor of 1.75.
- 11.0 Air Quality Atmosphere polluted with industrial gases and wastes because of proximity to petroleum refineries and fertilizer complex.
- 12.0 Sea water temperature
 - (a) Maximum 36.7 °C
 - (b) Minimum 22.8 °C
 - (c) Average 29.8 °C
- 13.0 Auxiliary Power Supply:

Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:

(a)	AC Power Supply System for Station Auxiliaries	415V AC, 3-phase, 4-wire solidly grounded system
(b)	AC Power Supply System for Lighting fixtures and space Heaters	240V, 1 phase, 2 wire, 50Hz AC supply with neutral lead grounded derived from (a)
(c)	Uninterrupted Power Supply	240 V, 1-phase, 50 Hz, 2-wire, AC supply
(d)	Construction Power Supply	415V, 3 phase, 4 wire, 50Hz AC supply solidly grounded
(e)	DC Power Supply system for control devices	Kalyan - 110 V DC Vikhroli - 220 V DC Saki - 220 V DC
(f)	DC Power Supply system for communication (Positive grounded)	Kalyan - 48V DC Vikhroli - 48V DC Saki - 48V DC

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(g)	DC Power Supply system for SCADA (Ungrounded)	Kalyan - 48V DC Vikhroli - 48V DC Saki - 48V DC
(h)	The above voltages may vary as follows: All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance. AC supply Voltage variation $\pm 10\%$ Frequency variation $\pm 5\%$ Combined voltage & frequency variation 10%	
(i)	Construction Power supply will be made available at site.	

14.0 Design System Parameters

Sr. No	Description of Parameters	Parameter
1.	Nominal voltage of a system U_n	22 kV
2.	Highest Voltage of a system U_s	24 kV
3.	Highest voltage for equipment U_m	36 kV
4.	Rated frequency (Hz)	50 Hz
5.	No of Phase	3
6.	Rated Insulation Levels Full wave impulse withstand voltage (8/20 micro sec)	170 kVp
7.	One-minute power frequency dry and wet withstand voltage (RMS)	70 kV
8.	Minimum creepage distance	31 mm/kV
9.	Rated Short circuit current Capacity	31.5 kA, 3 Sec
10.	System Neutral Earthing	Effectively Earthed

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A3 SCOPE OF WORK

1. For detailed scope of work, bidder to refer Section-B of equipment and system.
2. Any item missing in the Section B but required for successful completion of the project, should be considered in the bidder's scope and bidder shall submit Data sheet of that equipment's / systems and obtain approval for the same from Owner before proceeding further.

3.1 33k V GIS System Scope:

Design, engineering, manufacturing, assembly, testing at works, packaging, transport, delivery and supervisory services during shifting from place of storage and during erection, site testing and commissioning of 33kV (operated at 22kV level) GIS with completely prewired GIS mounted LV panel consisting of BCP, aux relays, multifunction meters, network components and associated accessories as specified below,

1. Metal clad partitioned, gas insulated switchgear, 36kV class, 31.5 kA for 3 sec, 2500A continuous current rating of bus bar with following feeder details,

Sr. no.	Description	Rating	Quantity (nos.)		
			Kalyan	Vikhroli	Saki
1.	Incomer	2500 A	3	4	1
2.	Tie Breaker	2500 A	3	5	1
3.	Tie Isolator	2500 A	3	3	1
4.	Outgoing	1250 A	13	25	3
5.	Capacitor Bank	1250 A	5	2	1
6.	Station Transformer	1250 A	2	1	0
7.	Bus PT (Set)	As per datasheet	6	8	2
8.	Surge arrestor (Set)		3	4	1
9.	Dummy (tentative)	-	3	4	1
10.	Total bus sections	-	3	4	1

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The GIS Bay shall be complete with all the accessories and auxiliary equipment's required for their satisfactory operation. Incomer, outgoing, bus section bays etc. shall be fitted with vacuum circuit breakers, three position disconnecter, earthing switches, voltage transformers, current transformers, metering instruments, protection relays, cable terminal ends/plugs for incoming & outgoing cable feeders etc.

2. The quantity of dummy panels are tentative and shall be used for competitive bidding. However, the PO shall be placed only as per actual requirement on a later date (irrespective of more or less than the quantity mentioned).
3. The cable terminations shall be suitable as per following details,

Sr. no.	Description	Rating	Tentative Cable details (Actual details during detail engineering)
1.	Incomer Tie Breaker Tie Isolator	2500 A	1C x 630sqmm x 33kV x Copper conductor x Armored XLPE x 4R per phase
2.	Outgoing Capacitor Bank Station Transformer	1250 A	3C x 400sqmm x 33kV x Copper conductor x Armored XLPE x 2R per phase

4. Preparation of SLD and room layout plan section drawing shall be in bidder scope of work.
5. Surge arrestor shall be connected to incomer cable side instead of on bus. The terminations, cables and associated accessories required for connection of the surge arrestor to the incomer shall be in bidder's scope of work.
6. Bidder shall consider supply of panels along with the required gas cylinder for site filling in the complete switchgear. All kind of site work including site ETC/Supervision necessary procedure for additions of Extn bays, SF6 gas cart for (evacuation, filling), gas leakage detector, any existing LV scheme modification etc. shall be in bidder scope of work.

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7. At Saki, the new GIS bus will be added in existing 22kV ring bus system in the station. Hence RBS configuration along with arrangement for extension of tie breaker CT to tie isolator panel relay shall be considered in schematics.
8. In remote control panel, bidder shall consider remote ON and OFF operation TNC switch and LED Indication lamp along with SLD MIMIC for disconnect switch and circuit breaker.

3.2 Automation requirement

The complete Substation Automation System shall be designed as per attached Technical Specifications for "B2-3BSub-station Automation System" Document along with BOM, GTP SQP etc.

1. The scope under this includes complete design, detailed engineering, preparation of ICS, manufacture, supply, inspection & testing at Bidder's work, packing, transportation, delivery to site, supervising erection and installation, coordination with other vendors, testing, commissioning, performance testing and handing over of Substation Automation System for 33/22 kV system.
2. All equipment, system and services covered under this specification shall comply with all current applicable statutory regulations and safety codes in the locality where the equipment is proposed to be installed. The equipment and systems shall also conform to the latest version of applicable codes and standards on the date of offer made by the Bidder, unless otherwise indicated. Nothing in this specification shall be construed to relieve the Bidder of this responsibility.
3. 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. Bidder shall offer the SAS Supply & Services accordingly.

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3.3 Metering requirement

1. General scope of work, Technical requirement and scheme diagram for Metering panels shall be as per Section-B Standard Specs for Prewired Metering panel.
2. Design, detailed engineering, manufacture, supply, inspection & testing at Bidder's work, packing, transportation, loading and unloading, delivery to site, supervisory services for erection, testing, commissioning, performance testing and handing over of following prewired Metering Panels in the below mentioned location:

Receiving station	Number of prewired metering panels
Kalyan	03
Vikhroli	11
Saki	02

3. Each panel shall be prewired for installation of 8 nos ABT meters irrespective of number of meters requirement for Receiving station. Complete supply and wiring of CT, PT, AC, DC, TTB's etc. inside each metering panel shall be for 8 nos of meters.

ABT Meters (Secure make - APEX 150)

4. General scope of work and Technical requirement for ABT meters as per Annexure - 9 Technical specification of ABT meters attached as Annexure in section B.
5. Location wise procurement of ABT meters (Secure make APEX 150) is explained in following table:

Receiving station	Quantity of ABT meters (APEX 150)
Kalyan	5
Vikhroli	26
Saki	3

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6. Supply, laying, crimping, splicing and termination of Armoured CAT6 (twisted pair cables)/FO cables from meters to communication panels is in bidder scope of work.
7. Looping between meters and extension of cables from meters to communication panels is in bidder scope of work.
8. Above mentioned ABT meters shall be installed in series with main and check meters of each outgoing feeders (Supply of Main and check meters is not in scope of bidder).
9. Supply, mounting and wiring of media converters as per BOQ is in bidder scope of work.
10. Supply and connection of Serial Device server (Make Moxa, Model – Nport 5232) as per BOQ is in bidder scope of work.

3.4 Prewired protection panels for Underfrequency Load Shedding (UFLS):

1. Scope of work for Protection shall be as per Section B Standard Technical Specifications for control and relay protection system.
2. Scope of work for Automation shall be as per Section B Standard Technical Specifications for Automation system.
3. Bidder shall consider supply of ethernet switches, LIU, patch cord, networking accessories etc & services up to Gateway. Bidder shall refer substation automation specification.
4. UFLS Relay to have redundant FO port for PRP compliance.
5. The integration of relays with existing station gateway, SCADA, DRCA etc as per Automation specifications shall be in bidder's scope.
6. Bidder shall refer to Section B Standard Technical Specifications for control and relay protection system. Following are the station details wherein UFLS schemes are required.

Sr No.	Receiving station	Protection required	Quantity of panels
1.	Kalyan	TYPE-G	3
2.	Vikhroli	TYPE-G	1

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7. Each protection shall be supplied with 8 nos of high speed, self-reset flag type lockout relay (continuous duty RXMS+RXME or equivalent).
8. Each UFLS IED shall be capable of changing its setting group based on internal frequency detection.
9. The UFLS IED shall have inbuilt auto restoration function and same shall not be derived by using frequency stages or configuration.
10. Requirement of Numerical Relay / Scheme
11. Each relay shall have
 - a. Minimum no of Setting Group: 04 no
 - b. Minimum no of under frequency stages: 05 no.
 - c. Minimum no of over frequency stages: 05 no.
 - d. Minimum No of df/dt stages: 05 no.
 - e. No. of Binary Input / Output: 18 / 18 no
 - f. User configurable function keys for IN/OUT: 05 nos
 - g. Memory based SR flip flop: 10 nos
 - h. Shall support universal power supply.
 - i. Frequency based setting group changeover facility for islanded mode.
 - j. The Relay shall be conformal coated with IEC 61850 Compliance.
12. All feeders of the new upcoming 33kV GIS in the station shall be connected to UFLS lockout contacts.

A4 TERMINAL POINTS

1. Substation automation network establishment up to Station Layer-3 switch Panel for integration with Purchaser's SCADA.
2. Point-point testing with Purchaser's SCADA as per RFP

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A5 EXCLUSIONS

1. Civil works for the project.
2. Earthing of GIS bays.
3. MV cables (termination accessories is in bidder scope).
4. LV control cable outside of GIS panel (Field cables).
5. Dismantling of existing panels.

A6 CODES AND STANDARDS

As per Section B

A7 BIDDER’S QUALIFICATION REQUIREMENTS

Refer Standard specification.

A8 PROJECT SCHEDULE / MILESTONES

Bidder shall submit with the bid, a detailed Project Schedule covering the following based on the milestones tabulated below:

- a. Start of 'Engineering'
- b. Completion of 'Engineering'
- c. Commencement of 'Manufacturing'/Manufacturing process
- d. Commencement of Supply
- e. Commencement of Supervision of erection, testing and commissioning

Milestone	Target
Pre bid meeting	Within 1 week of tender
Bid Submission	Within 2 weeks of tender
Drawing submission	Within 2 week of PO
Inspection of equipment	Within 16 weeks of PO
Delivery of equipment	Within 18 weeks of PO date
Completion of installation	Within 20 weeks of PO date

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A9 SUBMISSIONS BY BIDDERS

Bidder shall submit the following information along with the Technical Bid as per the checklist given at the start.

A10 DETAILED TECHNICAL SPECIFICATIONS

1. For detailed scope of work, bidder to refer Section-B of equipment and system.
2. Any item missing in the Section B but required for successful completion of the project, should be considered in the bidder's scope and Bidder shall submit Data sheet of that equipment's / systems and obtain approval for the same from Owner before proceeding further.

A11 LAYOUT REQUIREMENTS

Bidder must ensure layout of electrical equipment's as per applicable standards and section B. Bidder shall fit all the GIS panels in the designated available space as per specs.

A12 QUALITY REQUIREMENTS

1. Bidder to refer Annexure-11 for General Requirements of Quality Assurance & inspection applicable for the project.
2. Bidder to also refer Annexure-12 and specific FQP & guidelines provided in respective standard specification provided in Section B.

A13 PERFORMANCE REQUIREMENTS

Refer annexure quality requirements from Tata Power.

A14 MAINTAINANCE REQUIREMENTS

As per section B.

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**A15 TOOLS AND TACKLES FOR ERECTION, COMMISSIONING, AND
DISMANTLING**

Bidder shall arrange for all the tools and tackles required to complete the job.

All safety norms like use of PPE, safe tools and equipment's duly tested and approved by the client will have to be adhered to by the executing agency

A16 SPARES

Bidder needs to include competitive price for Mandatory Spare parts against the list specified in standard specs.

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B –STANDARD SPECIFICATIONS

Please refer annexure B.

THE TATA POWER COMPANY LIMITED

STANDARD TECHNICAL SPECIFICATION FOR

MV Switchgear (GIS)

(DOCUMENT NO - ENGG/ ELECT/STD-SPEC/ 14)

(WRENCH DOCUMENT NO – TE00054-00-E-SP-14)



Tata Power

Engineering T&D

Rev. No	Date	Revision History	Prepared By (Name & Sign)	Checked By (Name & Sign)	Approved By (Name & Sign)
R0	5.12.2016	First time issued	PP	DAJ	MVK
R1	29.10.2017	Modified for PQR	DAJ	DAJ	AM
A	14.05.2018	Modified for comments after CE meeting	DAJ	DAJ	AM
B	15.05.2022	DCDR and check list points are incorporated	MRP	SKV	AM
C	15.02.2024	Modified as per latest guidelines	SB / MRP <i>Snehal</i>	VVK VishalK	SKV <i>Shubhash</i> 030524

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2. **Pre-Qualifying Requirements including TTR**
3. **System Description and Scope**
4. **Codes & Standards.**
5. **Design Requirements**
6. **Layout Requirements for the equipment**
7. **Safety Requirements**
8. **Operational Requirements**
9. **Technical Parameters of Equipment including data sheet and make list for bought out items.**
10. **Quality Requirements (including SQP and FQP)**
11. **Inspection, Testing and Performance Requirements along with Warranty**
12. **Mandatory Spares**
13. **Data Submission by Bidder**

Enclosures: -

Annexure – 1: PQR

Annexure – 2: Standard Quality Plan

Annexure – 3: Standard Field Quality Plan

Annexure – 4: Reference reverse blocking scheme

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1.0 INTRODUCTION

This specification has been prepared for Bidder to assist the Owner for supply and commissioning of 33kV GIS system with all its accessories. This document covers the detailed specification for 33kV GIS system.

2.0 PRE-QUALIFYING REQUIREMENTS INCLUDING TTR

2.1 Please refer **Annexure-1** for PQR requirement.

2.2 All equipment / systems offered should have been successfully type tested, as per IEC or equivalent relevant standards, at any of the internationally / nationally accredited laboratories. The type test certificate of the equipment shall not be more than 5 years old as on the scheduled date of bid opening. Time period for type test may be extended by another 5 years as a special case if there is no change in design / material of construction (MOC).

2.3 General Qualifying Requirements

2.3.1 Acceptance of Owner's preferred list of vendor / sub vendor / OEM, which will be shared as part of Technical Specifications. However, if Bidder introduces additional vendor/sub vendor the same will be evaluated separately. This vendor/sub vendor evaluation / assessment shall inter-alia include (i) document verification; (ii) Bidders work / manufacturing facilities visit (iii) manufacturing capacity, details of works executed, works in hand, anticipated in future and the balance capacity available for present scope of works; (iv) details of plant and machinery, manufacturing and testing facilities, manpower and financial resources; (v) details of quality systems in place; (vi) past experience and performance; (vii) customer feedback; (viii) response to complaint.

2.3.2 Bidder must agree for handing over, to Owner, all project related drawings in AutoCAD format only. The pdf versions of above drawings shall be submitted through Wrench for formal approval process.

2.3.3 'As built" drawings to be provided in Autocad.

2.3.4 Acceptance of minimum quality requirements defined in technical specifications.

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3.0 SYSTEM DESCRIPTION AND SCOPE:

The scope covers:

3.1 33kV GIS:

- 3.1.1 Design, engineering, manufacture, testing at the BIDDER's works, route survey, supply, transport to site, unloading, erection, installation, site testing and commissioning of 33 kV GAS INSULATED SWITCHGEAR (Referred as 33 kV GIS) with completely prewired GIS mounted LV panel consisting of Bay Control and Protection Unit (BCPU) relay, auxiliary relays, multifunction meter, network components and associated accessories, as specified herein.
- 3.1.2 Bidder must visit site before submission of bid. Bidder shall submit detailed plan and section drawing of MV GIS in AutoCad format where proposed MV switchgear is planned to be erected and accordingly suggest placement of switchgear to reduce number of dummy panels during tender stage.
- 3.1.3 Bidder shall confirm the fitment of GIS as per Section-A and bill of material within the earmarked space available in the station.
- 3.1.4 Following miscellaneous items supply, installation, termination and commissioning shall be in bidders scope of work (Please refer BOM attached with project specification):

Sr. No.	Description of items	Quantity
a.	MV cable termination kits	Incomer/ Tie isolator/ Tie breaker - Minimum 4 runs per phase For all other feeders - Minimum 2 runs per phase
b.	Dummy plugs	a. Same as size and quantity of cable terminations
c.	Voltage plugs	1 no. of voltage plugs per project per receiving station
d.	Current plugs	2 no. of current plugs per project per receiving station

- 3.1.5 Supply of Mandatory spare as per clause no. 12 is in bidder scope of work.
- 3.1.6 In case bidder is expected to commission these panels in phased manner, any connection exposed to atmosphere on existing MV switchgear shall be safely secured (by means of

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blanking plates etc.). The tools and tackles, material and services required for phased commissioning shall be in bidder scope.

- 3.1.7 BCPU for each 33 kV feeder shall be mounted on respective Local Control panel (switchgear panel) along with multifunction meters.
- 3.1.8 Wherever, interconnection with existing AIS/GIS involved, bidder shall obtain all required services including modification in existing feeders schematics, relay configuration from OEM of existing equipment / relay make for successful integration & commissioning.
- 3.1.9 Preparation of interconnecting cable schedule as per Tata Power format for complete protection and automation systems associated with MV switchgear under supply shall be in bidder's scope.
- 3.1.10 All automation accessories like LIU, network switches, etc. shall be mounted in dummy, if available as per layout requirement. In case absence of dummy panel, bidder shall provide separate panel to mount all automation accessories. Bidder shall refer automation specs and BOM for detailed quantity of automation accessories.
- 3.1.11 Design engineering, manufacture, factory testing and supply of prewired remote control panel (RCP) with Close and open TNC control switches (for breaker) with LED indication lamps for breaker status shall be in bidder's scope. Each bus section shall have one control panel for respective bays including bus section breaker. Control panels are planned to be installed in control room (for breaker control in case of SCADA failure)
- 3.2 The accessories like suitable base frames made out of steel channels, anchor / foundation bolts and other hardware required for mounting of the switchgear panels shall be supplied by bidder. These materials shall be dispatched in advance so that they may be installed and leveled when the flooring is being done, welding of base frame to the insert plates shall be in Bidder's scope. The bidder may offer panels with built in base frame ready for dispatch and suitable for installation on indoor cable trenches.
 - 3.2.1 The bidder must confirm the technical & operational support for 25 years for equipment being procured under this requirement on their letter head.
- 3.3 ENGINEERING DATA AND DRAWINGS
 - 3.3.1 The engineering data shall be furnished by the Contractor in accordance with the Schedule for each set of equipment as specified in the Technical Specifications.
 - 3.3.2 The Documents shall be submitted through Document management system 'WRENCH'. Necessary training on Wrench Software will be provided to Bidders representative by

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consultant. Master Document List (MDL) shall be prepared by contractor and submitted for Owner’s approval.

- 3.3.3 The drawings will be approved in four categories as follows:
 Code I: Approved
 Code II: Approved subject to incorporation of comments as marked. Resubmit for formal approval
 Code III: Not Approved. Incorporate comments as marked. Resubmit for review / approval.
 Code IVa: Retain for Information.
 Code IVb: Resubmit after incorporation of comments.
- 3.3.4 It is responsibility of the Bidder to handover all project related drawings in Auto Cad formats only. The pdf version of above drawings / documents shall be routed through Wrench for formal approval process.
- 3.3.5 The Bidder shall submit 6 (six) sets of code I & code IVa approved drawings / design documents / data / test reports to the Owner.

3.4 PACKAGING AND PROTECTION

All the equipment’s shall be suitably protected, coated, covered, wooden boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the Owner, the Contractor shall also submit packing details/associated drawing for any equipment/material under his scope of supply, to facilitate the Owner to repack any equipment/material later, in case the need arises.

All equipment, system and services covered under this specification shall comply with all current applicable statutory regulations and safety codes in the locality where the equipment is proposed to be installed. The equipment and systems shall also conform to the latest version of applicable codes and standards on the date of offer made by the Bidder unless otherwise indicated. Nothing in this specification shall be construed to relieve the Bidder of this responsibility

It is not the intent to specify completely herein, all details of design and construction of the equipment. However, the equipment shall conform in all respects to high standards of engineering design and workmanship and be capable of performing in continuous commercial operation up to the BIDDER's guarantees in a manner acceptable to the Owner, who will interpret the meaning of drawings and specifications and shall be

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entitled to reject any work / material which in his judgement is not in full accordance therewith.

It is the responsibility of the bidder to provide all necessary hardware, software and necessary resources to commission the system as required by Owner and to their satisfaction.

4.0 CODES AND STANDARDS

All the equipment & design should adhere to the latest revisions of related IS/IEC standards. Refer the below mentioned list of standards for

Standards and Regulations		
CBIP substation manual		
CEA Technical Standards for Construction of Electrical Plants and Electric Lines Regulations and subsequent clarification for definition of GIS		
CEA Safety Regulations		
Equipment Standards		
1	IEC 62271-1, IEC 62271-200, IEC: 60694, IEC: 60898, IEC: 68871-800, IEC :60589, IS: 3487, IS: 18789, IS: 18063, IS: 13947, IS:9046	Switchgear and control gear
2	IEC 62271-100, IS 13118, IS 8516	Circuit Breaker
3	IEC 62271-102	Isolators and earthing switches
4	IEC:60044-1, IEC:61869-1, IEC:61869-2	Current Transformers
5	IS:3156, IEC:60186, IEC: 61869-3	Voltage Transformer
6	IS:1848	Indicating Instruments
7	IS: 13010	Energy Meters

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8	IS 8686, IS 3831, IS 3848, IEC60255	Relays
9	IS 6875	Control switches and push buttons
10	IS 9385	HV Fuses
11	IS 375	Arrangement of switchgear bus bars, main connections and auxiliary wiring
12	IS 6005	Code of practice for phosphating iron & steel
13	IS 5	Colors for ready mixed paints
14	IS 3078	Code of practice for installation and maintenance of switchgear
15	IS 2099	Support insulators
16	IS 3070 part-3, IEC 60099-4 part-4	Surge arresters
17	IEC 61243-5, IEC 62271-213, IEC 62271-215	Capacitor voltage indicator
18	IEC: 62271-4, IEC: 60376, IEC: 60480	Specification, Use and handling of SF6

5.0 DESIGN REQUIREMENTS

- 5.1 The switchgear and control gears shall have the short time current rating of 31.5kA for 3 sec unless otherwise specified in Section-A.
- 5.2 All equipment and components of the switchgear including bus support insulators shall be free of partial discharges when operated at rated voltage.
- 5.3 The switchgear assembly shall be of single bus bar type and suitable for extension at both ends without cutting and drilling. Welding is also prohibited for field assembly of the cubicles. It shall be possible to dismantle and remove any middle panel from the switchgear line-up without dismantling/removing the adjacent switchgear panel.
- 5.4 Each switchgear feeder panel shall consist of bus bar, disconnecter, earthing switch, circuit breaker, current transformer, voltage transformer, cable compartment, and low voltage

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compartment with control devices, bay control protection devices as per the protection requirement, multi-function meter and gas monitoring system.

- 5.5 Each of the gas compartments shall have a separate gas filling non return valve, gas density monitoring by means of a temperature-compensated pressure sensor, and its own pressure relief system.
- 5.6 The power cables shall be connected from the bottom of the panel. Provision shall be provided for cable testing and current and voltage injection.
- 5.7 The gas insulated switchgear and accessories shall be designed for maximum reliability and availability.
- 5.8 The BIDDER shall ensure and specifically confirm that failure of any one component in a circuit and the subsequent repair/testing shall not require shut down/outage of any other circuit of the GIS.
- 5.9 The design ambient temperature considered for continuous rating of the equipment shall be 50°C.
- 5.9.1.1 Switchgear panel and bus bar shall be with fan less design i.e. natural cooling and not forced cooling for the ratings mentioned in the specifications.
- 5.10 All bays viz. incomer, transformer DT bay, capacitor bank, station transformer, outgoing feeder, reactor feeder shall be interchangeable with each other for any of the application throughout the life of the switchgear without any modification / change in HV circuit of switchgear.

6.0 LAYOUT REQUIREMENTS FOR THE EQUIPMENT / SYSTEM

- 6.1 It is intended that the GIS shall be located indoors.
- 6.2 It is responsibility of 33kV GIS bidder to accommodate required GIS bays in the available space with all mandatory clearances as per electrical installations applicable rules/standards.
- 6.3 Bidder must visit site and obtain all inputs required for preparation of GIS plan and section drawings as per site space availability.
- 6.4 Bidder must submit general arrangement diagram for 33kV GIS, super imposed on present available space & confirm that bidder’s 33kV GIS will be accommodated in the available space along with bid document.
- 6.5 The GIS will be mounted on concrete foundations prepared by the Owner. Bidder shall indicate tolerance requirement of the foundation.

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- 6.6 Bidder shall indicate recommended clearance from the top of panel to the ceiling and also material handling facility. The BIDDER shall specifically review the area indicated and confirm suitability of the equipment offered to fit into the space shown including area required for future extensions. Deviations, if any, shall be highlighted in the bid with technical reasons.
- 6.7 The BIDDER shall also indicate dimensions and weight of the largest package shipping and preferred handling arrangements for the equipment offered and the provisions to be made.

7.0 SAFETY REQUIREMENT:

- 7.1 Bidder shall consider the best possible design and accessories in the switchgear which improves safety aspects during switchgear operation & maintenance.
- 7.2 Bidder to provide all required accessories for safe operation and maintenance of GIS.
- 7.3 Each element shall be in independent modules (Independent compartment) and safe to touch and fully ensure operational security and personnel safety under all normal and fault conditions.
- 7.4 Movable ladder shall be provided to facilitate climbing for O&M activities.
- 7.5 Mimic diagram shall be provided on the front panel of the switchgear
- 7.6 Lockout tagout and padlock arrangement shall be provided for each component of switchgear. It shall block mechanical as well as electrical operation of equipment.

8.0 OPERATIONAL REQUIRMENT

8.1 OPERATIONAL REQUIRMENT

OWNER"s Standard Practices require that Station Operator on routine inspection shall check pressure gauges, breaker and disconnect switch position, etc; from permanently installed platforms without opening doors, covers, etc. Also, when a breaker is made available for maintenance, the Station Operator is required to disable controls from the breaker, carry out the earthing operation, tag the isolating switches and valves, and otherwise guarantee safe conditions. The Operator must do this without the use of fuse-pullers, screw-drivers, portable ladders or any other tools. The platforms/ ladders and associated support structures, if any, for facilitating the operator to carry out the above, shall be in BIDDER's scope of supply. Access to the isolating switches and in particular hand

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operated maintenance earthing switches should be easily available. All mechanisms shall be such that the manual operation can be carried out by maintenance personnel without undue inconvenience. The manual earth switches shall be suitable for convenient and comfortable operation.

8.2 MAINTENANCE TOOLS

BIDDER shall give details of various tools, with price, required for maintenance, viz. SF6 handling station, temperature compensated pressure switch testing device, wrenches with compression head (1000 & 630 mm) including pull-off die for cables, and moisture measuring device, pressure gauges, SF6 gas leak detectors, antistatic gun (to remove charge from the insulators), instrument for checking calibration, SF6 gas density switch, instrument for repairing and recalibrating defective SF6 gas density switch, instrument for testing and fault detection of the cards (for protection & interlocking), etc; to meet the specific maintenance and operational requirement of the GIS.

The bidder shall supply complete Operation and Maintenance Manual of the Switchgear along with periodicity of checks & tests required.

8.2.1 The successful BIDDER shall furnish detailed erection, commissioning, and operating and maintenance manuals, in six bound volumes to enable OWNER to carry out erection, commissioning, operation and maintenance. BIDDER shall also furnish two soft copies of the manual in M.S. word / Excel format. The drawings shall be in AUTOCAD format.

8.3 MAINTENANCE REQUIRMENT

8.3.1 OWNER's preventive maintenance practice includes systematic inspection, overhaul and testing. It must be possible to remove and test a single circuit element without removing another element. The design shall be such that a platform/structure for cable support cum termination and disconnection to be made available.

8.3.2 Provision shall be made for test points at various locations to facilitate site testing. The earthing switches should be insulated to permit easy checking of the operating times of circuit breakers and also measurement of contact resistances. BIDDER shall give details of facility provided for easy testing of various equipment/circuit elements.

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8.3.3 The BIDDER shall ensure that the gas cylinders and enclosures meet the requirement of Indian Statutory Authorities. The gas cylinders shall be of seamless type and shall conform to BS 5045 Part I. Welded cylinders shall not be acceptable. The valves fitted to the cylinders shall conform to IS 3224/BS341 part I. The cylinders shall be inspected and certified by ISI approved inspection agencies, either Bureau VERITAS or Lloyds. All desired test reports and design data shall be furnished for approval of Statutory Authorities in India at least three months prior to FOB despatch of the gas cylinders.

8.3.4 The BIDDER shall submit detailed gas section diagram with the bid. The switchgear shall have separate and independent gas compartments for the following components. (i) Bus bar, isolator and earth switch chambers (ii) Circuit breaker and line side isolator chambers, (iii) Cable connection chamber (iv) Bus voltage Transformer.

9.0 TECHNICAL PARAMETERS

9.1 SWITCHGEAR ASSEMBLY

The switchgear assembly shall essentially consist of following items:

- a. Circuit breakers
- b. Disconnect Switches (Isolators) and earth switches, Voltage transformers, Current transformers and Surge Arresters.
- c. Cable housing for termination of Power cables along with termination arrangement and provision for connecting back to back cables.
- d. Isolated or 3-phase main bus enclosures and accessories.
- e. Local control cubicle.
- f. Dummy panels as per layout requirement.

The LV compartments/control cabinets shall have IP4X degree of ingress protection for Indoor installation. All control equipment/component or system provided in the GIS bay shall be without any DC-to-DC converter. All control equipment/component or system shall be suitable to operate on available station DC control voltage.

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9.2 **APPROVED VENDOR LIST:**

Following manufacturers are approved by Owner for supply and installation of components of 33kV GIS along with protection, substation automation and communication equipment. Bidder to supply as per preferred vendor list mentioned in table below. Items supplied of different make other than specified above, is not encouraged however if bidder wishes to offer some other make, shall require prior approval from Owner during bidding stage as per the Bidders Qualifying requirements as given below.

Bidder shall adhere to the following preferred vendor list.

S N	Equipment	Make
1.	Numerical Relays / BCPU/IED	Siemens (7SJ6x / 7UT6x Sip-4 series) / ABB (REF620 / RET620 series)/Schneider Electric P5 Series
2.	CT	Pragati Electricals/ECS/NPT/Ritz
3.	VT	Pragati Electricals / ECS/Ritz
4.	Bushings	ECS / CGL/ ABB
5.	Aux Relays	ABB Combiflex type
6.	Lamps / LED	Siemens / ABB / TECHNIK
7.	Selector switches	Switron / Kaycee
8.	MCB	Siemens / L&T / ABB/ Schneider Electric
9.	HV cable plugs and termination	Pfisterer / NKT / Euromold
10.	Space Heater	APT / Girish
11.	MFM	SATEC - PM130EH+
12.	Annunciator	MINILEC / ALAN PROTON
13.	CVD (Cap Voltage Indicator)	George Jordan / ECS / Kries/ Cavin
14.	Surge arrestor	Pfisterer / Euromould/ ABB
15.	Disconnecting links	Elmex KLTD4 (1.1kV, 40A rated)
16.	Control Wiring	Ravin Cables/ Gemscab Industries Finolex /Polycab

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9.3 CIRCUIT BREAKERS

- 9.3.1 The circuit breakers shall be isolated phase, metal clad type for independent pole operation and shall have two trip coils of same characteristics. Both the trip coil shall be supervised and annunciated for failure. They shall be electrically and mechanically trip free and shall have anti-pumping circuit. A manual emergency trip facility is required to be provided. Contactors shall not be used in trip circuit.
- 9.3.2 The circuit breaker shall normally be suitable for remote electrical operation at station DC voltage.
- 9.3.3 Breaker poles shall be mechanically gang operated with all three poles closing and opening together.
- 9.3.4 The name plate shall display the actual site rating of the equipment.
- 9.3.5 The minimum SF6 pressure at which bus/breaker compartment must be de-energized shall be clearly mentioned.
- 9.3.6 **Circuit Breaker Performances**
- 9.3.6.1 Duty Cycle: Open-0.3 seconds-Close-Open-3.0 minutes-Close-Open.
- 9.3.6.2 Interrupting Time: The maximum interrupting time at the minimum operating pressure of the mechanism shall be 3.0 cycles (60ms).
- 9.3.6.3 Switching Surges: All the circuit breakers shall be re- strike free during switching of overhead lines or cables. All the breakers shall be capable of switching transformers, shunt reactors and shunt capacitor banks without exceeding specified over-voltages.
- 9.3.6.4 Voltage withstand Vs. Time Graph
 The BIDDER is required to provide a Voltage withstand vs. Time Graph in the range of 0.5 to 1000 micro sec. which shows the guaranteed insulation performance for the equipment offered. If capacitance is added to line or circuit side of breaker, these values of capacitance should be included in the studies.
- 9.3.6.5 In case of vacuum circuit breakers, vacuum monitor device shall be supplied to aid maintenance personnel to estimate whether vacuum levels are within acceptable/ permissible limits. This device can be portable and shall be designed to permit easy connection/ disconnection with any breaker without in any manner influencing the integrity of sealing of the vacuum interrupter.
- 9.3.6.6 It shall be possible to quickly isolate mechanically the interrupter unit of a vacuum circuit breaker from the breaker operating mechanism for checking loss of vacuum inside the interrupter.

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- 9.3.6.7 Capacitor breakers shall be suitable for the following operating conditions Voltage Rating
- a. The breaker shall operate satisfactorily at 22kV and 33 kV continuously for controlling and switching 25 MVAR back to back connected capacitor banks.
 - b. Interrupting Rating: The circuit breaker shall interrupt short circuit currents (not exceeding 40 kA at 33kV) occurring on the capacitor side.
 - c. Momentary Current Rating: The circuit breaker shall have sufficient momentary current rating to adequately withstand both system short circuit current for faults at its terminals and inrush currents associated with energizing the capacitor bank.
 - d. Frequency of Operation: The mechanical and electrical design of the breaker shall be such that the breaker will withstand repetitive switching operations.
 - e. Direct circuit breaker controlling capacitor shall be provided without addition of other breaker / RC circuit etc in primary circuit. Type test report in these regards and confirmation from OEM is required for this application.
- 9.3.6.8 If Reactor breaker is envisaged as per specifications and bill of material, then the breaker controlling reactor shall have suitability for switching (ON & OFF) of 22kV and 33kV, 30 MVAR rated reactor. Direct circuit breaker controlling reactor shall be provided without addition of other breaker / RC circuit etc in primary circuit. Type test report in these regards and confirmation from OEM is required for this application.
- 9.3.7 Operating Mechanism
- 9.3.7.1 Circuit breakers shall be power operated by a motor charged spring operating mechanism. Main poles of the breaker shall be such that the design shall ensure a close pole spread with a maximum of 4 ms opening and 6 ms closing.
- 9.3.7.2 Spring charging limit switch brackets shall be highly secured and shall be of good quality material to prevent breakage. Strong and sturdy, high grade material to be used for spring charged limit switch bracket.
- 9.3.7.3 Circuit breakers shall feature high repeatability of absolute closing time over a wide range of parameters (ambient temperature, control voltages, etc.).
- 9.3.7.4 Main poles shall operate simultaneously. There shall be no objectionable rebound and the mechanism shall not require any critical adjustment. It shall be strong, rigid, positive and fast in operation.
- 9.3.7.5 Bidder to note that the trip coil mechanism shall not include any electronic component. Moreover, trip circuit supervision shall be available for the both trip coils.
- 9.3.7.6 Lock out relay should operate both Trip Coils of Circuit breaker.

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- 9.3.7.7 A mechanical indicator shall be provided to indicate open and closed positions at a location from where it will be visible to a man standing on the ground. An operation counter shall also be provided.
- 9.3.7.8 Closing coil shall operate correctly at all values of control voltage between 85% and 110% of the rated voltage. A trip shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and at all values of control supply voltage between 70% and 110% of rated voltage.
- 9.3.7.9 Working parts of the mechanism shall be of corrosion resisting material. Bearings which require grease shall be equipped with pressure type grease fittings. Bearing pin, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or changing of adjustment with repeated operation of the breaker.
- 9.3.7.10 Provision shall be made for attaching an operation analyzer to perform speed & Travel tests after installation of the breakers at site.
- 9.3.7.11 Spring Operated Mechanism
- a. Motor shall directly operate on station DC voltage.
 - b. Spring operated mechanism shall be complete with motor, opening spring, closing spring with limit switch for automatic charging and all necessary accessories to make the mechanism a complete operating unit.
 - c. If power is available to the motor, a continuous sequence of closing and opening operations shall be possible.
 - d. After failure of power supply to the motor, at least two close-open (C- O) operations of the circuit breaker shall be possible.
 - e. Breaker operation shall be independent of the motor which shall be used solely for spring charging
 - f. Motor rating shall be such that it shall require maximum 20 seconds for fully charging the closing spring.
 - g. Closing action of the circuit breaker shall compress the opening spring ready for tripping.
 - h. When closing springs are discharged after closing a breaker, closing springs shall automatically be charged for the next operation.
- 9.3.7.12 Operating Mechanism Control
- a. Operating mechanism shall normally be operated by remote electrical control. Electrical tripping shall be performed by trip coils. Provision shall be made for local electrical control.

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- b. A conveniently located manual tripping lever or break glass type push button shall also be provided for local tripping of the breaker and simultaneously opening the reclosing circuit. A local manual closing device shall also be provided for maintenance purpose. Direction of motion of handle shall be clearly and indelibly marked.

9.3.8 Contacts

- 9.3.8.1 Main contacts shall have ample area and contact pressure for carrying the rated current and the short time rated current of the breaker without excessive temperature rise which may cause pitting or welding. Contacts shall be easily replaceable and shall have a minimum of movable parts and adjustments to accomplish these results. Main contacts shall be the first to open and the last to close so that there will be little contact burning and wear.
- 9.3.8.2 Arcing contacts, if provided, shall be the first to close and the last to open and shall be easily accessible for inspection and replacement. Tips of arcing and main contacts shall be silver faced or have tungsten alloy tipping.
- 9.3.8.3 Minimum nos. of auxiliary status contacts for Circuit breaker, Disconnecter and Earth switch shall be equal to contacts used in scheme requirement + 2 NO & 2 NC spares for each status

9.4 Disconnect Switches and Earth Switches

- 9.4.1 The Isolators, earth switches and maintenance earth switches, as applicable, shall be complete with all parts that are necessary or essential for efficient and safe operation. Such parts shall be deemed to be within the scope of supply, whether specifically mentioned or not.
- 9.4.2 All similar parts shall be interchangeable.
- 9.4.3 The design shall be such that no lubrication of any part is required except at very infrequent intervals.
- 9.4.4 The isolator and earthing switch shall be provided with high current carrying contacts on the hinge and jaw ends and all contact surfaces shall be of silver faced copper.
- 9.4.5 Arrangement shall be provided to enable mechanical manual and remote electrical motorized operation of Isolators and earth switches. Whenever the emergency manual handle is inserted into the drive mechanism, it shall not be possible to control the device electrically.
- 9.4.6 Earthing switch shall be designed in a manner to prevent transmitting of impact to earth switch bushing during closing operation of the earth switch.
- 9.4.7 The earth switches shall have fault current rating same as switchgear short circuit rating.

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9.4.8 Operating Mechanism and Controls

- 9.4.8.1 Isolators shall be motor operated and controlled from the local control panel and from a remote point. Connections, interlocking requirements and auxiliary switches shall be in accordance with the OWNER's requirements.
- 9.4.8.2 The operating mechanism shall provide a quick, simple and effective operation. One man shall be able to operate the isolator/earthing switch (when manually operated) without undue effort.
- 9.4.8.3 The isolator shall be provide with positive continuous control throughout the entire cycle of operation. The operating pipes and rods shall be sufficiently rigid to maintain positive control under most adverse conditions and when operated in tension or compression for isolator closing. They shall also be capable of withstanding all torsion and bending stresses due to operation of the isolator
- 9.4.8.4 In addition to the limit switch contacts required for control of power operated isolators, sufficient number of auxiliary contacts shall be provided. These switch contacts shall be positive acting type and shall be directly driven from the isolator shaft through minimum linkages. The auxiliary contacts shall be of silver faced copper. When make before break contacts are specified, they shall be wiping type. All auxiliary contacts shall be able to make or break suitable current based scheme requirement without failure.
- 9.4.8.5 The control shall be arranged such that the desired operation shall be completed when corresponding push button is pressed even momentarily. The control circuit shall be so designed that necessary interlocks with associated breakers and earthing switch shall be incorporated in it.
- 9.4.8.6 Arrangement shall be provided to permit mechanical manual and electrical remote operation of isolators. The arrangements shall be such that when manual operating handle is in the engaged position, the power operation shall be made inoperative.
- 9.4.8.7 Disconnecter and earthing switch mechanisms shall be able to store energy to always assure completed operations.
- 9.4.8.8 If the power supply to Isolator/earthing switch is initially off and open/close command is given to isolator/earth switch which cannot be carried out due to non-availability of power at that moment, the operation of Isolator/Earth switch shall not take place when power supply is restored subsequently.
- #### 9.4.9 Short Circuit Requirements
- 9.4.9.1 All MV components of switchgear (breaker, isolator, earth switch, CT, PT, cable terminations etc.) shall withstand rated switchgear short circuit rating.
- 9.4.9.2 The rated peak short-circuit current or the rated short time current carried by an isolator or earthing switch for the rated maximum duration of short circuit shall not cause:

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- a. Mechanical damage to any part of the isolator or earthing switch.
- b. Separation of the contacts or contact welding.
- c. A temperature rise likely to damage insulation.

- 9.4.9.3 After the passage of these currents, the isolator shall be able to carry its rated current under specified conditions and the operation of the operating device shall not be impaired.
- 9.4.9.4 If earthing switch is combined with an isolator as a single unit, the rated peak short circuit current and the rated short time current of the earthing switch shall be equal to switchgear short circuit rating.
- 9.4.9.5 Tie isolator shall withstand cable charging and discharging current. Bidder to consider approximate 100mtr running length of MV tie cable.

9.5 Cable Live Indicators shall have following features

- 9.5.1 Voltage present indication shall be self-powered and independent of aux-supply.
- 9.5.2 It shall be rated for direct station auxiliary voltage without any power converter.
- 9.5.3 There shall be provision for measurement of secondary voltages, which shall be used for phasing in measurements.
- 9.5.4 Secondary voltages shall be minimum of 10V wrt to gnd at service voltage of GIS.
- 9.5.5 It shall have 2 no. relay changeover output contacts for remote indication & interlocking.
- 9.5.6 At least panels of one location should have equal capacitance value.
- 9.5.7 TEST mode to check the healthiness of indications & contacts.
- 9.5.8 Indicator shall follow the matrix

Condition	AUX SUPPLY PRESENT	HT SUPPLY PRESENT	RELAY 1	RELAY 2	FINAL OUTPUT
1	NO	NO	NO	NO	NO
2	YES	NO	NC	NC	NC
3	YES	YES	NC	NO	NO
4	NO	YES	NO	NO	NO

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9.6 **Current Transformer :**

- 9.6.1 All CT cores in this specification shall be of low reactance type except metering core.
- 9.6.2 No turn compensation shall be used in case of 'Class PS' CTs.
- 9.6.3 Turns compensation, if any, should be clearly brought out in the offer in guaranteed particulars.
- 9.6.4 In case of multi ratio CTs, the minimum specified requirements in respect of VA, accuracy and knee point voltage (KPV) and maximum secondary resistance specified shall be met at all taps.
- 9.6.5 The formula used to calculated knee point voltages for PS class CTs shall be as per IEEMA guidelines,

$$V_k = 2 * I_f(R_{CT} + 2R_L)$$
- 9.6.6 Magnetizing characteristics (extending well beyond KPV) and secondary impedance values shall be furnished in guaranteed particulars for all protection cores.
- 9.6.7 In case CTs are housed in SF6 compartment, CT primary polarity & Sr no shall be marked on the enclosure.
- 9.6.8 CT detailed specifications,

Core	Trafo Incomer	Tie /Bus sectionalizer
Core-1	Special Protection 3000-2000/1A, PS class $V_k > 500V, I_{ex} < 30mA @ V_k/2,$ $R_{CT} < 10\Omega$	Special Protection 3000-2000/1A, PS class $V_k > 500V, I_{ex} < 30mA @ V_k/2,$ $R_{CT} < 10\Omega$
Core-2	Special Protection 3000-2000/1A, PS class $V_k > 500V, I_{ex} < 30mA @ V_k/2,$ $R_{CT} < 10\Omega$	Metering 3000-2000/1A, 20 VA 0.2S class, ISF < 5
Core-3	Protection 3000-2000/1A, 5P20, 10VA	Special Protection 3000-2000/1A, PS class $V_k > 500V, I_{ex} < 30mA @ V_k/2,$ $R_{CT} < 10\Omega$
Core-4	Metering 3000-2000/1A, 20 VA 0.2S class, ISF < 5	

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Core	OG / Cap bank/ Reactor/ ST	Distribution Transformer
Core-1	Protection 400-800-1200/1A, 10 VA on 400A, 5P20 class	Special Protection 400-800-1200/1A, $V_k > 600V, I_{ex} < 30mA @ V_k/2,$
Core-2	Metering 400-800-1200/1A, 10VA 0.2S class, ISF < 5	Metering 400-800-1200/1A, 10VA 0.2S class, ISF < 5

9.7 Voltage Transformers

- 9.7.1 Voltage transformers shall be of the metal enclosed, gas-insulated inductive type, mounted directly on the high voltage enclosure with plug in contacts that allow easy removal.
- 9.7.2 Three-way isolator shall be provided for Bus PT with status supervision. BUS PT switch status to be configure in BI's.
- 9.7.3 The secondary terminal box for the voltage transformers shall also include necessary MCB for protecting the secondary circuit
- 9.7.4 Minimum accuracy, burden and transient response characteristics shall be in accordance with the Data Sheet of this specification.
- 9.7.5 Secondary terminals must be located in accessible grounded terminal boxes on the PT enclosure itself. The secondary connections must be wired to the terminal strip in the respective bay marshalling cubicle.
- 9.7.6 BIDDER shall provide the VT selection scheme for outgoing feeders i.e. Potential supply to protection system shall be switched to bus VT depending on position of bus side disconnect switch (power supply to the feeder and VT potential supply for protection shall be from the same bus.) PT changeover shall be provided for both metering and protection core.
- 9.7.7 PT Secondary Protection, MCB with monitoring contact shall be located immediately after secondary terminals.
- 9.7.8 Set reset type Bi-stable relay (RXMVB4) to be used for PT changeover instead of contactor. Backlit push button shall be provided for local and manual changeover with facility to changeover from remote SCADA.
- 9.7.9 Voltage and current transformers shall be provided with the following accessories:
 - a. MCB shall be provided for PT secondary with supervision.
 - b. Two earthing terminals for connecting the earthing conductors specified. Additional 6 sq.mm green earthing wire to be wired from PT primary "N" terminal.

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- c. Direct earthing of earthed PTs primary neutral to Earth bus individually without looping.
- d. Separate MFM shall be provided for each Bus PT additional to MFM for OG feeder.
- e. Rating and diagram plates shall be provided as per IEC standards.
- f. Voltage and current transformers shall be given tropicalized treatment for satisfactory operation in hot and humid climate.
- g. Direct Earthing of earthed PTs Primary Neutral to earth bus individually without looping.

9.7.10 Terminal and polarity marks shall be indelibly marked on each VT & CT on the associated terminals and these marks shall be in accordance with relevant standards.

9.7.11 The neutral of the primary winding intended to be earthed shall be brought out through a bushing and earthing connection shall be made outside.

9.7.12 PT detailed specifications,

Core	33kV	22kV
Core - 1	Metering $33\text{ kV}/\sqrt{3} / 110\text{ V}/\sqrt{3}$ 30 VA, 0.2 class	Metering $22\text{ kV}/\sqrt{3} / 110\text{ V}/\sqrt{3}$ 30 VA, 0.2 class
Core - 2	Protection $33\text{ kV}/\sqrt{3} / 110\text{ V}/\sqrt{3}$ 20 VA, 3P class	Protection $22\text{ kV}/\sqrt{3} / 110\text{ V}/\sqrt{3}$ 20 VA, 3P class

9.8 **Other CT and PT Requirements:**

9.8.1 Readily accessible name plate(s) shall be provided for each CT and PT showing ratings, terminal markings and low remanence designation.

9.8.2 The position of each primary terminal in the current transformer shall be clearly marked by two plates permanently fixed to the metal cladding at each end of the current transformer section.

9.8.3 In addition to the information requested, short time rating factors for 5, 15, 30 and 60 minutes shall also be provided.

9.8.4 CT and PT must have secondary terminals outside the high voltage enclosure, mounted in suitable accessible terminal boxes. All secondary leads of all CTs and PT must be wired to shorting type terminals on the terminal strip in the local control panel of each breaker bay.

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- 9.8.5 In case CTs are housed in SF6 compartment, CT primary polarity & Sr no shall be marked on the enclosure.
- 9.8.6 CT/PT secondary terminals shall be housed in a protective cover and the entire length of secondary wires (bunch) from terminals to the LV cubicle shall be protected/screened.
- 9.8.7 CT/PT immediate secondary terminals shall not have any provision for earthing at the terminal box itself via screws etc. CT/PT secondary shall be grounded only in the LV cubicle.
- 9.8.8 Open delta winding with shunt resistor shall be provided in PTs to avoid Ferro-resonance.
- 9.8.9 Terminals blocks rating shall be 1100V & 41A.
- 9.8.10 Only ring type lugs shall be used for CT circuit termination

9.9 Numerical Bay Control Protection Units (BCPU) relay

- 9.9.1 Bay Control Protection Units shall be micro-processor based and have Protection, monitoring, metering and control functions in the same unit. BCPU shall be mounted in LV compartment above 33kV GIS.
- 9.9.2 BCPU shall have inbuilt large display showing SLD and status of the bay. The control interlocking functions shall be readily available in BCPU and shall not be derived by making logics.
- 9.9.3 All numerical relays shall have conformal coating and shall be suitable to operate in non-air conditioned atmosphere throughout the life of BCPU.
- 9.9.4 Bay control and protection units are to be considered with 2 no's of fiber optic port at the rear end for SAS networking and RS485 port at rear end for future use. 1 No. Serial USB or 1 No. RJ45 Ethernet port shall be provided for local configuration of the IED.
- 9.9.5 BCPU shall support IEC61850 goose messaging and shall be suitable for configuring goose based reverse interlocking scheme and auto restoration scheme as per Tata Power requirement. BCPU shall have sufficient number of logic gates, memory based flip flops, timers etc for configuring various goose based schemes.
- 9.9.6 Self-reset high speed tripping relays (RXMS1+RXME18) to be provided for tripping of the breakers.
- 9.9.7 DC Supply supervision relays for each DC circuit branch to be provided. This relay shall be connected at the end of DC circuit loop.
- 9.9.8 Following minimum protections shall be provided for each feeder:
- a. Outgoing – BCPU with OC EF + LBBU
Auxiliary relay - Self reset RXMS1 trip relay
 - b. Station transformer (Up to 2.5MVA) - BCPU with OC EF + LBBU

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- Auxiliary relay - 5 nos RXMH2 with flag trip relays for mechanical trip viz. Buchholz trip, WTI/OTI trip, PRD trip, Spare trip + Fast acting hand reset bistable trip relay RXMVB2
- c. Distribution transformer (Above 2.5MVA) – Protection IED-1: BCPU with HV side OC + EF + HV LBBU
 Protection IED-2: Transformer biased differential + REF + OC EF + LBBU
 Auxiliary relay - 5 nos RXMH2 with flag trip relays for mechanical trip viz. Buchholz trip, WTI/OTI trip, PRD trip, Spare trip + Fast acting hand reset bistable trip relay RXMVB2
- d. Capacitor bank – BCPU with Directional OC EF + Under voltage + Over voltage + Neutral Unbalance + Neutral displacement + LBBU
 Auxiliary relay - Fast acting hand reset bistable trip relay RXMVB2
- e. Each of Buscoupler, Tie breaker, Tie isolator, Incomer – BCPU with Directional OC EF + LBBU
 Auxiliary relay - Self reset RXMS1 trip relay

Note - Tie Isolator panel shall also have separate BCPU. It shall be wired from the CT of associated Tie-Breaker for incorporating reverse blocking scheme. BCPU shall have control features for tie isolator.

All BCPUs shall have inbuilt trip coil supervision function and breaker I2t monitoring.

9.9.9 Design Standards:

The BCPUs 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.

9.9.10 Binary inputs / outputs: Typical Input/Outputs requirement

	(DI) Digital Input	(DO) Digital Output	Function Key
BCPU	32	16	5

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- 9.9.11 BCPU shall offer Binary input processing (Single point, double points, multiple points, system input and logic input), all acquired and time stamped at 1 msec accuracy.
- 9.9.12 The characteristic of the contact outputs per signal / command shall be adjustable via software: Latched/ Non latched /Time delayed reset
- 9.9.13 The Digital Output contacts of BCPUs and IEDs shall be rated to drive the Close / Open coils of Circuit Breakers / Isolators / Earth Switches. Output contacts rated for tripping duty as per IEEE C37.90 standards In addition to the digital output contact, bidder shall provide droppable type of terminal blocks for output contacts.
- 9.9.14 SATEC make PM130 EH+ Multifunction meters shall be provided on respective switchgear panels for each 33 KV bays. For bus VT, separate MFM per bus VT shall be considered. These MFMs shall communicate directly to proposed gateway on MODBUS (RTU) protocol.
- 9.9.15 Specific Requirement of BCPU and IED (numerical O/C & E/F relay)

Sl. No.	Description	Specification
1.0	System Frequency	50 Hz
2.0	Rated current	5A / 1A (User selectable at site)
3.0	Auxiliary Voltage	220/110 V DC (Universal AC / DC suitable)
4.0	Timing Accuracy	1 ms or better
5.0	Sampling Rate	Relay shall have DR with selectable sampling frequency in kHz.
6.0	Disturbance records & Sequential Events & Recorder memory	DR – Minimum 10 nos with FIFO SER - Latest 1000 entries shall be stored
7.0	Environment	Shall be conformal coated and suitable for continuous operation over a temperature range of -20°C to +65°C in accordance with IEC 60255-6.
8.0	Ingress Protection	IP 54
10.0	Additional separate protection for Capacitor Bank bay	Neutral unbalance relay and Neutral Displacement protection
11.0	Software tools	A user-friendly engineering and disturbance handling Tool shall be available.

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		Configuration of all input and output logical signals and binary inputs, Analog Inputs and relay outputs for all built-in functions and signals shall be possible both locally and remotely.
		It shall be possible for remote parameterisation.
		It shall be possible to access the BCPUs remotely from the Centralized Monitoring system for configuration & maintenance activity. The bay control shall have multilevel passwords to safeguard bay control, logic, and automation settings.
		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 (Configuration tool – Laptop).
12.0	Spare relay	One number spare relay of each model number / order code / MLFB number shall be supplied as spare. One number spare aux relay of each model number / order code / article number shall be supplied as spare
13.0	Protection Schemes using IEC61850 with GOOSE messaging	Bus bar protection to be implemented by reverse interlocking scheme using GOOSE messaging through BCPUs.
		Bus bar protection for “SF6 low pressure” shall be provided.
15.0	Communication (BCPU)	Front: 1 No. Ethernet / USB for BCPU Configuration Rear: a) 2 nos. Fibre optic ports for SCADA communication b) 1 No. RS 485
16.0	Cybersecurity compliant IEDs	All IEDs being supplied shall conform to latest cybersecurity standards as per IEC. The IEDs shall also conform to the latest CEA guidelines for Cybersecurity in power sector.

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9.10 **Surge Arresters:**

- 9.10.1 The specifications and characteristics of the surge arresters shall be in accordance with the system grounding in which the 33kV GIS system is being installed.
- 9.10.2 Surge arresters are used for the protection to metal-enclosed switchgears and transformers equipped with plug-in type bushings accessories.
- 9.10.3 Surge Arrester shall be with following features:
 - pluggable
 - Metal-enclosed
 - Fully-insulated
 - touchproof
 - free from arcing
 - High short-circuit protection
 - Maintenance-free
 - For outdoor and offshore use
 - Protection class IP 66
- 9.10.4 The live part shall consist metal oxide resistors without spark gap. The resistor shall possess high thermal stability. The live parts shall be enclosed by a silicone rubber jacket that provides insulation against the metal housing. The active component along with insulation shall be housed in hermetically sealed aluminum metal housing.
- 9.10.5 The arrester shall be equipped with corrosion resistant fracture membrane that opens the arrester in case of an internal fault and allows a defined axial pressure relief on the rear end of the arrester without damaging the plug-in system

9.11 **Low Voltage Panels**

- 9.11.1 The accessories and auxiliary equipment required for the correct functioning of each circuit element shall be installed in conveniently located mechanism cabinet.
- 9.11.2 Dedicated local control panels / Cabinets / Cubicles for each HV panel shall be supplied as a part of this contract to facilitate local control of circuit breakers, isolators and earth switches. These panels shall also house the various relays, timers, etc. to realize protection, control and various interlocks. Each of the contacts, signals and conditions between gas insulated switchgear, associated auxiliary and monitoring equipment shall be wired up to the local control panel, for OWNER’s further use.
- 9.11.3 All terminal blocks in LV control cubicle shall be droppable type 1.1kV, 41A rated Elmex make KLTD4. All terminal blocks shall be covered by acrylic covers.

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- 9.11.4 Completely separate and isolated circuit shall be used for switchgear control, tripping, alarms and auxiliary devices. Trip circuits shall be individually and permanently monitored for continuity.
- 9.11.5 Each auxiliary control circuit shall be monitored and shall be protected by a two-pole miniature circuit breaker with auxiliary contacts.
- 9.11.6 Constructional Features: All panels shall be totally enclosed rigid sheet steel structures. The design shall be such that there is no temperature raise on account of circulation of induced currents between multiple grounds. All doors, removable covers and plates shall be gasketed all around with EPDM gaskets.
- 9.11.7 Sheet Metal Work
 - a. The panel frame shall be fabricated using suitable mild steel structural sections of pressed and shaped cold rolled sheet steel.
 - b. Thickness of material (CRCA) shall be 2.5 mm for load bearing members and 2 mm for non-load bearing members. Stiffeners shall be provided wherever necessary. The Panels shall be provided with MS Base frame Channel of suitable size with anti-vibration pad.
 - c. All panel edges and door edges shall be reinforced against distortion by rolling, bidding or by the addition of welded reinforcement member.
 - d. Cut-Outs shall be without sharp edges.
 - e. The complete structure shall be rigid, self- supporting, free from vibration, twists and bends.
- 9.11.8 The paint shade for,
 - Exterior: shall be RAL7032, texture finish.
 - Interior: shall be White glossy finish
 - Base frame: Black semi glossy
 - Thickness: Minimum 80 Micron for powder coated
- 9.11.9 Cabinet Internal Wiring
 - a. Control cabinets shall be supplied completely wired, ready for PURCHASER's external connections at the terminal blocks. Wiring shall be carried out with multi-stranded FRLS, 1100V grade PVC, Copper conductor having oxygen index 29 and temp. index of 250 Deg. Wiring inside the panel shall be kept in plastic trays.
 - Following sizes of wires shall be used:

CT wiring	2.5 sq.mm	R / Y/ B / Black
PT Wiring	1.5 sq.mm	R / Y/ B / Black
DC wiring	1.5 sq.mm	Grey
1 ph. Ac wiring	1.5 sq.mm	R / Black

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Ground 2.5 sq.mm Green
 Annunciation 1.5 sq.mm Grey

b. All panel internal wires shall be connected at top of the TB or at the left side of TB in case of vertical channel mounting. The other side of the TB shall be left for field wiring. Enough depth and width of vertical and horizontal cable trays shall be provided considering bunch of external cable entry into panel. Cable tray lid shall properly close after routing field cables into panel. All wires terminated on relays and TBs shall be with sleeved ring type or 'O' type crimped lugs only. The cable tray carrying field cables shall be minimum 100x80mm size.

c. Ferrules should be provided for wires. Ferrules marked to correspond with the wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wires and shall not fall off when the wire is removed. Spare auxiliary contacts of the relays etc. shall be wired to terminal blocks. All wiring shall be terminated on terminal blocks using crimping type of tinned copper lugs. Insulated sleeves shall be neatly punched and cleaned without affecting access to equipment mounted within the cabinet. Wiring troughs shall be provided for vertical cabinet wiring and for interconnecting wiring between front and rear section of the cabinet.

d. 1.1 kV grade terminal blocks complete with insulated barriers, terminal studs, end plates, washers, nuts and locknuts and identification strips shall be used. All the terminal blocks shall be mounted horizontally on anodized channels at an angle to provide easy access at a height of minimum 250mm from the base. All the TBs shall be of disconnecting type, 1100 V Elmex make, 40 Amp, KLTD4 type. At least 20% spare terminal blocks shall be provided in each group (X1, X2 etc). Terminal blocks for control indication etc. shall be suitable for connecting at least two conductors of PURCHASER's cable of following sizes:

- i. Potential and control : 2.5 mm² multistrand copper wire.
- ii. CT circuits : 6 mm² multistrand copper wire

e. Terminal blocks shall be numbered for identification and grouped according to function. Engraved white on black labels shall be provided on the terminal blocks, describing the function of the circuit. The clearance between two rows of terminal blocks shall be a minimum of 100 mm. Terminal blocks shall be provided with transparent acrylic covers.

f. PURCHASER's external cable connections to the control cabinet will be carried out using 1.1 kV grade, stranded copper conductors, PVC insulated, PVC sheathed, armored and PVC jacketed cables. All necessary cable terminating accessories such as packing glands, crimp type tinned copper lugs, supporting clamps and brackets, etc. for PURCHASER's cables shall be included in Vendor's scope of supply.

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g. For equipment supplied / to be supplied by the PURCHASER, the bidders shall provide suitable cutouts and wiring shall be done up to the terminal blocks as per purchasers requirement.

9.11.10 Labels

All door mounted equipment as well as equipment mounted inside the control cabinets 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 control cabinet as furnished by PURCHASER. Labels shall be made of non-rusting metal. Labels shall have white letters on black or dark blue background. Sizes of labels and lettering are subject to PURCHASER's approval.

9.11.11 Tinned copper earthing strip (25x6mm) shall be provided with panel interconnecting links to form continuous earth busbar across board. All earth connections of relays, CT, PT, auxiliaries etc. shall be terminated to this earth strip.. Earthing connection shall be individually provided to respective circuits / accessories without allowing looping between earth wires. Dedicated ferrules at both ends of earth wire shall be provided for identification. The connection of earth wires to earth busbar shall be bolted type. Screw type connection not acceptable.

9.11.12 A light point with door switch and one 6 pin, 240V AC, 5/15A socket outlet shall be provided in each LV panel. A 5 watt LED batten (reputed make) shall be provided for lighting inside LV panel.

9.11.13 The following precautions shall be observed:

- a. All live parts shall be completely shielded using a halogen free fire-retardant insulating material.
- b. All control equipment shall be suitable for operating in an ambient temperature varying between -10 deg. C and +50 Deg.C.
- c. Cabinet doors shall have provision for padlocking. Door shall be constructed such that they do not seize in the event of an internal fire.
- d. All live parts shall be provided with at least phase to phase and phase to earth clearance in air of 25 mm and 20 mm respectively.
- e. Adequate interior cabling space and suitable removable cable gland plate shall be provided.
- f. All panel internal wiring shall be from top of the TB and all field wiring shall be from bottom side of TBs.
- g. Terminal wiring shall be accessible from the front side of the panel.

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- h. In the LV cubicle exclusive inter-panel passage or compartments shall be provided for running the inter-panel wires. The passage shall be divided into two compartments, one for control wiring and the other for SCADA wiring & FO cables.

9.11.14 Switches/MCBs

- a. All individual AC circuits, DC Circuits, CVD, Numerical relay power supply, numerical relay binary input / output circuit, closing circuit, trip circuit, indication circuit etc shall have dedicated and separate MCBs having add on contact for supervision.
- b. Switches/MCBs shall be hand operated, air break, heavy duty, quick make, quick break type conforming to applicable IEC standards.
- c. It shall be the responsibility of the BIDDER to fully coordinate the overload and short circuit tripping of the MCBs with the downstream MCBs provide satisfactory discrimination.
- d. A single throw isolating switches for complete isolation of the DC control circuits shall be provided.
- e. All MCB should have monitoring contact. This monitoring contact shall be looped and wired to RTU for annunciation.

9.11.15 Space Heater

Strip type space heaters with touch protective cover of adequate capacity shall be provided inside each cabinet including LV & cable compartments. Heaters shall be complete with rotary type ON-OFF switch, a single-pole MCB with overload and short circuit protection, link on the neutral and a thermostat to cut off the heaters at 45°C. The heaters shall be suitable for connecting to 240V, 1 phase, and 50 Hz supply. Shrouds shall be provided wherever required to prevent direct accidental contact with heaters. Heaters shall be provided with suitable cover to prevent accidental contact during maintenance. Ammeter to be provided on SWGR for indicating locally the current through the space heater.

Space heater with thermostat shall be provided in cable compartment and LV cubicle. Heater location shall not affect any other component and wiring inside the panel.

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9.12 **SF6 Gas**

9.12.1 Density & pressure: The nominal operating pressure of SF6 insulated gas in the metal- clad equipment shall be as low as is compatible with the requirements for electrical insulation and space limitations to reduce the effects of leaks and to ensure that there is no chance of the gas liquefying at the lowest ambient temperature. The initial gas pressure or density at the time of charging the equipment shall provide a sufficient margin above the minimum allowable pressure for the plant to be safely operated for a reasonably long period before recharging is necessary.

9.12.2 SF6 Gas purity: The SF6 switchgear shall be designed for use with SF6 gas complying with the recommendations of IEC-60376 at the time of the first charging with gas. All SF6 gas supplied as part of the contract shall comply with the requirements of IEC. 60376. Molecular sieve or activated alumina or other absorbent for removal of SF6 arc products and moisture absorbents shall be provided in each gas compartment.

9.12.3 SF6 Gas Monitoring Devices:

9.12.3.1 All gas compartments must have their own independent gas supervision and alarm systems. Each gas supervision circuit shall be equipped with a temperature compensated pressure gauge, test connection point and maintenance connection point and the same shall be easily accessible. The BIDDER shall provide individual temperature compensated gas pressure gauge(s)/density device(s) which continuously monitor and display the gas density values in each of the individual gas compartments as follows:

“Gas Refill” Level: This will be used to annunciate the need for gas refilling. The BIDDER shall provide two sets of potential free contacts for remote indication/ annunciation. Dual stage (contact) SF6 density monitors shall be provided for ALARM & TRIP.

“Breaker Block” Level: This is the minimum gas density at which the manufacturer will guarantee the rated fault interrupting capability of the breaker (in case the breaker is SF6 filled). At this level the device contact shall trip the breaker and block the closing circuits.

Over pressure alarm level: This alarm level shall be provided to indicate abnormal pressure rise in the gas compartment.

9.12.3.2 The gas density and pressure sensitive devices, together with all relays supplied by the manufacturer for use in protection, shall be approved by the OWNER. It shall be possible to test all gas monitoring relays without de-energising the primary equipment and without reducing pressure in the main section. Disconnecting type plugs and sockets shall be used for test

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purposes; the pressure/density device shall be suitable for connecting to the male portion of the plug.

9.12.3.3 Two potential free electrical contacts shall be provided with each alarm condition. These are to be grouped together and wired to the cable termination blocks in the local control panels to give remote alarm indications/annunciations in equipment being supplied.

9.12.3.4 BIDDER shall advise if the breakers are suitable for breaking the load current even if SF6 gas pressure has reduced to atmospheric pressure.

9.12.4 Sectionalization:

9.12.4.1 The assembly shall consist of separate, pressurized sections. The switchgear gas enclosures must be sectionalised with gastight barriers between sections or compartments.

9.12.4.2 The sections shall be so designed as to minimise the extent of plant rendered inoperative when gas pressure is reduced, either by excessive leakage or for maintenance purposes, and to minimise the quantity of gas that must be evacuated and then refilled before and after maintaining any item of equipment. It is preferable that bus bars and bus disconnectors shall not have common gas sections. Further, disconnectors, circuit breakers, voltage transformers, cable chambers shall be separated from adjacent compartments by gas tight barriers.

9.12.4.3 The arrangement of gas sections or compartments shall be such that it is possible to extend existing bus bars without having to take out of service more than one busbar at any given time.

9.12.4.4 In the event of interconnection of gas sections by means of external piping, each enclosure shall be provided with means of isolation from other gas compartments as well as means of filling up the SF6 gas such that gas evacuation/filling in one gas compartment shall not require gas evacuation/filling of any other compartment.

9.12.4.5 The mass of gas in all the individual compartments at rated nominal density shall be indicated in the bid.

9.13 **Support insulators and section barriers**

9.13.1 The support insulators and section barriers/insulators shall be manufactured from the highest quality material. They shall be free from all voids and the design shall be such as to reduce the electrical stresses in the insulators to a minimum. They shall be sufficiently strong to ensure that the conductor spacing, and clearances are maintained when short circuit faults occur.

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9.13.2 Tests shall be carried out during the manufacture of the switchgear to ensure that all insulators and barriers are free of partial discharge at a voltage which is at least 20% greater than the maximum service voltage.

9.13.3 The Gas section barriers including seals to the conductor and enclosure wall shall be gas-tight and shall be capable of withstanding the maximum differential pressure that could occur across the barrier i.e. with a vacuum drawn on one side of the barrier and on the other side, at least twice the rated gas service pressure that can exist under normal operating and maintenance conditions or the maximum gas over pressure, at least equal to the operating pressure of the relief devices, that could be attained with a persistent internal arc fault.

9.14 **Expansion joints**

9.14.1 Expansion joints or flexible connections, in the metal enclosures, to absorb the actual or relative thermal expansion and contraction of the SF6 equipment as well as structures, foundations and floors on which the equipment is mounted, resulting from variations in the temperature of the switchgear equipment shall be provided, if required. The number and position of expansion joints or flexible connections are to be determined by the BIDDER to ensure that the complete installation will not be subjected to any expansion stresses which could lead to distortion or premature failure of any piece of the GIS equipment, support structure or foundations. Electrical continuity of the connection for all enclosures across bolted joints/expansion/flexible connections shall be achieved.

9.14.2 Supply of SF6 gas: The contract shall include the supply of all the SF6 gas necessary for filling and putting into commercial operation the complete switchgear installation being supplied including loss during installation. In addition, ten percent of the total

9.14.3 SF6 gas required for the GIS shall be supplied as spare and shall be included in the contract.

9.14.4 SF6 Gas detecting instrument: Separate prices shall be quoted for portable SF6 gas detector. The portable SF6 gas detector shall be light weight and provided with long flexible probe to enable detection of SF6 gas leakage from hard-to-reach areas. The Bidder shall furnish details/catalogues regarding the features of the portable SF6 gas detector offered by him.

9.15 **Earthing**

9.15.1 It shall be the responsibility of the BIDDER to provide enough earth points so that dangerous voltages are not induced in the enclosure by the fault currents circulating in the inner conductor.

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- 9.15.2 The design of the earth system and connection to the switchgear shall also be compatible with the circulating currents that are present in the switchgear metal-cladding.
- 9.15.3 Every section of the SF6 switchgear equipment including all panels, cubicles, kiosks, enclosures separated with gaskets and boxes shall be solidly connected to the earthing system at minimum 2 locations. The sizing of earth conductor shall be as per short circuit rating of switchgear.
- 9.15.4 Earth switches surge arrestor neutral, voltage transformer neutral or any other active earth connections shall be directly connected to main earth riser of substation.
- 9.15.5 All steelwork, access decking, handrails etc., shall also be effectively bonded to the earthing system. The design of the earthing system shall be such as to ensure the safety and protection of all operating and maintenance personnel under all normal and fault conditions. Detailed earthing drawings shall be prepared for the complete installation which shall be provided under this contract and submitted to the OWNER for approval. The enclosure of the equipment and support structure of GIS shall be earthed in such a way that the following conditions are obtained:
- 9.15.6 Bidder to ensure that the touch potential / metal to metal potential at any part / between any of the enclosure shall be less than 50 V under all operating / fault conditions
- 9.15.7 The induced current during normal operation shall be prevented from entering the earthing grid.
- 9.15.8 Earth links of suitable size shall be provided across each gasket joints.

- 9.16 **Interlocks:**
- 9.16.1 All interlocks required between circuit breaker, disconnecter and earth switches shall be provided by the BIDDER. These shall take the form of an electrical interlock scheme operated from auxiliary switches attached to the mechanisms of the above equipment. The logic relays for this scheme shall be in BIDDER’s scope of supply and shall be mounted in a local control panels.
- 9.16.2 Interlocking devices must provide absolute and positive protection against potentially harmful mal operations of the switchgear. The following functions shall be provided:
 - a. Forcing the operator into the only safe and logic sequence to actuate breakers, switches, isolators and earth switches.
 - b. Checking the actual fully closed or fully open position of all switching elements before and after each move.
 - c. Providing the logical checks and issuing the resulting PERMISSIVE or BLOCKED signals for the switchgear.

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- d. Indicating positively the absolute condition/position of the supervised equipment.
- e. Local manual and remote electrical operation of all essential functions.
- f. Local emergency unlocking facilities via safety-key switches under the full responsibility of the operator.
- g. Provision of exclusive mechanical & electrical interlocks for Earth Switch. Provision mechanically blocking the earth switch.
- h. LOTO shall be provided to prevent mechanical as well as electrical operation of disconnectors, Earth switch and circuit breaker.
- i. Isolator and earthing switch shall be electrically and mechanically interlocked such that it will not be possible to close the earthing switch when the isolator is closed or vice-versa. Electrical interlocking arrangement shall be fail-safe type

9.16.3 Following scheme and interlocks shall be provided:

- a. For Capacitor feeder, Castle Key shall be provided for cable compartment. The interlock shall be provided such that the castle key can be removed only after earth switch of cap bank is closed.
- b. DC fail alarm through relay shall be distinguished between failures of Panel DC & relay failure. Hence, both should be separately hard wired for SCADA annunciation.
- c. Relay Binary Output carrying SCADA Close command shall be connected after Local/Remote switch and before Closing Interlocks. It shall not bypass any Closing Interlock.
- d. Tie breaker shall have:
 - 22kV GIS Tie Breaker Closing Interlock shall check SF6 Gas Pressure healthiness of Busbar on which associated Tie Isolator is connected.
 - Earthing scheme of adjacent bus via earth switch of tie breaker shall be designed in safe and fail safe manner with hard wired interlocks.
- e. Dummy panel / Bus Riser panel:
 - The UFLS trip contacts shall be wired up to dummy panel. This will reduce the control cabling from UFLS to individual feeders.
- f. Tie Isolator:
 - 33kV GIS Tie Isolator while Closing & Opening operation should check status of associated Tie Breaker
 - Also, when two tie isolators are interconnecting two opposite panels rows through cables, all sources to the bus shall be in open condition while closing or opening

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operation of tie isolator. Gas pressure healthy contact shall be checked before closing of isolator.

- Earthing scheme of adjacent bus via earth switch of tie isolator shall be designed in safe and fail safe manner with hard wired interlocks.

9.17 **Miscellaneous Constructional Requirements**

- 9.17.1 The equipment shall be constructed with all necessary compensators to allow for thermal expansion, and spacers or bellows with telescopic bus bars to allow for the removal of sections with the minimum of disturbance.
- 9.17.2 The system shall be complete with all necessary supports, platforms, mechanism cabinets and internal cable trays etc. Suitable maintenance/ operation platforms shall be provided.
- 9.17.3 The arrangement of equipment offered must provide adequate access for operation, testing & maintenance. The space around the cable sealing end boxes must be sufficient to allow cables to be made off or dismantled after the switchgear has been erected, without imposing bending stress at the cable end. Mechanism cabinet doors shall have provision for padlocking. Door shall be constructed such that they do not seize in the event of an internal fire.
- 9.17.4 The equipment and connections within each compartment shall be so arranged as to allow removal and replacement of any section with minimum disturbance to adjacent pressurized sections. Provision of bus sectionalisers /detachable device/bellow etc must be made in the main bus bar for ease of removal of a bay/component.
- 9.17.5 In the event of a fault in any one element of the GIS, it is a firm requirement that subsequent repairs/testing shall be possible to be carried out without affecting any other element and outage of any other bay/circuit or bus bar shall not be required. Suitable arrangements shall be made by the bidder & clearly brought out in the bid.
- 9.17.6 Minimum assembly work shall be required during installation. Completely factory assembled switchgear bays that require only cable connections at site will be preferred.
- 9.17.7 The fully enclosed bus bars shall be made from electrolytic drawn copper alloy. These bus bars and other current carrying equipment shall be rated for the continuous current of the switchgear under the maximum ambient design temperature as indicated in Section A without exceeding their permissible temperature rise. The capabilities of the bus duct shall be given on a symmetrical current basis and the relevant IEC standards.
- 9.17.8 Future extension:

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It is proposed to make provision for additional bays at a later date. It shall be possible in future to extend the bus bars. BIDDER shall separately quote for additional items required to be provided now to facilitate future extension without necessitating complete outage of the bus bars. It is a firm requirement that no changes are made to the enclosure during future extension. Also, the downtime must be minimum when extension is carried out. During erection/testing of extension, outage of only one bus section and associated equipment will be available. Under no circumstances outage of both the bus sections (resulting in complete shutdown of the station) will be permissible. The BIDDER is required to bring out in detail his proposal for achieving future extension and indicate if shutdown of any part of the equipment/circuit will be required for erection, dielectric testing along with Gas Line Diagram etc. The bidder shall give step by step procedure for extension of bays on either side of GIS, at later date.

9.17.9 Metal Cladding

- 9.17.9.1 The metal clad enclosures for the SF6 gas and circuit elements shall be made from non-magnetic material to prevent losses and heating from magnetic hysteresis in the case of single-phase enclosures. The type of material and thickness shall also be such as to keep heating due to induced circulating currents to a minimum.
- 9.17.9.2 Each enclosure shall be tested to withstand twice rated internal operating pressure, as a routine test free of cost to the Owner.
- 9.17.9.3 Enclosure shall comply with test as per IEC /IS to withstand the full rated fault currents during arcing faults, without puncturing.
- 9.17.10 Protective finish / corrosion protection
 - 9.17.10.1 The switchgear shall be treated and protected to withstand at least twenty five year of operation under site conditions without sustaining significant corrosion or attacks from fungus or rodents.
 - 9.17.10.2 The protective finish shall prevent deterioration due to corrosion, humidity, temperature, ageing and weather etc. under site conditions.
 - 9.17.10.3 All exterior surfaces shall be cleaned and painted before leaving the factory with one coat of approved primer and two coats of finish paint approved for the equipment. The underside of all surfaces bearing upon the concrete foundation shall be given two coats of approved primer. Extra paint for retouching shall be supplied by the manufacturer. The paint shade shall be as aircraft gray shade 693 of IS -5 and subject to OWNER's approval.

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- 9.17.10.4 Supporting framework shall be hot dip galvanised. Gas monitoring and service piping including all fittings and armatures shall be made of copper, brass or stainless steel. Joints of different metals that could lead to electrolytic corrosion must be avoided. Before the metal-clad enclosed sections are joined together and charged with the SF6 gas they must be thoroughly cleaned.

- 9.17.11 Pressure Relief Device
 - 9.17.11.1 Pressure relief devices shall be provided in each gas section to protect the main gas enclosures from damage or distortion during the occurrence of abnormal pressure increase or shock waves generated by internal electrical fault arcs.
 - 9.17.11.2 Pressure relief shall be achieved either by means of rupture diaphragms venting directly into the atmosphere. Suitable guards and deflectors shall be provided to prevent pieces of diaphragm from flying out or any dangerous SF6 arc product gases escaping, in a manner that could endanger personnel who may be present.
 - 9.17.11.3 Suitable guards and deflectors shall be provided to prevent pieces of the diaphragm or plug from flying out or any dangerous SF6 arc product gases escaping, in a manner that could endanger personnel who may be present.
 - 9.17.11.4 The enclosure and barrier insulators shall be designed to prevent rupturing in the event of a service failure. Each insulator shall withstand the pressure rise due to an internal arcing fault on one side and with vacuum on the other side.
 - 9.17.11.5 Foundation channels and support structure: All supporting steel structures for switchgear bays, bus duct support, etc. shall be a part of Bidder’s supply. The bidder shall provide suitable foundation channels for grouting into the foundation floor to support the switchgear assembly. Necessary supporting framework, levelling screws, inspection platforms etc. shall be provided by the BIDDER to fasten the switchgear base frames to the foundation channels. BIDDER shall submit drawing showing all details of the foundation channels on the civil guide drawing. As the 33 kV GIS will be installed in areas prone to earthquakes, it shall be designed to withstand seismic forces equivalent to maximum considered earthquake ground motion in that seismic zone. Necessary devices shall be provided with suitable anti earthquake clamping arrangement. All 33 kV GIS shall be supplied with bolts, nuts, washers and accessories required for fixing the GIS to the foundation.
 - 9.17.11.6 Temperature Rise: Temperature rise of enclosure and conductor shall be such that the final temperature does not exceed the values specified in Data Sheet for specified site

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conditions including the effects of solar radiation. BIDDER shall provide test reports/ calculations to prove this.

9.17.11.7 Gas leakage: The guaranteed maximum gas leakage shall be less than 0.5% per year for any individual gas compartment and for the whole equipment.

9.17.12 Welding Nuts and Bolts

9.17.12.1 All welding shall conform to the requirements of relevant IEC standards and shall be performed by a fully certified fabricator or suitable submerged arc welding machines. At least 10% of all welds must be subjected to non-destructive testing by X-rays or ultrasound, and all records thereof must be made available on request. When drawings are submitted for approval, BIDDER shall indicate following:

- a. Type of weld
- b. Procedure employed
- c. Inspection applied

9.17.12.2 Details of bolt sizes and threading shall be clearly shown on the appropriate drawings. Where self-locking type of nuts are used, they shall be of the re-usable type. Pressed type nuts are not acceptable.

9.18 **Accessories**

9.18.1 Position Indicator: A mechanical position indicating device shall be provided for each isolator/earthing switch which shall be clearly visible from ground.

9.18.2 Name Plate: A weather-proof and corrosion-proof name plate shall be provided on each isolator, earthing switch and operating devices etc. The name plates shall conform to applicable standards.

9.18.3 Each sectionalised compartment having SF6 shall be provided with a temperature compensated SF6 pressure gauge along with density monitor switch, with clear indications of safe & danger operating zones

9.19 **DATA SHEET:**

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Sr. no.	Description	Tata Power's Specifications/Requirements	Bidder's Specifications
A.	GENERAL PARTICULARS		
1.	Manufacturer's Name		
2.	Address of manufacturing unit		
	a. Installation	Indoor	
	b. Enclosure type / Bus bar type	Segregated / 3 ph encapsulated	
	c. Enclosure material	Aluminium / Mild Steel	
3.	Insulation	SF6 Gas conforming to IEC 60376, 60376A, 60480 and 62271-4.	
4.	Phases	3 – phase	
5.	Frequency	50 Hz	
6.	Type of cooling for entire switchgear	Air Natural	
7.	Voltage		
	a) Nominal operating voltage	33 kV / 22 kV	
	b) Highest system voltage	36 kV	
	c) Rated short duration power frequency withstand voltage	70 kV (rms)	
	d) Rated lightning impulse withstand voltage (1.2/50 µs)	170 kV (peak)	
8.	Rated current		
	a) Bus Bars	2500 A, Copper material	
	b) Incoming transformer breaker	2500 A	
	c) Bus-sectionaliser breaker / Tie Breaker / Tie Isolator	2500 A	
	d) Outgoing feeders	1250 A	
	e) Capacitor / Reactor feeders / Station Transformer feeders	1250 A	
9.	Rated short time withstand current	31.5 kA	
10.	Rated peak short circuit current	78.5 kA (peak)	
11.	Rated duration of short circuit	3 sec	
12.	Internal Arc Classification	IAC A FLR - 31.5kA for 1 sec	
13.	Temperature		
	a) Reference ambient temp.	50°C	

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	b) Max. Permissible temp. rise	As per IEC 62271-1 Clause 7.5	
14.	Seismic Coefficient acceleration	Respective to seismic zone for project site	
15.	System Earthing		
	a) Type	Effectively earthed	
	b) Earthing material	Copper Conductor of suitable size	
16.	Ingress Protection	HV Power parts - IP65 LV Compartment - IP4X	
17.	Auxiliary contacts for each equipment (CB, Disconnecter, Earth switch)	As per scheme requirement + 2 NO & 2 NC spares for each status	
18.	All components and accessories and equipments related to GIS are operating station DC voltage - 110 / 220V DC	Yes	
19.	Type of GIS Cable Housing	Inner cone / Outer Cone	
B.	33 kV CIRCUIT BREAKERS		
1.	Application	Control, operation, and protection of outgoing feeders, Bus-sectionaliser, transformers, tie breakers, reactors and capacitor banks.	
2.	Type	SF6 insulated, SF6/ Vacuum interrupter and metal enclosed; indoor	
3.	Class of operation	E2 M2 C2 as per IEC 62271	
4.	Nos. of poles	3	
5.	DC time constant of the rated short circuit breaking current	45 ms	
6.	Rated first pole to clear factor	1.5	
7.	Making capacity	78.5 kA (peak)	
8.	Operating duty	0 - 0.3s - CO - 3min - CO	
9.	Arcing time	By bidder	
10.	Opening time	60 ms max	
11.	Break time	By bidder	
12.	Closing time	100 ms max	

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13.	Make time	By bidder	
14.	Method of representing transient recovery voltage (TRV)	Two parameters	
15.	Desired transient recovery voltage for terminal faults	62 kV	
16.	Operating Mechanism	Trip free	
17.	Main contacts : Material and type	Copper	
18.	Arcing contacts : Material and type	Copper with silver faced or tungsten alloy tips	
19.	Tripping mechanism		
	a. Type of tripping mechanism	Hand and motor operated spiral spring type	
	b. No. of trip coils	2	
	c. Pick-up range	70 - 110 %	
	d. Trip coil rating including wattage	By bidder	
20.	Closing mechanism		
	a. Type of closing mechanism	Hand and motor operated spiral spring type	
	b. Closing coil rating including wattage	By bidder	
21.	Total interrupting time measured from instant of trip coil energization to arc extinction of resistor current	By bidder	
22.	Closing time measured from instant of application of power to closing device up to arcing contacts touching	By bidder	
23.	Reclosing time	By bidder	
24.	Critical current (Current giving longest arc when a break takes place)	By bidder	
25.	Cooling	Natural Air	
26.	Gauge Pressure of SF6 at 20 deg C	By bidder	
27.	Weight of complete circuit breaker	By bidder	

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	assembly		
28.	Material of circuit breaker enclosure	Stainless steel / Aluminium	
C	33 kV ISOLATORS AND EARTH SWITCHES		
1.	Quantity	As specified & as per 33kV GIS SLD for respective stations	
2.	No. of phases	3	
3.	Minimum number of operating cycles		
	a. Isolator	2000	
	b. Earth switch	2000	
4.	Current rating		
	a. Rated continuous at 500C	2500 A (For incomers, tie & Bus-sectionaliser isolators) 1250 A for all outgoing feeders	
	b. Fault making capability of Earth switch kA	For 1 sec, 3 sec & 10 cycles	
	c. Rated short circuit making current	78.5 kA	
5.	Insulation level		
	a. Impulse withstand voltage between line terminals and ground	170 kV (peak)	
	b. Impulse withstand voltage between terminals with disconnecter contacts open	195 kV (peak)	
6.	Material		
	a. Switch/Isolator Material	Copper	
	b. Contacts are silver faced	Yes	
7.	Operating mechanism	Manual and motorized	
8.	Hand operating facility provided?	Yes / No	
9.	Motor details		
	a. Rated voltage	Station DC voltage level	
	b. Rated current	By bidder	
	c. Rated output	By bidder	
	d. Time required to charge spring from fully discharged condition	By bidder	

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10.	Switch Operating time		
	a. Closing time	By bidder	
	b. Opening time	By bidder	
D	33 kV Voltage Transformers (VTs)		
1.	Type	Magnetic	
2.	Secondary winding withstand voltage	2 kV(rms)	
3.	Method of connection		
	Primary	Star	
	Secondary	Star	
4.	Power factor of secondary winding	0.8	
5.	Class of insulation	E	
6.	Open delta winding with shunt resistor is to be provided in PTs to avoid Ferro-resonance.	Yes / No	
7.	VT details as per specifications	Yes	
E	33 kV Current Transformers		
1.	Type	Magnetic	
2.	Insulation withstand level of secondary winding	3 kV, 1 min	
3.	Maximum temperature rise of windings at rated primary current and rated burden, above ambient temperature	As per IEC 62271-1	
4.	Class of insulation	E	
5.	Only ring type lugs are used for CT circuit termination.	Yes	
6.	CT details as per specifications	Yes	
F	Surge Arresters (SA)		
1.	Nominal discharge current (8/20 μ s)	10kA peak	
2.	Rated short circuit current (0.2 s)	16 kA	
3.	Line discharge class	Distribution Heavy Class	
4.	Nominal Voltage	22kV	33kV
5.	Max. Voltage	24kV	36kV
6.	MCOV (Max. continuous operating	19kV	29kV

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	voltage)		
G	Support Insulators		
1.	Type & voltage class of insulators	36 kV	
2.	Material of insulators	Non-hygroscopic cast-resin/Porcelain	
J	BCPU/ IED (Numerical O/C & E/f relay)		
1.	Make and Model no	1. Siemens - 7SJ6X / 7UT6X series 2. SE - P5F3 series for BCPU / Micom P64X series for Trafo diff 3. ABB - REF620 series for BCPU / RET620 series for Trafo Diff	
2.	Auxiliary Relays	ABB combiflex 1. RXMS1 - 6NO 2. RXMV2 - 4NO+4NC 3. RXMVB4 - 7NO+7NC 4. RXMH2 - Flag type	

10. QUALITY REQUIREMENTS INCLUDING SQP AND FQP

All the material quality checks and tests shall be carried out as per attached Standard Quality Plan. The Inspection shall be carried out as per inspection categorisation plan agreed between owner and the bidder. Bidder shall refer the quality requirements enclosed in this bid document. Commissioning of the Bay BCPUs and Bay IEDs on LCP and other accessories at site shall be the responsibility of the Bidder.

11 INSPECTION, TESTING AND PERFORMANCE REQUIREMENTS ALONG WITH WARRANTY

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11.1 Factory Acceptance Test (FAT)

The Bidder shall submit a test specification for factory acceptance test (FAT) and commissioning tests of the complete system for approval including switchgear, protection & automation equipment. For the individual bay level BCPUs applicable type test certificates shall be submitted. The manufacturing phase of the SAS shall be concluded by the factory acceptance test (FAT).The purpose is to ensure that the Bidder has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab. During FAT the entire System including complete control and protection system to be supplied under present scope shall be tested for complete functionality and configuration in factory itself. The extensive testing shall be carried out during FAT. The purpose of Factory Acceptance Testing is to ensure trouble free installation at site. No major configuration setting of system is envisaged at site.

11.2 Integrated Testing

The integrated system tests including GIS, protection and automation equipment at one place is mandatory and shall be performed as per agreed test plan and the approved configuration, protection schemes, interlock logics etc. Stage inspection or prototype inspection shall be carried out as per owner’s requirement.

Integrated tests at Factory based on RBS test protocol is included in approved FAT procedure. Also integrated RBS test with GIS and automations panels shall be done by bidder during FAT.

100% Integrated factory acceptance (FAT) testing of complete protection and automation system for MV switchgear along with all networking accessories shall be in bidder’s scope. All relays, meters, gateways, RTU (complete automation system) along with networking switches and accessories shall be made available and connected as per site during this factory inspection and testing for complying to 100% integrated FAT.

11.3 Hardware Integration Tests

The hardware integration test shall be performed on the specified systems to be used for Factory tests when the hardware has been installed in the factory. The operation of each item shall be verified as an integral part of system. Applicable hardware diagnostics shall be used to verify that each hardware component is completely operational and assembled into a configuration capable of supporting software integration and factory testing of the system.

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The equipment expansion capability shall also be verified during the hardware integration tests.

11.4 Integrated System Tests

- 11.4.1 If the complete system consists of parts from various suppliers or some parts are already installed at site, the FAT shall be limited to sub-system tests. In such a case, the Bidder can use their SCADA System for testing the functionality as per the Users requirement. Otherwise the complete system test shall be performed on site together with the site acceptance test (SAT).
- 11.4.2 Prior to release for shipment of the equipment the Owner or his representative will witness Factory Acceptance Test (FAT) in which the system is checked against the specifications.
- 11.4.3 The FAT shall include testing of all the hardware and software modules.
- 11.4.4 Spare modules and spare channels also will be tested in FAT.
- 11.4.5 Bidder shall indicate all the simulation facilities that will be used in FAT.
- 11.4.6 Bidder shall submit FAT procedure 2 weeks before commencement of FAT for Owner’s approval. FAT procedure document shall include acceptance tests pertaining to switchgear, protection devices (IEDs / BCPUs / Relays), metering and monitoring devices and communication & automation equipment.
- 11.4.7 Bidder shall incorporate all FAT comments prior to despatch. After Bidder confirms that all changes have been incorporated, Owner’s Office will issue Despatch Clearance.
- 11.4.8 The Test Reports as well as Test Certificates of OEM, third party, Bidder shall be submitted for approval / verification.
- 11.4.9 Tests shall include demonstration of System Responses and Loading (CPU, Memory & Communication Bus) including worst-case scenario and expandability of the system.
- 11.4.10 FAT and Despatch Clearance by the Owner shall not relieve the Bidder from complete responsibility for the total system and its performance subsequently.
- 11.4.11 Redundancy, Backup & Restoration functions shall be tested.
- 11.4.12 Diagnostic tools shall be demonstrated.
- 11.4.13 The system shall be kept ON continuously without interruptions for at least 72 hours during the FAT.
- 11.4.14 Tests requiring advanced Laboratory facilities that may not be available at site shall be conducted during FAT.
- 11.4.15 BCPU configurations and testing procedure shall be finalized before FAT & shall be demonstrated during FAT.
- 11.4.16 Travel, Boarding & Lodging expenses for the Owner’s representatives for FAT shall be borne by the Owner, Local transport for Owner’s representatives from the place of stay to Bidder’s

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works shall be arranged by the bidder. Bidder shall make available all necessary documentation & office facilities for Owner’s representatives. Specialists of sub-vendors shall be present for FAT. Training at Bidder’s Works shall precede FAT and shall include troubleshooting and advanced testing techniques.

- 11.4.17 Stage inspection / Prototype Inspection:
- 11.4.18 Stage inspection / prototype inspection of one complete panel (including HV as well as LV compartment with relay and its complete wiring) shall be in bidder’s scope.

11.5 Deficiency Reporting

- 11.5.1 In case of failures, deficiency reports shall be written for hardware, software, functional performance and documentation deficiencies. The deficiency reporting procedure includes methods to ensure that deficiencies are identified, documented and corrected. The documentation shall include a unique identifier for tracking as well as a detailed description of the deficiency. A deficiency status summary shall be included from time to time in the project progress reports, and up to date deficiency reports shall be made available to the Owner on demand.
- 11.5.2 When a test fails, a separate deficiency report shall be written for each problem that prevented the successful completion of the test. The presence of fatal discrepancies, such as the complete failure of the system, shall be acted upon immediately and may, at the discretion of the Owner, be cause for suspension of the tests. A retest shall be agreed which may include all or part of the test procedures. All other discrepancies shall be corrected and re-tested without suspending the entire test. The Owner will have the right to request that other hardware and software modules that may be impacted by the correction be re-tested.

11.6 Performance Requirements:

- 11.6.1 Bidder shall warrant that the equipment including software hardware, firmware and associated documentation are free of defects in material and workmanship and from defects or faults in design, in so far as the equipment fails to meet the requirements of this technical specification, for a period of 12 months from the date of final acceptance by the Owner after completion of 30 days trouble free operation. With respect to defects in equipment part, bidder’s liability is to make good by replacing the faulty equipment. It is the responsibility of the bidder to replace the faulty equipment within 7 working days.
- 11.6.2 After replacement of the faulty equipment, the Owner will return parts that are defective to the bidder. The bidder will cover the cost associated with the shipping of defective or failed items

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during warranty period. The new equipment, parts shall be delivered to the Owner’s facility CIF (Cost, Insurance, and Freight) free of charge.

11.6.3 Bidder must provide warranty of 5 years from the date of commissioning for entire 33kV switchgear and all associated equipment / system supplied as per Bill of material.

11.7 Post Warranty Maintenance

11.7.1 Bidder shall quote for post warranty Maintenance for two years with the following scope\ Periodic visits every four (4) months for a period of minimum five (5) working days per visit for Preventive Maintenance as well as for modifications (addition/deletion/reconfiguration etc.) and upgrades described elsewhere.

11.7.2 Bidder shall also arrange for Sub-vendor’s (third party) engineer during the periodic visits to attend the critical components.

11.7.3 The Bidder shall ensure proper performance of the entire system, integrated with Owner’s existing components (Masters, Communication Network etc.) to the complete satisfaction of the Owner.

11.7.4 Trouble Call visits – as and when required by Owner on per diem rate.

11.7.5 These prices are part of bid evaluation.

12 MENDATORY SPARES AND SPECIAL TOOLS

In addition to mandatory spares, the bidder is required to list the spares, which may be required for ensuring the guaranteed availability for the period of 5 years. The final list of spares shall form part of scope of supply and accordingly the price thereof shall be quoted by the bidder and shall be considered in the evaluation of the bids. During commissioning and warranty period, the spare parts supplied by the Bidder shall be made available to the Bidder for usage subject to replenishment at the earliest. Thus, at the end of warranty period the inventory of spares with the Owner shall be fully replenished by the Bidder. However, any additional spares required to meet the availability of the system (which are not a part of the spares mentioned in the table, shall be supplied by the Bidder) would have to be supplied immediately free of cost to the Owner. The Bidder shall provide a list of recommended spares for a period of five years from the date of Site Acceptance Test (SAT) and confirm that the shelf-life of these spares is such as to last for at least 5 years from the date of SAT. 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.

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12.1 Mandatory spares:

Bidder needs to include competitive price for Mandatory Spare parts against the specified list and schedules.

List of Mandatory Spares:

S. N.	Description	Quantity
1.	Voltage transformer	3 (1 set) of each rating & each type
2.	Current transformers of each type	3 (1 set) of each rating and each type
3.	Surge arrestor	1 no.
4.	Trip Coil	4 nos.
5.	Closing Coil	4 nos.
6.	CB Spring charging motor	2 nos.
7.	Auxiliary switch	1 set
8.	Auxiliary relay	1 no of each type
9.	Disconnecter motor	1 no. of each type
10.	Gas density switch of each type	2 nos.
11.	Bursting disc / pressure relief plate complete	2 nos. of each type
12.	Capacitive voltage indicator	1 set
13.	BCPU, one each for each unique equipment	1 no of each type
14.	Laptop (HP make, 15.6-inch, Core I7, 1TB SSD, 32GB RAM, 1 RJ45 port, 2 USB port, 1 Serial port, 1 HDMI port) for relay configuration and relay settings	1 no. per project per receiving station
15.	Gas density monitor	2 nos of each type
16.	Gas operating mechanism for breaker	1 Set
17.	Gas operating mechanism for isolator	1 Set
18.	Electronic card including MCU	1 no. of each type
19.	Spring charging handle, CB operating handle, disconnecter operating handle and ES operating handle	1 no. of each
20.	USB cable for relay connection to laptop	1 no. of each type

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Bidder shall include list of spares with quantities as recommended by him required for three years trouble free operation of equipment.

12.2 Special Tools & Tackles:

BIDDER shall give details of various tools, with price, required for maintenance, viz. SF6 handling station, temperature compensated pressure switch testing device, wrenches with compression head (1000 & 630 mm) including pull-off die for cables, and moisture measuring device, pressure gauges, SF6 gas leak detectors, antistatic gun (to remove charge from the insulators), instrument for checking calibration, SF6 gas density switch, instrument for repairing and recalibrating defective SF6 gas density switch, instrument for testing and fault detection of the cards (for protection & interlocking), etc; to meet the specific maintenance and operational requirement of the GIS.

For commissioning bidder to provide special tool and tackles if required.

13 DATA SUBMISSION BY BIDDER

Bidder shall submit the following information along with the Technical Bid:

- a. Acknowledgement of Bid receipt by duly signing all the pages of the bid documents.
- b. Deviation sheet
- c. Bid Guarantee in the format enclosed.
- d. Site visit attendance certificate duly acknowledged by Owner or Owners representative.
- e. Organization Chart
- f. List of Projects executed with Reference List.
- g. Guaranteed schedule of all the material to be supplied duly filled in with all technical parameters, etc.
- h. Testing Facility
- i. All Schedules along with the deviations.
- j. Data Sheets duly filled with the data.
- k. Complete set Type test reports with all pages without any declaration
- l. Mandatory Spare list
- m. Duly signed un-priced copy of price schedule along with technical bid.
- n. Project Schedule to be prepared and submitted by the bidder along with the bid documents

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- o. General arrangement diagram for 33kV GIS, super imposed on present available space & confirm that bidder's 33kV GIS is accommodated in the available area along with bid Supporting documents for bid qualification criteria
- p. Systems write up.
- q. Signed and stamped copy of project specification.
- r. Erection methodology

Bidder to submit all required documents as per above clause. If bidder is failed to submit listed documents within time period mentioned by Owner at the time of technical evaluation, then bidder will have all rights to reject the bid.

After Award of Contract

- a. Master Document list (MDL) will be finalized along with the bidder to cover the whole project which should cover the following but not limited to.
- b. Technical data sheets of all equipment's covered under this specification.
- c. GA drawings of all equipment's.
- d. Layout drawings of each system
- e. Civil detail drawings and design calculation
- f. Hydraulic calculation of system,
- g. Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality plan (FQP), Inspection categorization plan (ICP)
- h. Bidder to submit Operation and maintenance manual (5 copies)
- i. Bidder shall submit all the demanded in the individual.

.....END.....

Annexure 1 - PQR

Bidders Prequalifying Requirements for MV GIS

S No	Parameter	Tata Power Requirement	Documents To be submitted by Vendor to ascertain meeting of Pre-qualification requirement
1	2	3	4
1	Infrastructure	Bidder must be an OEM of MV GIS (including Protection & Automation) OR must have sourced MV GIS MV GIS (including Protection & Automation) with manufacturing facility / assembly in India.	Self-undertaking to be submitted in this regard. Tata Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.
2	Supply and Experience	<p>Bidder shall have supplied 300 nos of 33kV GIS bays in last 5 years. Out of this 50 quantity of 33kV GIS panels shall be in satisfactory service for last 2 years.</p> <p>"In case the bidder has a previous association with Tata Power for similar products and services, the performance feedback for that bidder by Tata Power shall only be considered irrespective of performance certificates issued by any third organization. Technical performance, delivery timelines, service and support records of past executed projects in Tata Power will be considered for technical evaluation of bidder."</p> <p>Indian Subsidiaries of global companies having plant in India are also eligible to bid if the qualification requirements stated above are met independently or in combination with the parent company. Declaration from parent company needs to be submitted.</p>	<p>Supply List & Performance Certificates from the utilities / clients</p> <p>Self-undertaking to be submitted in this regard. TATA Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.</p>
3	Type Test	<p>The bidder shall submit Type test reports obtained from NABL/ International Accredited Lab for the equipment / material offered. The type tests should have been conducted on the equipment / material of the same design.</p> <p>The type tests should have been conducted within 5 years prior to the date of bid opening. Time period for type test may be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC).</p> <p>In case the type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, then 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 despatch of the equipment / material.</p>	<p>Type Test Report.</p> <p>Undertaking that there is no change in design / material of construction (MOC) if Type Test Report older than 5 years but less than 10 years prior to date of bid opening has to be considered (if applicable)</p> <p>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 despatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, (if applicable)</p>
4	Commercial Capability		Copy of audited Balance Sheet and P&L Account to be submitted in this regard.
5	EPC Experience (if applicable)	In case the package involves installation & commissioning of the equipment / material, then the bidder shall have the following experience: a) He should have successfully completed one single order of value (80% of estimated value of similar work in last three years) OR b) He should have successfully completed two single orders of value (50% of estimated value of similar work in last three years) OR c) He should have successfully completed three single orders of value (40% of estimated value of similar work in last three years).	Performance Certificates from the utilities / clients

TATA POWER		The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing.		TATA
TPQA&I-QAXX-00-EX-SQP-332. REV. 0		STANDARD QUALITY PLAN FOR HV GAS INSULATED SWITCHGEAR (GIS), 11/22/33 KV.		Date of Issue: 14-Oct-2017.
Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	Remarks
1	2	3	4	5
1.0	Boughtout items/ Raw Material: All material shall be as per manufacturing drawing/ data sheet/ Specifications.			
1.1	SS Sheet, Aluminium Sheet, FRP, tie rods.	Chemical and Mechanical Properties.	TC verification by GIS manufacturer.	Corelated MTC review during final inspection by Tata Power.
1.2	Aluminium/Copper Conductor, Bus Bar with Silver Plated Joints and Cable Termination Kits.	Chemical and Mechanical Properties, Conductivity, Purity.		
1.3	Cast/Welded* Aluminium Enclosure	Visual checks, dimensions Chemical and Mechanical Properties, *DP and X-Ray on the welds, Welding Procedure.		
	HV Tank Assembly.	SF6 Gas leakage test, Pressure Test of Welded Enclosure 1.5 times higher than design value.(on 100% enclosures)		
1.4	Bought out items like: Control Cubicle: Protection relays, switches, indicating instruments, recording meters, MCB's, Contactors, MCCB's, Hooters, Annunciators, semaphore indicators, Cables, Closing/ tripping coils, Spring charging motors, hardware etc.	Routine & functional tests as per relevant standards.		
1.5	Gas Density Monitor, Rupture Disc, Surge Arrestor.			
1.6	Gas Barrier, Epoxy insulator, Current Transformer, VT, Disconnecting / Earthing Switches, Circuit Breaker & Bus Duct.	Routine & functional tests (including 100% PD tests at manufacturer) as per Relevant Standards & approved drawing. .		
2.0	INPROCESS INSPECTION: (Generally in line with manufacturer standard):			
2.1	Assembly and Operating Mechanism Test.	Visual, Clearances, measurement of voltage drop, polarity for CT & PT, tightening torque, Di-electric checks, continuity checks, operational & interlock checks etc. in line with manufacturer standards.	As per applicable manufacturer standard.	Verification of Records byTata Power during final inspection.
3.0	FINAL INSPECTION (IEC 60694, IEC 62271-100, 102, 200, 201, 203, IEC 61869, IEC 61958, IEC 60099).			
3.1	Routine Tests.	Supplier to conduct 100% routine tests on all equipment & shall offer 10% of bays of each type (min. 2 bay per type) for Witness to Customer. Sample will be selected by the Customer on random basis. (Detailed Test Procedure for Acceptance tests shall be submitted for Customer Approval).		
3.2	Acceptance Checks:			
3.2.1	Completely assembled GIS.			
a		Visual Check: Including verification of i) The language and data on nameplates. ii) The colour and quality of paint and corrosion protection of metallic parts.	IEC 62271- 200	" +/- 20% of design value".

TPQA&I-QAXX-00-EX-SQP-332.
REV. 0

STANDARD QUALITY PLAN FOR HV GAS INSULATED SWITCHGEAR (GIS), 11/22/33 KV.

Date of Issue:
14-Oct-2017.

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	Remarks
1	2	3	4	5
b	Completely assembled GIS.	Gas Tightness Test (by Leakage Detector method).	IEC 62271- 203-7.4	no leakage.
c		Power Frequency HV test on Main Circuit.	IEC 62271 / 60694	Check for Back charge indication.
d		Partial Discharge Measurement.	IEC 62271-203-7.1.2	less than 5 PC.
e		IR Test on main circuit before and after HV test.	Mfg Standard.	min. 2000 MOhms.
f		Loss of SF6 & SF6 General lockout.	IEC 62271-100.	
g		Contact Resistance Measurement across for pole, Isolator/ Earth switch & interpanel couplings (mvDrop Test).	IEC 62271 / 60694	
h		Operating coils resistance measurement.		
i		Verification of correct wiring.	IEC 62771- 203-7.103	
j		Goose signal sending & Receiving through Fibre Optic, IED interface check with SCADA.		
k		Check time synchronisation for all relays.		
l		Relay configuration check: Reverse blocking, directional over current feature of BC relay, OLTS operation & other designed features.		
m		Relay testing through secondary current injection.		
n		Integrated protection checks along with SCADA.		
o		Indicating & recording meter functional checks through primary & secondary current injection.		
p		LT panel door illumination & space heater checks.		
q		Arrangement for LOTO.		
r		Functional checks including interlocks checks on disconnecter and Earthing Switch.		
s		SF6 Gas Density Switch: Operating Pressure of Contacts testing	Manufacturer's Standard as per Data Record.	
t		Surge arrestor: Visual, IR test and earthing circuit checks		
3.2.2		Circuit Breaker.	a. Mechanical Operation Test:	IEC 62271-203-7.102 IEC 62271-100-7.101
	1-At 100% of control Voltage (5 O & 5 C).			
	2-At 110% of control voltage (5 O & 5 C).			
	3-At 70% of control voltage for Tripping (5 O).			
	4-At 85% control voltage (C).			
	5-At 100% control voltage (CO).			
	6-At 100% control voltage Duty Cycle Test.			
	b. Timing Test:		IEC 62271-100-7.101	
	1-Closing time.			
	2-Opening time.			
3-Open Close time (O-C operation).				
4-Spring Charging Current and Time taken by motor.				
c. Antipumping check on the breaker				

TPQA&I-QAXX-00-EX-SQP-332.
REV. 0



STANDARD QUALITY PLAN FOR HV GAS INSULATED SWITCHGEAR (GIS), 11/22/33 KV.

Date of Issue:
14-Oct-2017.

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	Remarks
1	2	3	4	5
3.2.3	Current Transformer	a. Visual Inspection according to manufacturing drawing.	IEC 61869-2.	
		b. Terminal Marking-Polarity Check.		
		c. Secondary winding resistance measurement.		
		d. Power frequency withstand on secondary winding.		
		e. Inter-turn over voltage test.		
		f. Excitation Characteristic Measurement.		
		g. Rated Knee Point and maximum excitation current measurement.		
		h. Determination of errors.		
		i. Turns Ratio Error measurement.		
		j. IR at 1000V for secondary		
		k. Magnetisation Curve Plot.		
				>1000 MΩ. Data Record.
3.2.4	Voltage Transformer	a. Visual Inspection according to applicable drawing with Isolating Device as indicated in the specification in Close and Open conditions.	IEC 61869-3.	
		b. Terminal Marking-Polarity Check.		
		c. Winding resistance measurement.		
		d. Power frequency withstand on primary winding.		
		e. Power frequency withstand between sections and on secondary winding.	As per relevant standard	
		f. Partial Discharge Measurement for all equipment.		
		g. Determination of errors (measurement of accuracy).		
		h. IR at 1000V Primary winding to ground.		
		i. IR at 1000V Secondary winding to ground.		
		j. Operation test of Isolating device (10 Open and 10 Close operations). If applicable.		
		k. Power Frequency Withstand Test on ID in open condition.		
		l. Dielectric Test on auxiliary and control circuit.		
		m. IR measurement of auxiliary and control circuit.		
a. Visual Verification of Layout, Name plate, identification Labels.	Manufacturer standard as per approved data sheet & drawing.			
b. Bill Of Material Verification.				
c. Paint shade, Thickness, Peel Off test.				
d. Panel Earthing arrangement.				
e. Dielectric Test on auxiliary and control circuit.	IEC 62271-203-7.2	Shall be checked along respective GIS bay.		
f. IR measurement of auxiliary and control circuit.	Manufacturer standard as per Data Record.			
g. Verification of correct wiring with approved diagram and requirement.	IEC 62271-203-7.103			
h. Single line Mimic Diagram on Panel is same as approved SLD.	Approved drawing.			
i. Functional checks based on schematic diagram.	Manufacturer standard as per Data Record.			
3.2.5	LT Cubicle (Control Panel).			

TATA POWER		The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing.		TATA
TPQA&I-QAXX-00-EX-SQP-332 REV. 0		STANDARD QUALITY PLAN FOR HV GAS INSULATED SWITCHGEAR (GIS), 11/22/33 KV.		Date of Issue: 14-Oct-2017.
Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	Remarks
1	2	3	4	5
3.3	Type Test as per (IEC 60694, IEC 62271-100, 102, 200, 201, 203 IEC 61869, IEC 61958, IEC 60099).			
a	Type Test for GIS (Integrated Bay).	Verification of Making and Breaking Capacities.	TC verification as per specific IEC standard /conducting test as per mutual agreement.	Valid type test certificate not older than 5 years Shall be Submitted for review & approval to TATA Power.
b		Internal Arc Test.		
c		Temperature Rise test at Maximum Rated Continuous Current.		
d		Insulator performance under Thermal Cycle and Gas Pressure Test.		
e		Lightning Impulse Test (after Power Frequency test).		
f		Peak and Short Time Withstand Current Test.		
g		IP degree protection.		
h		Noise Level (IEC 61672-1, IEC 61672-2).		
i		Corrosion test on earthing connection.		
j		Corrosion test on enclosure.		
k	Type Test for GIS.	Tests to prove satisfactory operation of the included switching devices.		
l		Electro Magnetic Compatibility Test.		
m		CT Type Tests.		
n		PT Type Tests.		
o		CB Type Tests.		
p		DS or Three position switch: Type Tests		
q		SA Type tests.		
r		Gas Leakage measurement as guaranteed by Manufacturer.		
s		Any other type tests as per IEC/ customer requirement.		
3.4		Final Checks:		
a		Gas tightness checks in all shipments.	As per Manufacturer standards & Relevant IEC standards.	Physical Inspection of available Bays.
b		Phase Indications at all terminations.		
c		Ensure SF6 transportation pressure in each shipment is per manufacturer std.		
4.0	Document review & Issuance of IRN:			
4.1	Document review & Issuance of IRN.	Review of Quality dossier (*) & Inspection report	Review	(*) along with index.
N O T E	<p>A) STATUTORY REQUIREMENTS WILL BE COMPLIED BY THE CONTRACTOR.</p> <p>B) ALL MATERIAL SHALL BE AS PER APPROVED DRAWINGS / DATA SHEET.</p> <p>C) TATA POWER / ITS REP IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED, IF REQD, SAME SHALL BE TRANSFERRED BY TATA POWER / ITS REP ONLY.</p> <p>D) FINAL INSPECTION OF THE MAJOR ACTIVITIES ARE WITNESSED BY CLIENT AND IT IS HOLD POINT (AT THE DISCRETION TATA POWER)</p> <p>E) MANUFACTURER SHALL PREPARE AND SUBMIT COMPLETE MANUFACTURING QUALITY PLAN IN PRESCRIBED FORMAT OR THEIR REGULAR FORMAT INDICATING THEIR REGULAR PRACTICES, TAKING CARE OF MINIMUM REQUIREMENT AS INDICATED ABOVE.</p> <p>F) INSPECTION OF SPARES SHALL BE MANUFACTURED & INSPECTED AS PER APPLICABLE CLAUSES OF THIS QUALITY PLAN. SPARES OFFERED FOR INSPECTION SHALL BE PREFERRED ALONG WITH MAIN ITEMS (IF ORDERD).</p> <p>G) AS PER SPECIFICATION PROPER PAINTING & PACKING SHALL BE ENSURED BY VENDOR BEFORE SHIPMENT TO AVOID ANY TRANSIT DAMAGE.</p> <p>H) ANY SEPARATE TEST SHALL BE CARRIED OUT IF CALLED FOR IN ACCORDANCE WITH TATA POWER TECHNICAL SPECIFICATION OR AS PER MUTUALLY AGREED IN MOP.</p> <p>I) CALIBRATION CERTIFICATES OF THE EQUIPMENT(INSTRUMENTS) USED FOR INSPECTION SHALL BE PROVIDED FOR REVIEW.</p> <p>J) TATA POWER RESERVES THE RIGHT TO DEMAND VERIFY/AUDIT/WITNESS ANY OF THE CHECK POINTS MENTIONED IN THE SCOPE OF THE SUPPLIER.</p>			
Meant for (Internal Circulation / External - Stakeholders Circulation)				
0	First Issue.	SR & 14.10.2017	CRB & 14.10.2017	SS
Rev.No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date

Annexure 3 - FQP


		The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing.								
TPQA&I-QAXX-00-EX-SFP-333 REV.0		STANDARD FQP FOR HV GIS INSTALLATIONS (11/22/33 KV).					Date of Issue: 10-Oct-2017.			
Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED		CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS	
1	2	3		4	5	6	7	8	9	
1.0	MATERIAL RECEIPT & STORAGE:	1	Availability of Instruction manuals, drawings for storage and erection.	Major	Physical	At the Time of Receipt.	Manufacturer's O&M Manual.	site log book.		
		2	Verification of shipments/ GIS panels and accessories for any transit damage.	Major	Physical		MDCC/ Packing list, BOM			Any shortfall/ damage shall be reported through joint protocol with FQC.
		3	Ensure storage of unpacked GIS Equipment as per Storage Type 4.	Major	Physical	At the time of storage.	Storage Type 4.			Refer the note for Storage (supplier to provide packing which is weather proof).
		4	Check & report any shortfall in presence of manufacturer.	Major	Physical	Once before erection.	No damage / defect/ shortfall			Jointly with FQC.
2.0	PRE-ERECTION:	1	Check availability of all tools & tackles required for erection works.	Major	Visual		Once before erection.	Manufacturer's Instruction Manual.	Inter dept. handing over protocol.	Check joint protocol for handing over of area from Civil to electrical.
		2	Check the Readiness of GIS installation floor with access, base frame, earthing grid, Cable chase/ vault, Cable entry arrangement & with EOT Crane/ hoist of adequate capacity (Check EOT/ Hoist has been successfully tested.	Major	Visual	Site Approved Installation Drawing.				
		3	Check floor is properly levelled for GIS Installation.	Major	Measurement					
		4	Ensure erection area, walls, floor, partition, roof are cleaned & dust free environment.	Major	Physical	Once before erection.	Manufacturer's Instruction Manual.	site log book.		
		5	Ensure the availability of erection sequence procedure & installation manual.	Major	Physical					

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS	
1	2	3	4	5	6	7	8	9	
2.0	PRE-ERECTION:	6	Check facilities for operation of SF6 filtration/ filling equipment, availability of power source with sufficient capacity, length of hose pipe etc.	Major	Visual	Once before erection.	Manufacturer's Instruction Manual.	site log book.	If applicable.
		7	Check readings of Shock Indicator/ impact recorder after unpacking for any abnormality.	Major	Physical				
		8	Check that there is no drop during transportation in gas pressure set by manufacturer.	Major	Physical				
		9	Check for additional facilities like skilled & semi-skilled man power & tools, tackles as required.	Major	Physical				
3.0	ERECTION:	1	Install/ dock the GIS panels as per the layout.	Major	Physical	During erection.	Site Approved Installation Drawing.	Erection Protocol.	Torque setting shall be in approval of FQC/ QA&I. If brazing is required, vendor has to establish BPS/PQR & Brazer certification at site.
		2	Ensure all panels are levelled/ aligned, placed correctly on brackets/ frames.	Major	Visual		General Arrangement		
		3	Coupling of GIS Panels & tightening of bus bar.	Critical	Physical				
		4	Install proper gasket, 'O' rings & hardware for inter panel coupling flanges.	Major	Visual				
		5	Ensure all hardware are tightened with applicable torque and marked after tightness.	Major	Physical	Once before erection.	Site Approved Installation Drawing.		
		6	Check for Earthing connections for all panels/ chambers as per the manufacturer instructions.	Major	Visual		Instruction Manual.		
		7	Check purity of SF6 gas for cylinders (DEW Point Measurement).	Major	Physical / Testing				
		8	Check suitable spacers/ expansion joints are provided, wherever applicable.	Major	Testing				

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
3.0	ERECTION:	9	Check SF6 Gas Density Switches are installed.	Major	Physical	100%	Erection Protocol.	
		10	Check for safety signage installation.	Major	Visual			
		11	Vacuuming of busbar/ breaker chamber (before filling of SF6 gas).	Major	Physical			
		12	Fill SF6 gas in each cubicles/ bay upto normal operating pressure.	Major	Physical			
		13	Check there is no gas leakage from the joints with leakage detector.	Major	Physical			
		14	Check for suitable supports for rigid cable duct, if applicable.	Major	Physical			
		15	Check all unused gland openings for LT panel are sealed suitably.	Major	Testing			
4.0	PRE-COMMISSIONING TESTS: (detailed procedure shall be submitted as Site Acceptance Test Procedure).							
4.1	Circuit Breaker:							
		1	Time measurement in Closing, Opening & CO operation.	Critical	Testing	100%	Site Test Report	
		2	Verification of essential Interlocking.					
		3	Close & Open coil current signature.					
		4	Scheme checks.					
		5	Check alarm & trip / operational block checking of circuit breaker for low SF6 pressure.					
4.2	Current Transformer:							
		1	Polarity check.	Critical	Testing	100%	Site Test Report	
		2	Insulation resistance measurement.					
		3	Winding Resistance measurement.					
		4	Knee point measurement for all core					
		5	Ratio check in all Taps					
		6	Secondary interturn insulation test.					
		7	Core identification at terminal box					
		8	Wiring checks.					

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS					
1	2	3	4	5	6	7	8	9					
4.3	Potential Transformer:												
		1 Polarity check.	Critical	Testing	100%	Factory test report.	Site Test Report						
		2 Insulation Resistance measurement.											
		3 Winding Resistance measurement.											
		4 Ratio check											
		5 Secondary induced voltage test.											
		6 Wiring checks.											
4.4	Complete GIS Assembly:												
	Complete GIS Assembly:	1 Visual Inspection of Installation.	Critical	Testing	100%	Manufacturer's Instruction manual, approved scheme drawing & data sheet.	Site Test Report						
		2 Verification of static filters, Density switches, safety diaphragm.											
		3 Wiring checks.											
		4 Insulation Resistance Measurement (before & After HV test).											
		5 Disconnecter, Earth switch & Breaker: Checking of Manual Operation (penetration, safety at opening, safety at closing).											
		6 Current drawn by motor & timing measurement for Closing & Opening of Isolator & earth switch.											
		7 Contact Resistance Measurement using mv Drop method (with 100A DC).											
		8 Moisture content measurement in SF6 gas.											
		9 Gas Tightness test (Leakage test for all Joints).											
		10 SF6 Gas Density switch test.											
		11 Power frequency high Voltage test (80% of Factory test Voltage for 1 min.).											Backcharge indication check at the time of HV test
		12 Relay tests through secondary current Injection.											

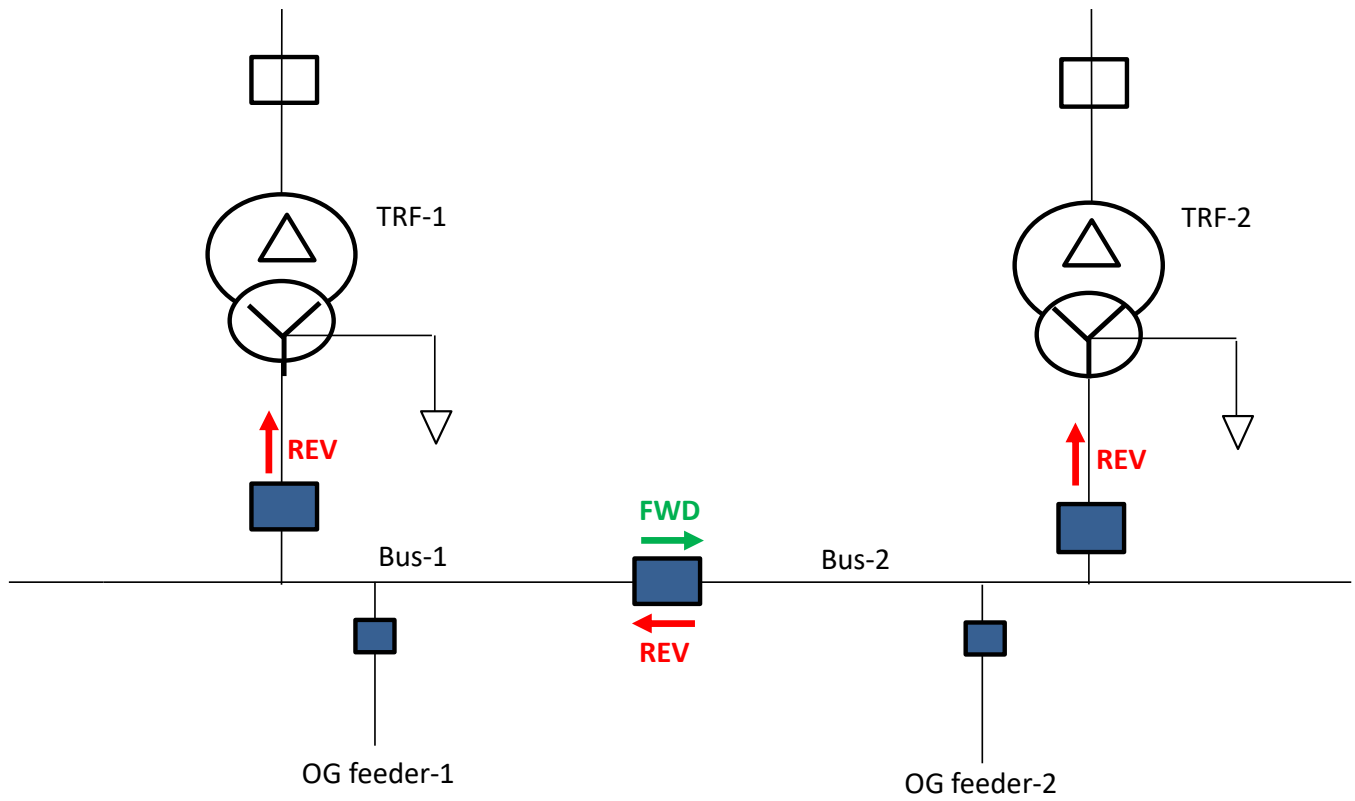
Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
		13 Scheme checks: Check for interlocks, changeovers, upstream/ downstream isolation, bus coupler operation..	Critical	Testing	100%	Manufacturer's Instruction manual, approved scheme drawing & data sheet.	Site Test Report	
		14 Operation through BCPU & wiring checks.						
		15 Integrated test with SAS/SCADA						
		16 Check for LOTO interlocks/ arrangement.						
		17 Primary current & Voltage injection to check healthiness of wiring for CT & PT circuits.						
		18 For Cable connections: Ensure suitable size cable termination kit is used for respective panels.						
		19 Adoption of approved relay settings & configuration.						Check for Reverse Blocking Scheme.
5.0	Submission of Quality Dossier prior to Handing over.	Complilation of all stage inspection protocol, test reports including closure of non conformance.	Critical	Visual	100%	_____	SWCF*	* Site Work Completion File
	COMMISSIONING (These tests shall be performed by Commissioning team where Testing & CTDS will be a member).	The procedure for these tests shall be submitted to PE/CTDS for approval. Tests shall be conducted, only as per the approved procedure by the concerned. Some of the indicative test are given for reference. 1. Check for Abnormality. 2. Check for Phase sequence & phase out. 3. Check for SF6 Gas Pressure. 4. Check Incoming & bus voltage, current.						

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TPQA&I-QAXX-00-EX-SFP-333 REV.0		STANDARD FQP FOR HV GIS INSTALLATIONS (11/22/33 KV).					Date of Issue: 10-Oct-2017.	
Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
A) STATUTORY REQUIREMENTS WILL BE COMPLIED WITH BY THE CONTRACTOR. B) FOR STAGES WITNESSED / DOCUMENTS REVIEWED BY TATA POWER, COPIES OF RELEVANT DOCUMENTS WILL BE FURNISHED TO TATA POWER. C) TATA POWER / ITS REP. IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED / GOT TRANSFERRED BY TATA POWER / ITS REP AT APPROPRIATE STAGES.(IF REQUIRED). D) THE EXTENT INDICATED IN COLUMN 6 IS IN CONTRACTOR'S SCOPE.TATA POWER MAY INSPECT AS PER THIS COLUMN OR RANDOM SAMPLES AT IT'S DESCRETION. E) COLUMN 7 WILL BE AS PER TATA POWER APPROVED DRAWINGS / DATA SHEETS / CONTRACT DOCUMENTS WHEREVER APPLICABLE. F). INSTRUMENTS FOR LEAK TESTS AND PERFORMANCE TESTS WILL HAVE VALID CALIBRATION CERTIFICATE WITH TRACEABILITY TO NATIONAL LEVEL.								
Critical Category is HOLD point.		This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing is permitted. 24 Hrs advance notice to be given to TATA POWER FQC. Contractor /sub contractor shall not process activity beyond HOLD point without written permission by TATA POWER FQC. This activity shall be performed by Main & Sub- Contractor (Execution + FQC) & witnessed jointly by TATA POWER (Execution + FQC). (Surveillance by Head FQC / Project Head).						
Major Category is Witness point.		This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing. 24 Hrs advance notice to be given to TATA POWER (Execution) . Contractor /sub contractor shall not process activity beyond Witness point without written permission by TATA POWER (Execution). This activity shall be performed by Main and Sub- Contractor (Execution + FQC) & witnessed by TATA POWER Execution & Surveillance by FQC.						
Minor Category is Review point.		This activity required review of documents by TATA POWER for the compliance & acceptance, However 24 Hrs advance intimation to be given to TATA power (Execution). This activity shall be performed by Main and Sub- Contractor (Execution +FQC) . (Surveillance by Execution / Project Head).						
TATA POWER reserves the right to carryout surveillance at any point of time through FQC.								
STORAGE TYPE: TYPE-1: OPEN AREA, ABOVE GROUND ON WOODEN PLANK WITH SLOPE FOR WATER DISPOSITION. TYPE-2: OPEN AREA, ABOVE GROUND ON WOODEN PLANK WITH SLOPE FOR WATER DISPOSITION AND COVERED WITH TARPAULIN. TYPE-3: OPEN SHED WITH FULLY FORMED FLOORING/CEMENT FLOORING. TYPE-4: COVERED SHED/STORE ROOM ON RACKS & IDENTIFIED LOCATION. TYPE-4A: CLOSED CHAMBER WITH TEMPERATURE & HUMIDITY CONTROL. NOTE: Items/equipments having shelf life like paints, alumina, desiccant etc. are to be stored separately for identification purpose.								
Rev. No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date	Issued By.			
RD	ISSUE FOR USE	SR / 14.10.2017	CB/ 15.10.2017	SS 16/10/17				

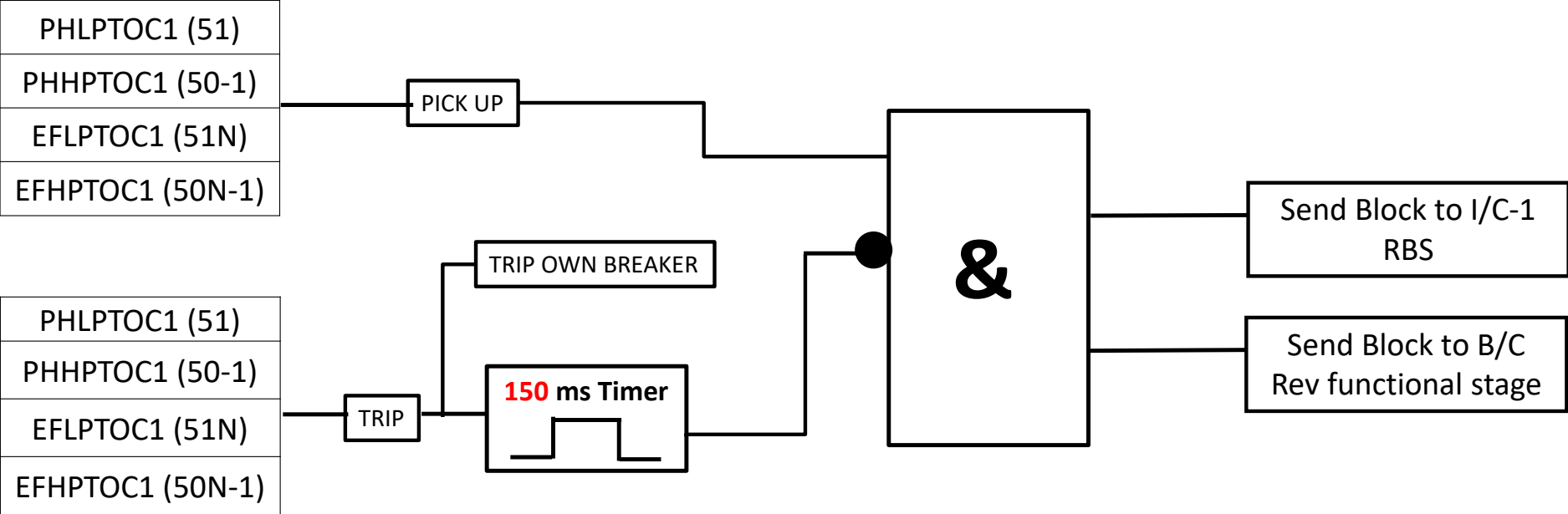
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Annexure - 4 Reverse Blocking Scheme

TATA POWER REVERSE INTERLOCKING SCHEME



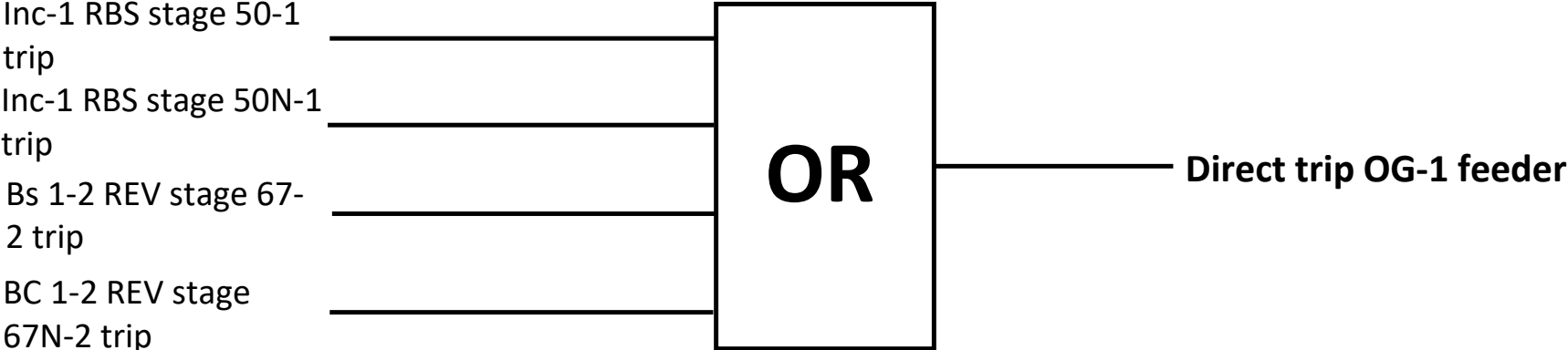
OG-1 signal Send



For blocking send, GOOSE IN is not required.

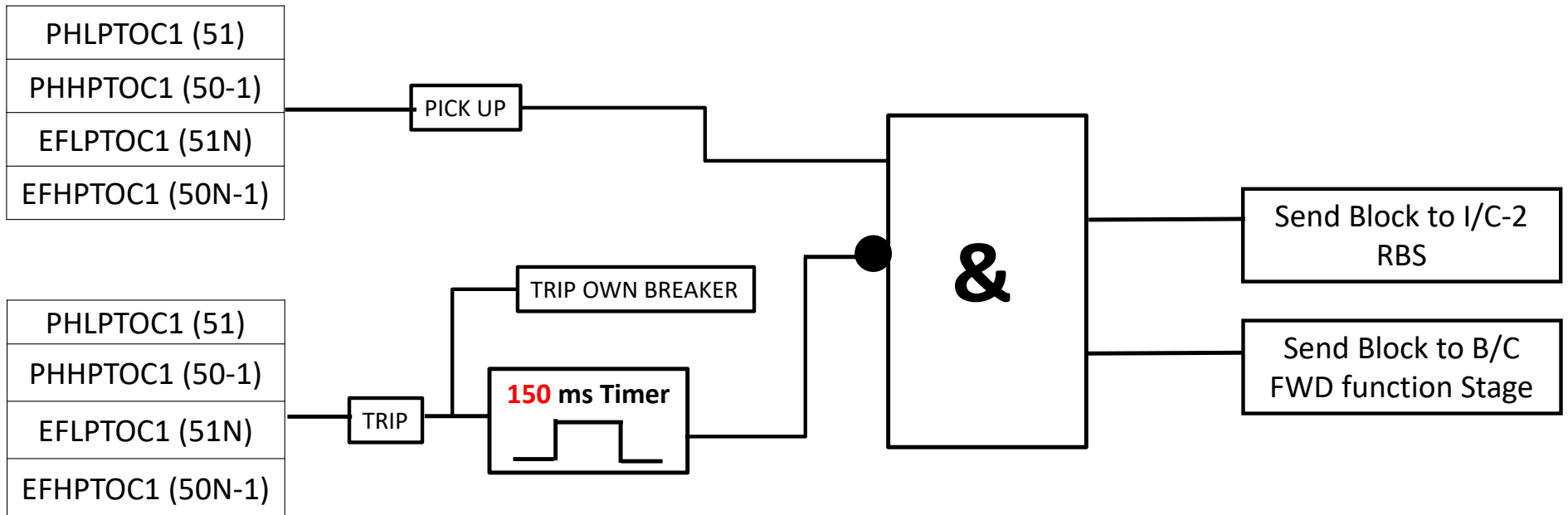
Note::: RBS: Reverse Blocking stage

OG-1 signal receive



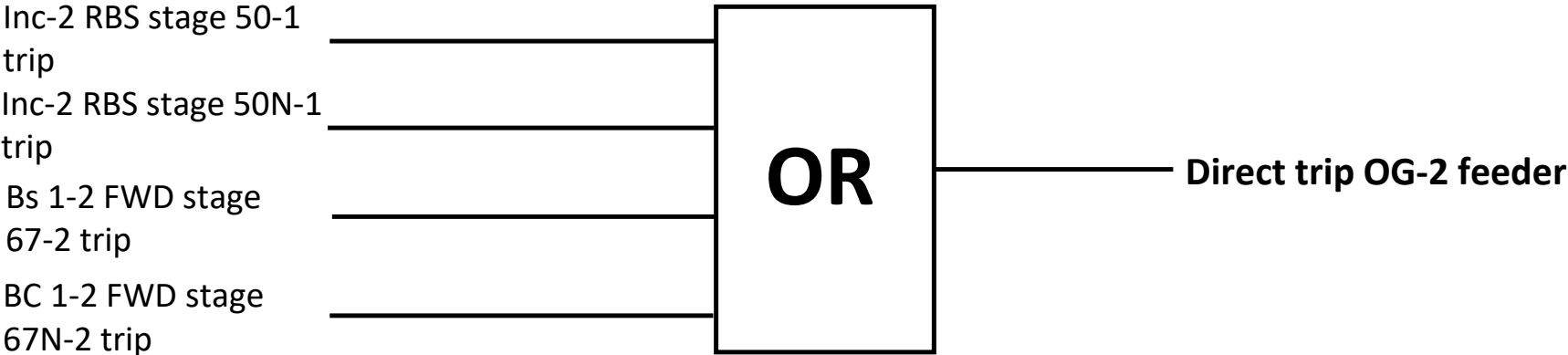
Note::: RBS: Reverse Blocking stage

Outgoing-2 signal Send



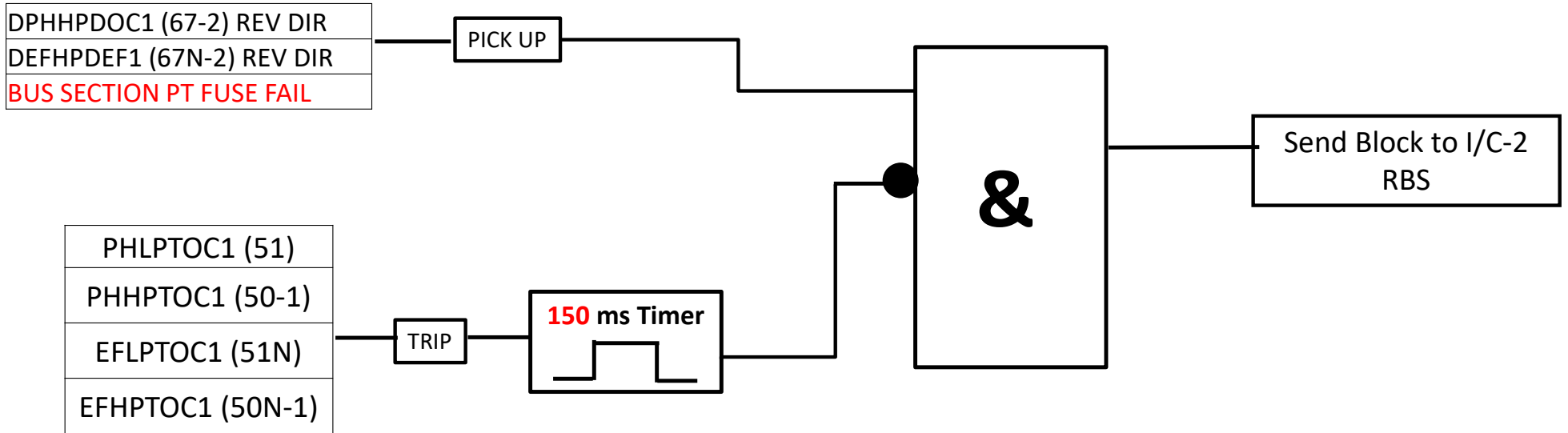
For blocking send, GOOSE IN is not required.

OG-2 signal receive



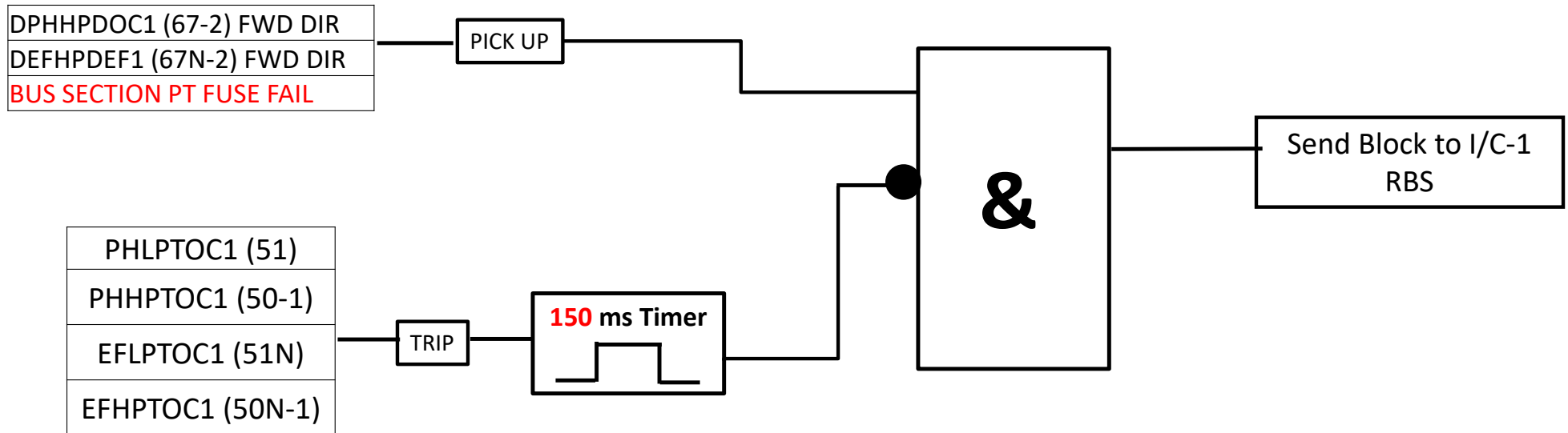
Note::: RBS: Reverse Blocking stage

Bus Section-1-2 Signal Send



For blocking send, GOOSE IN is not required.

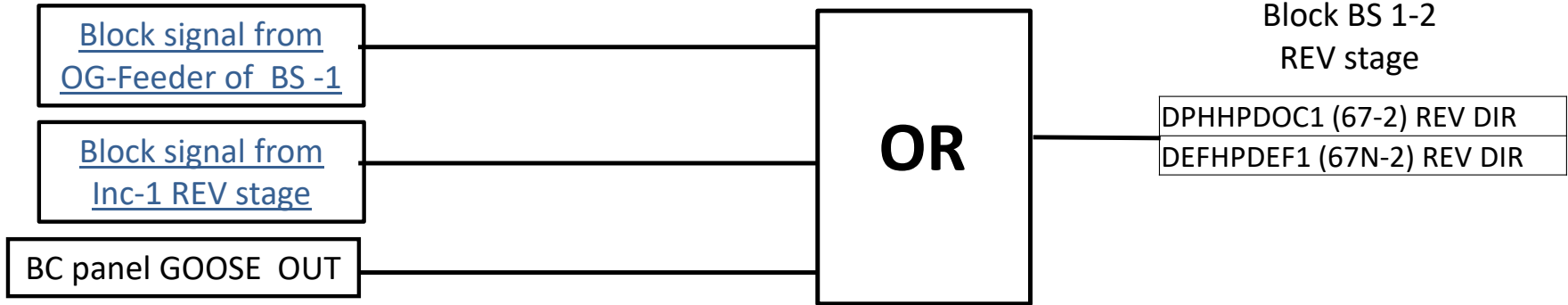
Bus Section-1-2 Signal Send



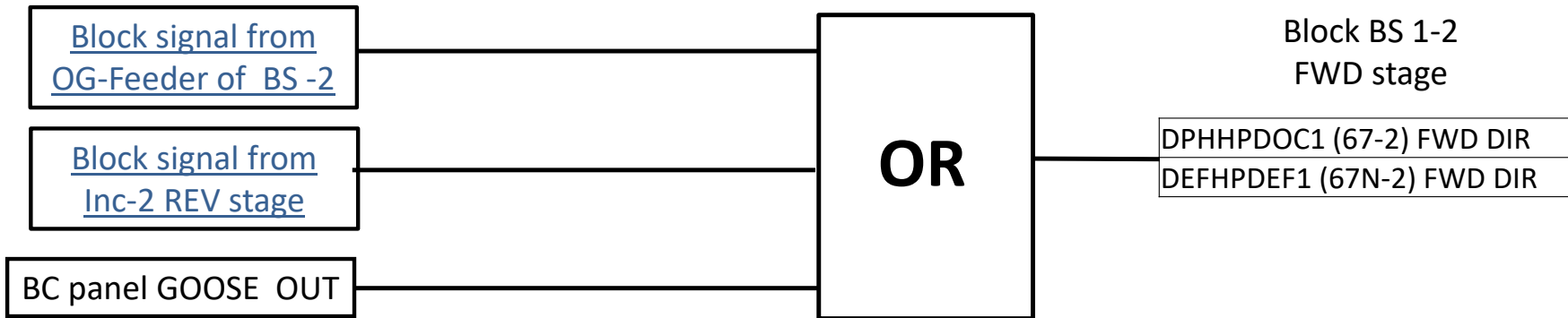
For blocking send, GOOSE IN is not required.

Bus Section-1-2 Signal Receive

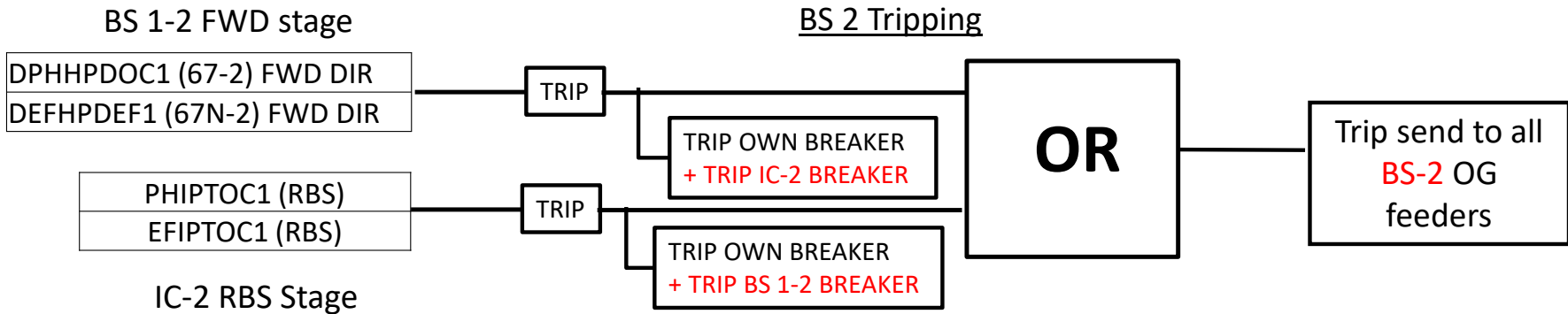
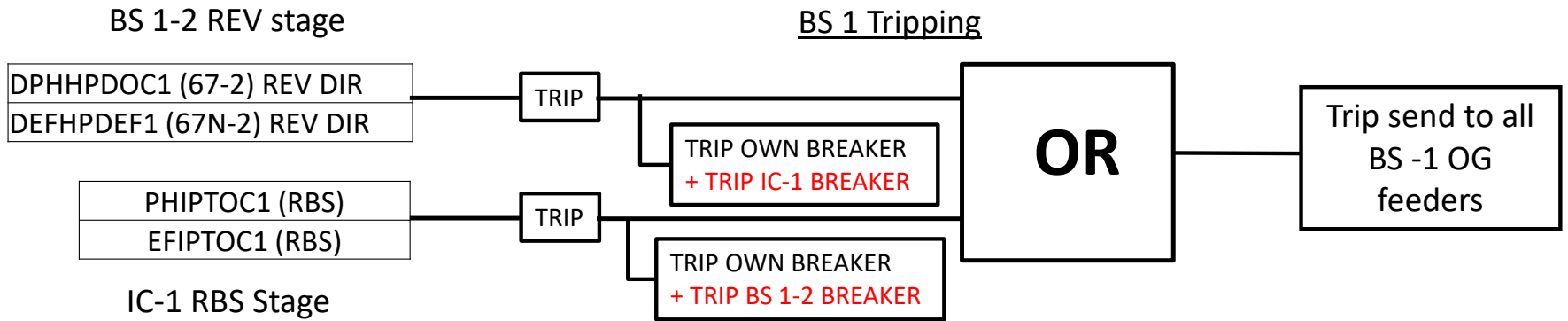
BS 1-2 Logic



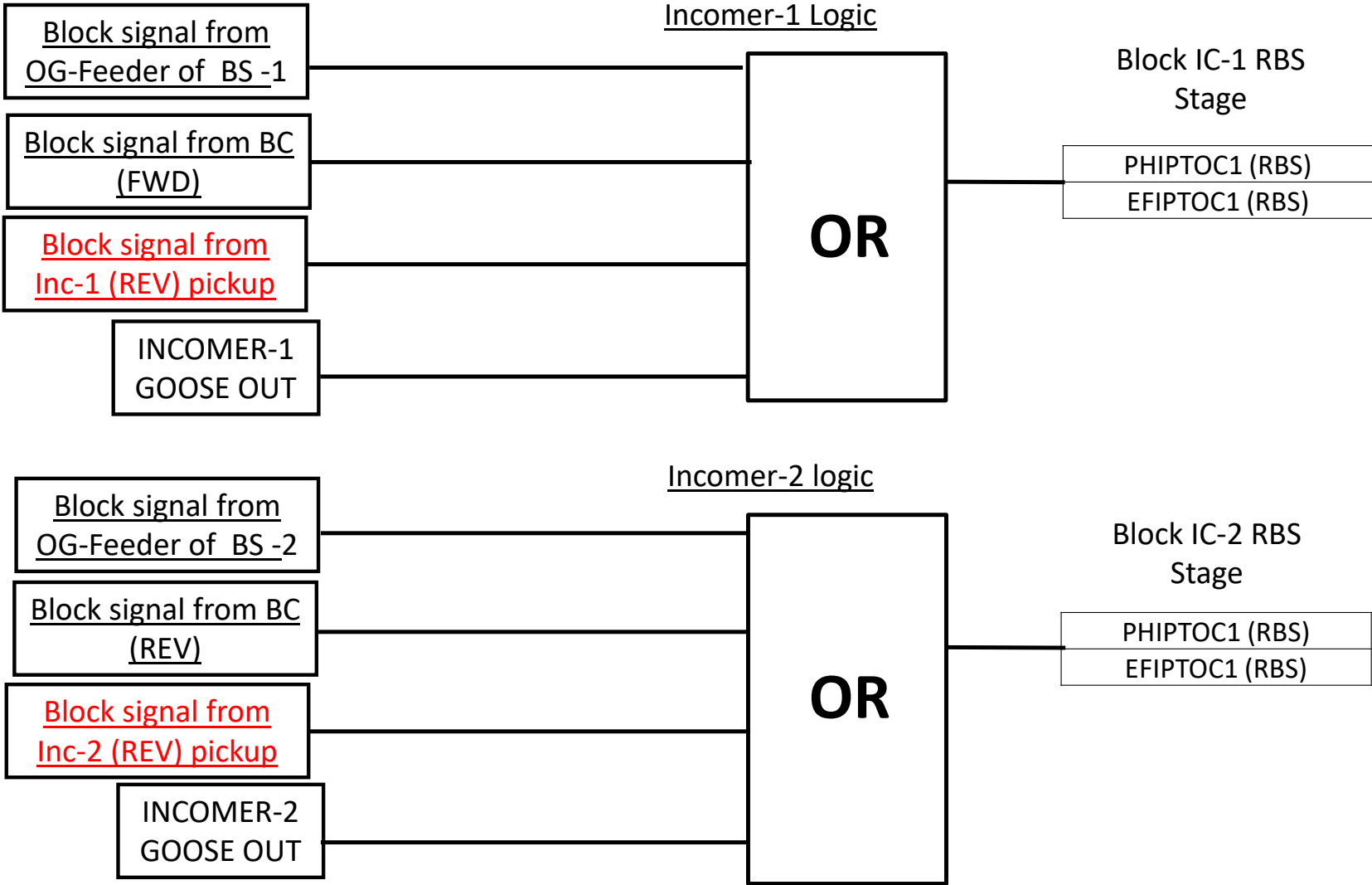
BS 1-2 Logic

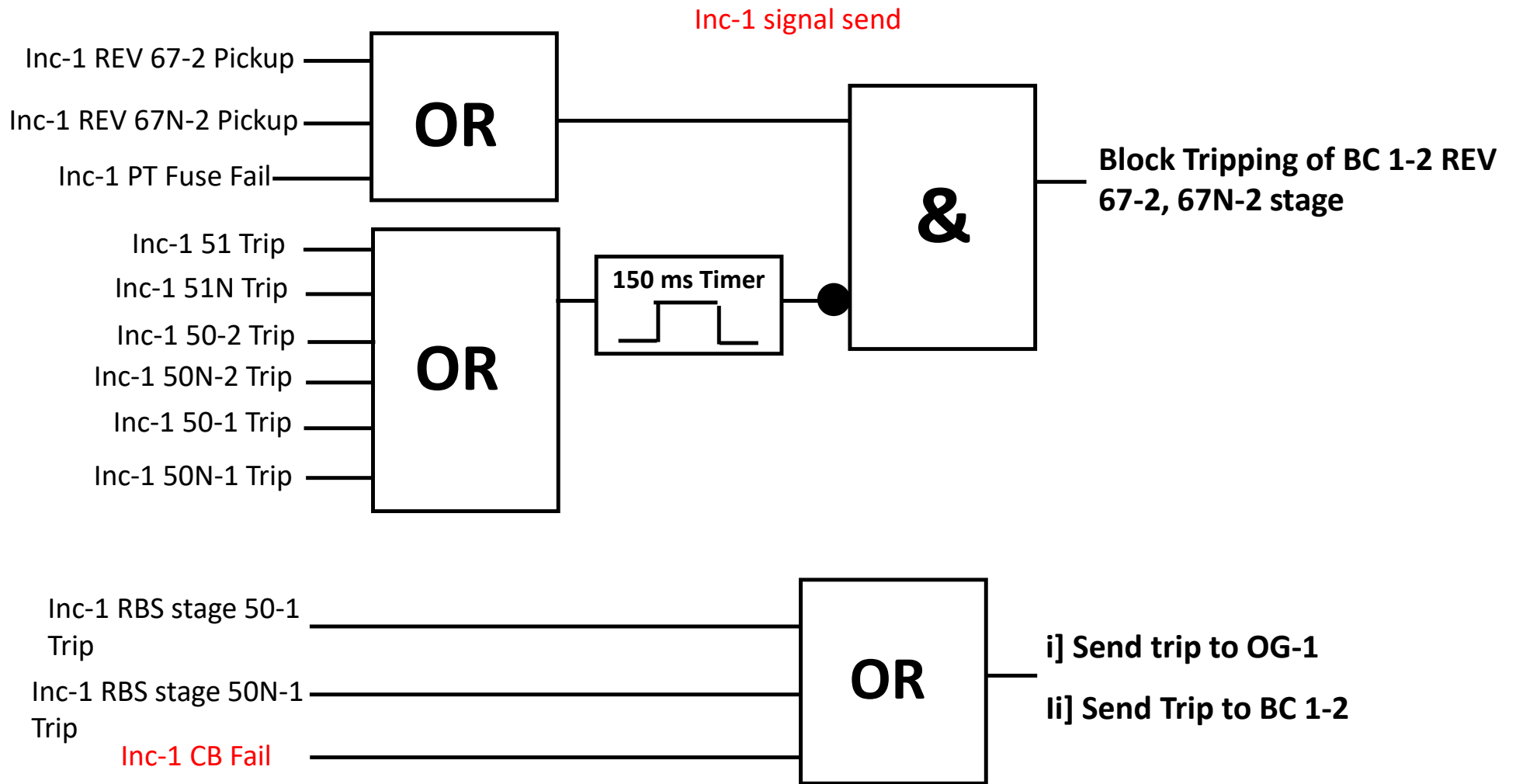


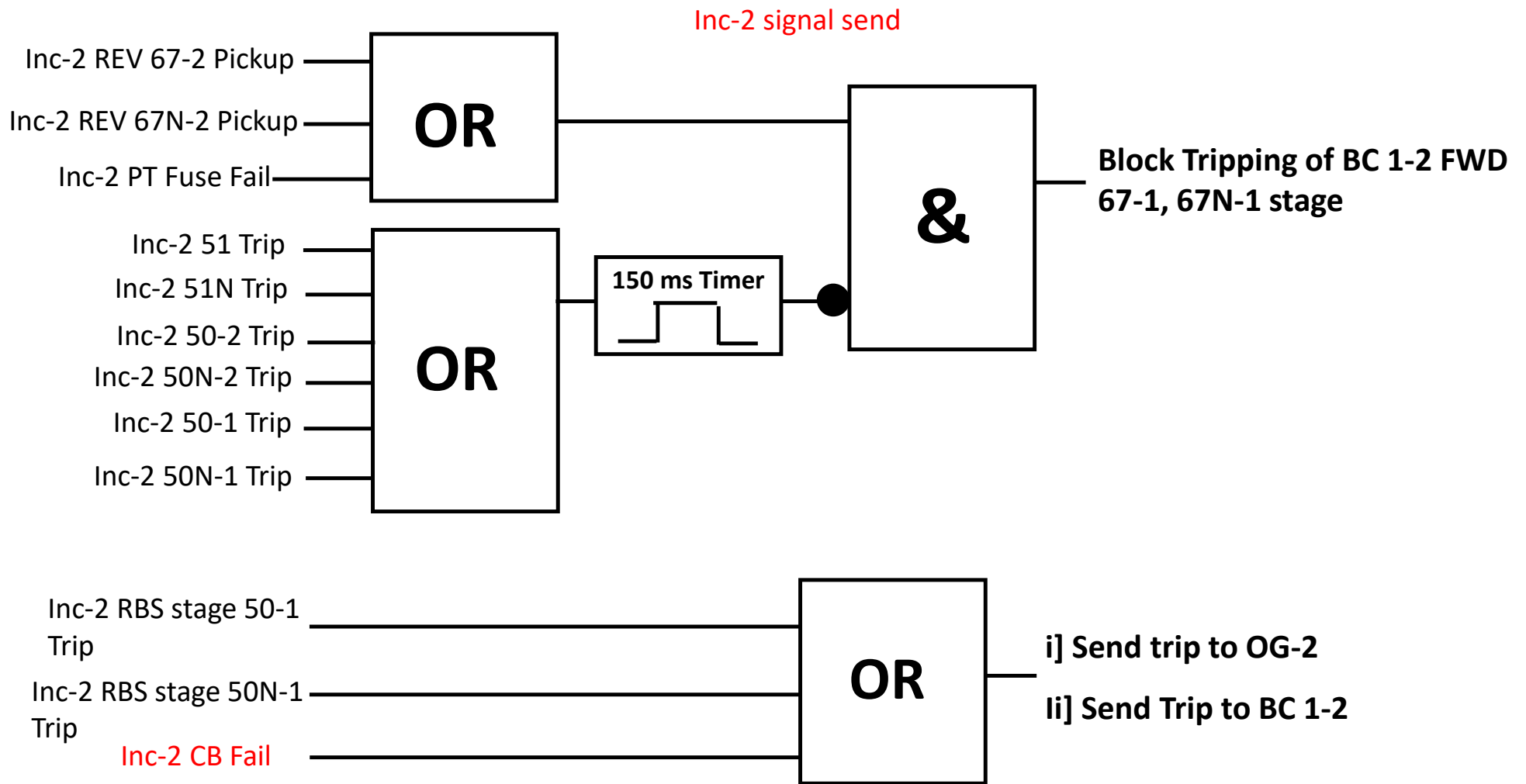
Tripping of OG breaker after operation of reverse blocking based busfault protection



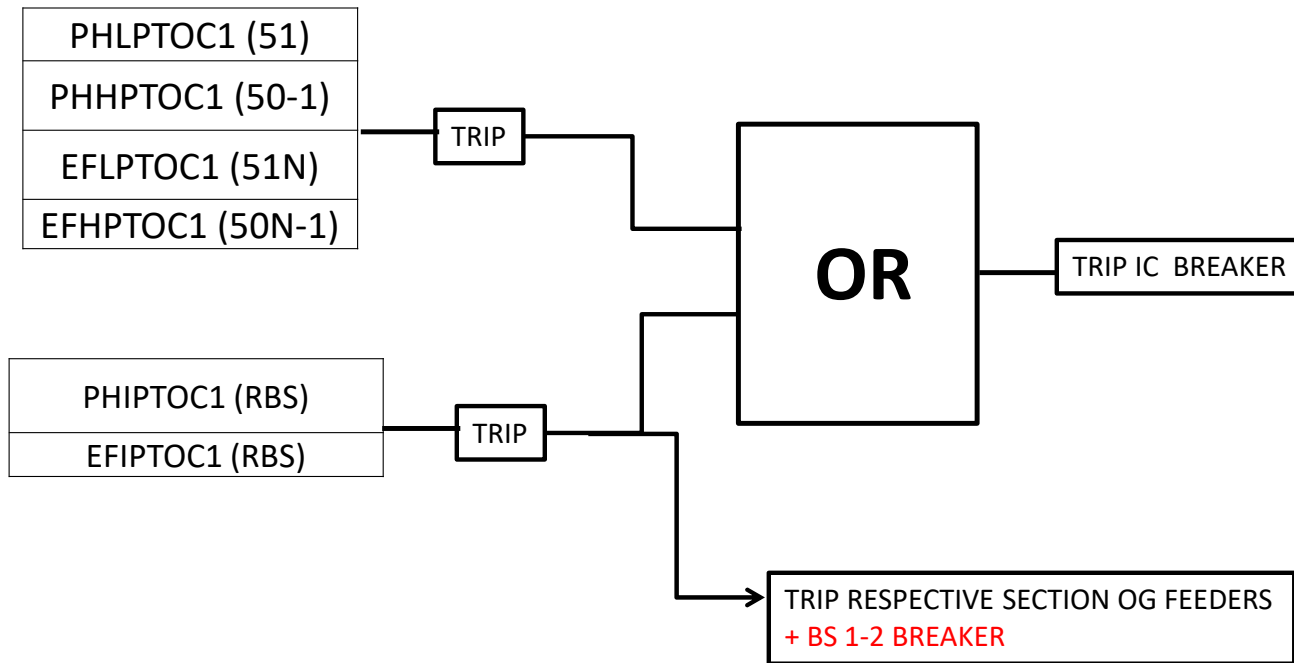
Bus Section-1 Blocking Receive







INCOMER TRIPPING NORMAL PROTECTION WITH RBS STAGE



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	IEC61850 based Bus bar protection Scheme Proposed Setting Philosophy	

Earth Fault PU for Bus fault Stage		
Bus Coupler	3000	1000
Incomer	3000	1500
Incomer Rev PU	3000	750/ 500 for 22/ 33 kV resp.

Note: Proposed pickup are kept above the maximum pickup on outgoing feeders i.e. for Phase fault – 1200 Amp & for Earth fault- 600 Amp.

b. Configuration Modification

It is recommended to modify the bus coupler configuration, In Block sending to incomer logic is modified as shown below.

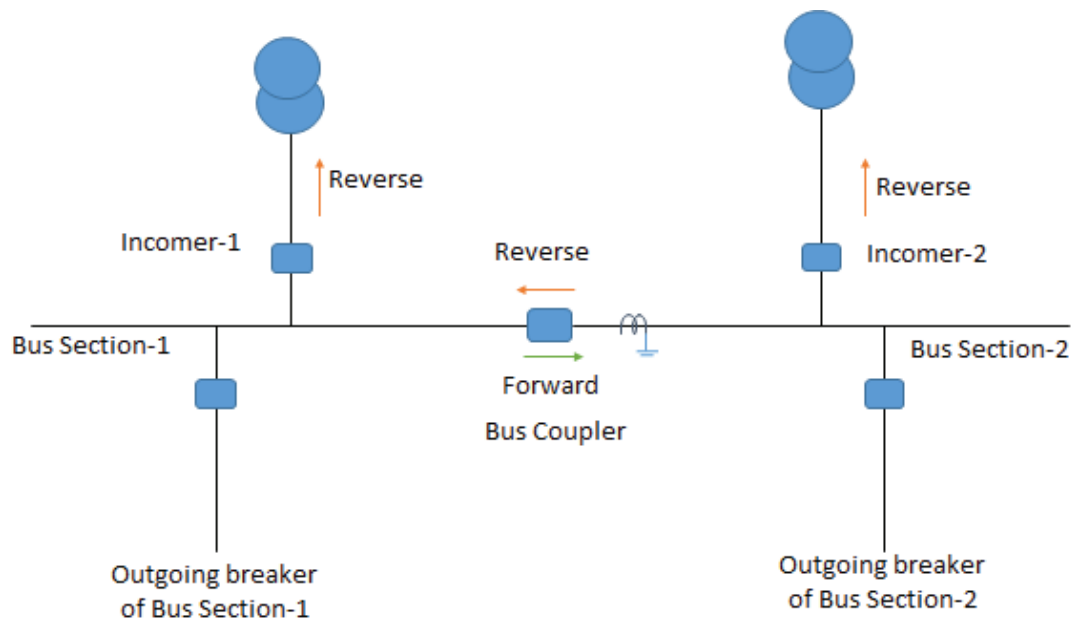
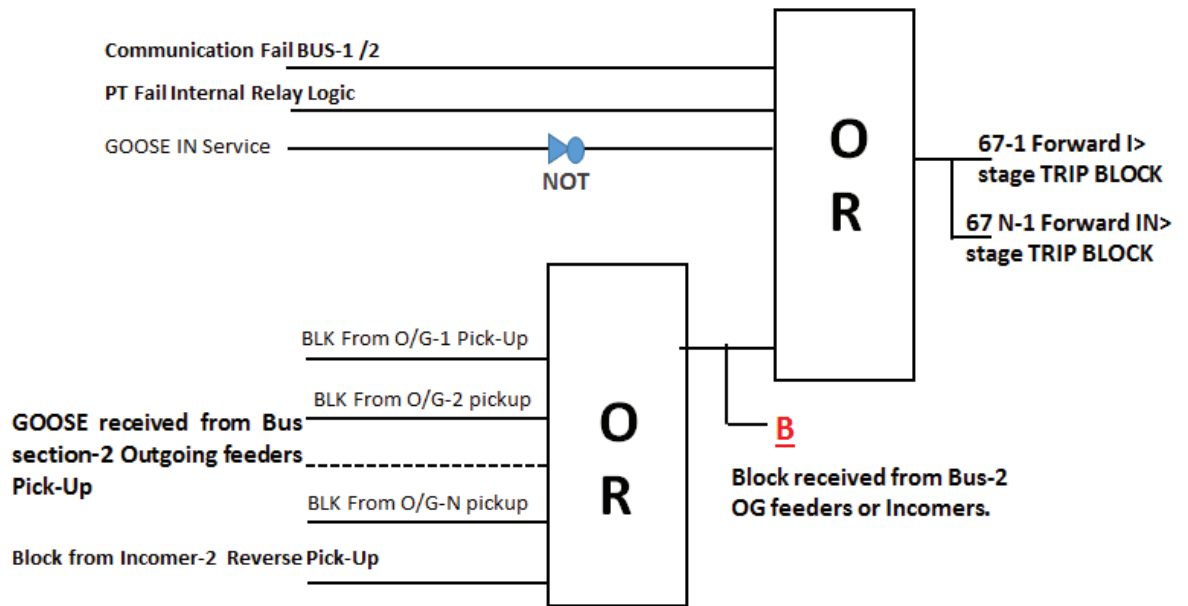


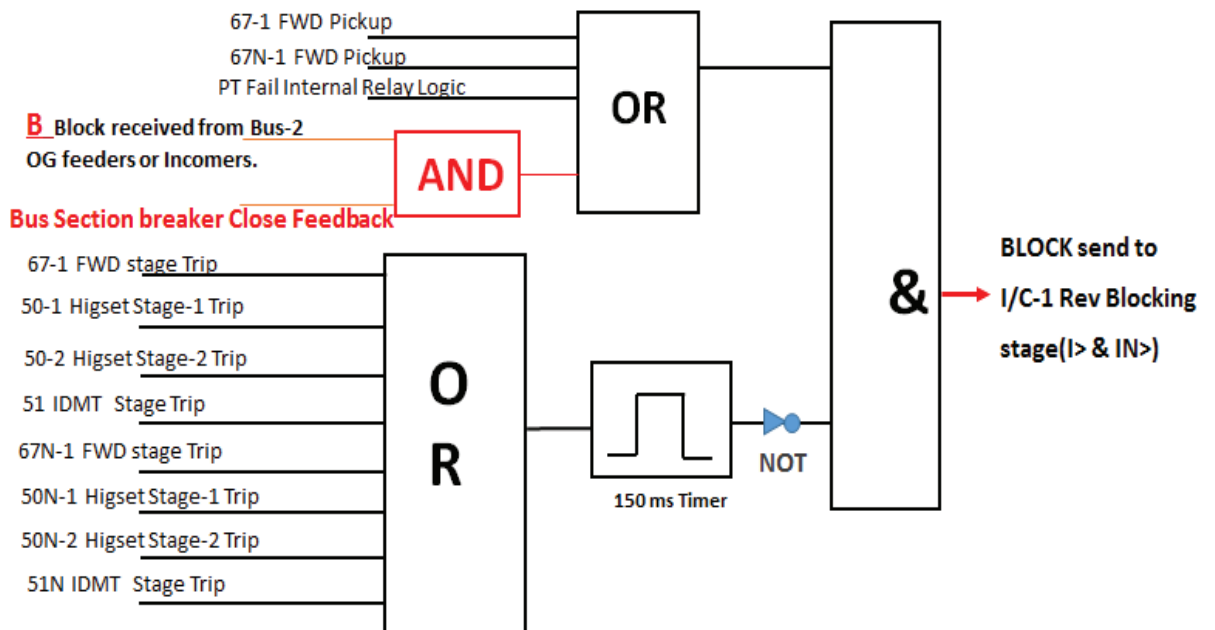
Fig:1] Typical Station Layout

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Logic-1 Own Forward stage bus fault blocking logic

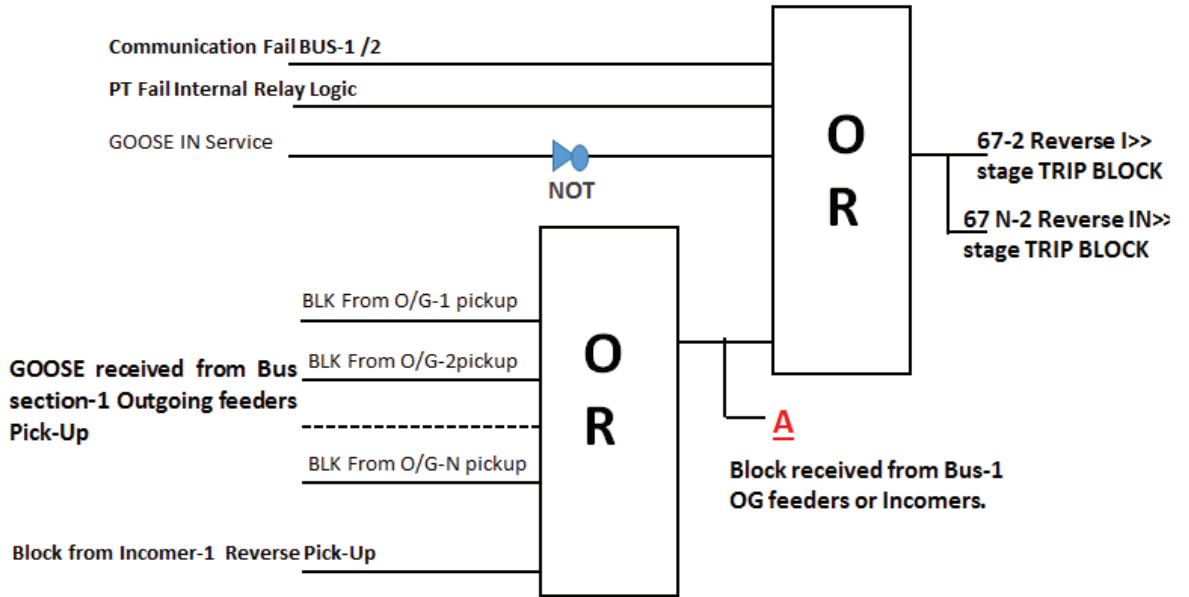


Logic-2 Modified Block send logic when Own Forward stage is Blocked / Picked Up

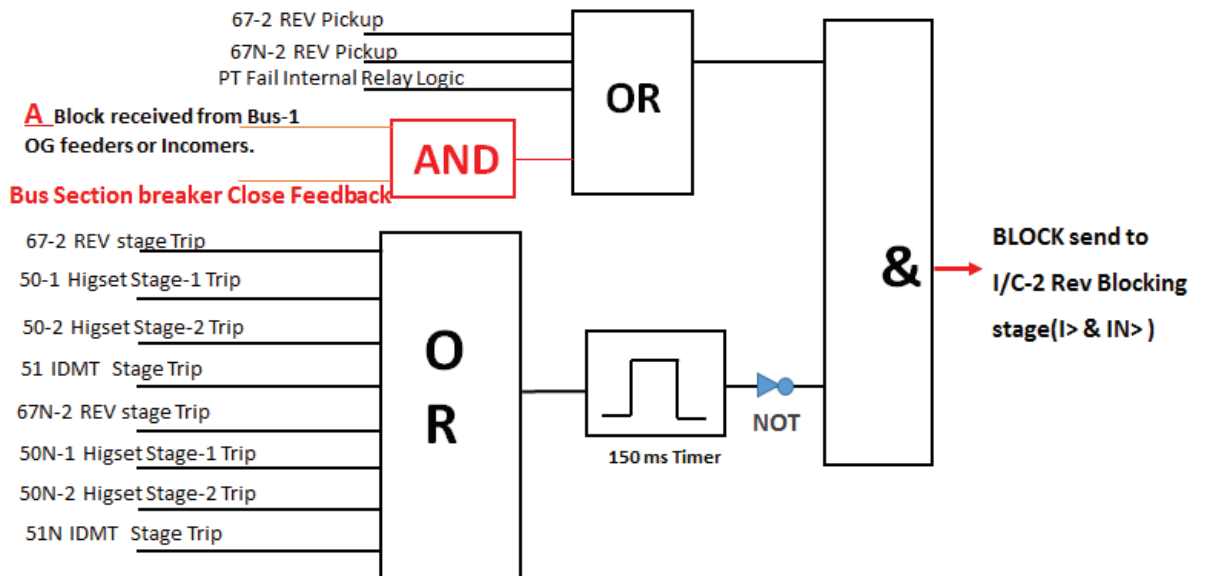


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	IEC61850 based Bus bar protection Scheme Proposed Setting Philosophy	

Logic-3 Own Reverse stage bus fault blocking logic



Logic-4 Modified Block send logic when Own Reverse stage is Blocked / Picked Up



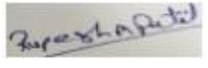


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SECTION B

CHAPTER - B2.3-B

TECHNICAL SPECIFICATION FOR “Sub-station Automation System”

Rev. No	Date	Revision History	Prepared By	Checked By	Approved By
R0	11-06-24	Final Release	VS	RSM	RMP
					

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1.0 **INTRODUCTION**

Tata Power Company Limited (Tata Power) hereinafter called the "OWNER" or "PURCHASER", proposes augmentation work at various Receiving Station (RSS) as mentioned in the RFP.

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. Bidder shall offer the Substation Automation System (SAS) Supply & Services accordingly.

The document covers the specific requirements for complete design, detailed engineering, installation, Integrated testing and commissioning of **Substation Automation System as per following**

- a. Substation Automation System for 33/22kV System at Saki, Vikhroli and Kalyan.
- b. Integration of Auxiliaries and other systems mentioned in the RFP.

All equipment, system and services covered under this specification shall comply with all current applicable statutory regulations and safety codes in the locality where the equipment is proposed to be installed. The equipment and systems shall also conform to the latest version of applicable codes and standards on the date of offer made by the Bidder, unless otherwise indicated. Nothing in this specification shall be construed to relieve the Bidder of this responsibility

2.0 **BIDDER'S QUALIFICATION REQUIREMENTS & APPROVED VENDOR LIST**

2.1 **Approved Vendor List for Purchaser**

Following Automation System Manufacturers are approved for supply and installation of Sub-Station Automation System.

- a. M/s Siemens India Limited
- b. M/s Hitachi Energy (APPSIL) India Limited
- c. M/s GE (T&D) India Limited
- d. M/s Schneider India Limited.

Purchasers preferred list of vendor / sub vendor / OEM (Refer Annexure-I List of Preferred Equipment's), which is shared as part of Technical Specifications and the same should be adhered by the bidder.

2.2 **Bidder's Qualifying Requirement**

Bidder must meet all following qualifying criteria for Substation Automation Systems:

- a. The bidder should have supplied minimum 20 nos. Protection, Automation and Communication systems for 110 kV and above sub-stations with at least 10,000 Input-Output Points (of Gateways) for each project. The system supplied should have been in satisfactory commercial operation for a minimum period of 05 years as on scheduled date of the bid opening. Bidder shall offer latest

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software on open architecture and should have supplied these at least for 5 projects in last 2 years. Protection and Sub-Station Automation must be from the same OEMs.

- b. Indian Subsidiaries of global companies having plant in India are also eligible to bid if the qualification requirements stated above are met independently or in combination with the parent company. Declaration from parent company needs to be submitted.
- c. Bidder must be OEM of protection relays, Sub-station Automation and Communication system, having manufacturing and testing facility in India.
- d. The bidder shall submit Type test reports obtained from NABL/ International Accredited Lab for the equipment / material offered. The type tests should have been conducted on the equipment / material of the same design. The type tests should have been conducted within 5 years prior to the date of bid opening. Time period for type test may be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC).
- e. In case the type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, then 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 despatch of the equipment / material.
- f. EPC Experience (if applicable), In case the package involves installation & commissioning of the equipment / material, then the bidder shall have the following experience:
 - a) He should have successfully completed one single order of value **XXX** INR (80% of estimated value of similar work in last three years) OR
 - b) He should have successfully completed two single orders of value **XXX** INR (50% of estimated value of similar work in last three years) OR
 - c) He should have successfully completed three single orders of value **XXX** INR (40% of estimated value of similar work in last three years).

3.0 SYSTEM DESCRIPTION AND SCOPE

The scope of work shall include but not be limited to the following:

- 3.1 The BIDDER shall consider scope for design, engineering, manufacture, procure, inspect/test at manufacturers works; deliver to the site, do erection, installation and testing, commission and hand over of a complete Substation Automation System (SAS) based on IEC61850 standards along with all its components and auxiliaries as described in sections below, integrations with other existing / third party systems etc. including integration of Protection IEDs, condition monitoring devices with Gateway to Purchaser's SCADA Systems on IEC104 protocol.

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The scope of SAS includes, in minimum, the following:

- a. Station Gateway
 - b. Misc. RTU
 - c. Managed ethernet Switches
 - d. Networking accessories viz. panel for SAS, LIU, 4 Port I/O boxes with Quad face plates with accessories, RJ45 connectors, Patch panels with cable guard/messenger, FO & CAT6 patch chords, FO & CAT6 armoured & unarmoured cables, RS485 armoured & unarmoured communication cables etc.
 - e. Integration with existing DRCA System
 - f. System management Software's and tools
 - g. Other components and accessories, hardware, software and firmware, to interconnect and integrate the above items into a common fully functional system.
 - h. Mandatory spares
- 3.2 The offered SAS system/solution shall be from single OEM and the entire automation products shall be from the same OEM family/ same SAS product series. Bidder cannot offer multiple product from Same OEM/multiple vendor to meet the design requirement.
- 3.3 The BCPU proposed for 22 kV system shall be mounted on the GIS Switchgear and shall be integrated to the proposed SAS redundant Gateway's on IEC 61850. The BCPU shall have redundant built-in Fiber Optic port.
- 3.4 In case of RTU based Gateway, The Gateway shall have dedicated redundant processors for Upstream communication(IEC104) & redundant processor for downstream communication (IEC61850) for each Bus-section.
- 3.5 Redundant communication network switches to be used for redundant Gateway system, each redundant communication network shall be capable of handling the entire 22kV/33kV system communication traffic.
- 3.6 Bidder shall consider Ethernet switches, Cables, Termination boxes, Patch cords and other networking accessories accordingly in their scope. Bidder shall consider the communication equipment either in the protection panel or in a separate network Panel (2200x800x800mm). The same shall be finalized during detailed engineering.
- 3.7 Protection relays/BCPU will be time synchronized with new GPS receiver as mentioned in the BOM.
- 3.8 Bidder to note that PRP/HSR communication architecture will be finalized during detailed engineering. Bidder to submit the technical offer accordingly.

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- 3.9 The gateway configurations (Own and Third-Party Gateway) shall be done in such a way that the system shall report to four independent redundant masters (MCC,BCC QAS and GE SCADA) on IEC60870-5-104 Protocol.
- 3.10 Multifunction meter shall be installed on the switchgear panel with necessary CT, PT and communication wiring, termination and power supply through MCB's. Integration of multifunction meter on Modbus protocol to redundant Gateway. Bidder to consider separate MFM for Bus PTs, these MFM shall be mounted along with Bus-coupler bay BCPUs.
- 3.11 Power supply arrangement for the individual BCPU, RTU Racks, Gateways, DI, DO, AI & MFM shall be through separate MCBs.
- 3.12 Scope of Protection IEDs (BCPU) integration includes all networking accessories and communication cables supply, laying & looping of the devices to the respective Gateways. Depending on the Bus-sections and GIS panel layouts the BCPUs shall be integrated through independent L2 switches for reliability & redundancy.
- 3.13 Bidder to ensure adequate space in the GIS (shall consider dummy panel) to mount the communication accessories and power supply arrangement for integration of BCPUs and MFM with redundant Gateway.
- 3.14 It is proposed that the bidder shall visit each site before bidding. Bidder is responsible for studying the existing automation and communication system at each location (under consideration) of TATA power and offer technical solution accordingly. Any additional hardware, software and services required will have to be considered by the bidder in Scope of supply and services. In case, any additional hardware, software and services are required during detailed engineering and execution, it is bidder's responsibility to meet all such requirement at no additional cost to purchaser.
- 3.15 Switches/LIU shall be distributed Bus-section wise as per the approved Single line diagram and GIS layout. A separate switch panel shall be considered for mounting of the networking accessories in case of space constraint in the switchgear or non-availability of dummy Panels. The switch panels shall be adjoined at either side of the 22k kV Switchgear as per final GIS layout. Bidder to submit the communication architecture accordingly with all required communication and functional redundancy, number of switches and other communication accessories for purchaser's review and approval.
- 3.16 Integration of Existing BS#1 & BS#2 BCPUs with Gateway & DRCA system is in bidder's scope.
- 3.17 Integration of proposed BCPUs with existing Disturbance Record Collector Cum Analyzer (DRCA). The integration will be at Station level as well as Purchaser's centralized DR system. The technical scope includes Auto DR, Relay parameterization, configuration management, fault record collection & analysis.
- 3.18 All necessary hardware, software or any other item required and not covered in the RFQ & BOM for successful commissioning of the Sub-Station Automation system; shall be arranged

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and supplied by the Bidder as a part of the scope adhering to the quality norms as per the direction and the satisfaction of the Purchaser.

- 3.19 All terminal blocks (output contact from Aux.relay) shall be mounted vertically, links when dropped should isolate the control circuit and the field cables will be connected at the bottom of the terminal block. Bidder shall consider the suitable size of Cable Trough (Both vertical & horizontal) and routing accordingly. The Cable trough should have minimum 50% free space to cater the field cables.
- 3.20 It is bidder responsibility to design the panels and propose to Purchaser considering all maintenance aspects viz. free access to the equipment, removal during repair/failure, Field wiring/cabling. Also, Bidder should also take care the Equipment wiring, routing of cable, wiring from equipment to Terminal blocks etc. with enough length and appropriate lugs & appropriate labels for equipment & Cable identification.
- 3.21 Bidder shall ensure the Segregation of network (VLANS) with proper configuration, inbound and outbound network filtering on all the interfaces. Separate network shall be established for each function defined in the specification and including protection System.
- 3.22 Bidder shall provide all the necessary cables, termination kits and accessories for commissioning of Sub-Station Automation system. Cable supply, laying and termination for powering up and networking of the supplied equipment's and connectivity to the Masters (within the premises).
- 3.23 All FO/CAT6 cables for inter and intra panel shall be armored/unarmored for integration of IEDs.
- 3.24 All Inter panel wiring shall be through cable conduit. All FO patch cords shall be ruggedized.
- 3.25 Bidder shall submit single Signal list (I/O list) and ICS for Substation Automation for the entire station. The ICS shall include details of either ends terminal numbers, cable type, cable size etc.
- 3.26 Bidder shall consider and supply the Universal IEC61850 configuration tools for configuration, parameterization, maintenance and troubleshooting of offered IEDs and gateway.
- 3.27 All software supplied shall be licensed and shall be in the name of the Owner. Bidder should offer the latest software & Firmware of the SAS products including 3rd party products which is tested and proven. Bidder shall provide all documentation in soft/ hard form about licensing information for each software supplied (OS, application software's of IED, other Application software's, configuration, diagnostics, simulation & testing tools).
- 3.28 Bidder to submit the architecture drawing and indicative bill of material along with the offer.
- 3.29 Demonstration / Testing of the fully configured system at Bidder's works before dispatch of the system at site (FAT). The factory inspection shall be integrated FAT of protection, automation and communication system of automation at a common workplace. FAT will be conducted as

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per the FAT procedure document to be submitted by the bidder during detailed engineering and approved by Owner after review.

- 3.30 Installation, testing & commissioning of the system including integration and configuration with Purchaser's existing systems, sub-vendors' systems & other systems and performance.
- 3.31 Submission of technical documentation related to design, construction/as built, testing, operation & maintenance of the equipment and submission of Test Reports, job progress reports etc. in hard copies (4 sets) and soft copies (3 sets, in PDF & AutoCAD).
- 3.32 Bidder to consider recommended and mandatory spares for all supplied items as mentioned in the separate section.
- 3.33 Development of system database, schemes and interlock logic etc. in BCPUs & SAS system at bidder's works/at site is in the scope of the bidder.
- 3.34 IRF of each BCPUs will be hardwired to the existing Misc RTU. The IRF signals shall be aggregated either in dummy panels/Bus-riser panels & further taken as a hardwired to existing Misc RTU Panel. IRF signals for SAS devices in Gateway panel to be wired & bought on terminal blocks inside Gateway & MISC RTU panels being considered.
- 3.35 Site Acceptance Test (SAT) to the Purchaser's satisfaction (as per the SAT document submitted by the bidder during detailed engineering and approved by the owner after review) with the completion of the following, in minimum:
 - a. Testing of the proposed Sub-Station Automation System from the Purchaser's SCADA systems.
 - b. Demonstration of system response
 - c. Integration of all supplied equipment under the contract.
- 3.36 Supply of recommended and mandatory spares for all supplied items as mentioned in the separate section.
- 3.37 Bidder shall provide 5 years of warranty for the supplied Substation Automation products including the 3rd party items viz. Ethernet Switches, Convertors, GPS system etc., Bidder shall consider the scope for warranty as specified in the specifications & share the warranty details including third party items as specified above
- 3.38 Maintenance of the system during warranty period and post warranty maintenance as specified. Providing software upgrades and modifications.
- 3.39 Any interoperability issues/integration issues arising during commissioning and during warranty period, bidder shall undertake to resolve them within 2 months (maximum) period without any cost implication to the Purchaser. In case the issue persists more than 2 months, Purchaser shall have right to take any action (either alternate technical solution suggested by Purchaser or Commercial implications) on the vendor.

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- 3.40 Indicative I/O list, Bill of material and Data sheets attached in this specification are only as a reference for bid purposes. Details provided in these documents are minimum requirement of the purchaser. It is the responsibility of the bidder to meet the functional requirement as specified in the specification.
- 3.41 Unless specified otherwise, Bidder shall consider the products of quality, industrial grade & reputed make with replacement warranty, spares availability & maintenance support as per this specification document which applies for all SAS items.

Bidder shall note that, it is not the intent of this specification to specify completely herein, all details of design & construction of Sub-Station Automation system. However, the bidder shall include and supply the required material and resource at any stage of the project for successful and complete commissioning of the system.

4.0 CODES AND STANDARDS

The design, manufacture and performance of the Sub Station Automation 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 relays and 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

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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
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)
Safety		
1	61010-1	Harmonized Safety Standard
2	60255-5 2000-12	Insulation coordination for measuring relays and protection equipment- Requirements and tests
Power Supply Standards		
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 D.C. power supply
4	61000-4-29+2000-08, 60255-11	Voltage dips, short interruptions & voltage variations on D.C. input power port immunity test
Environmental Standards		
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
Communication Standards		
1	61850-3 IEEE 802.3 CSMA/CD	Substation Comm. Standard access method and physical layer specifications
Cyber Security Standards		

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1.	IEC62351	Security in Automation Systems
2	IEC60870-5-7	Security extension
3.	IEC 62443	Cybersecurity standards are multi-industry standards listing cybersecurity protection methods and techniques
4.	NERC CIP & IEEE1686	(CIP-003, CIP-005, CIP-007)
5	CEA Guidelines, 2021	Cybersecurity in Power Sector

The proposed automation system 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.

5.0 DESIGN REQUIREMENTS

- 5.1 The Substation Automation System shall be designed such that it facilitates both local and remote monitoring with priority for remote monitoring. The Substation automation system shall enable complete unmanning of the sub-station and allow for complete remote monitoring and control from Purchaser's Power System Control Center (PSCC)
- 5.2 The Automation system design shall be based on distributed architecture with central monitoring and control in line with existing Unified SCADA and SAS implemented across Purchasers sites.
- 5.3 The systems shall be State-of the art system; based on IEC61850 standards for operation under electrical conditions present in high-voltage substations.
- 5.4 All SAS components supplied as a part of this specification shall be industrial grade suitable for 24x7 operations and equipment shall be selected accordingly by the bidder.
- 5.5 Bidder should offer the latest software, firmware of the equipment including 3rd party products which are tested, proven and in service.
- 5.6 The offered product shall comply to all open protocols such as IEC 61850, C37.94 (Tele-protection), etc. and compatible with all other OEM's products. Any interoperability issues arising during commissioning and during guaranty period, bidder shall undertake to resolve them within 2 months (maximum) period.
- 5.7 The Bidder shall follow the latest engineering practices & ensure compatibility requirements, continuity of equipment supply and the safety of the personals. All required safety interlocks and fail-safe logics shall be incorporated in the system wherever required.

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- 5.8 Redundancy shall be ensured in terms of processor, ports and path of communication to ensure reliability & availability. There shall be no single point of failure in the system until specify as non-redundant in the specification .
- 5.9 All substation automation system shall be designed with ungrounded 48VDC redundant power supply. However, Using of AC-DC Converter (UPS to 48VDC) and or DC-DC Converter (Station Aux to 48VDC) or direct 48V DC shall be finalized during detailed engineering.
- 5.10 All Automation Panels shall be provided with redundant Diode OR-ing units (+ve & -ve diode isolation) which meets functional & O&M requirements and DC-DC converters (Shall be finalized during detailed engineering).
- 5.11 All protection and automation system shall be time synced and shall have the same reference time i.e. from the station GPS. The station GPS shall have multiple SNTP/ NTP ports to synchronize the systems.
- 5.12 The system shall be designed such that maintenance, modification or extension of components shall not cause a shutdown of the whole system.
- 5.13 The system shall be self-healing without human interventions. Self-monitoring of components, modules and communication shall be incorporated to increase the availability and the reliability of the equipment and minimize maintenance.
- 5.14 The systems shall be modular in nature and shall be capable for expansion to meet future requirement.
- 5.15 The substation automation system shall be designed and implemented using the best Cyber Security practices. The system shall provide in minimum the following features viz. Authentication, Authorization, Audit Trails, Network segregation, backups, ports hardening, virus/malwares/ransomware prevention, intrusion prevention and detection.
- 5.16 All Automation Panels will have Louvers & Fan arrangement (min.2 nos). The Panel shall be either front Swing frame or front fixed and the rear side shall be double door type. The Panel IP class shall be IP55.The Panel shade shall be Siemens Grey (RAL 7032).

Bidder shall comply to the technical parameters mentioned in the SAS equipment and Cyber security standards mentioned in this specification. The offered solution should adopt defence in depth multi-layer security measures, and this should be not limited to Network segregation, Host hardening, Malware prevention, Authentication, RBAC, Security event logging, Software integrity.

In addition to above, bidder to ensure & comply on the following

- a. Necessary security measures should be considered for System Level and Component Level.
- b. The offered shall be tested in National /international accreditation labs viz. KEMA, CPRI. Bidder to submit the certificates & details during offer submission.

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- c. Minimum baseline document briefing cybersecurity parameters & setting which need be adapted in the system. The document shall also include
- i. *Type test reports of all products including Communication protocol & Cyber security conformance tests.*
 - ii. *Methodical approach to verification & validation of SAS solution.*
 - iii. *The use of IEC61850 resources for testing in Ed.2.1*
 - iv. *Recommended Testing practices on the offered solution.*
 - v. *Definition of the process for testing IEC61850 based devices & systems using communication example. GOOSE, SMV, MMS etc.,*
 - vi. *Protection & Control function Verification & testing*
- d. The proposed Architecture must limit the number of its access points (one if possible). The access point should generally be a router combining VPN, firewall and authentication proxy functions.
- e. Switches shall be configured to reduce threat impact on the network by organizing the LAN traffic
- f. System Hardening shall be done;
- i. *Disabling USB ports or from Windows.*
 - ii. *Unnecessary user accounts (including .guest. and .administrator.) and daemons/services are to be disabled.*
 - iii. *The audit and password policies should be shared by OEM.*
 - iv. *A user session should be automatically terminated after a configurable time out.*
 - v. *Application Whitelisting to be performed in order to ensure Only software that is present in the white list is allowed to be executed.*
 - vi. *Antivirus software to be installed in order to ensure malware prevention*

Bidder to demonstrate the same during FAT & SAT in terms of performance testing, Product Type test reports and setting adaption as per the baseline document .

5.17 **22kV/33kV system**

- a. Each Switchgear will have Bay control & protection unit (BCPU) and shall be integrated to 22kV/33kV Gateway on IEC 61850 protocol.
- b. Physically independent redundant communication networks shall be considered **Bus-section wise**. Adequate switches at BCPU end along with panels/mounting arrangements shall be considered.

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- c. In case of no dummy panel/ no space available in the switchgear to house the Ethernet switches, LIU etc. Bidder may explore & consider a panel /housing unit which can be installed over the switchgear along with louvers, fans with power supply arrangement. It is the responsibility of the bidder to assess the space requirements, mounting arrangements, co-ordination with switchgear team etc., for the complete SAS solution.
- d. All these independent networks shall be connected to the switches in the Gateway panel.
- e. The Gateway shall have separate ports for communication to the Automation WAN (Station L3 switches).
- f. The Gateway configurations shall be done in such a way that the system shall report to four independent redundant masters (MCC,BCC and QAS system) on IEC60870-5-104 Protocol.
- g. All DI signals shall be terminated in knife edge type TBs CKT4U or equivalent. For DO signals stud type droppable links (CBT4U or equivalent) shall be used.

5.18 **Disturbance Recorder Collector and Analysis system (DRCA)**

- a. All BCPUs shall integrate to Existing DRCA system through the Bay level switches/Network Panel.
- b. The Station DRCA shall become part of the Centralized DRCA system to enable automatic downloading of DR files and remote parameterization.

5.19 **Safety in Design:**

- a. All IED viz. RTU, BCU, BCPUs, Gateway shall have Select before execute for equipment control, Single command execution at a given time for equipment control
- b. All required safety interlocks and fail-safe logics shall be incorporated in the system wherever required.
- c. Feedback of the equipment before and after control, in absence of equipment status feedback, controls are blocked
- d. Control Command time out in case of long ideal state. All Control commands shall de-energised in case of re-booting the RTU/BCU/Gateway.
- e. Disconnected Terminal blocks for safety isolation, Control command links shall be vertically mounted, Series contacts used in Aux. relays for equipment Control.
- f. Ensuring Breaking mechanism (Fuse, MCB) in all equipment Schematic in case of abnormal conditions.
- g. Opto-coupler isolation for all DI/DO/AI cards
- h. Selection of Panel with appropriate IP Class – (e.g. IP54 (dust-proof with rodent protection))
- i. All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trim shall be made of flame-retardant material and shall not produce toxic gasses under fire conditions.

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- j. Equipment's should comply to Cybersecurity aspects required under SAS.

6.0 **LAYOUT REQUIREMENTS**

- 6.1 All systems shall be installed based on the approved equipment layout and plot plan.

7.0 **OPERATIONAL AND MAINTENANCE REQUIRMENT**

7.1 **OPERATIONAL REQUIREMENTS**

- a. The system shall be user-friendly and suitable for remote operations and control from existing/new Unified SCADA system.
- b. Any failure or disturbance in the substation shall be annunciate to PSCC via the SCADA system as per Tata Power's operation philosophy.
- c. The system shall facilitate safe and secure operations of all the equipment.
- d. Wherever local and remote operations are possible, selector button shall be made available both in local as well as remote. The selection of local/remote mode of operation shall be reported to the SCADA system.
- e. Proper Rating of MCB, Power supply Units, Converters etc, to be selected. Appropriate & suitable lugs, wires and terminal blocks to be selected during design of Panel & Equipment.
- f. Opto-coupler isolation for all DI/DO/AI cards along with LED indication for each input & Output

7.2 **MAINTENANCE REQUIREMENTS**

- a. Bidder shall provide facilities for carrying 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. Bidder shall provide the details in their bid.
- b. Bidder should provide Maintenance strategy of the product being offered so as to schedule appropriate timeline for maintenance. maintenance along with comprehensive checklist depicting checkpoints for software & hardware maintenance inclusive of third party products offered along with SAS solution.

Warranty :

- a. Bidder shall warrant that the equipment including software, hardware, firmware and associated documentation are free of defects in material and workmanship and from defects or faults in design, in so far as the equipment fails to meet the requirements of this technical specification, bidder to adhere to the warranty of 60 months from the date of final acceptance by the Tata Power after completion of 30 days trouble free operation.
- b. With respect to defects in equipment part, Bidder's liability is to make good either by repairing or replacing the faulty equipment (prefers a replacement by Purchaser). It is the responsibility of the Bidder to replace the faulty equipment in warranty within 7 working days. In case any failure of equipment which affects operations, Bidder shall arrange for stop gap/interim

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hardware/equipment arrangement to Purchaser's operational requirement till the defective material is getting repaired/replaced.

- c. After replacement of the faulty equipment, the purchaser shall return parts that are defective to the Bidder. The Bidder shall cover the cost associated with the shipping of defective or failed items during warranty period. The new equipment, parts shall be delivered to the purchasers facility CIF (Cost, Insurance, and Freight) free of charge.
- d. During the warranty period, the bidder shall upgrade the firmware of the modules with the latest available. This activity shall be carried out free of cost at site as and when the patches are released. Sample testing for the operation of devices and associated equipment shall be carried out after the Up gradation of any software upon agreed by the purchaser.
- e. With respect to software, the Purchaser will notify the problem to the Bidder, including a detailed description of the deficiency and associated condition. Bidder shall guide the purchaser for corrective action. If the same is not resolved, the Bidder shall depute his personnel to attend the same within 24 hours from the time of reporting the problem. The system Bidder shall be fully responsible to resolve hardware and software deficiency reported by the purchaser.
- f. With respect to third-party software and consumable parts supplied, the Bidder shall make reasonable effort to obtain the best warranties possible from the sub-Vendor thereof and assign to the purchaser any such warranties to the extent that such warranties may be assigned to the purchaser.
- g. Bidder may consider longer warranties than included in these specifications.
- h. Bidder shall extend all warranties / guarantees to the purchaser, provided by sub- Vendors, of duration longer than that in this specification.

Upgrades & Modifications

- a. Bidder shall continuously keep the Owner informed of all Software and Hardware upgrades as & when these are released through advisories/ mails.
- b. Bidder shall supply upgrades of all installed software (both own and third party) for a period of five years from the date of system acceptance without any commercial implication.
- c. Bidder shall rectify all design defects and software bugs at no extra cost for a period of 5 years from the date of system acceptance
- d. Bidder shall provide lifetime support (15 years) for the system, even if no upgrades are implemented.
- e. The Product life cycle and support for the offered system shall be for 15years. Bidder to maintain all the product spares & expertise support during the period of product lifecycle which can be availed by Tata Power as per the requirement.
- f. In case of product obsolescence , Bidder to inform/give advance notice to Tata power at least 24 months before the declaration of the product. In case the obsolescence falls during warranty

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period. Bidder to maintain the system spares & support for next 10years from the date of product obsolescence.

- g. The system referred to above includes Bidder's own as well as third party components.
- h. Bidder shall port the supplied software onto upgraded hardware (as per Bidder's standard offerings) without additional Software License Fees.

Support Services

- i. Bidder shall have support service Centre in India to cater after sales services. Technical support facilities including qualified manpower, testing tools, instruments and integration facilities available within India

7.3 TRAINING REQUIREMENT

- a. Bidder shall provide training to the Purchaser's personnel on the configuration, operation and maintenance of the system supplied including configuration related to Cybersecurity aspects & Non-OEM equipment/3rd Party equipment. The training shall cover development, integration, installation and commissioning of both software & hardware components of the system.
- b. Bidder to consider minimum 30 man-days training for Purchaser's personnel for automation systems.
- c. The Bidder shall provide Classroom as well as hands-on training on the system. All required training materials such as system catalogues, test instruments, demo equipment, and simulation jigs, etc. shall be provided by the Bidder. 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 third-party systems viz. Ethernet switches and converters etc.,
- d. All clauses related to Transport, Lodging & Boarding, Local transport for Owner's personnel etc. shall be as per the terms and condition defined in the GCC/Section-A.
- e. Factory training shall be immediately prior to FAT. Site Training shall be prior to commissioning on a mutually convenient schedule.
- f. Bidder shall indicate their Training facilities including test tools and simulation facilities. Bidder shall provide the training calendar & details of topics considered for the equipment offered.
- g. General requirements relating to the training are specified below:
 - i. Personnel who speak understandable English and who are experienced in instruction shall conduct training courses.
 - ii. Bidder shall provide all necessary training material. Each trainee shall receive individual copies of the technical manuals and pertinent documents.
 - iii. The Purchaser shall be permitted to video tape all training classes.

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- iv. 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 use only.
- v. Training sessions shall accommodate the number of candidates as per the contract.

8.0 TECHNICAL PARAMETERS OF EQUIPMENT INCLUDING DATA SHEET

8.1 Bay Control and Protection Unit (BCPU)

Please refer GIS/Switchgear specification for the details of Bay Control and Protection Unit (BCPU)

8.2 Gateway

Gateway is envisaged for data acquisition, protocol conversion and integration with control centres to carry out remote operation and control of the Substation. A state-of-art microprocessor based industrial gateway designed for the electrical process environment in a decentralized manner shall be considered. The gateway shall guarantee high availability and ensure safe and secure operations of all substation equipment.

The Gateway 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.

Gateways shall be redundant to provide a reliable system for acquisition of required information from the RTUs, BCUs, BCPUs, Numerical relays, Multifunction meters, condition monitoring devices and other communicable devices.

The gateway shall be capable of seamlessly integrating to the existing/new Unified SCADA system. The gateway integration shall follow all the integration and configuration practices followed in the Unified SCADA system.

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

- 1) The Gateway shall be based on a decentralized architecture with function-oriented, distributed intelligence.
- 2) RTU based Gateway only acceptable meeting the technical requirements.
- 3) The proposed gateway can be of the same family of BCU/RTU or embedded (no OS dependency & OEM of automation vendor) & reliability. Gateway hardware shall be easily scalable to integrate IEDs in future on open protocols.

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- 4) The Gateway shall be redundant in hot standby mode with auto changeover.
- 5) Gateway shall have vast protocol conversion capability, adaptable for customization and additional protocols and Multi master communication capability.
- 6) The Gateway shall support a wide range of protocols including IEC61850 (server/client), IEC104 (Master/Slave), IEC103, Modbus - RTU, Modbus - TCP/IP (Master/Slave).
- 7) The Gateway shall have min 10,000 I/O tags and shall support integration of at least 120 IEDs on IEC61850 and at least 75 IEDs on serial protocols. Bidder to consider the hardware such as Serial Ports, Communication processors, Converters etc., in the Gateway accordingly.
- 8) The proposed Gateway shall have the capability to support simultaneous communications with four independent remote master (redundant) stations on IEC104 Protocol.
- 9) Gateway 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 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.
- 10) Disturbance and fault record collection and management
- 11) IEC61131 based programming logic
- 12) Time sync based on IEEE1588 V2/, SNTP, Protocol specific synchronization (IEC 104 etc.)
- 13) Device management using SNMP/Web server, File Upload / Download Support, Remote configuration etc.
- 14) Gateway shall be capable of acquiring 32-bit analog and accumulator data from Multi-function meters, numerical relays on MODBUS/IEC60870-5-103.
- 15) Gateway communication protocol shall be configured to report analog & Status changes by exception to master stations. However, Gateway 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.
- 16) 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.
- 17) The Gateway 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.

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- 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).
- 19) The Master Station user shall be able to perform a virtual connection through gateway with any RTU/BCU/IED, provided by the communication protocol functionality, to support the information transfer from and to the RTU/BCU/IEDs. For example, 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 RU/BCU/IEDs configuration parameters, code changes, etc.
- 20) The system shall comprise of features namely failsafe control (i.e. check-before-execute, selection timeout etc.), Interlock and Sequential Logic Control system, Sequence of Event Recording (SER) system, Interfacing with third party IEDs (e.g. Multifunction Meters, condition monitoring equipment etc.), interfacing with third party computer system, Integration of data as per time base (e.g. 15 minutes integration of energy data per feeder), direct GPS clock connectivity, through IEEE1588/SNTP server or through the Master (main and standby mode) for time synchronization. Gateway shall support redundant time synchronization inputs.
- 21) In case of power supply failure, auto start-up and restoration of the Gateway shall be possible without manual intervention.
- 22) Remote database downloading and uploading of Gateway from master station shall be provided.
- 23) It shall be possible to increase the number of communication ports in the Gateway by addition of cards, if required in future. The Gateway shall support the use of a different communication data exchange rate and scanning cycle on each port and different database for each master station.
- 24) Internal battery backup to hold data in SOE buffer with time & date.
- 25) The proposed Gateway shall be KEMA Certified or by equivalent certification body. The device shall be Cybersecurity compliant as per CEA guidelines, OCT-21.
- 26) The proposed Gateway shall be KEMA Certified or by equivalent certification body.
- 27) Separate set of communication modules shall be used for communicating to slave IEDs and to Purchaser's FEP/Master Systems.
- 28) 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.
- 29) Gateway shall communicate to MCC, BCC, ECC, Nodal & QAS SCADA system through IEC60870-5-104 protocol. Interoperability profile shall be as per ALSTOM E-terra platform and OSI monarch.
- 30) It shall be the bidder's responsibility to integrate his offered system with Purchaser's existing SCADA systems for exchange of desired data.
- 31) Continuous self-supervision function with self-diagnostic feature shall be included.

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32) Communication**Ports**

- a. Redundant IP ports for simultaneous communication with min 4 independent redundant Masters using IEC60870-5-104 protocol.
- b. Inbuilt Redundant IP ports for simultaneous communication with IEDs (IEC61850). In case of any limitation in IED handling in each processor, Bidder to consider more communication processors including on redundancy aspects)
- c. Inbuilt Redundant IP ports for simultaneous communication with BCUs & RTUs (IEC61850). In case of any limitation in IED handling in each processor, Bidder to consider more communication processors including on redundancy aspects 2 nos. RS485/RS 232 electrical ports (Configurable)
- d. 8 nos. RS 485 electrical ports

Protocols

- a. The communication protocol for gateway to Master Control Center must be IEC 60870-5-104.
- b. IEC 61850 and IEC 60870-5-103, MODBUS (Serial and TCP/IP) communication protocol for IEDs. The Gateway shall meet the IEC 61850 standard in every respect and interoperability with other manufactures IEDs and tools shall be verified.
- c. IEC 60870-5-104 (Master & Slave) for BCU, RTU integration.
- d. Time synchronization using SNTP/IEEE1588 V2
- e. Master and slave licenses shall be considered for all the above-mentioned protocols.
- f. Should generate XML file for integration/engineering with vendor Independent SCADA systems.
- g. Gateway shall be PRP compliant for communication redundancy.
- h. SNMP (v1, v2c and v3) for Health monitoring of the Hardware.

33) Algorithm and Logic

- a. The Gateway shall be based on advanced and proven algorithms and an easy and efficient upgrade of the Gateway functionality shall be possible.
- b. The Gateway shall support interlocking via station bus or process bus.
- c. The Gateway shall facilitate user defined logic functions such as automatic control sequences by means of available logic elements. For example, with one command perform a safe change of the 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).

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- 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.

34) **Self-Supervision**

- a. The Gateway shall have extensive self-supervision including all functional module and communication channel.
- b. The Gateway shall have LEDs for healthiness / error indication
- c. Gateway shall have the facility to generate and download the log files for maintenance and troubleshooting.
- d. Each Gateway 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 level point. If the control action is not completed within a specified time, the command should get cancelled (Run Time Command cancellation). The timer for this command time-out feature shall also be 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 Gateway through the LAN/WAN from a remote location.

35) **Disturbance & Event Recording pertaining to Gateway**

- a. An event recorder that can handle up to 5000 time tagged events shall be included. Events shall be stored in non-volatile memory.
- b. The Gateway shall have an internal clock with the stability of minimum 10 ppm or better. The Gateway 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 Gateway shall maintain a clock and shall time-stamp the digital status data. Any digital input data in the Gateway shall be assignable as an SOE point. Each time a SOE status indication point changes the state, the Gateway shall time-tag the change and store in SOE buffer within the Gateway. SOE shall be transferred to Master Station through gateway as per IEC 60870-5-104 protocol.
- d. It shall be possible to retrieve the recorded event on the Purchaser's SCADA system.

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36) **Power Supply**

- a. Redundant Power supply module of 48 V DC +/- 20 % shall be available. Bidder may consider the redundant DC-DC (110/220 V DC ~ 48 V DC) converter and add-on NO contact on each MCB's. Provision of two 110/220 V DC feeder shall be made available by the Purchaser from the DCDB. Same shall be finalized during detailed engineering.
- b. The Gateway shall have adequate protection against reversed polarity, over current and under voltage conditions.

37) **Time Synchronization**

- a. Gateway time synchronization shall be through GPS clock via communication ports on IEEE 1588 / NTP or direct IRIG-B port through GPS clock. **Gateway in turn shall be capable of synchronizing all the slave IEDs**
- b. Timing Accuracy: The Gateway shall time-tag event reports to an absolute accuracy of 10 µs or better.
- c. Gateway shall generate an alarm if it gets drifted or loose the synchronization signal.
- d. In absence of direct synchronization signal from GPS receiver, the Gateway shall be synchronized through Master/FEP.
- e. Gateway shall have min 2(two) options for Time synchronization with priority provision.

38) **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 Gateway panel shall be installed in switchyard RTU room or control room buildings with no temperature or humidity control. The Gateways 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.

39) **Expansion in future**

Offered system shall be suitable for extension in future for additional RTUs, BCUs & 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 with source codes 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 variable, digital I/Os, modify interlocking logics etc. for additional bays/equipment which shall be added in future.

40) **Engineering Functions**

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- a. A tool for user friendly engineering and disturbance handling shall be available.
- 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. The Gateway shall have multilevel passwords to safeguard control, logic, and automation settings.
- d. For IEC 61850 compliance, the Gateway shall be test certified by KEMA or equivalent.
- e. The device shall have PICS, MICS & TICS & PIXIT files.

41) Gateway Functionalities

a. Data acquisition

The Industrial grade system shall provide the ability to display data via workstations, and to store data in appropriate logs. The computer systems shall provide the ability to display and log any data value in the system via any of the system devices. This requirement includes the following types of data:

- i. Telemetered data received from BCUs/RTUs and other computer systems
- ii. Calculated data
- iii. Manually entered data

b. Sequence of Event Processing

Sequence-of-events (SOE) data shall be collected by the industrial grade systems for subsequent review by relevant user personnel. The SOE data shall be time-oriented listings of status change events collected from RTU/IEDs. The time difference between events shall be resolved within one millisecond.

c. Event & Alarm Processing

The alarm and event list shall contain alarm and events that are important for the control and monitoring of the substation.

The alarm list shall consist of a summary display of the present alarm situation. Each alarm shall be reported on one line that contains:

- i. The date and time of the alarm
- ii. The name of the alarming object
- iii. A descriptive text
- iv. The acknowledgement state

v. User-Authority Levels

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The access rights shall be defined by passwords assigned during the log-in procedure. Only the system administrator shall be able to add/remove users and change access rights. Atleast following access rights shall be possible:

- a) Display only
- b) Normal Operation
- c) System Administration
- d) Engineering / Configuration

d. Test Function

- i. Vendor to provide the detailed test procedure for testing the Gateway functionalities using IEC61850, GOOSE messaging and protection scheme Implemented/proposed. Vendor to ensure the required hardware and software to test the above at the time of FAT and SAT.
- ii. The protection system shall support a test mode where it shall be possible to set or reset binary Input signals, signalling and tripping contacts individually or in groups.
- iii. All output relay contacts can be blocked via a setting and configuration program.
- iv. Using the test function, it shall be possible to set or reset signalling and tripping contacts individually.
- v. A test sequencer for the local bay protection functions shall be part of the user Interface program. Virtual current, voltage and binary signals shall be programmable in a minimum of six different sequences to verify the correct operation of the respective functions and settings in the respective bay unit.
- vi. It shall be possible to run these test sequences and simulations during normal operation, i.e. without affecting the station protection system in service. Re-use of saved test sequences shall be supported.

42) Cybersecurity

- a) **Secure access-** Level Wise enabling of settings with User Rights should be incorporated with Password protection in the Gateway. Each User shall have his/her own User Id & Passwords.
- b) User Credentials to access Gateway shall be authenticated through Purchaser's Active directory Server.
- c) All actions/modifications/deletions shall be logged in the Gateway. These logs shall be pushed to Purchaser's Central Asset Management system/SOC.
- d) It shall be possible to access the Gateway 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 Gateway should also supports Authentication and Authorization of individual users, Security logging.

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- f) Gateway shall be NERC-CIP/NIST 7628, IEC62351 and IEEE 1686 compliant.
- g) Gateway shall be enabled with System hardening viz. disabling/removal of unused ports and services.

8.3 Pre-wired Miscellaneous RTU Panel

The RTU unit shall use industrial grade components and shall be same of BCU family. The remote terminal unit, based on microprocessor technology, shall use numerical techniques for the calculation and evaluation of analogue signals. It shall incorporate select-before-operate control principles as safety measures for operation via SCADA System. They shall perform all sub-station related functions, such as control commands, bay interlocking, data acquisition, data storage, event recording, arithmetic, logical and trigonometric calculations and shall provide inputs for status indication and outputs for commands. The RTU shall acquire and process all data of the field (Equipment status, fault indications, measured values, alarms etc.) and transmit these to the SCADA system either directly or through gateway. The remote terminal unit shall have the capability to store all the time stamped data at least for 30 days.

The individual/group of circuits/equipment of the power system network are controlled and supervised from dedicated lower level I/O modules in remote terminal units (RTU). The number of I/O modules shall be provided for control and supervision of all circuits / equipment of the entire power system network as specified against items mentioned in the BOM.

Pre-wired RTU panel (2300mmX800mmX800mm) along with signal conditioning interfaces, terminal blocks/Field interface module and auxiliary relays shall be provided for miscellaneous input/outputs from non-microprocessor-based relays/IEDs and for supervision and control of station auxiliary equipment's.

The system shall comprise the following in-built sub-system namely failsafe control (i.e. in built check-before-execute feature), Interlock and Sequential Logic Control system, Sequence of Event Recording (SER) system and Fault Disturbance Recording System (FDR), Interfacing with third party IEDs (e.g. Multifunction Meters, condition monitoring equipment etc.), interfacing with third party computer system, Integration of data as per time base (e.g. 15 minutes integration of energy data per feeder), direct GPS clock connectivity, through SNTP server or through the Gateway (main and standby mode) for time synchronization. RTU shall support redundant time synchronization inputs.

The RTUs 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.

All analogue/digital parameters related to auxiliary system, protection devices, which cannot be directly communicated to the Gateway shall be interfaced with Protection & Miscellaneous RTU such as following, but not be limited to:

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- a. ACDB, DCDB, Battery Charger etc current, voltage, status.
- b. Fire Alarm signals, HVAC signals etc.
- c. Hardwired Protection signals (Auxiliary)
- d. 415V system alarms, control and Analog signals
- e. UPS, fire-fighting system, etc.
- f. All automation panel & equipment's - power supply & health monitoring

The following scheme / features shall be available:

- 1) The Input / Output capacity of RTUs shall cater all specified requirement.
- 2) The System shall be based on a decentralized architecture and on a concept of function-oriented, distributed intelligence.
- 3) The RTU shall be suitable for control, monitoring and protection of circuit breakers, disconnectors and earthing switches for all types of switchgear configurations up to the highest voltage levels.
- 4) The RTU shall be with min **5000 I/O tags**.
- 5) 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.
- 6) All status inputs shall be scanned by the RTU at 1 millisecond periodicity.
- 7) The standard 19" modular case of the RTU with a user-selected number of plug-in modules shall provide a flexible solution for easy integration of the devices into the substation.
- 8) XML and SCL configuration interfaces shall allow information to be shared between the various configuration tools, reducing the overall engineering time.
- 9) For IEC 61850 compliance, the device shall be test certified by KEMA or equivalent laboratory. The device shall be Cybersecurity compliant as per CEA guidelines, OCT-21.
- 10) The device shall have PICS, MICS & TICS & PIXIT files.
- 11) It shall support device interoperability using IEC 61850 & GOOSE Communication
- 12) 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.
- 13) RTU shall be capable of communicating to Gateway.
- 14) All transducers mA/mV DC measurement (various ranges of DC current, Voltage) of electrical and non-electrical quantities such as Transformers Winding Temperature, Oil Temperature and Tap

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Position shall be wired to the Misc. RTU panel. Bidder shall consider all necessary transducers for the parameters, other than analog parameters available from the Multifunction Meters.

- 15) RTUs shall be time synchronized with the GPS clock on SNTP protocol or on IEEE 1588 V2 protocol, and subsequently RTU shall synchronize all its slave IEDs.
- 16) Digital inputs/outputs from/to Electromechanical Relays, if any, shall be connected to the miscellaneous RTU.
- 17) Digital inputs/outputs from/to auxiliary system, SCADA equipment's, shall be connected to the miscellaneous RTU. Potential free contacts of health check (such as failure of communication, power supply & CPU) shall be provided for RTUs, Gateways, Communication equipment; shall be wired to miscellaneous RTU panel.
- 18) The RTU shall provide necessary sensing voltage, current, optical isolation and de-bounce filtering independently for each status input. The RTU shall be set to capture contact operations of 10 msec or more duration. Operations of less than 10 msec duration shall be considered no change.
- 19) To take care of status contact chattering, a time period for each point and the allowable number of operations per time period shall be defined. If the allowable number of operations exceed, the status change shall not be accepted as valid.
- 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).
- 21) The Master Station user shall be able to perform a virtual connection with any RTU/IED through Gateway, provided by the communication protocol functionality, to support the information transfer from and to the RTU/IEDs. For example, the Master Station shall gather on-demand IED data; visualize IED configuration parameters, and IED source code depending upon the IED capabilities. On the other hand, the Master Station shall be able to download to the RTU/IEDs configuration parameters, code changes, etc. depending upon the capabilities of the offered system.
- 22) At station level, the entire station shall be controlled and supervised from the Purchaser's SCADA System. Clear control priorities shall prevent operation of the equipment at the same time from more than one of the various control levels, i.e. SCADA system at MCC ,BCC & QAS. The priority shall always be on the lowest enabled control level.
- 23) The RTU shall be connected to the communication infrastructure for data sharing and meet the real-time communication requirements for automatic functions. The data presentation and the configuration of RTUs shall be compatible with the overall system communication and data exchange requirements.
- 24) In case of power supply failure, auto start-up and restoration of the RTUs shall be possible without manual intervention.

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- 25) RTU shall provide Programmable DO, DI, LED based on IEC61131-3.
- 26) RTU shall meet the requirements for withstanding electromagnetic interference according to relevant parts of IEC 61850 and other IEC standards. Failure of any single component within the equipment shall neither cause unwanted operation nor lead to a complete system breakdown.
- 27) RTU shall offer Binary input processing (Single point, double points, multiple points, system input and logic input), all acquired, and time stamped at <1 msec accuracy and discrimination.
- 28) Bidder to consider Auxiliary relays (OMRON/OEN) for digital outputs as per the quantity mentioned in the BOM.
- 29) 2 Normally Open (NO) contacts of Auxiliary Relay in the DO circuit shall be wired in the series.
- 30) The optocoupler input voltage of DI and DO shall have a wide range of DC input voltage from 48 - 250 VDC.
- 31) All exposed portions (if any) of the RTU shall be covered with protective cover.
- 32) The field wiring shall be terminated such that these are easily detachable from the I/O module without disconnection of the field cables.
- 33) Remote database downloading & uploading of RTU from master station shall be available.
- 34) 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.
- 35) Internal battery backup to hold data in SOE buffer memory, time & date.
- 36) The proposed RTU shall be SSL/VPN, NERC/CIP compliance.
- 37) The BCU database shall be MS-Excel based for easy configuration, export & import of database file.
- 38) The characteristic of the contact outputs per signal/command shall be adjustable via software:
 - i. Latched
 - ii. Non latched
 - iii. Time delayed reset
- 39) **Communication**
 - Ports**
 - a. A galvanically isolated USB port for local engineering through laptop.
 - b. 8 nos. RS 485 port, 2 nos. RS 232 port
 - c. 2 Nos. Fiber optic port or Redundant Ethernet port 100/1000 MBPS, with dual active depending on the proposed configuration

Protocols

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Communication protocol IEC 61850, IEC 60870-5-103, IEC60870-5-104 (Master & Slave), MODBUS (Serial & TCP), SNMP v1, v2c and v3 and SNTP / IEEE1588 V2 with Server and Client license shall be available. The RTU shall meet the IEC 61850 standard in every respect and interoperability with other manufactures IEDs and tools shall be verified. Master and slave license shall be provided for all the above-mentioned protocols.

40) **Algorithm and Logic**

- a. The RTU shall be based on advanced and proven algorithms for writing interlock logics, so an easy and efficient upgrade of the RTU functionality shall be possible.
- b. The interlock logics shall be User interface based (or) Functional block diagram based.
- c. Necessary advanced logical & arithmetic functions shall be available.
- d. Interlocking modules for all types of switchgear arrangements shall be available in order to avoid damaging switchgear operations and to ensure personal safety.
- e. The RTU shall support interlocking via station bus and/or hardwired solutions.
- f. RTU shall facilitate user defined logic functions such as automatic control sequences by means of available logic elements. For example, with one command perform a safe change of the connection of a selected line from one busbar to another busbar in double busbar switchgear.
- g. 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).
- h. 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).
- i. A delay/integrator shall allow the pick-up and reset of binary signals to be delayed before being displayed or used to control other functions.

41) **Self-Supervision**

- a. The RTU shall have extensive self-supervision including all I/Os and communication channel.
- b. The RTU shall have LEDs for healthiness / error indication
- c. RTU shall have the facility to generate and 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 level point. If the control action is not completed within a specified time, the command should get cancelled (Run Time Command cancellation). The timer for this command time-out feature shall also be configurable.

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f. In case of restoration of communication links, power supply after failure, the software along with hardware shall be capable of booting automatically & synchronize with the remaining system without any manual intervention.

g. It shall be possible to re-boot the BCU through the LAN/WAN from a remote location.

42) Disturbance & Event Recording

a. An event recorder that can handle up to 2000 time tagged events shall be included. Events shall be stored in non-volatile memory.

b. The RTU shall have an internal clock with the stability of 10 PPM or better. The RTU time shall be set from time synchronization messages received from GPS Receiver/Gateway. 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 status input data point 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 gateway as per IEC 60870-5-104 protocol.

d. It shall be possible to retrieve the recorded event on the Purchaser's SCADA system.

e. All recorded disturbance data from the RTUs shall be automatically uploaded (event triggered or once per day) to a Purchaser's SCADA Systems.

43) Control and Monitoring

a. The system shall incorporate the control and monitoring, self-monitoring, signalling and testing facilities, measuring as well as memory functions, event recording and evaluation of disturbance records.

b. Supervision of mA input signals from transducers shall be possible to include.

c. Raise and lower operation of OLTC taps of transformer, Control of protection relay systems in or out of service shall be available through RTU.

d. The operation shall depend on the conditions of other functions, such as interlocking, etc.

e. The analogue values acquired/calculated from multifunction meter shall be available to SCADA System. The abnormal values must be discarded. The analogue values shall be updated every second. The RTU shall convert the raw data from the MFM to an engineered readable value and send it to the SCADA systems. RTU shall be capable of acquiring 32 bit analog and accumulator data from Multi-function meters/Numerical relays on MODBUS/IEC60870-5-103.

f. The commands are always to be executed 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.

44) Power Supply

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- a. Redundant Power supply module of 48 V DC +/- 20 % shall be available. Bidder shall consider the redundant DC-DC (110/220 V DC ~ 48 V DC) converter and add-on NO contact on each MCB's. Provision of two 110/220 V DC feeder shall be made available by the Purchaser from the DCDB. Same shall be finalized during detailed Engineering.
- b. The RTU shall have adequate protection against reversed polarity, over current and under voltage conditions, to prevent the RTU internal logic from being damaged and becoming unstable causing mal operation.

45) **Time Synchronization**

- a. **Time synchronization interface:** The unit shall be capable to synchronize the internal RTC via communication ports on SNTP or on IEEE1588 through GPS clock.
- b. In absence of direct synchronization signal from GPS receiver, the RTU shall be synchronized through gateway.
- c. **Timing Accuracy:** The RTU shall time-tag event reports to an absolute accuracy of **10 μ s or better**. RTU at different system locations shall have the same absolute minimum timing accuracy.

46) **Environment requirements, Reliability & Cooling**

- a. The panels shall be installed in switchgear room or in relay room with no temperature or humidity control. The 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.
- b. 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, condensation, humidity, fungus etc.

47) **Expansion in future**

Extension possibilities with additional I/O's inside the RTU unit or via Fiber optic communication and process bus. The RTU shall also support sub-rack arrangement.

48) **I/O Sub Systems**

- a. Hot replacement of all I/O modules.
- b. A complete set of process interface
- 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 dual redundancy
- g. Modularity, permitting step-by-step expansion
- h. Reliability and auto-diagnostics

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- 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 controllers shall not be more than 2 ms.

49) **Engineering Functions**

- a. A tool for user friendly engineering and disturbance handling shall be available.
- b. Configuration of all input and output logical signals and binary Inputs and relay outputs for all built-in functions and signals shall be possible both locally and remotely.
- c. It shall be possible to access the RTU remotely from the Master Station for configuration/maintenance activity. The bay control shall have multilevel passwords to safeguard bay control, logic, and automation settings.
- d. 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 (Configuration tool- Laptop)
- e. The configuration software should be able to configure control, protection, inputs, outputs, etc. The software should also have provision to view all the electrical parameters. Actual conditions of all inputs, outputs, protection and control elements.
- f. The software should allow configuration of the IED with different versions.
- g. It should be possible to configure the IED for its protocol settings.
- h. For IEC 61850 protocol, the ICD file generation should be possible through software.

50) **Cyber Security**

- 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.
- 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 and IEEE 1686 compliant.
- g. RTU shall be enabled with System hardening viz. disabling/removal of unused ports and services.

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51) **Test Function**

- a. Vendor to provide the detailed test procedure for testing the RTU functionalities using IEC61850, GOOSE messaging and protection scheme Implemented/proposed. Vendor to ensure the required hardware and software to test the above at the time of FAT and SAT.
- b. The protection system shall support a test mode where it shall be possible to set or reset binary Input signals, signalling and tripping contacts individually or in groups.
- c. All output relay contacts can be blocked via a setting & configuration program.
- d. Using the test function, it shall be possible to set or reset signalling & tripping contacts individually.
- e. A test sequencer for the local bay protection functions shall be part of the user Interface programme. Virtual current, voltage and binary signals shall be programmable In a minimum of six different sequences to verify the correct operation of the respective functions and settings in the respective bay unit.
- f. It shall be possible to run these test sequences and simulations during normal operation, i.e. without affecting the station protection system in service. Re-use of saved test sequences shall be supported.

52) **Binary inputs / outputs: Typical Input/Outputs requirement**

Refer Automation BOM for configuraiton

8.4 **Engineering Station Engineering Laptop)**

Engineering LAPTOP shall be industrial grade LAPTOP system loaded with software for Gateway configuration, diagnosis, simulation, Logic development (Ladder Logic Programming) in Gateway. Also, shall be loaded with configuration and management software of RTUs, BCUs & DRCA on IEC 61850 LAN.

- a. A tool for user friendly engineering and disturbance handling shall be available.
- b. The Hardware & OS shall be compatible with offered SAS Software.
- c. Engineering laptop shall have SSD hard disk (Minimum 500GB). Refer BOM & GTP for the configuration.
- d. 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.
- e. Configuration application shall have multilevel passwords to safeguard control, logic, and automation settings.
- f. Data collection, data modelling, configuration and parameter setting
- g. Engineering of process information for automation and control centre systems

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- h. Engineering of process information for automation of non-bidder systems and their individual parameters.
- i. User friendly on-line monitoring facility of real time data shall be provided to maintenance engineer for monitoring/analysing the real time status of the process, program logic from the engineering station.
- j. **Configuration Application**
- i. SCL Tool shall be used to model the (IEDs) as stipulated in the standard IEC61850. SCL Tool shall be capable of generating the configuration files for any IEC61850 compliance IED.
- ii. The main functions that the application shall perform are:
- Read and edit any type of configuration file compliant with the defined restrictions by the schema of the SCL language.
 - Model devices from the libraries of Logical Nodes (LNs), Common Data Class (CDCs) and Common Data Attributes (CDAs) defined in the norm.
 - Generation of the modelling and SCL configuration files for devices IEC61850.
 - Capacity to manage projects with several devices, generating the files for the configured devices.
 - 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.
 - 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.
 - Compatible with IEC 61980-6 Ed:1, Ed:2, and other associated models like IEC 61850-7-410, IEC 61850-7-420
 - Create SCD / SSD / SED / ICD / IID SCL Files
 - Import & Export of SCD / SSD / SED / ICD / IID / CID SCL Files
 - Facilitate enhanced management of SCL files and its validation
 - 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
 - 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

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RTU/IED simulator & protocol analyzer software tool

- iii. RTU simulator tool shall be provided to test the communication interfaces of Master station, RTU, Gateway and IEDs.
- iv. 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.
- v. The protocol analyzer shall be used to monitor all communication traffic on a channel (between Master station & RTU /Gateway and between RTU/Gateway & IEDs without interfering channels operation. Channel traffic captured in the active or passive modes of operation shall be displayed.
- vi. The Master station simulator and protocol analyzer tool shall be provided and shall have following features:
 - a. Each received message shall be checked for validity, including the check sum.
 - b. The tool shall maintain and display error counters so that the number of errors during a period of unattended testing can be determined.
 - c. All fields of a message shall be displayed. A pass/fail indication for the message shall be included.

8.5 Layer 2 Industrial Grade Managed Switch

The switch shall be of industrial grade type designed for continuous operation.

- a. Switch shall have combination of RJ45 / Fiber ports of 100/1000 Mbps with 20% spare ports of each type.
- b. Switch shall be 19-inch rack mountable.
- c. Switch shall support IEEE802 series for VLAN, RSTP, MSTP and Suitable for ring configuration etc.
- d. Switch shall be IEC 61850 EMC and operating conditions for Power Substations Complaints.
- e. Switch shall be Conformal Coated as per environment standards to handle harsh environment
- f. Switch shall be IEEE 1613 Environmental Standard for Electric Power Substations complaint.
- g. Switch shall have design for minimum Heat generation and high MTBF (minimum time between failure)
- h. Switch shall Support Simple plug and play operation - automatic learning, negotiation, and crossover detection
- i. Switch shall Support Quality of Service (802.1p) for real-time traffic
- j. Switch shall Support SNTP time synchronization (client and server) & IEEE 1588 PTP V2 (Precision Time Protocol) for precise time synchronization of networks

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- k. Switch shall Support Industrial automation features (e.g. Modbus, Ethernet/IP and PROFINET protocols for transparent data transmission)
- l. Switch shall be suitable for PRP/HSR configuration and devices.
- m. Switch shall Support Management Tools like:
- n. Web-based, Telnet & Command Line Interface (CLI) for quickly configuring major managed functions
- o. SNMPv1/v2c/v3 for different levels of network management
 - i. Remote Monitoring (RMON)
 - ii. Rich set of diagnostics with logging and alarms
- p. **LAYER 2 features**
 - i. 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.
 - ii. The Switch should support Rapid Spanning Tree Protocol & Multiple Spanning Tree Protocol.
 - iii. 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.
 - iv. The switch should have support for Port mirroring
 - v. The Switch should be able to discover the neighbouring 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
 - vi. The Switch should support a mechanism to prevent edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes
- q. **Management features**
 - i. The Switch should support SNMP v2c, V3
 - ii. The Switch should support Configurable SNMP traps
 - iii. The Switch should support Logging to syslog with time stamp
 - iv. The Switch should support NTP support.
 - v. Full environmental monitoring of PSUs, fans, temperature and internal voltages, with SNMP traps to alert network managers in case of any failure
- r. **Power supply**
 - i. Switch shall Support Redundant Power supply of 48V/ 110V / 220V DC.
 - ii. Power supply voltage level shall be selected during detailed engineering

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s. **Environmental**

- i. The switches should have IEEE 802.3az Energy efficient Ethernet and ROHS compliance
- ii. Switch should be capable of operating under normal room temperature without the requirement of Air conditioning.

8.6 **Layer 3 Industrial Grade Managed Switch**

a. **Generic Requirements**

- i. The Switch should have 24-port module of 10/100/1000T Gigabit with a minimum of 8 no's combo/dedicated ports of 1 G SFP having DOM functionality and 16 Cu ports 100/1000 Mbps
- ii. It should support Active-Active Clustering, VSS or equivalent technology for high availability and quick resiliency.

b. **LAYER 2 features**

- i. 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.
- ii. The Switch should support Rapid Spanning Tree Protocol & Multiple Spanning Tree Protocol.
- iii. 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.
- iv. The switch should have support for Port mirroring
- v. The Switch should be able to discover the neighbouring 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
- vi. The Switch should support a mechanism to prevent edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes
- vii. Switch shall be Conformal Coated as per environment standards to handle harsh environment

c. **LAYER 3 features**

- i. The Switch should support basic Routing-Static IP routing, RIP v1/v2, RIPng and policy based routing.
- ii. The Switch should support hardware enabled advance IP routing protocols OSPF, OSPFv3, BGPv4, PIMSM, PIM-DM, PIM-SSM etc.
- iii. The switch should support at least 500 routing table entries.
- iv. The Switch should support VRRP, LACP & Non-blocking L3 switching

d. **Virtual Switching Support**

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- i. The Switch should support combining of two separate physical switches in a single logical unit
 - ii. The Virtual switch system should be responsible for the control plane of both the switches
 - iii. The Virtual switch data planes of both the physical switches should be active
 - iv. The virtual switching links between the 2 High Available switches should be min of 20Gbps bandwidth with no single point of failure, all the required modules / other related cards should be proposed from day one.
 - v. The switch should support In-Service OS upgrade mechanism with a minimal disruption of traffic through upgrade process.
 - vi. The failover should be transparent to other networking devices
 - vii. It Should support configuration roll back for quick correction of wrong configurations
- e. **IPv6**
- The switch should support IPV6 in hardware without the addition of special modules to achieve that forwarding & the Switch PPS performance should not degrade for IPv6 packets
- f. **Quality of Service**
- i. The Switch should support Per-port -per-VLAN policies, Distributed policing (up to 4 K polices), Egress/Ingress policing, Diff Serv QoS on all ports, minimum four queues per port in hardware.
 - ii. The Switch should support Congestion Avoidance: WTD or WRED, multiple Queue Thresholds or equivalent technology.
 - iii. The Switch should support Strict-Priority Queue (protects mission-critical, delay-sensitive traffic), Weighted Round Robin (WRR), Priority queuing, Weighted Random Early Detection (WRED), Tail-drop thresholds or equivalent technology.
 - iv. The switch should support Traffic policing, Traffic shaping, Traffic marking and classification
 - v. The switch should support IEEE802.1p CoS and DSCP based traffic marking
 - vi. The switch should support Cross stack QoS
- g. **Security features**
- i. The Switch should support IEEE 802.1x
 - ii. The Switch should support at least 500 ACL
 - iii. The Switch should support VLAN ACLs, Router ACLs, port based ACLs
 - iv. The Switch should support TACACS+/RADIUS
 - v. The Switch should support Shall have SSHv1, SSHv2, SNMPv1, SNMPv2, SNMPv3, Web Based GUI, Telnet and NTP support
 - vi. The Switch should support Management Access Filter (Access Policies) & Port level access-lists

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- vii. The Switch should support Dynamic ARP inspection
 - viii. The Switch should support IP Source guard
 - ix. The Switch should support MAC binding
 - x. The Switch should support Per-port storm control
 - xi. The Switch should support Secure admin access over SSH
 - xii. The Switch should support IEEE 802.1x
 - xiii. The Switch should support Security encryptions
 - xiv. The Switch should support Private VLANs
 - xv. The Switch should support a mechanism to prevent a malicious user from spoofing or taking over another user's IP address by creating a binding table between client's IP and MAC address, port, and VLAN
- h. **Management features**
- i. The Switch should support SNMP v2c, V3
 - ii. The Switch should support Configurable SNMP traps
 - iii. The Switch should support Logging to syslog with time stamp
 - iv. The Switch should support NTP support.
 - v. Full environmental monitoring of PSUs, fans, temperature and internal voltages, with SNMP traps to alert network managers in case of any failure
- i. **Power supply**
- i. Redundant 48 VDC power supply module
 - ii. Provision for connecting redundant power supply option should be available.
- j. **Environmental**
- i. The switches should have IEEE 802.3az Energy efficient Ethernet and ROHS compliance
 - ii. Switch should be capable of operating under normal room temperature without the requirement of Air conditioning.

8.7 **GPS Receiver**

GPS based time facility, using Universal Time Coordination (UTC) source, shall be provided for time synchronization of Sub-Station Automation System at various Receiving Stations. The time receiver shall include an offset adjustment to get the local time. It shall have propagation delay compensation to provide an overall accuracy of +/- 1.5 microseconds. The GPS system shall have dual 10/100/1000Mbps LAN interface along with other interfaces. The time receiver shall detect the loss of signal from the UTC source, which shall be suitably indicated and reported to purchaser's SCADA system. Upon loss of signal, the time facility shall revert to its internal time base. The

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internal time base shall have a stability of 2 PPM or better. The GPS system shall include digital displays for time and date in the format DDD:HH:MM:SS (the hour display shall be in 00 to 23 hour format) GPS system shall also be used to drive separate time, day, date and frequency indicators which shall be wall mounted type. The display for time shall be in the 24-hour, HH:MM:SS:SSS format. The display for the day & date shall be xxx format (MON through SUN) & DD:MM:YYYY, frequency XX.XXX respectively. Bidder shall provide wall mounted type digital display units for time, day, date & frequency indication. The frequency shall be derived from 230V AC supply. Each digit on the time, day and frequency indicators shall be at least 7.5 cm in height and shall be bright enough for adequate visibility in the control room from a distance of 15 meters. The offered GPS clock shall also provide at least one 2 MHz (75 ohm interface conforming to ITU-T G.703) synchronization interface to meet the time synchronization requirement of the communication system. This interface shall conform to the requirements specified in ITU-T G.811 for accuracy, jitter, wander etc.

Technical requirements: The system shall include GPS antenna, GPS receiver, signal processing unit, comparator, signal conditioning units, power supplies, lightning arrestor with batteries, standard antennae cable with additional 50m length, etc. The frequency & Time display Units shall be wall mounted in the control room. Bidder to indicate the battery back-up time provided.

The system shall be capable of providing time synchronizing signals in the following formats

- a. RS 232 / 485
- b. IRIG-B (AM 1 KHz SIGNAL)
- c. IEEE 1588 V2, NTP, SNTP

The system shall have the minimum following features supported:

- a. Any single failure shall not lead to loss of partial/full functionality.
- b. The system shall be based on Global Positioning System (GPS) reference.
- c. The System shall receive the synchronizing signals from remote satellite and after suitable conversions and conditioning shall provide time signals for synchronization of RTU, BCU, BCPUs, Numerical Relays, DRCA and Fault Disturbance Recorder systems.
- d. Electronic earthing for the supplied system to the nearest grounding box/earth pit shall be included in the scope.
- e. The Master Clock shall be configured as Real Time Clock with display of time in 24 hrs format and date and shall drive slave clocks.
- f. All cabling between the Bidder supplied equipment shall be in Bidder scope.
- g. Any Servers (e.g. NTP/SNTP server) shall be included in the scope
- h. Bidder shall offer time synchronization using Serial and IP based ports.
- i. The system shall be suitable for continuous operation under the specified site conditions.

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- j. The master clock shall have the facility to be programmed from a Web-interface that can be accessed through any typical web browser such as Microsoft Internet explorer.
- k. Technical features of the Master Clock System shall be as follows:
- l. **GPS Receiver**
- Type : Microcontroller based where applicable
 - Tracking : GPS-L1, C/A code, 12 channels, accuracy < 1 microsecond
 - Redundant : Fully redundant
 - Output : Minimum 4 nos. independent NTP/SNTP outputs for 4 independent IP network configuration, Serial & Potential free Contacts (1PPS, 1PPM, 1PPH), ports and contacts as per BOM.
 - Operating Temp : 0 to 50 Deg C, (-30 to +80 Deg C for GPS Antenna)
 - Display : Backlit LCD, Functions – showing local date & time, Position – latitude, longitude, altitude, Receiver & Clock status, deviation & Event time.
 - Time format : 24 hours format
 - Time Reference : Oven Controlled Crystal Oscillator with stability of 1PPM
 - Front Keypad : For Configuration and status monitoring
 - Mounting : Standard 19” Rack mountable
 - Alarm : Potential free contacts and displays for system failure, GPS signal lost , Any critical alarms to meet the time sync monitoring.
 - Back up signals : On loss of GPS signal, GPS receiver shall continue to send out time synchronization pulses based on own clock
 - Signal conditioner : Suitable for all type of protocols specified.
 - Power Supplies : Redundant DC Power Supply
 - Amplifier : To be included as required
- m. **GPS Antenna**
- Type : Helical & Redundant
 - Noise : Less than 1 dB
 - Tracking method : Code / Carrier tracking
 - Output data : NEMA 0183 format
 - Output rate : Continuous
 - Mounting : Fixed Outdoor (sky view), wall / floor mounted,
 - Lightning Arrestor : Required
 - Antenna Cable : Low loss cable, length as per site requirement (min 50 metres)

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- Weather Condition : All Seasons

8.8 Networking Accessories

a. Ruggedized Fiber Patch cords for SAS

Multimode patch cords of suitable length shall be supplied which would be compatible to the end devices and LIUs. The FO patch cords shall be ruggedized and the patch cord color shall be Orange.

b. LIUs- SAS

LIUs which are part of the SAS shall be rack mounted type and shall be installed in network switch panels (L2 switches) as per the configuration diagram. The LIUs type for SAS shall be Multi-mode and the connectors type shall be of ST/LC type(preferably). 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.

c. Patch Panel - SAS

The Patch panel shall have 24Port with RJ45 Connectors (Jack field) with cable support. All structured UTP armoured cabling shall be terminated through patch panels before connects to Ethernet switch/end equipment.

d. I/O Box- SAS

All the structured CAT6 cabling on the device side shall be terminated on I/O boxes. The IO box shall have QUAD face plate with 4 RJ45 connectors, Back covers and mounting screws.

e. UTP Patch cords (CAT6) - SAS

Prefabricated (factory crimped) CAT6 UTP Patch cords for intra panel connection/within panel from equipment to equipment.

8.9 Multifunction Meter

Bidder to consider Multifunction meter for each bay, which shall be mounted on the switchboard along with BCPUs. These meters shall be integrated to Gateway on MODBUS (Serial) protocol. Separate MFM shall be considered for Bus PTs (Bus Voltages).

Auxiliary Systems:

MFM mounted in 415v Switchgears, ACDB, DCDB, UPS, Fire protection & detections system shall be looped in daisy chain and shall be integrated with Misc./Gateway.

Single RS-485 daisy chain loop shall not exceed more than 10 MFM Meters.

Also, integration through Modbus TCP/IP with Gateway shall be explored during detailed engineering.

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8.10 **Satelite Workstation with Monitor**

The Workstation shall have the minimum configuration mentioned below :

- Intel(R) Xeon(R) W-1250P, 6core,4.1GHz
- 32GB (16GBx2),500GB SATA
- 2 nos. of 1 GB Ethernet Ports
- Inbulit speakers, Wired Keyboard and mouse
- Nvidia Quadro RTX 4000, 8GB, 3DP,Windows 10 Professional 64-bit

Make shall be DELL – T5820/ HP- Z2 TWR G4/equivalent or better

Monitor:

- Diagonal Viewable Size - 23.8"
- Color Support - 16.7 million
- Resolution - 1920 x 1080
- Aspect Ratio - 16:9

Make shall be DELL - P2422H/ HP- z24n.Incase these models are outdated, Bidder shall consider higher running models.

8.11 **Temperature and Humidity Sensor (Digital Thermo Hygrometer)**

a. **Functional Requirement**

Temperature & Humidity Transmitter (Digital Thermo Hygrometer) is required for measurement of climatic condition of (temperature and humidity) switchyard and other operational areas of various units.

b. **General requirement**

- i. Transmitter shall be Microcontroller based design.
- ii. Isolated 4-20 mA proportional and linearized for both Temperature and % Humidity.
- iii. RS 485 MODBUS RTU serial interface or Ethernet TCP/IP (optional)
- iv. Local display for temperature and humidity
- v. Transmitter shall also be suitable for outdoor application (Switchyard); Bidder shall consider necessary protection for outdoor application.
- vi. Mounting arrangement: Suitable for wall mounting, all necessary mounting accessories, cables etc. shall be included in the offer with the transmitter.
- vii. Auto diagnostic and Auto correction sensors
- viii. Analog output shall be selectable and scalable
- ix. Heat from the electronic components shall not affect the sensors.

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- x. 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.
- xi. Bidder to consider services for mounting, configuration and integration with Purchaser's Automation system.

8.12 Panel and other Accessories

- a. All Automation Panels shall be front Swing / front fixed type and rear side shall be double door. All the panels shall be of IP54 class and industrial grade.
- b. Bidder shall submit the GA drawing considering the clearance between the equipment, easy access and removal during failure/repair, maintenance and aesthetic requirements and submit the drawings along with bill of material for purchaser's review.
- c. Panel shall have Louvers (min.2nos) & Fan (Min.2nos) arrangement for ventilation. Bidder shall guarantee the satisfactory functioning of the system hardware mounted in the panels even in the event of failure of air-conditioning.
- d. Proper size Cable trough (Width, length) shall be provided in the panel after reviewing the number of cables to be terminated in the panel.
- e. Enough space (for easy termination, for easy viewing of cable tags) shall be provided between the terminal channels and cable trough.
- f. Control panel shall be suitable for bottom cable entry.
- g. Interconnection between panels shall be by prefabricated cables with proper conduit.
- h. All Source terminal blocks shall be droppable (or equivalent) and the 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.

l. 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, levelled 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.

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

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

m. Constructional Features

SAS cabinet shall be indoor type, floor mounted, with total dimension (2315 (H) x 800 (W) x 800 (D)) and front swing frame or front fixed and rear double door . Front glass door with 19” rack arrangement.

The panel dimension shall be 2200 (H)x800(W)x800mm(D),100 mm(H) plinth and Anti-vibration pad of 15 mm (H) thickness should be provided.

The panel shall be -

- i. Of the metal enclosed indoor, floor mounted.
 - o Preferred make of Automation Panels – Rittal make only.
- ii. Made up of the requisite vertical sections.
- iii. dust, moisture and vermin proof construction
- iv. It shall have lifting i-bolts for hooks of good capacity and even distributed lifting. Test certificates shall be available for the lifting bolts.
- v. Suitable to provide a degree of protection of not less than IP 54 as per IS: 2147.
- vi. 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.
- vii. 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.
- viii. Provided with labels on the front and rear indicating the panel designation.
- ix. Proper provision has to be provided for the entry of FO cables and Ethernet cables at the bottom. AC & DC incoming cable entry provision should also be there.
- x. Provided with pocket on rear door for keeping A4 size copy of panel drawings.
- xi. Provided with 4 nos. of lifting hooks.
- xii. Provided with neoprene gaskets all-round the perimeter of covers, gland plates, removable covers and doors.
- xiii. 150 sq.mm copper earth bar has to be provided for equipment earthing.

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- xiv. All sheet steel work shall be degreased, pickled, phosphated 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/RAL7035). The final finished thickness of paint film on steel shall not be less than 100 microns and shall not be more than 150 microns.
 - xv. For every distribution of AC and DC circuits MCB's has to be provided. These MCB's has to be rated according to the load on the distributed circuit.
 - xvi. Each RTU/Gateway, Switch panels shall be provided with 20% spare terminals.
 - xvii. 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.
 - xviii. Interconnection between panels shall be by prefabricated cables.
 - xix. 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.
 - xx. 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
 - xxi. Proper lighting arrangement shall be made on both sides of the panel if both sides of the panels are used.
 - xxii. Space heater with thermostat shall be provided in the panel to maintain the required temperature & are to be placed at such location so as to not interfere with the field cabling thereby avoiding heating of the field cables at entry point.
 - xxiii. Disconnecting type terminal blocks shall be used for AC & DC sources and for all Digital Outputs from relay coil for SCADA command.
 - xxiv. Enough space (for easy termination, for easy viewing of cable tags) shall be provided between the terminal channels and cable trough.
 - xxv. Terminals shall be distributed functionally in the panel.
 - xxvi. The panel shall also have a document pocket.
 - xxvii. Horizontal and vertical Grounding bus shall be provided in the panel. Green colored 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.
- n. Cabinet Internal Wiring**
- SAS cabinet shall be wired with all the DC distribution wiring and AC wiring for the Illumination and fans. Following sizes of wires shall be

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Colour Codes

DC wiring	1.5 sq.mm	Red/ Black/Grey
AC wiring	1.5 sq.mm	Blue/Yellow
Earthing	2-2.5 sq.mm	Green

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 without affecting access to equipment mounted within the cabinet. Wiring troughs shall be provided for cable routing inside the cabinet. One piece moulded, 650 V grade terminal blocks complete with insulated barriers, screws, identification strips shall be used. Terminal links shall be of Elmex or Connect well 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 solder less 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.

o. Labels

All equipment's 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.

p. 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 equal to

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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.

DATA SHEETS – SUB-STATION AUTOMATION

Refer annexure E2- 3B Automation Technical Requirement of Automation

- Pre-wired Gateway Panel with Layer #3 Switch
- Misc.RTU
- Layer-2 Switch for BCPu & Gateway Integration
- Multi-function meter (MFM)
- GPS receiver
- Engineering Laptop
- Satellite workstation
- Temperature & Humidity Sensor

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9.0 **QUALITY REQUIREMENTS, INSPECTION, TESTING**

9.1 **Quality Assurance**

To ensure that a well-engineered and contractually compliant system is produced, vendor shall adhere to a quality assurance program for the preparation of all contract deliverables, which includes hardware, software and documentation. The program shall provide for early detection of actual or potential deficiencies, timely and effective corrective action, and a method of tracking all such deficiencies. Bidder shall submit the following information along with the Technical Bid and project specific document after award of contract. Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP)

9.2 **Factory Acceptance Test (FAT)**

The Vendor shall submit a test specification for factory acceptance test (FAT) and commissioning tests of the Substation Automation System for approval. For the individual bay level, and Misc cum Protection level BCUs applicable type test certificates shall be submitted. The manufacturing phase of the SAS shall be concluded by the factory acceptance test (FAT). The purpose is to ensure that the Vendor has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab. During FAT the entire System including complete control and protection system to be supplied under present scope shall be tested for complete functionality and configuration in factory itself. The extensive testing shall be carried out during FAT. The purpose of Factory Acceptance Testing is to ensure trouble free installation at site. No major configuration setting of system is envisaged at site.

9.3 **Integrated Testing**

The integrated system tests include Protection & Automation shall be performed as detailed in subsequent clauses as per following configuration:

Bay BCU / BCPU's, Gateway, Protection cum Miscellaneous RTU, Station HMI, DR work station, two switches along with all IEDs for the GPS Receiver and clock. Vendor should arrange complete Hardware & software as per the approved architecture under this RFP for the integrated FAT.

All other components for complete sub-station as detailed in section project shall be simulated as needed.

9.4 **Hardware Integration Tests**

The hardware integration test shall be performed on the specified systems to be used for Factory tests when the hardware has been installed in the factory. The operation of each item shall be verified as an integral part of system. Applicable hardware diagnostics shall be used to verify that each hardware component is completely operational and assembled into a configuration capable of supporting software integration and factory testing of the system. The equipment expansion capability shall also be verified during the hardware integration tests.

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9.5 Integrated System Tests

Integrated system tests shall verify the stability of the hardware and the software. During the tests all functions shall run concurrently, and all equipment shall operate properly. The integrated system test shall ensure the SAS is free of improper interactions between software and hardware while the system is operating as a whole.

If the complete system consists of parts from various suppliers or some parts are already installed at site, the FAT shall be limited to sub-system tests. In such a case, the Vendor can use their SCADA System for testing the functionality as per the Users requirement. Otherwise the complete system test shall be performed on site together with the site acceptance test (SAT).

- i. Prior to release for shipment of the equipment the Purchaser or his representative shall witness Factory Acceptance Test (FAT) in which the system is checked against the specifications.
- ii. The FAT shall include testing of all the hardware and software modules.
- iii. Spare modules and spare channels also shall be tested in FAT.
- iv. Bidder shall indicate all the simulation facilities that shall be used in FAT.
- v. Vendor shall submit FAT procedure 2 weeks before commencement of FAT for purchaser's approval.
- vi. Vendor shall incorporate all FAT comments prior to despatch. After Vendor confirms that all changes have been incorporated, Purchaser's Office shall issue Despatch Clearance.
- vii. The Test Reports as well as Test Certificates of OEM, third party, Vendor shall be submitted for approval / verification.
- viii. Tests shall include demonstration of System Responses and Loading (CPU, Memory & Communication Bus) including worst-case scenario and expandability of the system.
- ix. FAT and Despatch Clearance by the Purchaser shall not relieve the Vendor from complete responsibility for the total system and its performance subsequently.
- x. Redundancy, Backup & Restoration functions shall be tested.
- xi. Diagnostic tools shall be demonstrated.
- xii. The system shall be kept ON continuously without interruptions for at least 72 hours during the FAT.
- xiii. Tests requiring advanced Laboratory facilities that may not be available at site shall be conducted during FAT.
- xiv. Travel, Boarding & Lodging expenses for the Purchaser's representatives for FAT shall be borne by the Purchaser, Local transport for Purchaser's representatives from the place of stay to Vendor's works shall be arranged by the vendor. Vendor shall make available all necessary documentation & office facilities for Purchaser's representatives. Specialists of sub-vendors shall

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be present for FAT. Training at Vendor's Works shall precede FAT and shall include troubleshooting and advanced testing techniques.

xv. Deficiency Reporting

- In case of failures, deficiency reports shall be written for hardware, software, functional performance & documentation deficiencies. The deficiency reporting procedure includes methods to ensure that deficiencies are identified, documented & corrected. The documentation shall include a unique identifier for tracking as well as a detailed description of the deficiency. A deficiency status summary shall be included from time to time in the project progress reports, & up to date deficiency reports shall be made available to the purchaser on demand.
- When a test fails, a separate deficiency report shall be written for each problem that prevented the successful completion of the test. Deficiencies shall be classified by their severity as follows:
 - i. Fatal - Priority A
 - ii. Major - Priority B
 - iii. Minor - Priority C
 - iv. Documentation - Priority D
- The presence of fatal discrepancies, such as the complete failure of the system, shall be acted upon immediately and may, at the discretion of the purchaser, be cause for suspension of the tests. A retest shall be agreed which may include all or part of the test procedures. All other discrepancies shall be corrected and re-tested without suspending the entire test. The purchaser shall have the right to request that other hardware and software modules that may be impacted by the correction be re-tested.

9.6 **Commissioning**

- i. The commissioning of the system (hardware and software) including Site Acceptance Test and one month Trouble-free Operation shall be the responsibility of vendor. Development and customization of all software components shall be in Bidder's scope.
- ii. Adequate number of competent engineers (Hardware & Software) as approved by Purchaser shall be posted at site during the entire period of installation & commissioning. In addition telecom specialists shall be deputed to site for establishing communication systems.
- iii. Daily site work shall be planned and executed as per due approvals from Purchaser's representative.
- iv. Vendor shall submit detailed site organization chart of Personnel for Purchaser's approval. Purchaser reserves the right to review the same. Vendor's commissioning engineers shall also train purchaser's engineers during commissioning apart from scheduled Training.
- v. The responsibility for Installation, Commissioning, Performance Guarantee and Warranty shall remain with the vendor.

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- vi. The vendor shall furnish procedures, protocols and time schedules for commissioning and Acceptance Test activities.
- vii. 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.
- viii. All passwords, access keys etc. are the property of the Purchaser and shall be handed over to the Purchaser.
- ix. All Inter-Operability Tables for interfacing to other systems shall be supplied.
- x. Principal's representatives including specialists shall participate at site for supervision & certification of commissioning and Acceptance Tests.

9.7 Site Acceptance Test (SAT)

- i. 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 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.
- ii. IEDs used for protection, control, etc.; the redundant inter-bay bus (and associated communications hardware/software), the redundant station bus (and associated communications hardware/software), the time synchronization system (redundant GPS receivers) and the local/station HMI are to be considered as SAS components, and shall undergo commissioning requirements as part of the SAT.
- iii. 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.
- iv. 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.
- v. Unstructured tests shall be employed as necessary, to verify overall system operation under field conditions.

9.8 Test Procedures

Test Procedures (for FAT, Commissioning and SAT) shall be prepared by the vendor to test the specified functional and performance requirements of the system which shall include but not be limited to the following:

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a. System Hardware Tests**• Visual Test:**

Verification that the system includes all required equipment and is properly configured. This includes a visual inspection for proper workmanship and labelling, including cables and connectors.

• Verification of Upgrade and Expansion Capabilities:

Inspection and verification, to the extent possible, that provision to upgrade and expand the system are furnished as required by the contract.

• Hardware Diagnostic Test:

The hardware diagnostic test consists of individual test of all system hardware. These tests consist of running standard hardware diagnostic programs, plus special diagnostic programs used by vendor where appropriate.

b. 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.

- Verification of proper data acquisition & control from the BCUs, BCPUs and RTUs.
- Verification of proper data acquisition from the Energy Meters
- Verification of proper data acquisition & control from Purchaser's external systems.
- Verification of proper data acquisition & control from third party systems.
- Verification of the proper response of the system to include
 - Loss / Restoration of BCUs, BCPUs and RTUs
 - Loss / Restoration of Input Power
 - Loss / Restoration of Communication System
- Verification of System Redundancy including fail-over procedures and restart.
- Verification of all development and maintenance capabilities Including:
- Database Generation and Maintenance
- Back-up and Restoration functions of all systems.

c. Cybersecurity Test

- Configuration/Settings related to cybersecurity features in SAS products, BCPUs & 3rd party systems viz. Switches etc.,

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- Product compliance w.r.t Cyber security standards

9.9 System Performance Tests

The system performance tests shall verify that the performance requirements are met for the system as specified in the purchaser's technical specification. For example, performance testing shall include the verification of data acquisition performance etc.

9.10 System Availability Test

To ensure that the system software is error-free and that the hardware system is reliable, thirty (30) days continuous run of the system shall be performed after the successful completion of system functional tests and system performance tests. The system configuration shall be as per the final system configuration.

This test shall be considered successful if no critical function is lost and no hardware or software failure occurs within a consecutive 30 days period. Any minor or major hardware deficiencies shall be removed prior to starting the test.

During this test, the system shall be exercised a manner, which approximates an operational environment. No software patches, modifications, or changes shall be allowed to bypass failed modules during this test. If a module affecting a critical function fails. The failed module shall be replaced, and portions of the system functional tests affected by the change shall be repeated and the system availability test shall be re-run in totality.

10.0 **PERFORMANCE REQUIREMENTS**

10.1 System Performance Standards

The system shall meet performance as per the IEC & IS standards required to maintain real-time monitoring and control of the network.

10.2 System Response

The system shall meet the following response and resource utilization requirements:

- a. The system functions and associated databases shall be capable of accommodating at least a 50% increase in the delivered capacity without requiring regeneration, recompilation, or any processing other than definition of the database by Tata Power.
- b. All Digital Inputs shall be reported with a resolution of 1 msec.
- c. All Digital Inputs shall have individual channel reporting
- 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.
- e. The worst loading condition shall include the following tasks:
 - All processor inputs scanning and processing is in progress and all the data is transmitted over the main data bus every sec.

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- All controls in operation.
- Control / information request is initiated from all terminals.

10.3 System Utilization

Name	Utilization	Comments	
Main Memory	30%	Normal Loading	
	50%	Peak Loading	
Processor Utilization			
	Application processor	30%	Normal Loading
		50%	Peak Loading
Communication processor	30%	Normal Loading	
	50%	Peak Loading	
Local Area Networks	40%	Normal Loading	
	60%	Peak Loading	

11.0 SPARES AND SPECIAL TOOLS AND TACKLES

The spares supplied shall be strictly interchangeable with parts for which they are intended for replacement.

The spares shall be treated and packed for long storage (minimum 5 years) under the climatic conditions prevailing at the site.

The start-up spares shall be delivered at the site well in time before the start-up and commissioning of the plant.

11.1 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 Owner. 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 Owner will be carried out without hindrance and delay. All start-up spares which remain unused after the taking over the sub-station shall remain the property of the Owner. The Bidder shall furnish the Schedule of Start-up Spares.

11.2 Mandatory Spares

Essential spares are those considered necessary by the owner for first three (5) years of normal sub-station operation. A list of such spares has been listed in the below mentioned table and the same shall be included in bidder's scope. When a particular item of spares is indicated as 'percentage', it shall be considered as percentage of total number of that item of spares in the

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single equipment/system, 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 Server, set of Gateway, shall include HMI, keyboard, mouse 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.

Bidder to consider following mandatory spares in the offer.

SL. No.	System	Qty. (Nos./Set)
1	Complete Gateway (Rack, Power supply, Communication Processor (each type including license)	1 Set
2	Managed Ethernet Switch (Each type)	1 Set
3	Diode OR-ing Unit	2nos
4	Ruggedized FO Patch cords 15mts each	5nos
5	Ruggedized FO Patch cords 20 mtrs each	5nos

Table-3

11.3 Recommended Spares

In addition to the spares mentioned above, the Bidder shall also furnish in his bid a list of recommended spares with unit prices. The Owner reserves the right to buy any of the recommended spare parts as considered necessary by him. The prices of recommended spares shall be consistent with those of start-up/essential spares. Purchase of these spare parts will be covered by a separate order or an amendment to the contract.

The Bidder shall provide a list of recommended spares for a period of five years from the date of handover of the project to Owner. The shelf-life of these spares is such as to last for at least 7 years from the date of handover of the project.

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

The table above indicate the minimum requirement of the owner, bidder to include the spares, which are not part of this table, but required for maintenance and upkeep of the system.

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11.4 Special Tools & Tackles

Bidder to consider and supply special tools and tackles required for erection, commissioning and maintenance of the offered system. After commissioning of the system all tools and tackles shall be handed over to Owner'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 bidder.

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

12.0 DATA SUBMISSION BY BIDDER

Following Documents must be submitted along with the bid.

Bids are liable to be rejected if following minimum documents are not submitted along with the bid.

- a. Deviation if any from specification strictly following the prescribed format.
- b. Compliance to the approved vendor list
- c. List of major relevant experiences of the Principal, Collaborator and the Product respectively.
- d. Technical support facilities including qualified man-power, testing tools and instruments and integration facilities available within India.
- e. Technical data sheet of critical equipment
- f. System architecture drawing.
- g. Compliance to data sheets covered in the specification.
- h. Product life cycle document for all supplied equipment.
- i. Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP)
- j. Type test certificates of the offered equipment
- k. Confirmation on lifetime, spares, manufacturing, onsite & Offsite technical support of the supplied equipment for the period of 15 years.
- l. The Bidder shall furnish the following drawings/documents during detailed engineering within 2 month 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 Owner.
- m. System Architecture Drawing. This drawing should show in detail of the following:
 - i. Network connections

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- ii. Protocol used
- iii. Type of interconnecting cable
- iv. All IED's, workstations, gateways, network switches, meters etc. which are part of the SAS.
- n. Panel GA and Complete wiring diagram
- o. Functional Design Specification document
- p. Step by Step test procedures for Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) including on cybersecurity aspects
- q. SCADA I/O List with protocol details along with addresses
- r. Interconnection Schedule (ICS) for Automation
- s. Hardware, Software and Application manuals for all the equipment supplied including that of Third parties.
- t. All Software Licenses (both own & third party), key for Hardware Locks
- u. All interoperability tables
- v. Guaranteed technical parameters & Guaranteed availability and reliability
- w. Calculation for power supply dimensioning
- x. Bill of Material listing equipment designation, make, type ratings, etc. of all the equipment's supplied
- y. Logic Diagram (Hardware & Software)
- z. Operator's Manual
- aa. Complete documentation of implemented protocols between various elements
- bb. IP addressing chart for all the IED's, Gateways, Workstations, network switches which are connected to the network
- cc. Diagnostic and performance evaluation software and hardware tools
- dd. Details of software (Operating systems, application software, engineering tools, communication systems management software, license details, I/O distribution protocol-wise etc.) for SAS computer equipment (including PCs, Station HMI equipment and configuration laptop computers) and loadable in CD/DVD ROM
- ee. All SAS related drawings in both AutoCAD & Pdf format only. However, the pdf versions of above drawings shall be submitted through wrench for formal approval process. All AutoCAD drawings of the entire project shall be submitted through Secondary Media viz. USB Storage disk.
- ff. Bidder shall agree to comply with minimum quality requirements and Contractor Safety Code of Conduct, defined in bid documents.
- gg. Other documents as may be required / applicable during detailed engineering

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- hh. All drawings and data shall be annotated in English.
- ii. Bidder shall furnish six (6) hardcopies and 3 soft copies on reliable media of all drawings, manuals (Administration, Operation & Maintenance, Troubleshooting and Installation), Technical catalogues, Test Certificates and Acceptance Test Reports.
- jj. Two copies of the internal test report, FAT and SAT documents with test protocol formats shall be submitted for approval at least 4 weeks before Factory Acceptance Test. Two copies of SAT protocol shall be submitted for approval at least two weeks before Site Acceptance Test.
- kk. 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.

13.0 ANNEXURES

Annexure 1

List of preferred vendor list

Sl. No.	Item Description	Preferred Make / Model
1	Bay Control & Protection Unit (BCPU)	Hitachi Energy (APPSIL)/Siemens/GE
2	Gateway	Hitachi Energy (APPSIL)/Siemens/GE T&D /Schneider
3	Disturbance Record Collector & Analysis System (DRCA)	Make: Kalkitech Model: Sync 3000
3	Layer 2 & Layer 3 Ethernet Switch	Ruggedcom / Hirschman / MOXA
4	Firewall	Juniper/Cisco/Checkpoint/Palo Alto
5	LIU (Fiber Optic)	Raychem / AFS / 3M
6	I/O Boxes	Systimax / Tyco/ CommScope
7	Armored UTP CAT6 Cable	Systimax / Tyco / CommScope
8	Armored Fiber Optic Cable	Finolex / KEC / Apar
9	Unarmored UTP Cable	Systimax / Tyco / CommScope
10	Patch Panel (RJ45) with Connectors, I/O boxes	Systimax / Tyco / CommScope
11	Fiber Optic Patch Chords	Raychem / Preston / Tyco
12	CAT6 UTP Patch Chords	Systimax / Tyco / CommScope
13	4P X 0.36 Sq.mm. Armored Communication Cable (Multistrand, individual pair and overall shielded)	BELDEN / LAPP / SATYAM
14	4P X 0.36 Sq.mm. Unarmoured Communication Cable (Multistrand,	BELDEN / LAPP / SATYAM

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	individual pair and overall shielded)	
15	Fiber Optic Transceiver	CTC union / MRO TEK / Allied Telesis / MOXA
16	GPS Clock with remote display unit	Sertel / Masibus / SANDS/Meinberg
17	Gateway / DRCA/RTU/Network Panel (SAS)	Rittal
18	Layer -3 Stack Switch panel (Communication)	Valrack
19	RS 232 / RS 485 converter	MOXA / Advantech
20	DC-DC Converter	Cossel / Phoenix / Paramount
21	Diode-Oring Unit	Paramount / Phoenix
22	Droppable type Terminal Block for Digital Output, CT & PT.	Connectwell – CBT4U or equivalent
23	Disconnecting type (Knife edge) Terminal Block for Digital Input	Connectwell - CKT4U or equivalent
24	Auxiliary Relays – BCU Breaker Isolator & other Digital Inputs	Make – OMRON MM4XP-D MM2XP-D
25	Auxiliary Relays - Miscellaneous RTU	OMRON
26	Multifunction Meter	Make – SATEC Model – PM130EH+
27	Rack Mounted Sliding monitor with keyboard & Touch pad.	Make – ATEN
28	Voltage Transducers	Make – RISHABH
29	Modbus TCP/IP converter	Moxa, Advantech
30	Configuration Laptop	HP/DELL/Lenovo
31	Temperature & Humidity Sensor	Make & Model : KIMO & C-310

Gateway (G/W)			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	BIDDER RESPONSE
1	Gateway	RTU Family	
2	Make		
3	Model		
5	I/O handling & IEDs Integration	> 10,000 physical tags / Gateway	
6	IEDs integration	Shall be capable of integrating all the station IEDs, on different protocols with	
	On IEC61850 - > 120 IEDs	Electrical/FO interface, Bidder to consider appropriate interfaces for 120 nos. of IEDs on	
	On IEC103, MODBUS - > 75 IEDs	IP and 75 nos. of Serial	
7	Gateway Hardware		
7.1	Hardware	RTU based-modular, it shall be of same family of BCU and RTU (Preferbly)	
7.2	Communication with similar systems on same/different protocols, same/different Addressing	Communication with minimum 4 independent Redundant SCADA masters simultaneously on different networks	
		Communication with BCU/RTU on IEC61850 /IEC104 Protocol.	
		Communication with Station IEDs on IEC61850 and other open IP protocols	
		Communication with IEDs on serial protocol i.e. IEC60870-5-103, MODBUS etc.	
7.3	Status LEDs on all module – for fault indication	Required, Mandatory	
7.4	Module replacement in Gateway	Hot-Swappable module	
7.5	Battery Backup / Flash-PROM backup	Required	
7.6	Ports Requirement		
	For Main & Standby SCADA System/Gateway Interfacing	Redundant IP ports (100/1000 MBPS TCP/IP) for communicating to four redundant masters on different IP address simultaneously using IEC60870-5-104 protocol	
	For IEDs (BCU, RTU, MFM, Relays), Time synchronization	Redundant IP Ports for simultaneous communication with IEDs on IEC61850	
	Gateway shall support expandability of RS232/RS485 ports by adding only communication module, in case more ports are required to integrate station IEDs	Min 2 nos. RS232 electrical ports, RJ45 type,	
	For structuring (Configuration) system (separate port)	Min 8 nos. RS-485 Ports with RJ45 Type	
8	Redundancy support features	Device redundancy - back-up device automatically (in case of Embedded System). In case of RTU family CPU, Communication & Power Supply redundancy	
		Switch over from active device in case of failure	
		Upstream redundancy - parallel communication channels to send / receive simultaneous data upstream to control center	
		Downstream redundancy - parallel communication channels to send / receive simultaneous data to downstream IEDs(Redundant Communication Processor to be considered for each Bus section incase of RTU based Gateway)	
		High performance priority based algorithm for switchover management	
9	Gateway Software		
9.1	XML based Substation Configuration description Language (SCL) for IEC 61850 configuration	Required	

Gateway (G/W)			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	BIDDER RESPONSE
9.2	Protocol Support		
9.2.1	Main & Standby SCADA System	IEC 60870-5-104 (Master & Slave protocol), SNMP	
9.2.2	BCU / IED / Relays / RTUs	IEC 61850, IEC 60870-5-103, IEC60870-5-104 (Master and Slave), MODBUS (Serial, TCP/IP), SNMP	
9.2.3	Time synchronization between IEDs, Gateway and Master	On IEEE1588 / SNTP, Gateway shall be capable of synchronizing slave IEDs on open protocol	
9.2.4	Time Synchronization Priority Provision	Min.2 Options, Provision for Manually setting the priority	
9.2.5	Communication Compliance	PRP, HSR	
9.3	SOE List	Min 5000 (shall be user configurable) SOE Retention – 1 month	
9.4	Manual Status Points	Required	
9.5	Manual Analog Points	Required	
9.6	Calculated Analog Points	Unlimited	
9.7	Calculated Digital Points	Unlimited	
9.8	Check-Before-Execute Scheme for control	Mandatory	
9.9	SCSMs Supported – SCSM : IEC61850.8.1 (MMS)	Required	
9.10	Generic Substation event Model – Goose Publisher / Subscriber	Required	
9.11	Data Modeling	IEC61850 Logical Nodes Ed.2	
9.12	Reporting Schemes	Buffered Report Control Block (BRCB) Unbuffered Report Control Block (URCB)	
9.13	Commands	Direct Control, Enhanced Direct Control SBO Control, Enhanced SBO Control	
9.14	File Transfer	Via MMS and FTP	
9.15	Support of Mathematical Function	Required, Mandatory	
	Arithmetic functions		
	Logical functions		
	Trigonometric functions, Differential & Integration functions		
	Timer, Counter etc.		
9.16	Configuration shall be possible both locally and remotely	Required	
	Configuration Software and Maintenance Tools – SCL, Diagnostic tools, Master & IED Simulator tool, Maintenance tools		
	Configuration application for database and process control program development - Interlock logic and Calculation functionality		
	Allow configuration of the Gateway with different versions of the Configuration Tool		
	ICD file generation shall be possible from the proposed Configuration Tool		

Gateway (G/W)			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	BIDDER RESPONSE
	Gateway shall have the provision to identify and configure the IP of the BCUs, RTUs and other IEDs		
10	Cyber Security Feature	Gateway shall have multilevel passwords	
		NERC-CIP security Compliant	
		IEC62351 support	
		SSL VPN with AES, DES or 3 DES encryptions	
		Bidder to confirm Cyber security measures as indicated in the Specification	
11	Response Time		
	Digital Input	1 msec or better	
	Analog	1 sec or better	
	Digital Output	<1 sec or better	
	Time stamping at Gateway level, I/O level, IED level	Required	
	Monitoring & Management		
	Disturbance and fault record Collection and Management	Required	
	Transparent / Tunneling support for remote configuration and disturbance collection of IEDs	Required	
	Master station user shall be able to perform a virtual connection through Gateway with any RTU/BCU/IED	Required	
	IED management using SNMP / Web server, File upload / Download, Remote Configuration	Required	
	Capable of acquiring 32 bit Analog & Accumulator data from MFM	Required, Mandatory	

GPS Receiver with Frequency, Time & Date Display			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	BIDDER RESPONSE
1	Make		
2	Model		
3	Network support	Multiple LAN network topology Multiple IEEE1588 V2 /PTP & SNTP ports supporting different IP networks (as per the specification)	
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, Mandatory	
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	LED Indicators : Power, Watchdog, GPS Locked, Event, GPS Sata	
		LCD display for: 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	TCP/IP	
		Min 4 Nos. independent SNTP Ports for Station Bus & Minimum 4 Ports for Process Bus on IEEE1588 V2	
		GPS Clock shall have suitable format / software for IEEE1588 / NTP / SNTP to broadcast the time on TCP/IP network to all devices	
		IP address of the GPS shall be user configurable	
		Pulse	
		4 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 220 V DC, 100 mA	
Serial			
		2 Nos. RS 232C serial port for configuration and synchronous time string broadcast, capable of giving time in format to suit various applications such as UNIX / LINUX / Windows server, simultaneously. 1200 – 19200 baud, 7 or 8 data bits, 1 or 2 stop bits; Even / Odd / No Parity	

GPS Receiver with Frequency, Time & Date Display			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	BIDDER RESPONSE
		<p>Potential Free Contacts for Alarms</p> <p>Dry and isolated alarm contacts for GPS Sync Lost, Power Failure, Watchdog and 1 spare (Configurable)</p> <p>IRIG-B</p> <p>IRIG-B amplitude modulated time code signal</p> <p>IRIGB – 1 kHz, TTL pulse, positive edge on time</p> <p>RS232/RS485 Port</p> <p>2 Nos. RS485 / RS232 port with driver</p>	
11	Antenna	<p>Type – Helical</p> <p>Axial Ratio – 5dbs – 5db</p> <p>Noise < 1 db</p> <p>Operating Temperature - 30°C to +80°C</p> <p>Connector – N or BNC-J</p> <p>Output Data - NEMA 0183 format</p> <p>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).</p> <p>Mounting – Fixed (sky view) outdoor</p> <p>Weather Condition – All seasons</p> <p>Weight of the Antenna – less than 0.5 kg</p> <p>Lighting Arrester – Mandatory</p> <p>Redundant Antenna for each GPS receiver - Required with all necessary mounting accessories</p>	
12	Remote Time & Frequency Display	<p>Display : Time: HH:MM:SS:SSS in 24 hrs format, Frequency – XX.XXX Hz</p> <p>Display size: 100 mm 7 Segment RED LED</p> <p>Input : From GPS receiver</p> <p>Connection: from GPS Receiver Serial Communication / Wireless Remote Display</p> <p>Signal Updation: Continuous, Every Second</p> <p>Each digit on the time, day and frequency indicators shall be at least 7.5 cm in height and shall be bright enough for adequate visibility in the control room from a distance of 15 meters</p> <p>Redundant Power Supply 110V DC/220VDC or 230 V AC with battery backup (bidder to provide details for offered battery back-up)</p> <p>The GPS Receiver 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</p>	

GPS Receiver with Frequency, Time & Date Display			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	BIDDER RESPONSE
		Environment: Display Units with accessories will be installed in the Relay/Control room with no temperature or humidity control. The Display Units 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	
		Mounting: Wall mounting with all necessary mounting accessories & kit.	
13	Expected Accuracy	GPS / IRIG-B < 1 Microsecond	
		IEC61850-9-2 LE, IEC 62439-3 (PRP & HSR), IEC61850 Ed1&Ed2, IEC104, Modbus RTU	
		NTP, SNTP: WAN < 10 msec LAN < 1 msec	
		IEEE 1588 : < 10 microseconds or better	
14	Remote Monitoring	SNMP v1,v2,v3 for Monitoring from Remote	
15	Cybersecurity	NERC CIP, IEC62443 standard	
15.1	Syslog reporting	Yes,Mandatory	
15.2	Management	Shall be Managed from Remote throgun secured Access	
16	Conformal Coated	Yes,Mandatory	
17	IP class	IP64	
18	Power Supply	Redundant Power supply module of 48V DC. 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	
19	Electronic Earthing	Provision of electronic earthing to the nearest grounding box/earth pit	
20	Environment	GPS Receiver with accessories will be installed in the Gateway 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	
21	Other Required Features	Offset Adjustment	
		Propogation 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	

Managed Layer - 2 Switch			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	BIDDER RESPONSE
1	Make		
2	Model		
3	Type of Switch	Industrial Grade, 19" Rackmountable	
4	No. of Ports per switch	Minimum 24	
4.1	No. of Copper ports (10/100 mbps)	As per Bidder's Proposed Architecture	
4.2	No. of Fiber Ports (100/1000 mbps)	As per Bidder's Proposed Architecture	
4.3	SFPs to be considered for fiber ports	Required, Mandatory	
4.4	Copper Ports	2nos Minimum & Mandatory	
5	Compliance		
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	IEC 62439-3	Mandatory	
5.5	QAS (802.1p)	Mandatory	
6	Time Synchronization	SNTP, IEEE1588 V2	
7	Suitable for PRP/HSR architecture	Mandatory, As per proposed Architecture	
8	Other Required Features	Automatic Learning, Ngotiation, 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 configuratble SNMP traps	
		Syslog Reporting, Mandatory	
9	Management Tools support	Port Spanning feature, Mandatory - Local & Remote with multi Span	
		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	TATA POWER REQUIREMENT	BIDDER RESPONSE
10	Auxiliary Power Supply	Redundant Power supply module of 48V DC or 110 / 220 V 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	Environment Requirement, Reliability & Cooling	Switch with accessories will be installed in the Relay Panel/Switchgear/Outdoor Panels with no temperature or humidity control. The Switch shall be capable of operating in ambient temperature from -40 to +65 degree Cand relative humidity of 95%, non-condensing Conformal Coating, Mandatory	
12	Health Monitoring of Hardware such as Ethernet ports, Power supply cards & Communication links and internal voltages through SNMP to Gateway	Mandatory	

Managed Layer - 3 Switch (SAS)			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	BIDDER RESPONSE
1	Make		
2	Model		
3	No. of Ports	24	
3.1	No. of copper Ports (10/1000 mbps)	16 Minimum	
3.2	No. of Fiber Ports (100/1000 mbps)	8 Minimum	
3.3	PRP & HSR Support	Mandatory	
4	Layer 3 features	Non-Blocking L3 switching	
		Static IP routing	
		Dynamic Routing Protocols – RIP, RIP v1/v2, RIPng OSPF (Day 1) and BGP (scalable)	
		VRRP	
		LACP	
		Shall support IP v6 in hardware without any additional module	
		IGMP, multicast routing (scalable)	
		Policy based routing	
		LACP	
		OSPF routes – min 500 table entries	
5	Layer 2 features	MAC address table size min 4K	
		Shall support Layer 2 switch ports with Secure VTP or similar protocols to reduce administrative burden for VLANs Configuration	
		Port aggregation using IEE 802.3	
		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	
		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	
		Automatic Learning, Negotiation, and Crossover Detection	
		Port Spanning feature, Mandatory - Local & Remote with multi Span	
6	Virtual Switching Features	Common Virtual Switch control plane for both switches	
		Common Virtual Switch Active Data plane for both switches	
		VRRP, VSS, Stacking or equivalent HA solution	
		Min 20 Gbps bandwidth on the high availability link between switches	

		Switches shall support Ring resiliency protocols (RPR / EPSR) to ensure sub 50 ms convergence	
7	QOS Features	Per port egress queues	
		Priority queuing	
		Custom queuing	
		Traffic policing	
		Traffic shaping	
		Traffic marking and classification	
		Congestion avoidance using WTD or WRED	
		Cross stack QOS	
8	Security features	Port level access list	
		Dynamic ARP inspection	
		IP source guard	
		MAC binding	
		Per port storm control	
		Secure admin access over SSH	
		Admin access restrictions	
		IEEE 802.1x	
		AAA using RADIUS / TRACS+	
		Security encryptions	
		Private VLANs	
9	Management features	SNMP v2c, V3	
		Configurable SNMP traps	
		Logging to Syslog with time stamp	
		NTP support	
10	Power Supply	Redundant Power supply module of 48V DC. 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	
11	Environment	Switch with accessories will be installed in the Gateway with no temperature or humidity control. The equipment 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	
		Conformal Coating, Mandatory	
12	Health Monitoring of Hardware such as Ethernet ports, Power supply cards & Communication links through SNMP	Protocol shall be SNMP	

Multi- Function Meter (MFM)			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	BIDDER RESPONSE
1	Make		
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 upto 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	Universal Power Supply with 85V to 265 V AC and 88 -290 V DC 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 LCP Panel / Relay / 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	TATA POWER REQUIREMENT	BIDDER RESPONSE
1	Make		
2	Model		
3	Hardware	64 Bit with Latest processor, 6Core, 2.30 GHz to 4.70GHz, 512GB PCIe SSD or better, 32 GB RAM, DDR4 , NVIDIA T600 8GB GDD R6, DVD RW, 1no Ethernet port, 4 USB Ports & HDMI, 15.6" Display with 1 no. serial to USB converter	
4	Software	Microsoft Windows & Office License latest	
		Antivirus software (Apex one)	
		BCU, Gateway Configuration Software	
		IEC61850 Configuration Tool	
		RTU/BCU/GW, Master Simulation & Protocol Analyzer Software	
5	Accessories	Wireless Mouse & Laptop Bag	
6	Auxiliary Power Supply	230V AC	

Operator & Engineering Workstation

Sl. No.	Technical Particulars	Tata Power Requirement	Bidder's response
1	Make	DELL/HP/Lenovo	
2	Model	DELL Precision 5820 or better / HP Z4 G4 or better	
3	Operating System	Windows 10 , 64 bit	
4	Processor	Intel (R) Xeon(R) processor,6 Core, 4.1 GHz or better	
5	Memory	32 GB RAM (16GBx2)	
6	Hard Disk	1 TB HDD	
7	Optical Drive	DVD-RW drive	
8	Ethernet Ports	2nos 1000 Mbps Ethernet ports	
9	Additional ports	4 Display ports for Monitor & LVS	
10	USB ports	Yes	
11	Power Supply	230V AC	
12	Size	Tower Mounted	
13	Peripherals	Wired Keyboard & Optical Mouse	
14	Graphic card	8 GB NVIDIA Quadro	
15	Other I/O interface	Sound Card and Speakers for audible alarms, Stereo line-in, Microphone-in, front headphone/speaker out	
16	Other Software	MS Office 2019 or better	

Temperature & Humidity Sensor			
SL. NO.	TECHNICAL PARTICULARS	TATA POWER REQUIREMENT	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)	
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	Universal Power Supply with 85V to 265 V AC or 88 -290 V DC +/- 10% 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.	

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ANNEXURE – II

Indicative Bill of Material- Sub-Station Automation

(Bidder shall refer the equipment technical specification for more details and offer the solutions accordingly)

Refer the attached Indicative Automation BOM annexure separately

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ANNEXURE III

Reference Input / Output List

The below I/O list is only for reference, the same will be finalized during detailed engineering

22kV/33kV GIS SCADA IO list				
Sl. No.	Signal Description	Signal Type	State10	State 01
Bay - Outgoing				
Digital Inputs				
1	Breaker Status	DPI	Open	Close
2	Isolator	DPI	Open	Close
3	Earth Switch	DPI	Open	Close
4	Local/Remote Switch Status	SPI	On Local	On Remote
5	SF6 Gas pressure	SPI	Normal	Alarm
6	Circuit Breaker Spring Status	SPI	Discharged	Charged
7	Trip Circuit-1 Supervision	SPI	Failed	Healthy
8	Trip Circuit-2 Supervision	SPI	Failed	Healthy
9	Group Setting A Changed	SPI	Active	Nil
10	Group Setting B Changed	SPI	Active	Nil
11	Group Setting C Changed	SPI	Active	Nil
12	Group Setting D Changed	SPI	Active	Nil
13	A phase start	SPI	Operated	Reset
14	B phase start	SPI	Operated	Reset
15	C phase start	SPI	Operated	Reset
16	Phase Instantaneous O/C Trip Stage-1 (RBS BF)	SPI	Operated	Reset
17	Phase Instantaneous O/C Trip Stage-2	SPI	Operated	Reset
18	Phase Instantaneous O/C Trip Stage-3	SPI	Operated	Reset
19	IP IDMT O/C Trip	SPI	Operated	Reset
20	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
21	Phase Inst OC Trip stg2	SPI	Operated	Reset
22	Phase Inst OC Trip stg3	SPI	Operated	Reset
23	IP IDMT E/F Trip	SPI	Operated	Reset
24	VT Fuse Failure (10S >)	SPI	Alarm	Reset
25	VT Fuse Failure (Instantaneous)	SPI	Alarm	Reset
26	Operation Lever Inserted	SPI	Normal	Inserted
27	Busbar Gas Pressure Healthy	SPI	Alarm	Reset
28	Cable	SPI	Live	Dead
29	22kV/33KV OG Cable Auxiliary Supply MCB	SPI	Trip	Reset

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30	Block to IC-1 & BC 1-2A	SPI	Send	Reset
31	Trip from IC-1	SPI	Received	Reset
32	Trip from BC-1-2A	SPI	Received	Reset
33	Fault Current If A Phase	Analog	Value	Nil
34	Fault Current If B Phase	Analog	Value	Nil
35	Fault Current If C Phase	Analog	Value	Nil
36	Fault Current If N	Analog	Value	Nil
37	Fault Duration	Analog	Value	Nil
38	I Square t	Analog	Value	Nil
39	Breaker Contact Wear out	SPI	Operated	Nil
40	Time Sync	SPI	Sync	Not Sync
Digital Output (Control Command)				
1	Breaker Status	DCO	Open	Close
2	Isolator	DCO	Open	Close
3	Earth Switch	DCO	Open	Close
4	Group Setting A	SCO	In Service	Out of Service
5	Group Setting B	SCO	In Service	Out of Service
6	Group Setting C	SCO	In Service	Out of Service
7	Group Setting D	SCO	In Service	Out of Service
Bay – Out Going with BUS PT				
Digital Inputs				
1	Breaker Status	DPI	Open	Close
2	Isolator	DPI	Open	Close
3	Earth Switch	DPI	Open	Close
4	Bus-PT Isolator	DPI	Open	Close
5	Earth Switch Bus-PT	DPI	Open	Close
6	Local/Remote Switch Status	SPI	On Local	On Remote
7	SF6 Gas pressure	SPI	Normal	Alarm
8	CB Spring Charge	SPI	Discharged	Charged
9	Trip Circuit-1 Supervision	SPI	Failed	Healthy
10	Trip Circuit-2 Supervision	SPI	Failed	Healthy
11	Group A Setting Status	SPI	Active	Nil
12	Group B Setting Status	SPI	Active	Nil
13	Group C Setting Status	SPI	Active	Nil
14	Group D Setting Status	SPI	Active	Nil
15	A phase start	SPI	Operated	Reset
16	B phase start	SPI	Operated	Reset
17	C phase start	SPI	Operated	Reset
16	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset

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17	Phase Inst OC Trip stg2	SPI	Operated	Reset
18	Phase Inst OC Trip stg3	SPI	Operated	Reset
19	IP IDMT OC Trip	SPI	Operated	Reset
20	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
21	Phase Inst OC Trip stg2	SPI	Operated	Reset
22	Phase Inst OC Trip stg3	SPI	Operated	Reset
23	IP IDMT E/F Trip	SPI	Operated	Reset
26	VT Fuse Failure (10S >)	SPI	Alarm	Reset
27	VT Fuse Failure (Instantaneous)	SPI	Alarm	Reset
28	Operation Lever Inserted	SPI	Normal	Inserted
29	Busbar Gas Pressure Healthy	SPI	Alarm	Reset
30	cable	SPI	Live	Dead
31	22kV/33KV OG Cable Aux Supply MCB	SPI	Trip	Reset
32	Block to IC-1 & BC 1-2A	SPI	Send	Reset
33	Trip from IC-1	SPI	Received	Reset
34	Trip from BC-1-2A	SPI	Received	Reset
35	BUS-1 PT Selected	SPI	Selected	-
36	BUS-2 PT Selected	SPI	Selected	-
37	Fault Current If A Phase	Analog	Value	Nil
38	Fault Current If B Phase	Analog	Value	Nil
39	Fault Current If C Phase	Analog	Value	Nil
40	Fault Current If N Phase	Analog	Value	Nil
41	Fault Duration	Analog	Value	Nil
42	I Square t	Analog	Value	Nil
43	Breaker Contact wear out	SPI	Operated	Nil
Digital Output (Control Command)				
1	Breaker Status	DCO	Open	Close
2	Isolator	DCO	Open	Close
3	Earth Switch	DCO	Open	Close
4	Group Setting A	SCO	In Service	Out of Service
5	Group Setting B	SCO	In Service	Out of Service
6	Group Setting C	SCO	In Service	Out of Service
7	Group Setting D	SCO	In Service	Out of Service
Bay - Capacitor Bank				
Digital Inputs				
1	Breaker Status	DPI	Open	Close
2	Isolator	DPI	Open	Close
3	Earth Switch	DPI	Open	Close
4	Local/Remote Switch Status	SPI	On Local	On Remote

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5	SF6 Gas pressure	SPI	Normal	Alarm
6	CB Spring Charge	SPI	Discharged	Charged
7	Trip Circuit-1 Supervision	SPI	Failed	Healthy
8	Trip Circuit-2 Supervision	SPI	Failed	Healthy
9	Group Setting A Changed	SPI	Active	Nil
10	Group Setting B Changed	SPI	Active	Nil
11	Group Setting C Changed	SPI	Active	Nil
12	Group Setting D Changed	SPI	Active	Nil
13	A phase start	SPI	Operated	Reset
14	B phase start	SPI	Operated	Reset
15	C phase start	SPI	Operated	Reset
16	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
17	Phase Inst OC Trip stg2	SPI	Operated	Reset
18	Phase Inst OC Trip stg3	SPI	Operated	Reset
19	IP IDMT OC Trip	SPI	Operated	Reset
20	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
21	Phase Inst OC Trip stg2	SPI	Operated	Reset
22	Phase Inst OC Trip stg3	SPI	Operated	Reset
23	IP IDMT E/F Trip	SPI	Operated	Reset
24	VT Fuse Failure (10S >)	SPI	Alarm	Reset
25	VT Fuse Failure (Instantaneous)	SPI	Alarm	Reset
26	Operation Lever Inserted	SPI	Normal	Inserted
27	Busbar Gas Pressure Healthy	SPI	Alarm	Reset
28	cable	SPI	Live	Dead
29	33 kV Cap Bank Cable Aux Supply MCB	SPI	Trip	Reset
30	U/V operated	SPI	Operated	Reset
31	L/O Status	SPI	Operated	Reset
32	Block to IC & BC	SPI	Send	Reset
33	Trip from IC	SPI	Received	Reset
34	Trip from BC	SPI	Received	Reset
35	Fault Current If A Phase	Analog	Value	Nil
36	Fault Current If B Phase	Analog	Value	Nil
37	Fault Current If C Phase	Analog	Value	Nil
38	Fault Current If N Phase	Analog	Value	Nil
39	Fault Duration	Analog	Value	Nil
40	I Square t	Analog	Value	Nil
41	Breaker Contact wear out	SPI	Operated	Nil
Digital Output (Control Command)				
1	Breaker Status	DCO	Open	Close
2	Isolator	DCO	Open	Close

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3	Earth Switch	DCO	Open	Close
4	Group A Setting Command	SCO	In Service	Out of Service
5	Group B Setting Command	SCO	In Service	Out of Service
6	Group C Setting Command	SCO	In Service	Out of Service
7	Group D Setting Command	SCO	In Service	Out of Service
8	L/O Reset Command	SCO	Reset	-
Bay - Reactor				
Digital Inputs				
1	Breaker Status	DPI	Open	Close
2	Isolator	DPI	Open	Close
3	Earth Switch	DPI	Open	Close
4	Local/Remote Switch Status	SPI	On Local	On Remote
5	SF6 Gas pressure	SPI	Normal	Alarm
6	CB Spring	SPI	Discharged	Charged
7	Trip Circuit-1 Supervision	SPI	Failed	Healthy
8	Trip Circuit-2 Supervision	SPI	Failed	Healthy
9	Group A Setting Status	SPI	Active	Nil
10	Group B Setting Status	SPI	Active	Nil
11	Group C Setting Status	SPI	Active	Nil
12	Group D Setting Status	SPI	Active	Nil
13	A phase start	SPI	Operated	Reset
14	B phase start	SPI	Operated	Reset
15	C phase start	SPI	Operated	Reset
16	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
17	Phase Inst OC Trip stg2	SPI	Operated	Reset
18	Phase Inst OC Trip stg3	SPI	Operated	Reset
19	IP IDMT OC Trip	SPI	Operated	Reset
20	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
21	Phase Inst OC Trip stg2	SPI	Operated	Reset
22	Phase Inst OC Trip stg3	SPI	Operated	Reset
23	IP IDMT E/F Trip	SPI	Operated	Reset
24	Operation Lever Inserted	SPI	Normal	Inserted
25	Busbar Gas Pressure Healthy	SPI	Alarm	Reset
26	Cable	SPI	Live	Dead
27	22kV/33KV Reactor Cable Aux Supply MCB	SPI	Trip	Reset
28	L/O Relay	SPI	Operated	Reset
29	Differential Protection Stage 1	SPI	Operated	Reset
30	Differential Protection Stage 2	SPI	Operated	Reset
31	Block to IC & BC	SPI	Send	Reset
32	Trip from IC	SPI	Received	Reset

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33	Trip from BC	SPI	Received	Reset
34	Fault Current If A Phase	Analog	Value	Nil
35	Fault Current If B Phase	Analog	Value	Nil
36	Fault Current If C Phase	Analog	Value	Nil
37	Fault Current If N Phase	Analog	Value	Nil
38	Fault Duration	Analog	Value	Nil
39	I Square t	Analog	Value	Nil
40	Breaker Contact wear out	SPI	Operated	Nil
Digital Output (Control Command)				
1	Breaker Status	DCO	Open	Close
2	Isolator	DCO	Open	Close
3	Earth Switch	DCO	Open	Close
4	Group A Setting Command	SCO	In Service	Out of Service
5	Group B Setting Command	SCO	In Service	Out of Service
6	Group C Setting Command	SCO	In Service	Out of Service
7	Group D Setting Command	SCO	In Service	Out of Service
8	L/O Reset Command	SCO	Reset	-
Bay - Incomer				
Digital Inputs				
1	Breaker Status	DPI	Open	Close
2	Isolator	DPI	Open	Close
3	Earth Switch	DPI	Open	Close
4	Local/Remote Switch	SPI	On Local	On Remote
5	SF6 Gas pressure	SPI	Normal	Alarm
6	CB Spring	SPI	Discharged	Charged
7	Trip Circuit-1 Supervision	SPI	Failed	Healthy
8	Trip Circuit-2 Supervision	SPI	Failed	Healthy
9	Group A Setting Status	SPI	Active	Nil
10	Group B Setting Status	SPI	Active	Nil
11	Group C Setting Status	SPI	Active	Nil
12	Group D Setting Status	SPI	Active	Nil
13	A phase start	SPI	Operated	Reset
14	B phase start	SPI	Operated	Reset
15	C phase start	SPI	Operated	Reset
16	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
17	Phase Inst OC Trip stg2	SPI	Operated	Reset
18	Phase Inst OC Trip stg3	SPI	Operated	Reset
19	IP IDMT OC Trip	SPI	Operated	Reset
20	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset

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21	Phase Inst OC Trip stg2	SPI	Operated	Reset
22	Phase Inst OC Trip stg3	SPI	Operated	Reset
23	IP IDMT E/F Trip	SPI	Operated	Reset
24	VT Fuse Failure (10S >)	SPI	Alarm	Reset
25	VT Fuse Failure (Instantaneous)	SPI	Alarm	Reset
26	Operation Lever	SPI	Normal	Inserted
27	Busbar Gas Pressure Healthy	SPI	Alarm	Reset
28	Cable	SPI	Live	Dead
29	33 kV Incomer Cable Aux Supply MCB	SPI	Trip	Reset
30	33 kV INC1 GOOSE Message Activity	SPI	Disable	Enable
31	Overload Trimming Scheme	SPI	Operated	Reset
32	LBBU Protection Trip	SPI	Operated	Reset
33	LBBU Protection Initiated	SPI	Operated	Reset
34	LBBU Out of service	SPI	In Service	Out of service
35	Bus Fault Stage I> BLOCKED	SPI	Received	Reset
36	Bus Fault Stage IE> BLOCKED	SPI	Received	Reset
37	Block to Bus Coupler 1-2A Reverse Trip on own REV P/U	SPI	Send	Reset
38	Block from Bus Coupler 1-2A FWD P/U	SPI	Received	Reset
39	Block from Own Reverse Stage	SPI	Active	Reset
40	Trip from BC REV Trip	SPI	Received	Reset
41	Trip to BC & O.G feeder of Bus section-1	SPI	Operated	Reset
42	Bus Fault Stage Trip	SPI	Operated	Reset
43	Bus 1 Communication Fail	SPI	Healthy	Failed
44	Fault Current If A Phase	Analog	Value	Nil
45	Fault Current If B Phase	Analog	Value	Nil
46	Fault Current If C Phase	Analog	Value	Nil
47	Fault Current If N Phase	Analog	Value	Nil
48	Fault Duration	Analog	Value	Nil
49	I Square t	Analog	Value	Nil
50	Breaker Contact wear out	SPI	Operated	Nil
51	Time Sync	SPI	Sync	Not Sync
Digital Output (Control Command)				
1	Breaker Status	DCO	Open	Close
2	Isolator	DCO	Open	Close
3	Earth Switch	DCO	Open	Close
4	Group A Setting Command	SCO	In Service	Out of Service
5	Group B Setting Command	SCO	In Service	Out of Service
6	Group C Setting Command	SCO	In Service	Out of Service

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7	Group D Setting Command	SCO	In Service	Out of Service
8	OLTS Relay	DCO	IN	OUT
Bay - Bus Coupler				
Digital Inputs				
1	Breaker Status	DPI	Open	Close
2	Isolator	DPI	Open	Close
3	Earth Switch	DPI	Open	Close
4	Isolator (Bus Riser)	DPI	Open	Close
5	Earth Switch (Bus Riser)	DPI	Open	Close
6	Local/Remote Switch Status	SPI	On Local	On Remote
7	SF6 Gas pressure	SPI	Normal	Alarm
8	CB Spring Charge	SPI	Discharged	Charged
9	Trip Circuit-1 Supervision	SPI	Failed	Healthy
10	Trip Circuit-2 Supervision	SPI	Failed	Healthy
11	Group A Setting Status	SPI	Active	Nil
12	Group B Setting Status	SPI	Active	Nil
13	Group C Setting Status	SPI	Active	Nil
14	Group D Setting Status	SPI	Active	Nil
15	A phase start	SPI	Operated	Reset
16	B phase start	SPI	Operated	Reset
17	C phase start	SPI	Operated	Reset
16	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
17	Phase Inst OC Trip stg2	SPI	Operated	Reset
18	Phase Inst OC Trip stg3	SPI	Operated	Reset
19	IP IDMT OC Trip	SPI	Operated	Reset
20	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
21	Phase Inst OC Trip stg2	SPI	Operated	Reset
22	Phase Inst OC Trip stg3	SPI	Operated	Reset
23	IP IDMT E/F Trip	SPI	Operated	Reset
26	VT Fuse Failure(10S >)	SPI	Alarm	Reset
27	VT Fuse Failure (Instantaneous)	SPI	Alarm	Reset
28	Operation Lever Inserted	SPI	Normal	Inserted
29	Busbar Gas Pressure Healthy	SPI	Alarm	Reset
30	Cable	SPI	Live	Dead
31	22kV/33KV BC Cable Aux Supply MCB	SPI	Trip	Reset
32	GOOSE Messaging activity	SPI	Disable	Enable
33	BC1 NON-DIR Phase Inst OC Trip stg1	SPI	Operated	Reset
34	BC1 NON-DIR Phase Inst OC Trip stg2	SPI	Operated	Reset
35	BC1 NON-DIR Phase Inst OC Trip stg3	SPI	Operated	Reset
36	BC1 NON-DIR IP IDMT OC Trip	SPI	Operated	Reset

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37	BC1 NON-DIR E/F Inst Trip stg1	SPI	Operated	Reset
38	BC1 NON-DIR E/F Inst Trip stg2	SPI	Operated	Reset
39	BC1 NON-DIR E/F Inst Trip stg3	SPI	Operated	Reset
40	BC1 NON-DIR IEP IDMT OC Trip	SPI	Operated	Reset
41	Block from BS-1 OG	SPI	Received	Reset
42	Block from BS-1 I/C Rev P/U	SPI	Received	Reset
43	Block From BC2A-2B FWD P/U	SPI	Received	Reset
44	Trip from BS-1 I/C	SPI	Received	Reset
45	Block to BS-1 I/C for BC FWD P/U	SPI	SEND	Reset
46	Block to BS-2 I/C and BC2A-2B REV Trip	SPI	SEND	Reset
47	Trip to BS-1 IC/Outgoings Bus 1	SPI	Operated	Reset
48	Trip to BS-2A IC/Outgoings Bus 2A	SPI	Operated	Reset
49	Bus Fault Forward Stage Trip Block	SPI	Active	Reset
50	Bus Fault Forward Stage Trip	SPI	Operated	Reset
51	Block from BS-2A Outgoing	SPI	Received	Reset
52	Block from BS-2A IC Rev P/U	SPI	Received	Reset
53	Trip from BS-2A I/C	SPI	Received	Reset
54	Trip from BC-2A-2B REV Trip	SPI	Received	Reset
55	Bus Fault REVERSE Stage Trip Block	SPI	Active	Reset
56	Bus Fault REVERSE Stage Trip	SPI	Operated	Reset
57	Forward Directional Element Start	SPI	Operated	Reset
58	Reverse Directional Element Start	SPI	Operated	Reset
59	Bus 1 Communication Fail	SPI	Healthy	Failed
60	Bus 2A Communication Fail	SPI	Healthy	Failed
61	Fault Current If A Phase	Analog	Value	Nil
62	Fault Current If B Phase	Analog	Value	Nil
63	Fault Current If C Phase	Analog	Value	Nil
64	Fault Current If N Phase	Analog	Value	Nil
65	Fault Duration	Analog	Value	Nil
66	I Square t	Analog	Value	Nil
67	Breaker Contact wear out	SPI	Operated	Nil
68	Time Sync	SPI	Sync	Not Sync
Digital Output(Control Command)				
1	Breaker Status	DCO	Open	Close
2	Isolator	DCO	Open	Close
3	Earth Switch	DCO	Open	Close
4	Group A Setting Command	SCO	In Service	Out of Service
5	Group B Setting Command	SCO	In Service	Out of Service
6	Group C Setting Command	SCO	In Service	Out of Service

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7	Group D Setting Command	SCO	In Service	Out of Service
8	Isolator (Bus Riser)	DCO	Open	Close
9	Earth Switch (Bus Riser)	DCO	Open	Close
Bay - Distribution Transformer / Station Transformer				
Digital Inputs				
1	Breaker Status	DPI	Open	Close
2	Isolator	DPI	Open	Close
3	Earth Switch	DPI	Open	Close
4	Local/Remote Switch Status	SPI	On Local	On Remote
5	SF6 Gas pressure	SPI	Normal	Alarm
6	CB Spring Charge	SPI	Discharged	Charged
7	Trip Circuit-1 Supervision	SPI	Failed	Healthy
8	Trip Circuit-2 Supervision	SPI	Failed	Healthy
9	Group A Setting Status	SPI	Active	Nil
10	Group B Setting Status	SPI	Active	Nil
11	Group C Setting Status	SPI	Active	Nil
12	Group D Setting Status	SPI	Active	Nil
13	A phase start	SPI	Operated	Reset
14	B phase start	SPI	Operated	Reset
15	C phase start	SPI	Operated	Reset
16	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
17	Phase Inst OC Trip stg2	SPI	Operated	Reset
18	Phase Inst OC Trip stg3	SPI	Operated	Reset
19	IP IDMT OC Trip	SPI	Operated	Reset
20	Phase Inst OC Trip stg1 (RBS BF)	SPI	Operated	Reset
21	Phase Inst OC Trip stg2	SPI	Operated	Reset
22	Phase Inst OC Trip stg3	SPI	Operated	Reset
23	IP IDMT E/F Trip	SPI	Operated	Reset
24	VT Fuse Failure (10S >)	SPI	Alarm	Reset
25	VT Fuse Failure (Instantaneous)	SPI	Alarm	Reset
26	Operation Lever Inserted	SPI	Normal	Inserted
27	Busbar Gas Pressure Healthy	SPI	Alarm	Reset
28	cable	SPI	Live	Dead
29	22kV/33KV OG Cable Aux Supply MCB	SPI	Trip	Reset
30	Block to IC-1 & BC 1-2A	SPI	Send	Reset
31	Trip from IC-1	SPI	Received	Reset
32	Trip from BC-1-2A	SPI	Received	Reset
33	Fault Current If A Phase	Analog	Value	Nil
34	Fault Current If B Phase	Analog	Value	Nil
35	Fault Current If C Phase	Analog	Value	Nil

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36	Fault Current If N	Analog	Value	Nil
37	Fault Duration	Analog	Value	Nil
38	I Square t	Analog	Value	Nil
39	Breaker Contact wear out	SPI	Alarm	Normal
40	Diff A Phase Trip	SPI	Trip	Reset
41	Diff B Phase Trip	SPI	Trip	Reset
42	Diff C Phase Trip	SPI	Trip	Reset
43	Diff Fault Current If A Ph	Analog	Value	Nil
44	Diff Fault Current If B Ph	Analog	Value	Nil
45	Diff Fault Current If C Ph	Analog	Value	Nil
47	OTI TRIP	SPI	Trip	Reset
48	WTI TRIP	SPI	Trip	Reset
49	OSR TRIP	SPI	Trip	Reset
50	IE>TRIP INST-EF Trip.	SPI	Trip	Reset
51	IEP TRIP-IDMT-EF-Trip	SPI	Trip	Reset
53	Neutral Fault Current	Analog	Value	Nil
54	OTI/MOG(OLTC)/BUCH ALARM	SPI	Alarm	Reset
55	WTI/MOG(MAIN)/PRV(MAIN)	SPI	Alarm	Reset
56	BUCH TRIP	SPI	Operated	Nil
57	Time Sync	SPI	Sync	Not Sync
Digital Output (Control Command)				
1	Breaker Status	DCO	Open	Close
2	Isolator	DCO	Open	Close
3	Earth Switch	DCO	Open	Close
4	Group A Setting Command	SCO	In Service	Out of Service
5	Group B Setting Command	SCO	In Service	Out of Service
6	Group C Setting Command	SCO	In Service	Out of Service
7	Group D Setting Command	SCO	In Service	Out of Service
System Event list (Hardwired)				
Sl. No.	Description	Signal Type	State Table	
			State10	State 01
1	(Voltage level) (Bus section Number) BCPU IRF Status	SPI	Failed	Healthy

List of Parameters from Multi-Function Meter		
Sl. No.	Parameter Description	Parameter Type
1	R-Phase Current	Analog
2	Y-Phase Current	Analog

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3	B-Phase Current	Analog
4	R-Y Phase Voltage (KV)	Analog
5	Y-B Phase Voltage (KV)	Analog
6	B-R Phase Voltage (KV)	Analog
7	Active Power (KW)	Analog
8	Reactive Power (KVar)	Analog
9	Apparent Power (KVA)	Analog
10	Power Factor	Analog
11	Frequency (Hz)	Analog
12	MWH Sent	Accumulator
13	MWH Received	Accumulator
14	MVARH Sent	Accumulator
15	MVARH Received	Accumulator

Note: The above IO list is indicative. However, the final IO list will be reviewed and finalized during detailed engineering, as per the design requirement.

RBS, Auto-restoration scheme and any specific Interlock schemes (if applicable) signals will be finalized during detailed engineering.


Annexure – IV

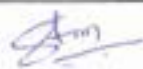
Standard Quality Plan

Attached Separately

END

SQP for Automation System

TATA POWER		The Tata Power Company Limited Corporate Engineering-Quality Assurance & Inspection		 TATA	
TPQA&I-QAXX-00-EX-SQP-371 REV.0		STANDARD QUALITY PLAN FOR SCADA SYSTEM.		Date of Issue: 15-10-2018	
Sr. No	COMPONENT / OPERATION	CHARACTERISTICS TO BE CHECKED	TYPE / METHOD OF CHECK	REMARKS	
1	2	3	4	5	
1.0 MATERIAL: (As per technical specification/ drawings/ approved data sheet).					
1.1	Sheet Steel, CRCA	Thickness, dimensional, surface finish, bend test/ mechanical tests & Chemical Analysis.	MTC & Report verification as per approved datasheet/ specification & inward material inspection by system supplier.	Correlated manufacturer TC & Inspection report verification by Tata Power.	
1.2	Server, Ethernet switch, HMI, Workstation, Terminal Server, RTU, BCU, Gateway, Interposing Relays, Firewall, Multi-Function Meters, Media Converters & Power supply.	1. BOM verification, 2. Configuration checks, 3. Warranty clauses. 4. Cyber security checks (wherever applicable).			
1.3	Control Cables & its accessories.	Type & rating of cable, Color check, No. of Strands , Conductor resistance, shielding, dimensional checks, HV test, Insulation resistance; FRLS tests.			
1.4	Fibre Optic Cable, Patch Cords, Fibre Optic Termination equipment and Fibre Management Panel.	Wavelength, Type (SM/MM), Length, Interface Ports.			
1.5	Fibre Multiplexer, Protection Coupler, PLCC, WAN Network Switch.	BOM verification, Configuration and Functional checks			
1.6	GPS system (As applicable)	Type & Make. Range & Functional checks.			
2.0 INPROCESS INSPECTION: (Generally in line with manufacturer standard).					
2.1	Cabinet Assembly of system.	Visual & Dimensional checks. Check for Mounting of components, labeling, dressing, ferruling & wiring continuity, gland plate installation and earthing. Check compatibility of interface modules & SCADA system. HV test on internal wiring at 2kV & IR test.	Testing & Measurement to be carried out by manufacturer.	Verification of Records by Tata Power.	
3.0 FINAL TEST & INSPECTION: (As per approved drawings/ data sheet, technical specification and relevant standards) - Customer Hold Point (CHP)					
3.1	Acceptance Test	BOM, Visual & Dimensional checks. Check for panel thickness, paint shade & thickness, ferruling, continuity, color coding of panel wires & Terminal Blocks. Check for isolation between electronic component grounding & panel grounding. Check for power up sequence test. Check behaviour of modules during U/V or O/V. System architecture & configuration check for server, its license, Hardware components, DR (Disturbance Recorder) collector & DR analysis system, firewall, power supply and other interface modules. Functional & Integration tests for hardware & software operations. Check for integrated testing of IEDs (Intelligent Electronic devices) with Gateway.	Testing & measurement as per approved GA drawing, specification/ datasheet/ FAT procedure.	CHP	



	Acceptance Test	Verification of database as per I/O list, interlock logics, etc. Check Time synchronization of SCADA system (including HMI & ethernet switches), IEDs & Gateway with GPS system. Check time stamping of alarms & events. Check for Mimics & Displays, Reports & Trends. Check for redundancy of SCADA & communication system. Check for IED parameterization (i.e. communication & configuration of IEDs through softwares). Simulation for verification of specified automatic download of DR to DR collector.	Testing & measurement as per approved GA drawing, specification/ datasheet/ FAT procedure.	CHP
3.2	Type tests	1. IP class for the enclosure, 2. Burn-in test / System to run for 48hrs. 3. Compatibility test of H/W & S/W for Gateway, SCADA, Communication system & IEDs. 3. Protocol (PICS, MICS (Protocol & Model Implementation Conformance Statement) documents for IEC 61850/MODBUS/IEC103/IEC104 compliance) compatibility test for Gateway & IEDs.	Verification of TC/ as indicated in specifications.	Valid type test certificates not older than 5yrs. To be submitted.
4.0 QUALITY DOSSIER:				
4.1	Document Review & Issuance of IRN	Review of Quality Dossier along with Index & software licence.	Customer Hold Point (CHP)	
<p>N O T E</p> <p>A) STATUTORY REQUIREMENTS SHALL BE COMPLIED BY THE CONTRACTOR. B) THIS DOCUMENT IS INDICATIVE & IS WITH MINIMUM QUALITY CHECKS. ANY ADDITIONAL CHECKS/QUALITY REQUIREMENT (INCLUDING ADDITIONAL TYPE/ DESIGN VALIDATION TESTS) AS PER TECHNICAL SPECIFICATIONS/ PO/ CONTRACT REQUIREMENT, SHALL BE DISCUSSED & ADDED IN THE MANUFACTURING QUALITY PLAN. C) TATA POWER / ITS REP IDENTIFICATION STAMP ON MATERIALS SHALL BE PRESERVED, IF REQD, SAME SHALL BE TRANSFERRED BY TATA POWER / ITS REP ONLY FOR MATERIAL TRACEABILITY. D) INSPECTION & TEST ACTIVITIES SHALL BE WITNESSED BY CLIENT AND IS HOLD POINT (AT THE DISCRETION OF TATA POWER). E) MANUFACTURER SHALL PREPARE AND SUBMIT COMPLETE MANUFACTURING QUALITY PLAN IN PRESCRIBED FORMAT OR THEIR REGULAR FORMAT INDICATING THEIR REGULAR PRACTICES, TAKING CARE OF MINIMUM REQUIREMENT AS INDICATED ABOVE. F) INSPECTION OF THE MAINTAINANCE SPARES SHALL BE OFFERED ALONG WITH THE MAIN SUPPLY AS PER THE INSPECTION STAGES 1 TO 4. G) CALIBRATION CERTIFICATES OF THE EQUIPMENT USED FOR TESTING SHALL BE PROVIDED FOR REVIEW. H) AS PER SPECIFICATION PROPER PAINTING, PACKING & PRESHIPMENT CHECKS SHALL BE ENSURED BY SUPPLIER BEFORE SHIPMENT TO AVOID ANY TRANSIT DAMAGE. I) TATA POWER RESERVES THE RIGHT TO DEMAND / VERIFY/ AUDIT/ WITNESS ANY OF THE CHECK POINTS MENTIONED IN THE SCOPE OF SUPPLIER.</p>				
0	FIRST ISSUE	 Shruti Marathe	 C R Bhonslay	 S. Simha
Rev. No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date

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SECTION - B

THE TATA POWER COMPANY LIMITED

STANDARD TECHNICAL SPECIFICATION

FOR

Prewired Metering Panels

(DOCUMENT NO - ENGG/ ELEC/STD-SPEC/105)



Tata Power

Engineering (T&D)

Rev No.	Date	Revision History	Prepared By	Checked By	Approved By
D	08.01.2024	Revised to include the metering scheme	AS <i>Aswath</i>	VK	SKV
C	04.05.2023	Revised to include the GA of metering panels	AS	VK	SKV
B	01.08.2022	Revised to include location of meters at interface point, update IEC standards and Data sheet	AS	VK	AM/UGP
A	25.04.2020	Revised to include updated PQR	DAJ	SBL	AM
R0	28.01.2022	First time issued for prewired metering panels without meters	DAJ	SBL	AM

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1.0	Introduction
2.0	Qualifying Requirements
3.0	System Description and Scope
4.0	Codes & Standards
5.0	Design Requirements
6.0	Layout Requirements for the Equipment / System
7.0	Operational Requirements
8.0	Technical Parameters of Equipment (incl. Data Sheet)
9.0	Quality Requirements, Inspection and Testing (incl. SQP & SFP)
10.0	Performance Requirements
11.0	Mandatory Spares
12.0	Data Submission by Bidder
12.1	Along with Bid
12.2	After Award of Contract
13.0	Annexures
	Annexure-I Bidders Pre-qualification requirements
	Annexure-II General arrangement of Metering panels
	Annexure-III Standard Quality Plan
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1. **INTRODUCTION:**

The Technical specification covers the complete design, detailed engineering, manufacture, supply, inspection & testing at Bidder's work, packing, transportation, loading and unloading, delivery to site, storage at site, handling at site, erection, testing, commissioning, performance testing and handing over of prewired Metering Panels along with ABT (Availability Based Tariff) meters.

All equipment, system and services covered under this specification shall comply with all current applicable statutory regulations and safety codes in the locality where the equipment is proposed to be installed. The equipment and systems shall also conform to the latest version of applicable codes, standards and regulatory norms on the date of offer made by the Bidder unless otherwise indicated. Nothing in this specification shall be construed to relieve the Bidder of this responsibility.

2. **BIDDER'S QUALIFACTION REQUIREMENT:**

Bidder must meet all qualifying criteria mentioned in Annexure I.

3. **SYSTEM DISCRPTION AND SCOPE:**

3.1. This specification covers complete design, Engineering, manufacture, Factory acceptance test (FAT), transportation, supply, inspection, testing and commissioning of prewired metering panels along with ABT meters.

Metering panel shall be suitable for installation of ABT (Availability Based Tariff) meters of given make for intended feeders. Each feeder shall operate on separate core of CT & separate VTs. Main & Check meters shall be connected in series. CT & VT input for both the meters (Main and check) should be from the same core and for standby meter different CT/VT shall be used.

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3.2. ABT meters shall be Secure make APEX 150 model number meeting specification requirement given in Annexure no. V.

Installation, Testing & Commissioning of Metering Panels is in Vendor's scope.

Preferred makes of components inside Metering Panels:

S.No.	Component	Make
1.	Lamps/LED	Siemens / ABB / TECHNIC
2.	Selector switch	Switron / Kaycee
3.	MCB	Siemens / L&T / ABB
4.	Thermostat and space heater	APT / Girish
5.	Disconnecting links	Elmex make KLTD4
6.	TTB of 3P4W	DAV make SSFS-TC-3, Nelster welcon

3.3. Location of Meters:

The location of interface meters, meters for energy accounting and meters of EHV Consumer directly connected to InSTS (Intra state transmission system) and Interstate transmission system shall be as given in the Table-1 below.

Table 1:

Type	Interface point	Applicable for	Main meter	Check meter	Standby meter
Type I	Generation-Transmission (G-T)	Generating Stations-Independent Conventional Power Plant - Directly connected to InSTS bus	1) EHV side of each generator transformer (GT) 2) EHV/HV Sides of each Station Auxiliary transformer (SAT)	In series with main meter	All outgoing feeders of InSTS bus of generating station.

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Type	Interface point	Applicable for	Main meter	Check meter	Standby meter
Type II	Generation-Transmission (G-T)	Generating Stations- Conventional captive Power Plant - connected to InSTS on dedicated transmission line.	1) InSTS end of transmission line. 2) a) EHV Side of each Generator transformer (GT) b) EHV/HV Sides of each station Auxiliary transformer (SAT)	In series with main meter	Other (InSTS) end of transmission line
Type III (a)	Generation-Transmission (G-T)	Generation station- Renewable Power (Co-Gen, Small Hydro, Solar, Wind etc.)- Radial connection	At the generator end of the line (in case the line is part of InSTS.)	In series with main meter	Other end of transmission line
Type III (b)	Generation-Transmission (G-T)	Generation station- Renewable Power (Co-Gen, Small Hydro, Solar, Wind etc.)- Radial connection	At InSTS end of line (in case line is not part of InSTS)	In series with main meter	Other end of transmission line
Type IV (a)	Generation-Transmission (G-T)	Generation station- Renewable Power (Co-Gen, Small Hydro, Solar, Wind etc.)- LILO connection	Common Point of LILO & common injection point (in case of Generator bus.)	In series with main meter	Generator end of lines.

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Type	Interface point	Applicable for	Main meter	Check meter	Standby meter
Type IV (b)	Generation-Transmission (G-T)	Generation station- Renewable Power (Co-Gen, Small Hydro, Solar, Wind etc.)- LILO connection	If common injection point is not available i.e. no generator bus, EHV Side of Generator Transformer (GT).	In series with main meter	Generator end of lines.
Type V	Generation-Transmission (G-T)	Generators connected on 11/22/33kV Bus of InSTS Substation	HV Side of Generator Transformer (GT)	In series with main meter	InSTS end of feeders.
Type VI (a)	Transmission-Distribution (T-D)	O/G feeders belongs to same Licensee	On each Transformer L.V. side.	In series with main meter	On each Transformer H.V. side.
Type VI (b)	Transmission-Distribution (T-D)	O/G feeders belongs to different distribution Licensee	On each O/G feeder of Distribution Licensee	In series with main meter	On L.V. side of each transformer
Type VII	Transmission-Transmission (T-T)	Only CTU-STU interface points to be taken.	On each O/G feeders at S/s. end, to whom belongs the ownership of Transmission Line.	In series with main meter	The meter at the other end of line
Type VIII (a)	T-D interface at EHV level	EHV consumer directly connected to InSTS (LILO)	At the consumer premises at the connection point.	In series with main meter	The meters at the LILO Point at Consumer End.
Type VIII (b)	T-D interface at EHV level	EHV consumer directly connected to InSTS (radial)	At the consumer premises at the connection point.	In series with main meter	Other end of radial line (In case of radial).
Type IX	Open Access Customers directly connected to InSTS	Open Access Customers directly connected to InSTS	Open Access Customers	In series with main meter	InSTS end of feeders

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3.4. General Requirement:

Bidder must agree for handing over, to Owner, all project related drawings in AutoCAD format only. The pdf versions of above drawings shall be submitted through Wrench for formal approval process.

Acceptance (without any deviations) of minimum quality requirements defined in SQP & technical specifications.

4. CODES AND STANDARDS:

The design, manufacture and performance of the Metering Panels shall comply with all the requirements of the latest editions of international codes and standards applicable. Given below are the acceptable code and standards. The Bidder shall take Owners approval for use of other codes & standards

S.No.	Standard No.	Standard Title
1.	State Electricity regulation/ Metering guidelines	As applicable in respective states.
2.	IEC 62052-11	Electricity metering equipment (AC) – General requirements, tests and test conditions- Part 11: Metering equipment
3.	IEC 62056	Standards for Electricity metering data exchange
4.	IEC 60529	Standard for Ingress Protection for Prewired panels.

5. DESIGN REQUIREMENT:

Metering panels shall be suitably equipped with following requirements

- 5.1. Panel enclosure shall comply to IP54 for indoor installation. Type test report for the same shall be submitted by the bidder with the bid itself which shall be within 5 years from bid submission date.
- 5.2. The panel shall be of the metal enclosed indoor, floor mounted, Simplex type (W = 800 mm, D = 600 mm, H = 2315 mm) with single glass door for front. All the devices shall be panel

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mounted inside the panel. All equipment mounted inside the panels shall be completely wired to the terminal blocks ready for external connection.

- 5.3. Panel sheet thickness shall be maintained above 2 mm for non-load bearing members and the load bearing sheet shall be more than 3 mm including base frame, gland plate and blanking plate. The Panels shall be provided with anti-vibration pad.
- 5.4. Enclosure panel shall be powder coated.
- 5.5. Each panel shall be prewired for installation of 8 nos ABT meters irrespective of number of meters requirement for particular project. Complete supply and wiring of CT, PT, AC, DC, TTB's etc. inside each metering panel shall be for 8 nos of meters.
- 5.6. Cable entries shall be from bottom. Suitable removable cable gland plate shall be provided on the cabinet for this purpose. Necessary number of cable glands shall be supplied/fitted on to this gland plate. Cable glands shall be screw-on type and made of brass.
- 5.7. Bottom and gland plate details:
Bottom plate with two opening size 275mm x 550mm
Two gland plates of size 315mm x 590mm
- 5.8. The metering panel shall be provided with Indication lamps with lables, power socket, toughened glass inspection window and provided with labels on the front and rear indicating the panel designation.
- 5.9. The panel shall be provided with cable entry facilities and removable gland plates at required locations. The wiring shall be secured in the cable trays and troughs with covers. All TBs shall have covers including TBs with disconnecting type links.
- 5.10. Check meters shall be in series with main meter.
- 5.11. Main and check meter shall be installed in the same panel and standby meters shall be installed in different panel.
- 5.12. Same CT and PT core shall be used for Main and check meters. For standby meters CT/PT shall be different from Main and check meters.
- 5.13. Round lugs to be used for CT, PT & DC wiring.
- 5.14. Bidder to provide separate TBs for CT and PT for each meter.

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- 5.15. Metering panel wiring shall be as per owner's practices. Wiring shall be carried out with multi-stranded, Copper, FRLS, 1100V grade PVC having oxygen index 29 and temp. index of 250 Deg. Wiring inside the panel shall be kept in plastic trays.
- 5.16. Following sizes of wires shall be used:

CT wiring	2.5 sqmm	R/Y/B/Black
PT wiring	2.5 sqmm	R/Y/B/Black
DC wiring	1.5 sqmm	Grey
1-ph AC wiring	1.5 sqmm	R/Black
Earthing	2.5 sqmm	Green

- 5.17. All TBs shall be disconnecting type of Elmex make KLTD4 type.
- 5.18. TB grouping for each meters shall be provided.
- 5.19. All panel internal wires shall be connected at top of the TB. The bottom of the TB shall be left for field wiring. Enough depth and width of vertical and horizontal cable trays shall be provided considering bunch of external cable entry into panel. Cable tray lid shall properly close after routing field cables into panel. All wires terminated on relays and TBs shall be with sleeved ring type or 'O' type crimped lugs only.
- 5.20. Test Terminal Block (TTB) of DAV make and of model SSFS-TC-3, shall be used to provide testing facility even in service condition.
- 5.21. Separate grounding Link shall be provided.
- 5.22. The meters shall normally operate with the power drawn from DC auxiliary power supply (Range 110V to 220V DC) to reduce the VT burden. In addition, there shall be provision to operate the meter from the VT secondary circuit having a rated secondary line-to line voltage of 110V, and CTs having a rated secondary current of 1 A or 5A. Any further transformers/ transactions/ transducers required for their functioning shall be in-built in the meters. Necessary isolation and/or suppression shall also be built-in, for protecting the meters from surges and voltage spikes that occur in the VT and CT circuits of extra high voltage

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Prewired Metering Panels		

switchyards. The reference frequency shall be 50Hz. Also, the meter shall have suitable of $\pm 15\%$ tolerance for DC supply.

- 5.23. Each meter shall be fed from independent DC MCB. MCB shall have self-monitoring contact which shall be connected to SCADA.
- 5.24. For each meter AC supply provision will also be there. For this bidder to provide one common MCB with monitoring contact for all 8 nos of meters and for each meters bidder to provide TBs for AC supply.
- 5.25. Separate wires for Auxiliary supply of meters shall be provided from links, meter to meter looping is not acceptable.
- 5.26. Panel sealing arrangement shall be provided.
- 5.27. Bunching of wires at meters shall be designed in such a way that meter terminal block cover can be fixed properly.
- 5.28. Paid Locking arrangement shall be provided on door for long term durability.
- 5.29. All metallic parts shall be properly earthed to the earth busbar.
- 5.30. Earthing busbar (25 x 6 mm) tinned Cu and earthing bolts shall be provided. All the earth connections to earth busbar shall be nut bolt type with washer. Screw type connection is not acceptable.
- 5.31. Strip type space heaters of adequate capacity shall be provided for each panel. Heaters shall be complete with rotary type Auto ON-OFF thermal switch, a single pole MCB with overload and short circuit protection, link on the neutral and a thermostat to cut off the heaters at 45 deg C. The space heaters shall be covered with protective mesh. The panels shall have 240V, single phase, 50 Hz, 8 Watt LED light fixtures for interior illumination controlled by ON/OFF switches and 240V, 1 phase, 3 pin receptacles. Power source for interior lighting and receptacle shall be completely independent of control power source. LED type lamp shall be used for cubicle illumination.
- 5.32. Panel shall be designed in such a way that all component/ equipment's operate satisfactorily without exceeding their respective maximum permissible temperature rises under temperature conditions prevailing within the cubicles.
- 5.33. Lifting hook, danger sticker, name plate with Order details, wiring plan pocket shall be provided.

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	Prewired Metering Panels	

- 5.34. Test Terminal Block (TTB) shall be of 3 phase 4 wire and shall have screw type connections at the back plate. Safe distance between studs is expected for better wiring with continuous rating at 50 degree Celsius.
- 5.35. For proper wiring connections, safe distance between Back Connection Screws (studs) is expected, approximate dimensions between Screws / studs used for CT connections is 17 mm and approximate dimensions between Screws / studs used for PT connections is 20 mm).
- 5.36. Back Connection Screws (studs) should be fix type i.e. Screw (studs) are first fixed in threaded holes provided on TTB and then removable Nuts and Washers are provided on these back connection Screws (studs).

6. LAYOUT REQUIREMENTS

The layout of the Metering panels shall be such that the wiring and terminal blocks are properly visible and all terminals and links are easily accessible. Proper wiring trufs and covers shall be provided. Lug crimping and tightness shall be proper. No protruding parts and pointed edges shall be eliminated after completion of wiring.

SAFETY REQUIREMENT

All equipment, system and services covered under this specification shall comply with all currently applicable statutory regulations and safety codes in the locality where the equipment is proposed to be installed.

Panel earthing shall be provided at two locations.

7. OPERATIONAL AND MAINTENANCE REQUIREMENT

7.1. OPERATIONAL REQUIREMENT

The Operational requirements of the Metering System: The meters should be installed in panels at such height that the readings are visible from ground level and meters should be easily accessible for data downloading.

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7.2. MAINTENANCE REQUIREMENT

- Panel wiring should be done neatly with proper identification, tagging and labeling on the terminals and wires, to make the maintenance / modifications hassle free.
- Panels shall be factory pre-wired for fast and reliable installation. Required accessories and components shall be pre-installed.
- Durable enclosures shall provide high tolerance for external force and protect it well.
- Metering panels shall be plug and play type high quality components like fuses, MCBs, disconnecting type Elmex make KLTD4 type links and terminal blocks with round lug wires.
- All pre-wiring shall be clearly labelled with color-coded terminal blocks and grounding.
- CT TB to be installed such that after dropping the link it should be come downward.
- PT cable lug should be ring type.
- Ring type lug with insulated sleeve to be used in CT secondary terminal, lug should have small OD so that the gap between secondary terminal S1 and S2 should be enough to avoid secondary shorting.
- Bidder to ensure that, in the event of replacement of any meter shall not require the shutdown of other meters in the same panel.

8. TECHNICAL PARAMETERS OF EQUIPMENT INCLUDING DATA SHEET

As mentioned in design requirement point no 5 and ANNEXURE-II (Data sheet) for bidder to fill up.

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DATA SHEET

Sr. No.	Description	Tata Power's specification/Requirement	Bidder's qualification requirement
1.	ABT Meter (Make/Model)	Secure make APEX 150 model	
2.	Type of panel (Simplex) with single glass door for front	Yes	
3.	Sheet steel (Hot rolled/cold rolled)	Cold rolled	
4.	Locking and sealing arrangement required	Yes	
5.	Thickness of sheet steel		
a.	Base (mm)	MS frame 3mm width and 75 x 50 mm size	
b.	Side and tops (mm)	2 mm	
c.	Front and rear (mm)	3 mm	
d.	Base channel provided	Yes	
e.	Anti-vibration pad provided	Yes	
6.	Degree of protection provided	IP54	

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7.	Cable entry (Bottom/top)	Bottom	
8.	Thickness of gland plate	3 mm	
9.	Accessories provided (Yes/No)		
a.	MCB for controlling 240 V AC of Panel	Yes	
b.	Cubicle Space Heater with Thermostat	Yes. APT / Girish make	
c.	Plug Point with ON-OFF switch	Yes	
d.	LED Lightening Fixture with cover and ON-OFF Lighting switch	Yes	
e.	Nameplates front and rear	Yes	
f.	Acrylic labels for each equipment	Yes	
10.	Overall dimension of each panel (L X D X W)	800 X 600 X 2315	
11.	Earthing Bus Material & Size	Tinned Copper 150 sqmm (25x6 mm)	
12.	Design ambient temperture	50 deg C	
13.	Terminal blocks		
a.	Make & Model	Elmex make KLTD4 type	
b.	Disconnecting type which falls with gravity	Yes	
c.	Terminal numbering provided (Yes/No)	Yes	

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d.	10% spare terminal provided in each panel	Yes	
e.	Wiring / Terminal block voltage grade	1.1kV	
f.	Test terminal block (TTB)	DAV make and SSFS-TC-3 model, Nelster welcon	
14.	Internal panel wiring		
a.	Multi-strand copper wires provided (Yes/No)	Yes	
b.	Size & Colour of CT wiring	2.5 sqmm R/Y/B/Black phase wise	
c.	Size & Colour of PT wiring	2.5 sqmm R/Y/B/Black phase wise	
d.	Size & Colour of DC wiring	1.5 sqmm Grey	
e.	Size & Colour of Earthing wiring	2.5 sqmm Green	
15.	Control voltage (in Volts)	As per station details in relevant sections	
16.	Provision for wiring and cutout for 8 nos of ABT meters per panel	Yes	

9. QUALITY REQUIREMENTS, INSPECTION, TESTING

Bidder should comply the attached standard quality plan and field quality plan. (Refer Annexure-III & IV)

9.1 Factory Acceptance Test:

FAT shall include the following as per Quality & testing plan:

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- 9.1.1 Dimensional checks as per approved GA
- 9.1.2 Bill of material verification.
- 9.1.3 Panel door locking arrangements.
- 9.1.4 Panel sealing arrangement
- 9.1.5 Functional tests including AC and DC supply checks
- 9.1.6 Current injection for meters
- 9.1.7 Auxiliary circuit checks
- 9.1.8 Wiring continuity checks

9.2 Routine Tests

Routine tests shall be carried out on all components as per quality & test plan.

9.3 Type Tests:

Required type test reports as per standard quality plan shall be provided for metering panels which should have been carried out within 5 years at the time of bidding.

9.4 Site Test:

All commissioning tests shall be carried out on all components as per field quality & test plan.

10. PERFORMANCE REQUIREMENTS

TEST PROCEDURE

Test Procedures (for FAT, Commissioning and SAT) shall be prepared by the vendor to test the specified functional and performance requirements of the system, 6 months prior to actual test for Owners approval.

PERFORMANCE GUARANTEE PARAMETERS AND LD CLAUSES FOR NON PERFORMANCE

Successful completion of all the tests as per approved MQP/ Test Plan shall be considered as proof of performance guarantee. In case of failure during installation, testing and commissioning at site, the equipment will be rejected & same shall be replaced with new equipment within committed delivery schedule.

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11. SPARES SPECIAL TOOLS AND TACKLES

SPARES

Bidder to provide substation wise list of Mandatory spares required for trouble free operation of Metering panels, if any.

SPECIAL TOOLS AND TACKLES

Bidder should ensure availability of required tools & Tackles for successful Erection, Testing & commissioning of ABT Meters & Metering Panels

12. DATA SUBMISSION BY BIDDER

- 12.1. Following Documents must be submitted along with the bid: **Bids will be rejected if following minimum documents are not submitted along with the bid.**
- 12.1.1. Bidder shall provide the technical offer including data sheets, architecture etc., of hardcopies and soft copies for the technical evaluation. All datasheets of the BOM items shall be enclosed along with the technical offer. In absence of technical data sheet, architecture drawing, detailed bill of material, detail GTP etc, the offer submitted by the bidder may not be considered.
- 12.1.2. Dully filled in schedules, listed in section 'C'.
- 12.1.3. Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP)
- 12.1.4. System Architecture Drawing
- 12.1.5. Catalogues of the equipment's offered
- 12.1.6. The attached Bill of Materials (BOM) and datasheets enclosed with the specification are indicative. The Bidders are expected to submit the detailed BOM mentioning the quantity, make, model and warranty.
- 12.1.7. Product life cycle document for all supplied equipment.
- 12.1.8. Confirmation on lifetime, spares, manufacturing, onsite & Offsite technical support of the supplied equipment for the next 15 years.
- 12.1.9. Bidder to submit all relevant test certificates for evaluation
- 12.1.10. Type test reports
- 12.2. After award of contract

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The following documents shall be submitted for Purchaser’s approval during detailed engineering through Wrench system (Web based system of TATA Power). All drawings will be reviewed, commented and approved by TATA Power through Wrench system. Bidder shall nominate document manager for this activity and TATA Power will provide training on the same.

12.2.1. The Bidder shall furnish the following drawings/documents for Metering panels during detailed engineering within 15days from date of PO placement

Sr. No.	List of Drawings and Documents	Approval/Information	Submission format	
			ACAD	PDF
1.	General Arrangement Drawings for prewired Metering panels along with meters	Approval	Yes	Yes
	Detailed bill of material			
2.	Filled up Data Sheets	Approval	---	Yes
3.	Metering panel wiring scheme	Approval	Yes	Yes
4.	Quality plan for metering panels	Approval	---	Yes
5.	Field quality plan for panels	Approval	---	Yes
6.	Factory Acceptance Test Procedure	Approval	---	Yes

12.2.2. All drawings and data shall be annotated in English.

12.2.3. Bidder shall furnish four (4) hardcopies (plus 3 soft copies on reliable media) of all drawings along with manuals (Administration, Operation & Maintenance, Troubleshooting and Installation), Technical catalogues, Test Certificates and Acceptance Test Reports along with delivery.

12.2.4. Two copies of the internal test report, FAT and SAT documents with test protocol formats shall be submitted for approval. Approved FAT and SAT documents are one of the prerequisites of commencement of FAT and SAT. Bidder shall also furnish Original plus one copy of all System Software (OS and standard RTU/Gateway and other related software) along with delivery.

12.2.5. Bidder shall submit the final as built drawings & documents on AutoCAD & PDF format.

12.2.6. All licenses shall be valid for the entire lifecycle of the system supplied.

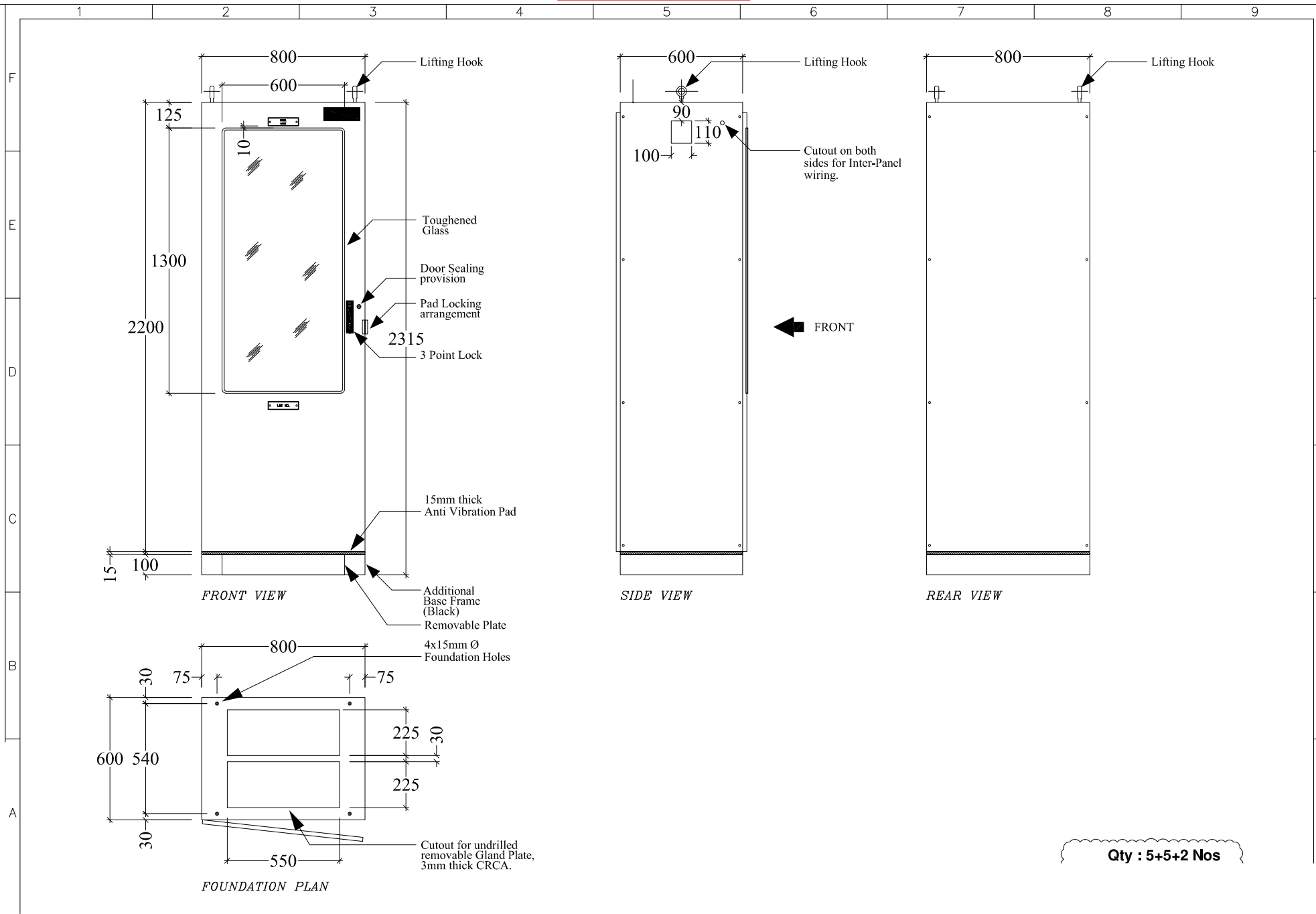
13. ANNEXURES (enclosed separately)

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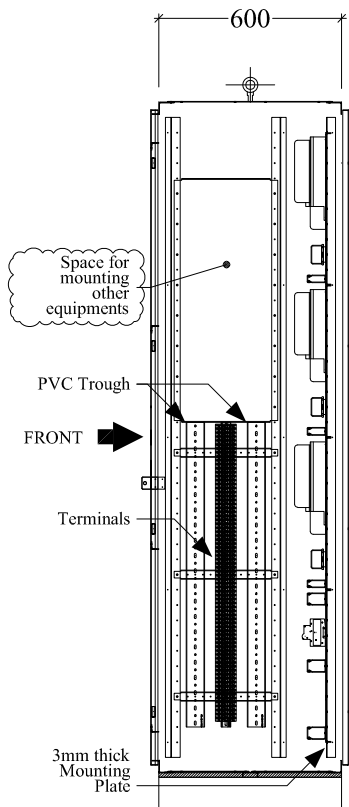
- ANNEXURE I - Bidder's Prequalifying Requirements
- ANNEXURE II - GA and scheme of metering panels
- ANNEXURE III - Standard Quality Plan (SQP)
- ANNEXURE IV - Standard Field Quality Plan (SFP)
- ANNEXURE V - Standard specification for ABT meters

ANNEXTURE - I			
Bidders Prequalifying Requirements for Prewired Metering Panel			
S No	Parameter	Tata Power Requirement	Documents To be submitted by Bidder to ascertain meeting of Pre-qualification requirement
1	2	3	4
1	Infrastructure	Bidder must be an OEM of Prewired Metering panel with manufacturing facility / assembly in India.	Self-undertaking to be submitted in this regard. Tata Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.
2	Supply and Experience	<p>Bidder shall have supplied minimum 20 nos. of Prewired Metering panels for sub-stations in last 5 years as on date of bid submission. Such systems supplied by the Bidder should have been in satisfactory commercial operation at least at 2 no. sub-stations for a minimum period of two years as on scheduled date of the bid submission.</p> <p>Indian Subsidiaries of global companies having plant in India are also eligible to bid if the qualification requirements stated above are met independently or in combination with the parent company. Declaration from parent company needs to be submitted.</p>	<p>Supply List & Performance Certificates from the utilities / clients</p> <p>Self-undertaking to be submitted in this regard. TATA Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.</p>
3	Type Test	<p>The bidder shall submit Type test reports obtained from NABL/ International Accredited Lab for the equipment / material offered. The type tests should have been conducted on the equipment / material of the same design.</p> <p>The type tests should have been conducted within 5 years prior to the date of bid opening. Time period for type test may be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC).</p> <p>In case the type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, then 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 despatch of the equipment / material.</p>	<p>Type Test Report.</p> <p>Undertaking that there is no change in design / material of construction (MOC) if Type Test Report older than 5 years but less than 10 years prior to date of bid opening has to be considered (if applicable)</p> <p>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 despatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, (if applicable)</p>
4	Commercial Capability		Copy of audited Balance Sheet and P&L Account to be submitted in this regard.
5	EPC Experience (If applicable)	<p>In case the package involves installation & commissioning of the equipment / material, then the bidder shall have the following experience:</p> <p>a) He should have successfully completed one single order of value (80% of estimated value of similar work in last three years) OR</p> <p>b) He should have successfully completed two single orders of value (50% of estimated value of similar work in last three years) OR</p> <p>c) He should have successfully completed three single orders of value (40% of estimated value of similar work in last three years).</p>	Performance Certificates from the utilities / clients

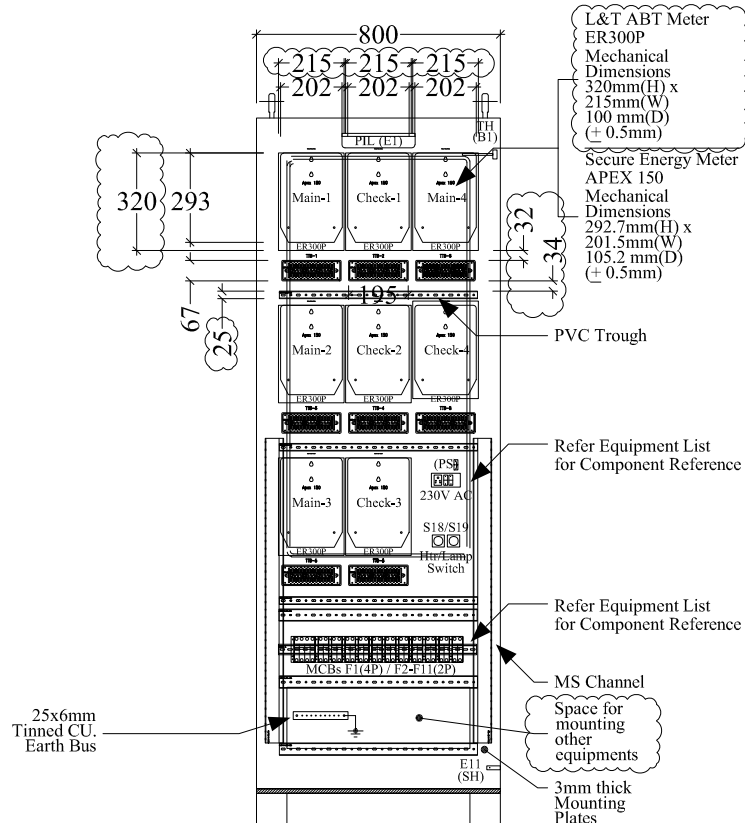
Annexure II



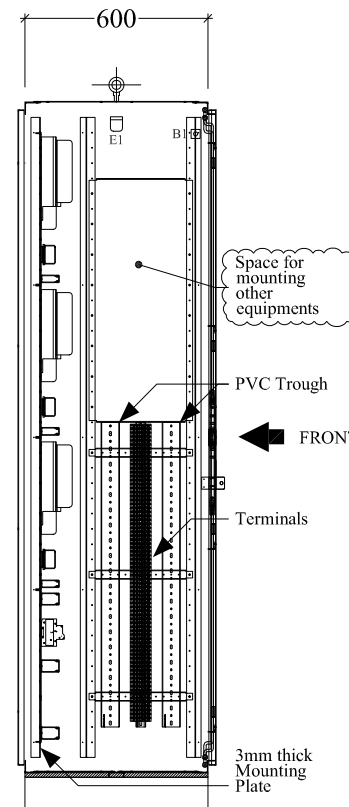
Qty : 5+5+2 Nos



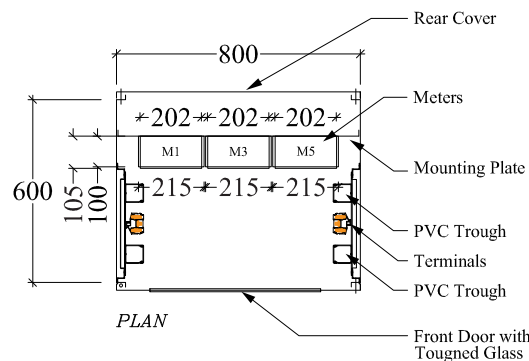
SIDE VIEW (LHS)
INTERNAL



FRONT VIEW
INTERNAL



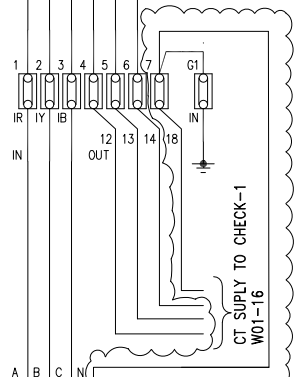
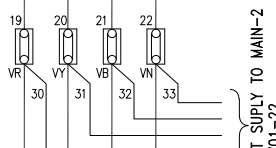
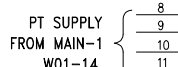
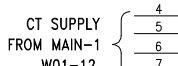
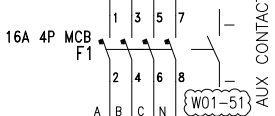
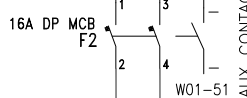
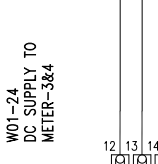
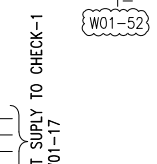
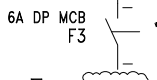
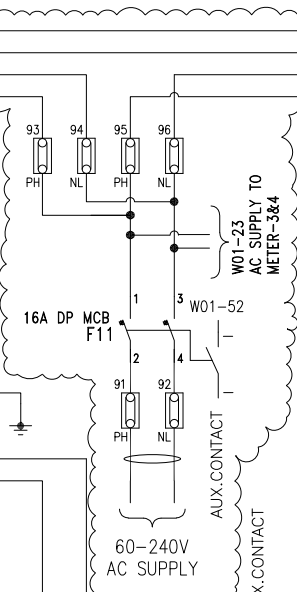
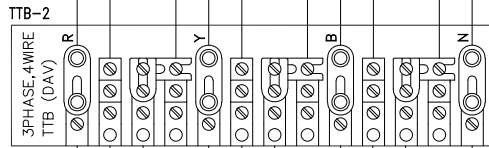
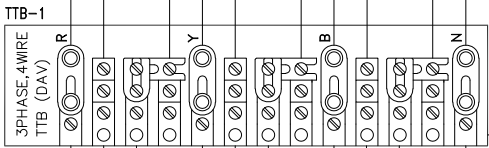
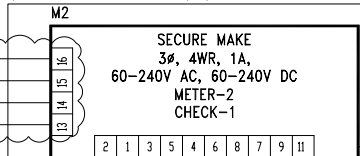
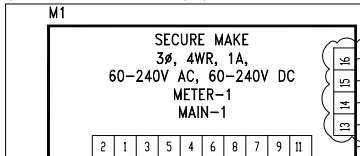
SIDE VIEW (RHS)
INTERNAL



PLAN

(Not in DSCPL's scope)

(Not in DSCPL's scope)



110V DC FOR SUPPLY FOR AMBERNATH

MAIN-1 CT I/P

PT SUPPLY

PT SUPPLY FROM MAIN-1 W01-14

PT SUPPLY TO MAIN-2 W01-22

F
E
D
C
B
A

(Not in DSCPL's scope)

M3

SECURE MAKE
3 ϕ , 4WR, 5A,
60-240V AC, 60-240V DC
METER-3
MAIN-2

(Not in DSCPL's scope)

M4

SECURE MAKE
3 ϕ , 4WR, 5A,
60-240V AC, 60-240V DC
METER-4
CHECK-2

TTB-3

3PHASE 4WIRE
TTB (DAV)

TTB-4

3PHASE 4WIRE
TTB (DAV)

W01-14

AC SUPPLY

W01-54

DC SUPPLY

6A DP MCB
F5

AUX. CONTACT

6A DP MCB
F6

AUX. CONTACT

PT SUPPLY FROM CHECK-1
W01-19

CT SUPPLY TO CHECK-2
W001-26

PT SUPPLY TO CHECK-2
W01-27

DC SUPPLY

W01-15

CT SUPPLY
FROM MAIN-2
W01-22

PT SUPPLY
FROM MAIN-2
W01-24

PT SUPPLY TO MAIN-3
W01-32

MAIN-2 CT I/P

F
E
D
C
B
A

(Not in DSCPL's scope)

(Not in DSCPL's scope)

M5

SECURE MAKE
3Ø, 4WR, 5A,
60-240V AC, 60-240V DC
METER-5
MAIN-3

M6

SECURE MAKE
3Ø, 4WR, 5A,
60-240V AC, 60-240V DC
METER-6
CHECK-3

TTB-5

3PHASE, 4WIRE
TTB (DAV)

TTB-6

3PHASE, 4WIRE
TTB (DAV)

W01-24

AC SUPPLY

W01-25

DC SUPPLY

W01-55

W01-56

6A DP MCB F7

6A DP MCB F8

AUX. CONTACT

W01-29

PT SUPPLY FROM CHECK-2

W01-36

CT SUPPLY TO CHECK-3

W01-32

CT SUPPLY FROM MAIN-3

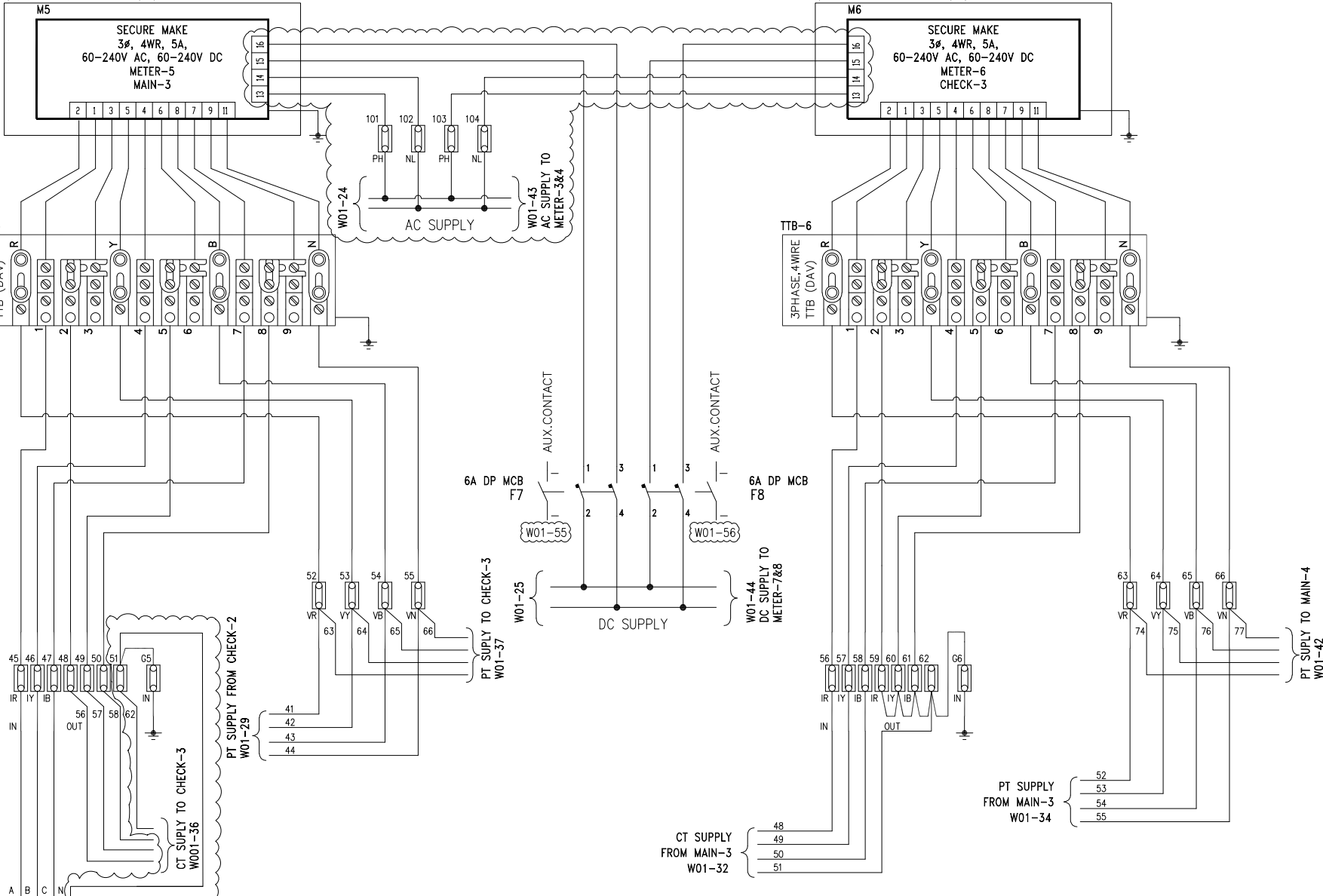
W01-34

PT SUPPLY FROM MAIN-3

W01-42

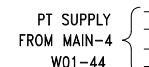
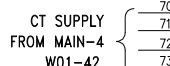
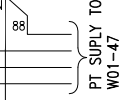
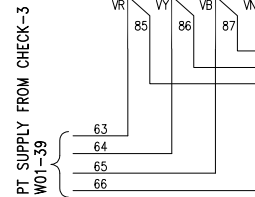
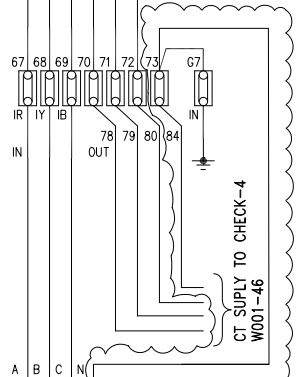
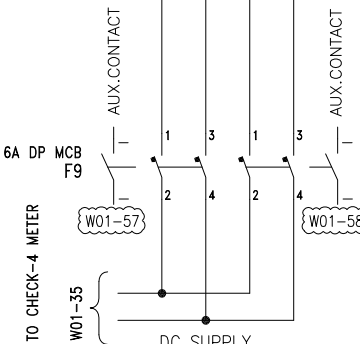
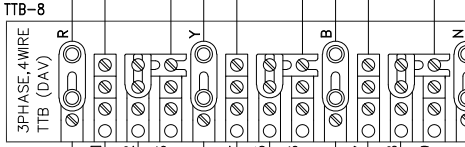
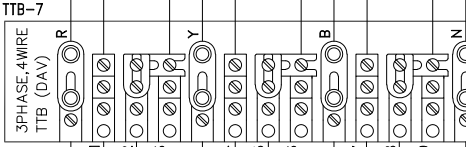
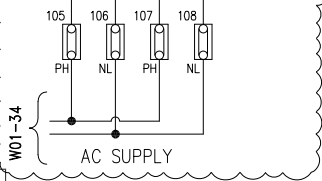
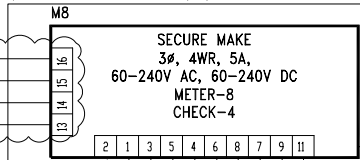
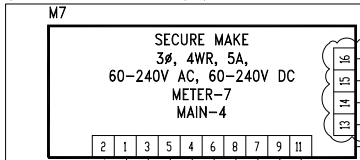
PT SUPPLY TO MAIN-4

MAIN-3 CT I/P

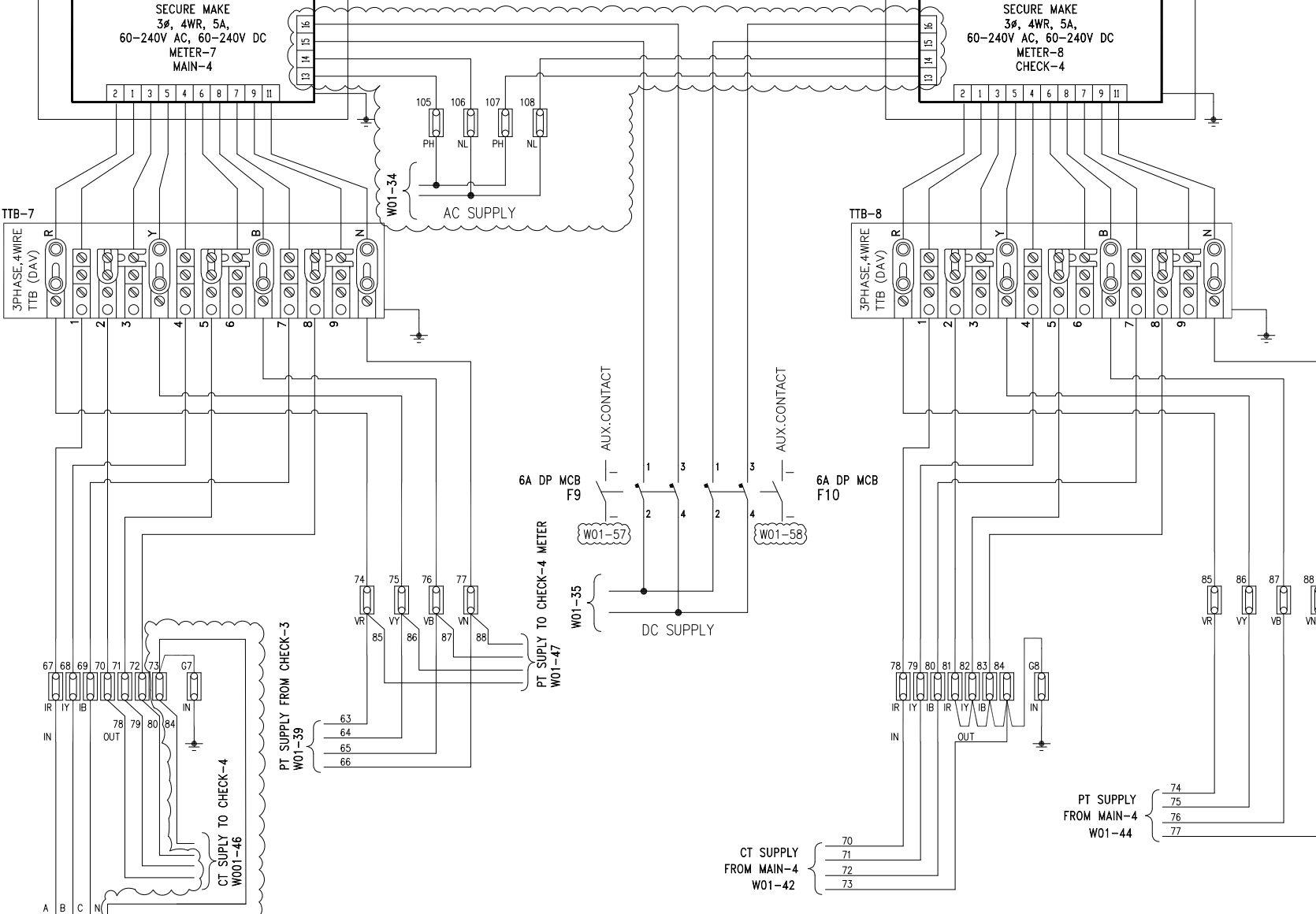


(Not in DSCPL's scope)

(Not in DSCPL's scope)



MAIN-4 CT I/P



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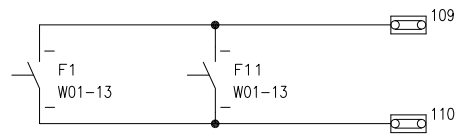
57

58

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F

POTENTIAL FREE CONTACTS OF AC MCBs (PT & ENERGY METER)

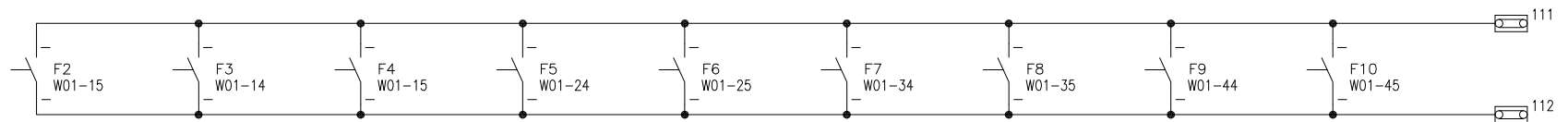


E

D

C

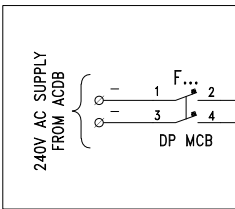
POTENTIAL FREE CONTACTS OF DC MCBs (ENERGY METER)



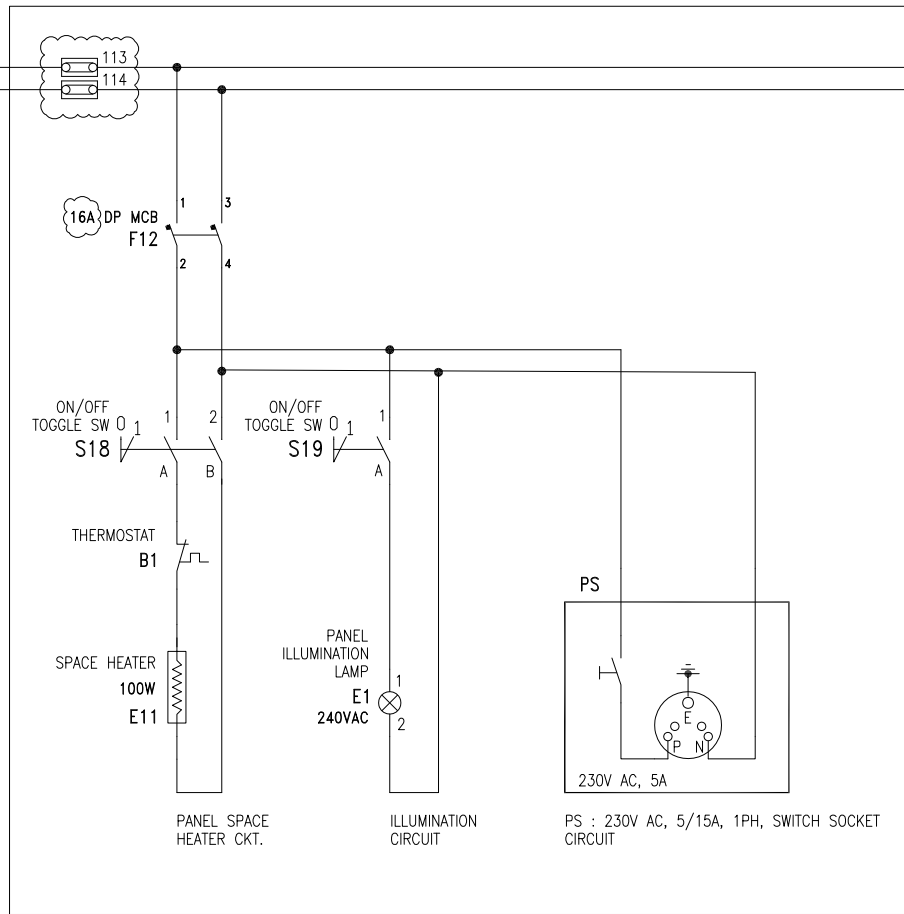
B

A

ACDB



METERING PANEL-1



PH
NL

METERING PANEL-2/3/4/5

TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing	 TATA
TPQAIT-QAXX-00-EX-SQP-082 REV.0	STANDARD QUALITY PLAN FOR METERING & CONTROL PANEL	Date of Issue:

Document Title
**STANDARD QUALITY PLAN FOR
METERING & CONTROL PANEL**

		<i>Ravi</i> 30/08/2015	<i>CRB</i> 30/31	<i>Shweta</i> 30/31/15	
0	Initial Submission.	RP	CRB (Head QAI- E)	SGP Chief (QAIT)	
Revision No.	Reason for revision	Prepared By & Date	Checked By & Date	Approved By & Date	Issued by & Date
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Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED		TYPE / METHOD OF CHECK	REMARKS
1	2	3		4	5
1.0	Raw Material:	(Generally in-line with technical specification, drawing and datasheet)			
1.1	CRCA/ HRCA Sheet steel	1	As per IS 513 & approved specification	Test to be carried out by material / component supplier.	All items TCs to be reviewed by main supplier. (The TCs for Auxillary relay, transducer, indicating meters are to be submitted to TATAPOWER as per requirement.)
1.2	Transducer, Indicating meters (Analog / Digital), Auxillary relay, Cable, Push button, Switches, Annunciations, Test Switches, Hooter, Electronic bell etc.	1	Relevant Standards & Specifications		
2.0	INPROCESS INSPECTION: (Generally in line with manufacturer standard)				
2.1	Panel Fabrication	1	Dimensional Conformity, Bend Angle, Profile, Deburring & welding checks, slag removal.	Test to be carried out by panel manufacturer, Verification by main supplier	Verification of records by TATA POWER.
		2	Surface preparation checks		
		3	Surface Finish, Paint Shade, Finishing, Coating thickness.		
2.2	Panel Assembly test	1	Insulation resistance before and after HV test.	Test to be carried out by main supplier	
		2	HV test on control circuit.		
3.0	FINAL TESTING: (As per approved GA, Datasheet, BOM, QAP, IS-8623-1/2/3)				
3.1	Routine Tests	1	Visual & Dimension measurement.	Testing & Measurement as per IS 8623-1/2/3 by main supplier	Customer Hold Point
		2	Metal sheet thickness, paint shade, coating thickness measurement		
		3	Visual Check for mounting of all equipment wrt to GA, BOM, Rating, Type, Make of components.		
		4	Verification of wiring, Ferruling, Continuity Check, Colour coding of wires & TB, Earthing		
		5	Interchangeability of components		
		6	Logic & Functional checks- Sequential Operation (for set of panel, interpanel wiring shall be completed as per scheme)		
		6.1	Logic checks for control circuit with all interlocks		
		6.2	Functional checks for supervision and measurement circuit.		
		6.3	Functional checks for indication and annunciation circuit.		
		6.4	Functional test for door limit switch, thermostat, heater circuit & auxiliary circuit.		
		7	Secondary injection tests on relays, meters, transducers.		
		8	Insulation resistance test on power & control circuit		
		9	High voltage test on power & control circuit. (2 kV for 1 min between all terminals & earth) in not covered in process.		
		10	Integration test for Relays, MFM, & SCADA communication protocol		
11	Metering System (As applicable)				
11.1	Functional test on meters at different Power Factors				
11.2	Trials of PT changeover system (if included in the scheme)				
11.3	Check the PT failure condition, PT fuse ratings & fuse failure annunciation.				

TATA POWERThe Tata Power Company Limited
Corporate Engineering-Quality Assurance Inspection & TestingTPQAIT-QAXX-00-EX-SQP-082
REV.0**STANDARD QUALITY PLAN FOR
CONTROL & METERING PANEL**

Date of Issue:

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED		TYPE / METHOD OF CHECK	REMARKS
1	2	3		4	5
		11.4	Availability Based Tariff meter (ABT) / Time Of Day (TOD) parameters & communication checks.		
		11.5	TTB checks, wiring gauge check for CT & PT wires, super flexible cable verification.		
		11.6	Check communication with Win CC or SCADA system for remote operations.		
3.2	TYPE Test	1	IP Degree Verification as per IEC 62271-200 clause no 6.7.1	TC verification as per specific IEC standard /conducting test as per mutual agreement	Valid TYPE tests certificate not older than 5 year is pre-requisite.
		2	Any other special / type test as per technical specifications		
Any Separate Type/ Design validation tests shall be carried out in accordance with TATA POWER specification/ PO or as per mutually agreed in MQP.					
4.0	PACKING, PRE-SHIPMENT & DISPATCH:				
4.1	PACKING & PRE-SHIPMENT.	1	Visual Verification.	Measurement & Visual.	
		2	Packing in cartons.		
		3	Quantity Verification.		
		4	Identification.		
4.2	DISPATCH.	Issue of Release note / MDCC.		Customer Hold Point.	
N O T E	A) ALL MATERIAL SHALL BE AS PER APPROVED DRAWING/ DATA SHEET.				
	B) STATUTORY REQUIREMENTS WILL BE COMPLIED BY THE CONTRACTOR.				
	C) TATA POWER / ITS REP IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED, IF REQD, SAME SHALL BE TRANSFERRED BY TATA POWER / ITS REP ONLY FOR MATERIAL TRACEABILITY.				
	D) FINAL INSPECTION OF THE MAJOR ACTIVITIES ARE WITNESSED BY CLIENT AND IT IS HOLD POINT (AT THE DISCRETION TATA POWER)				
	E) MANUFACTURER SHALL PREPARE AND SUBMIT COMPLETE MANUFACTURING QUALITY PLAN IN PRESCRIBED FORMAT OR THEIR REGULAR FORMAT INDICATING THEIR REGULAR PRACTICES, TAKING CARE OF MINIMUM REQUIREMENT AS INDICATED ABOVE.				
	F) INSPECTION OF THE MAINTAINANCE SPARES SHALL BE OFFERED ALONG WITH THE MAIN SUPPLY AS PER THE INSPECTION STAGES OF 1 TO 4.				
	G) CALIBRATION CERTIFICATES OF THE EQUIPMENT USED FOR TESTING SHALL BE PROVIDED FOR REVIEW.				
	H) TATA POWER RESERVES THE RIGHT TO DEMAND / VERIFY/ AUDIT/ WITNESS ANY OF THE CHECK POINTS MENTIONED IN THE SCOPE OF SUPPLIER.				
	I) AS PER SPECIFICATION PROPER PAINTING & PACKING SHALL BE ENSURED BY VENDOR BEFORE SHIPMENT TO AVOID ANY TRANSIT DAMAGE.				
Meant for (Internal Circulation / External – Stakeholders Circulation)					

TATA POWER		The Tata Power Company Limited Corporate Engineering-Quality Assurance & Inspection						TATA
TPQAIT-QAXX-00-EX-SFP- REV.0		STANDARD FIELD QUALITY PLAN FOR METERING PANEL INSTALLATION						Nov'18
Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
1.0	<u>Receipt of Material</u>	Availability of Instruction manuals, drawings, quality dossier including IRN & MDCC and Packing slip from OEM.	Minor	Physical	At the Time of Receipt.	IRN, MDCC, Bill of material, shipping list	Site register	Any shortfall/ damage shall be analysed & reported jointly with site FQC
		Verification of main unit and all loose items / accessories for any visual damage and shortage during transit.				No damages.		
		Check for transportation gas pressure on receipt of material (in case of pressure drop, contact OEM).	Major			As per manufacturer		
		Joint inspection of material	Major			Manufacturer's Instruction Manual.		
2.0	<u>Storage & Preservation</u>	Storage Type-2 (for short term storage) For long term Type- 3 / 4	Major	Physical	At the time of storage	Manufacturer's Instruction Manual.	Site register	Short term storage shall be 1 month or as per manufacturer's recommendation which ever is stringent
3.0	<u>Transportation from storage yard</u>	Ensure transportation of panel from storage yard to site using proper loading tools and tackles.	Minor	Physical	100%	Manufacturer's Instruction Manual.	Site register	
4.0	<u>Unpacking</u>	Check material thoroughly and report damage or shortfall of equipments (loose) if any	Major	Physical	100%	Dispatch document and packing list	Joint inspection record	
5.0	<u>Pre erection</u>	Check for readiness of foundation/ base & space around for movement of lifting equipment.	Minor	Physical	100%	Manufacturer's Instruction Manual.	Site register	
6.0	<u>Erection</u>	Alignment and levelling of base frame as per drawing.	Minor	Physical	100%	Site Approved Drawing.	SIR* (Site Inspection Report)	
		Install the panel on the frame and check the quality of welding/ bolting tightness of stand with the existing structure.						
		Verification of all the Name Plates for type & rating.						
		Complete & proper inter panel control wiring, cable termination & supporting, sleeving,						
		Check for cleanliness i.e. removal of loose wire, dust and vermin proofing.						
		Phase identification, provision of shrouds, barriers.						
		Check Earthing connections						

TPQAIT-QAXX-00-EX-SFP- REV.0

**STANDARD FIELD QUALITY PLAN FOR
METERING PANEL INSTALLATION**

Nov'18

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
		Bolt size for fixing with Base frame, jointing of Earth strip & External GI Flat & Overlapping area to be checked. Completeness of panel as per GA drawing including installation of loose accessories. Refer to EI drawing.						

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
7.0	Pre commissioning checks	Functional checks on illumination circuit (as applicable), space heater/ thermostat & door interlock.	Critical	Measurement	100%	Manufacturer's Test Report.	SIR* (Site Inspection Report)	
		Operational & inerlock checks on earth switch, isolator & breaker.						
		IR of power and control circuit before & after HV test.						
		HV test on power circuit.						
		Adoption of approved relay settings.						
		HMI/ SCADA communication checks (if applicable).						
8.0	Commissioning checks (Indicative)	Charging clearance of panel from appropriate authority.	Critical	Physical	100%	Approved Drg, Data sheet.	Commissioning Report.	Checks shall be as defined by Commissioning team with PE
		Check for the voltage, current, frequency.		Measurement				
		Check for the phase sequence.						
9.0	Final documentation for Handing Over	Compilation of all field inspection protocol, test reports including closure of non conformance if any.	Critical	Visual	100%	SAT (Site acceptance test report)	*SWCF (Site work completion file)	

- NOTE**
- A). STATUTORY REQUIREMENTS WILL BE COMPLIED BY THE CONTRACTOR.
 - B). FOR STAGES WITNESSED / DOCUMENTS REVIEWED BY TATA POWER, COPIES OF RELEVANT DOCUMENTS WILL BE FURNISHED TO TATA POWER.
 - C). TATA POWER / ITS REP. IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED / GOT TRANSFERRED BY TATA POWER / IT'S REP AT APPROPRIATE STAGES. (IF REQUIRED).
 - D). THE EXTENT INDICATED IN COLUMN 6 IS IN CONTRACTOR'S SCOPE.TATA POWER MAY INSPECT AS PER THIS COLUMN OR RANDOM SAMPLES AT ITS DESCRETION.
 - E). COLUMN 7 WILL BE AS PER TATA POWER APPROVED DRAWINGS / DATA SHEETS / CONTRACT DOCUMENTS WHEREVER APPLICABLE.
 - F). INSTRUMENTS FOR LEAK TESTS AND PERFORMANCE TESTS WILL HAVE VALID CALIBRATION CERTIFICATE WITH TRACEABILITY TO NATIONAL LEVEL.

Critical Category is HOLD point.

This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing is permitted, 24 Hrs advance notice to be given to TATA POWER QA/QC. Contractor /sub contractor shall not process activity beyond HOLD point without written permission by TATA POWER QA/QC. This activity shall be formed by TATA POWER (Execution +QA/QC), Main & Sub- Contractor (Execution +QA/QC) . (Also Surveillance by Head FQA / Project Head)

Major Category is Witness point.

This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing. 24 Hrs advance notice to be given to TATA POWER (Execution) . Contractor /sub contractor shall not process activity beyond Witness point without written permission by TATA POWER (Execution). This activity shall be performed by TATA POWER (Execution), Main and Sub- Contractor (Execution +QA/QC) , (Surveillance by FQA)

Minor Category is Review point.

This activity required review of documents by TATA POWER for the compliance & acceptance, However 24 Hrs advance notice to be given to TATA power (Execution). This activity shall be formed by Main and Sub- Contractor (Execution +FQC) . (Surveillance by Execution / Project Head).

TATA POWER QA/QC is also authorized to carryout surveillance in any major & minor class of check at their discretion.

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9

STORAGE TYPE:

- TYPE-1: OPEN AREA & ABOVE GROUND ON WOODEN PLANK WITH SLOPE FOR WATER DISPOSITION.
- TYPE-2: OPEN AREA & ABOVE GROUND ON WOODEN PLANK (WITH SLOPE FOR WATER DISPOSITION) AND COVERED WITH TARPAULIN.
- TYPE-3: OPEN SHED WITH FULLY FORMED FLOORING/CEMENT FLOORING.
- TYPE-4: COVERED SHED/STORE ROOM ON RACKS & IDENTIFIED LOCATION.
- TYPE-4A: CLOSED CHAMBER WITH TEMPERATURE & HUMIDITY CONTROL.

NOTE: Items/equipments having shelf life like paints, alumina, desiccant etc. are to be stored separately for identification purpose.

Rev. No	Reason for Revision	Prepared By & Date		Checked By & Date			Approved By & Date	
R0	ISSUE FOR USE	SAM		SR			CRB	

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TATA POWER CO. LTD.

TECHNICAL SPECIFICATION FOR THREE PHASE, FOUR WIRE Class 0.2 ABT Meters (**Lag+Lead**)

(This document is a property of Tata Power. This is not transferable & shall not be used for any purpose other than, for which it is supplied)

Document No.	MMG-ABT	Approved By	N Manjunath
Issue No.	01	Issue Date	10.01.2020

13.1 Interface Meters: Functional requirements

- (a) The Interface meters suitable for ABT shall be static type, composite meters, as self contained devices for measurement of active and reactive energy, and certain other parameters as described in the following paragraphs. The meters shall be suitable for operating with auxiliary supply AC 60 to 110 volts 1 phase 50 Hz AND DC 220 Volts or DC 110 Volts. The meters shall be suitable for being connected directly to voltage transformers (VTs) having a rated secondary line-to-line voltage of 110 V, and to current transformers (CTs) having a rated secondary current of 1 Amp or 5 Amp (3 phase 4 wire). The reference frequency shall be 50 Hz. The meter should be **DLMS compliant**. Meter shall be programmed as **Lag + Lead** configuration i.e. Leading PF shall not be considered as unity.
- (b) The meters shall have a non-volatile memory in which the following shall be automatically stored:
- (i) Average frequency for each successive 15-minute block.
 - (ii) KWh import consumption in each 15 minute block
 - (iii) KWh export consumption in each 15 minute block
 - (iv) KVARh lag consumption in each 15 minute block
 - (v) KVARh lead consumption in each 15 minute block
 - (vi) KVAH import (Lag+Lead) consumption in each 15 minute block
 - (vii) KVAH Export (Lag+Lead) consumption in each 15 minute block
 - (viii) Power factor in each 15 minute block
 - (i) Net KWh transmittal during each successive 15-minute block, upto second decimal, with plus/minus sign
 - (ii) Cumulative KWh transmittal at each midnight, in six digits including one decimal.
 - (iii) Cumulative VARh transmittal for voltage high condition, at each midnight, in six digits including one decimal.
 - (iv) Cumulative VARh transmittal for voltage low condition, at each midnight, in six digits including one decimal.
 - (v) Date and time blocks of failure of VT supply on any phase, as a star (*) mark.
- (c) The meters shall store all the above listed data in their memories for a period of at least sixty days. The data older than 60 days shall get erased automatically on First-in-First –out (FIFO) basis. Each meter shall have an optical port on its front for tapping all data stored in its memory using a hand held data collection device (i.e. CMRI). The meters shall have at-least one RS-485 / Ethernet LAN port suitable for transmitting the data to remote location using appropriate communication medium. The communication protocol shall be open protocol and shall not be proprietary nature.
- (d) It shall be possible to reprogram at site only those parameters, which do not affect the integrity of the data or basic settings of the meters. Reprogramming of critical parameters such as CT Ratio, PT Ratio, ToD registers etc, at site, shall be possible.
- (e) The active energy (Wh) measurement shall be carried out on 3-phase, 4-wire principle, with accuracy as per class 0.2 S of IEC-687/IEC-62053-22.
- (f) The Var and reactive energy measurement shall also be on 3-phase, 4-wire principle, with accuracy as per class 0.5 of IEC-62053-23 or better. There shall be two reactive energy registers, one for the period when average RMS voltage is above 103% and the other for the period the voltage is below 97%.
- (g) The 15-minute Wh shall have a +ve sign when consumer is drawing power from grid, and a –ve sign when consumer is exporting power to grid.
- (h) The meters shall also display (on demand), by turn, the following parameters:

1.) **Auto scrolling (Mode1)** should display following parameters(63)

- Meter Serial Number
- RTC date & time
- Active Energy Cumulative (Total kWh) (Import)
- TOD-1 Active Energy (Cumulative) (Import)
- TOD-2 Active Energy (Cumulative) (Import)
- TOD-3 Active Energy (Cumulative) (Import)
- TOD-4 Active Energy (Cumulative) (Import)
- TOD-5 Active Energy (Cumulative) (Import)
- Reactive Energy (Lag) (Total KVARH) (Import)
- TOD-1 Apparent MD with date & time stamping (Import)
- TOD-2 Apparent MD with date & time stamping (Import)
- TOD-3 Apparent MD with date & time stamping (Import)
- TOD-4 Apparent MD with date & time stamping (Import)
- TOD-5 Apparent MD with date & time stamping (Import)
- Reactive Energy (Lead) (Total KVARH) (Import)
- Apparent Energy (Q1) (Total KVAH) (Import)
- TOD-1 Apparent Energy (Cumulative) (Import)
- TOD-2 Apparent Energy (Cumulative) (Import)
- TOD-3 Apparent Energy (Cumulative) (Import)
- TOD-4 Apparent Energy (Cumulative) (Import)
- TOD-5 Apparent Energy (Cumulative) (Import)
- Active Energy Cumulative (Total kWh) (Export)
- TOD-1 Active Energy (Cumulative) (Export)
- TOD-2 Active Energy (Cumulative) (Export)
- TOD-3 Active Energy (Cumulative) (Export)
- TOD-4 Active Energy (Cumulative) (Export)
- TOD-5 Active Energy (Cumulative) (Export)
- Reactive Energy (Lag) (Total KVARH) (Export)
- TOD-1 Apparent MD with date & time stamping (Export)
- TOD-2 Apparent MD with date & time stamping (Export)
- TOD-3 Apparent MD with date & time stamping (Export)
- TOD-4 Apparent MD with date & time stamping (Export)
- TOD-5 Apparent MD with date & time stamping (Export)
- Reactive Energy (Lead) (Total KVARH) (Export)
- Apparent Energy (Q1) (Total KVAH) (Export)
- TOD-1 Apparent Energy (Cumulative) (Export)
- TOD-2 Apparent Energy (Cumulative) (Export)
- TOD-3 Apparent Energy (Cumulative) (Export)
- TOD-4 Apparent Energy (Cumulative) (Export)
- TOD-5 Apparent Energy (Cumulative) (Export)
- Average PF
- Latest reset- Active Energy (Cumulative) (Import)
- Latest reset TOD-1 Active Energy (Cumulative) (Import)
- Latest reset TOD-2 Active Energy (Cumulative) (Import)
- Latest reset TOD-3 Active Energy (Cumulative) (Import)
- Latest reset TOD-4 Active Energy (Cumulative) (Import)
- Latest reset TOD-5 Active Energy (Cumulative) (Import)
- Latest reset Reactive Energy (Lag) (Total KVARH) (Import)
- Latest reset TOD-1 Apparent MD with date & time stamping (Import)
- Latest reset TOD-2 Apparent MD with date & time stamping (Import)

- Latest reset TOD-3 Apparent MD with date & time stamping (Import)
- Latest reset TOD-4 Apparent MD with date & time stamping (Import)
- Latest reset TOD-5 Apparent MD with date & time stamping (Import)
- Latest reset Apparent Energy (Lead) (Total KVARH) (Import)
- Latest reset- Apparent Energy (Cumulative) (Import)
- Latest reset TOD-1 Apparent Energy (Cumulative) (Import)
- Latest reset TOD-2 Apparent Energy (Cumulative) (Import)
- Latest reset TOD-3 Apparent Energy (Cumulative) (Import)
- Latest reset TOD-4 Apparent Energy (Cumulative) (Import)
- Latest reset TOD-5 Apparent Energy (Cumulative) (Import)
- Latest reset- Active Energy (Cumulative) (Export)
- Latest reset TOD-1 Active Energy (Cumulative) (Export)
- Latest reset TOD-2 Active Energy (Cumulative) (Export)
- Latest reset TOD-3 Active Energy (Cumulative) (Export)
- Latest reset TOD-4 Active Energy (Cumulative) (Export)
- Latest reset TOD-5 Active Energy (Cumulative) (Export)
- Latest reset Reactive Energy (Lag) (Total KVARH) (Export)
- Latest reset TOD-1 Apparent MD with date & time stamping (Export)
- Latest reset TOD-2 Apparent MD with date & time stamping (Export)
- Latest reset TOD-3 Apparent MD with date & time stamping (Export)
- Latest reset TOD-4 Apparent MD with date & time stamping (Export)
- Latest reset TOD-5 Apparent MD with date & time stamping (Export)
- Latest reset Apparent Energy (Lead) (Total KVARH) (Export)
- Latest reset- Apparent Energy (Cumulative) (Export)
- Latest reset TOD-1 Apparent Energy (Cumulative) (Export)
- Latest reset TOD-2 Apparent Energy (Cumulative) (Export)
- Latest reset TOD-3 Apparent Energy (Cumulative) (Export)
- Latest reset TOD-4 Apparent Energy (Cumulative) (Export)
- Latest reset TOD-5 Apparent Energy (Cumulative) (Export)
- Latest Reset Average PF
- KVA Rising Demand
- Display Check

In case Cover open & ESD tamper occurs, the display should toggle cover open/ESD indicative message & cumulative kWh readings

2.) **The Push Button** (Mode 2) display (High resolution) should display following parameters
(153)

- Meter Serial Number
- RTC date & time
- Active Energy Cumulative (Total kWh) (Import)
- TOD-1 Active Energy (Cumulative) (Import)
- TOD-2 Active Energy (Cumulative) (Import)
- TOD-3 Active Energy (Cumulative) (Import)
- TOD-4 Active Energy (Cumulative) (Import)
- TOD-5 Active Energy (Cumulative) (Import)
- Reactive Energy (Lag) (Total KVARH) (Import)
- TOD-1 Apparent MD with date & time stamping (Import)

- TOD-2 Apparent MD with date & time stamping (Import)
- TOD-3 Apparent MD with date & time stamping (Import)
- TOD-4 Apparent MD with date & time stamping (Import)
- TOD-5 Apparent MD with date & time stamping (Import)
- Reactive Energy (Lead) (Total KVARH) (Import)
- Apparent Energy (Q1) (Total KVAH) (Import)
- TOD-1 Apparent Energy (Cumulative) (Import)
- TOD-2 Apparent Energy (Cumulative) (Import)
- TOD-3 Apparent Energy (Cumulative) (Import)
- TOD-4 Apparent Energy (Cumulative) (Import)
- TOD-5 Apparent Energy (Cumulative) (Import)
- Active Energy Cumulative (Total kWh) (Export)
- TOD-1 Active Energy (Cumulative) (Export)
- TOD-2 Active Energy (Cumulative) (Export)
- TOD-3 Active Energy (Cumulative) (Export)
- TOD-4 Active Energy (Cumulative) (Export)
- TOD-5 Active Energy (Cumulative) (Export)
- Reactive Energy (Lag) (Total KVARH) (Export)
- TOD-1 Apparent MD with date & time stamping (Export)
- TOD-2 Apparent MD with date & time stamping (Export)
- TOD-3 Apparent MD with date & time stamping (Export)
- TOD-4 Apparent MD with date & time stamping (Export)
- TOD-5 Apparent MD with date & time stamping (Export)
- Reactive Energy (Lead) (Total KVARH) (Export)
- Apparent Energy (Q1) (Total KVAH) (Export)
- TOD-1 Apparent Energy (Cumulative) (Export)
- TOD-2 Apparent Energy (Cumulative) (Export)
- TOD-3 Apparent Energy (Cumulative) (Export)
- TOD-4 Apparent Energy (Cumulative) (Export)
- TOD-5 Apparent Energy (Cumulative) (Export)
- Average PF
- Latest reset- Active Energy (Cumulative) (Import)
- Latest reset TOD-1 Active Energy (Cumulative) (Import)
- Latest reset TOD-2 Active Energy (Cumulative) (Import)
- Latest reset TOD-3 Active Energy (Cumulative) (Import)
- Latest reset TOD-4 Active Energy (Cumulative) (Import)
- Latest reset TOD-5 Active Energy (Cumulative) (Import)
- Latest reset Reactive Energy (Lag) (Total KVARH) (Import)
- Latest reset TOD-1 Apparent MD with date & time stamping (Import)
- Latest reset TOD-2 Apparent MD with date & time stamping (Import)
- Latest reset TOD-3 Apparent MD with date & time stamping (Import)
- Latest reset TOD-4 Apparent MD with date & time stamping (Import)
- Latest reset TOD-5 Apparent MD with date & time stamping (Import)
- Latest reset Apparent Energy (Lead) (Total KVARH) (Import)
- Latest reset- Apparent Energy (Cumulative) (Import)
- Latest reset TOD-1 Apparent Energy (Cumulative) (Import)
- Latest reset TOD-2 Apparent Energy (Cumulative) (Import)
- Latest reset TOD-3 Apparent Energy (Cumulative) (Import)
- Latest reset TOD-4 Apparent Energy (Cumulative) (Import)
- Latest reset TOD-5 Apparent Energy (Cumulative) (Import)
- Latest reset- Active Energy (Cumulative) (Export)
- Latest reset TOD-1 Active Energy (Cumulative) (Export)

- Latest reset TOD-2 Active Energy (Cumulative) (Export)
- Latest reset TOD-3 Active Energy (Cumulative) (Export)
- Latest reset TOD-4 Active Energy (Cumulative) (Export)
- Latest reset TOD-5 Active Energy (Cumulative) (Export)
- Latest reset Reactive Energy (Lag) (Total KVARH) (Export)
- Latest reset TOD-1 Apparent MD with date & time stamping (Export)
- Latest reset TOD-2 Apparent MD with date & time stamping (Export)
- Latest reset TOD-3 Apparent MD with date & time stamping (Export)
- Latest reset TOD-4 Apparent MD with date & time stamping (Export)
- Latest reset TOD-5 Apparent MD with date & time stamping (Export)
- Latest reset Apparent Energy (Lead) (Total KVARH) (Export)
- Latest reset- Apparent Energy (Cumulative) (Export)
- Latest reset TOD-1 Apparent Energy (Cumulative) (Export)
- Latest reset TOD-2 Apparent Energy (Cumulative) (Export)
- Latest reset TOD-3 Apparent Energy (Cumulative) (Export)
- Latest reset TOD-4 Apparent Energy (Cumulative) (Export)
- Latest reset TOD-5 Apparent Energy (Cumulative) (Export)
- Latest Reset Average PF
- Previous reset- Active Energy (Cumulative) (Import)
- Previous reset TOD-1 Active Energy (Cumulative) (Import)
- Previous reset TOD-2 Active Energy (Cumulative) (Import)
- Previous reset TOD-3 Active Energy (Cumulative) (Import)
- Previous reset TOD-4 Active Energy (Cumulative) (Import)
- Previous reset TOD-5 Active Energy (Cumulative) (Import)
- Previous reset Reactive Energy (Lag) (Total KVARH) (Import)
- Previous reset TOD-1 Apparent MD with date & time stamping (Import)
- Previous reset TOD-2 Apparent MD with date & time stamping (Import)
- Previous reset TOD-3 Apparent MD with date & time stamping (Import)
- Previous reset TOD-4 Apparent MD with date & time stamping (Import)
- Previous reset TOD-5 Apparent MD with date & time stamping (Import)
- Previous reset Reactive Energy (Lead) (Total KVARH) (Import)
- Previous reset- Apparent Energy (Cumulative) (Import)
- Previous reset TOD-1 Apparent Energy (Cumulative) (Import)
- Previous reset TOD-2 Apparent Energy (Cumulative) (Import)
- Previous reset TOD-3 Apparent Energy (Cumulative) (Import)
- Previous reset TOD-4 Apparent Energy (Cumulative) (Import)
- Previous reset TOD-5 Apparent Energy (Cumulative) (Import)
- Previous reset- Active Energy (Cumulative) (Export)
- Previous reset TOD-1 Active Energy (Cumulative) (Export)
- Previous reset TOD-2 Active Energy (Cumulative) (Export)
- Previous reset TOD-3 Active Energy (Cumulative) (Export)
- Previous reset TOD-4 Active Energy (Cumulative) (Export)
- Previous reset TOD-5 Active Energy (Cumulative) (Export)
- Previous reset Reactive Energy (Lag) (Total KVARH) (Export)
- Previous reset TOD-1 Apparent MD with date & time stamping (Export)
- Previous reset TOD-2 Apparent MD with date & time stamping (Export)
- Previous reset TOD-3 Apparent MD with date & time stamping (Export)
- Previous reset TOD-4 Apparent MD with date & time stamping (Export)
- Previous reset TOD-5 Apparent MD with date & time stamping (Export)
- Previous reset Reactive Energy (Lead) (Total KVARH) (Export)
- Previous reset- Apparent Energy (Cumulative) (Export)
- Previous reset TOD-1 Apparent Energy (Cumulative) (Export)

- Previous reset TOD-2 Apparent Energy (Cumulative) (Export)
- Previous reset TOD-3 Apparent Energy (Cumulative) (Export)
- Previous reset TOD-4 Apparent Energy (Cumulative) (Export)
- Previous reset TOD-5 Apparent Energy (Cumulative) (Export)
- Previous Reset Average PF
- R Phase Voltage
- Y Phase Voltage
- B Phase Voltage
- R Phase Current
- Y Phase Current
- B Phase Current
- Instantaneous active Power
- Instantaneous reactive Power
- Instantaneous apparent Power
- Phase sequence
- Instantaneous PF R-ph
- Instantaneous PF Y-ph
- Instantaneous PF B-ph
- Net average PF
- MD reset count
- Defrauded Energy Cumulative KWH
- Defrauded Energy Cumulative KVAH
- High resolution Cumulative energy in KWh (Import)
- High resolution Cumulative energy in KWh (Export)
- High Resolution Reactive Energy Cumulative KVARH Lag (Import)
- High Resolution Reactive Energy Cumulative KVARH Lag (Export)
- High Resolution Reactive Energy Cumulative KVARH Lead (Import)
- High Resolution Reactive Energy Cumulative KVARH Lead (Export)
- High Resolution Apparent Energy KVAH (Import)
- High Resolution Apparent Energy KVAH (Export)
- Cumulative tamper count
- History of last 3 tampers
- LCD Test

3.) **The Battery (Mode 3)** display (High resolution) should display following parameters(38)

- Active Energy Cumulative (Total kWh) (Import)
- TOD-1 Active Energy (Cumulative) (Import)
- TOD-2 Active Energy (Cumulative) (Import)
- TOD-3 Active Energy (Cumulative) (Import)
- TOD-4 Active Energy (Cumulative) (Import)
- TOD-5 Active Energy (Cumulative) (Import)
- Reactive Energy (Lag) (Total KVARH) (Import)
- TOD-1 Apparent MD (Import)
- TOD-2 Apparent MD (Import)

- TOD-3 Apparent MD (Import)
- TOD-4 Apparent MD (Import)
- TOD-5 Apparent MD (Import)
- Reactive Energy (Lead) (Total KVARH) (Import)
- Apparent Energy (Total KVAH) (Import)
- Active Energy Cumulative (Total kWh) (Export)
- TOD-1 Active Energy (Cumulative) (Export)
- TOD-2 Active Energy (Cumulative) (Export)
- TOD-3 Active Energy (Cumulative) (Export)
- TOD-4 Active Energy (Cumulative) (Export)
- TOD-5 Active Energy (Cumulative) (Export)
- Reactive Energy (Lag) (Total KVARH) (Export)
- Reactive Energy (Lead) (Total KVARH) (Export)
- Apparent Energy (Total KVAH) (Export)

Note: Latest reset is History 1

Previous reset is History 2

For manual display :

PI add Channel 1 and Channel 2 in following Pages:

1	Main Energy Parameters
2	High Resolution Parameters
3	Last IP Parameters

- (i) The three line-to-neutral voltages shall be continuously monitored, and in case any of these falls below 70%, the low voltage condition shall be suitably indicated and recorded. Each meter shall have a built-in calendar and clock, having an accuracy of 30 seconds per month or better.
- (j) The meters shall be totally sealed and tamper-proof, with no possibility of any adjustment at site, except for a restricted clock correction
- (k) Internal MF shall be 1. CTR and PTR programmed in meter shall be -/1, 5 A and -/110V.
- (l) MD Reset Push Button is to be disabled.
- (m) Display Digits Configuration for Energy and Demand shall be : 5+3
- (n) Meters shall support 5 TOD slots as follows :

TOD 1	22.00 to 06.00 Hrs
TOD 2	06.00 to 09.00 Hrs
TOD 3	09.00 to 12.00 Hrs
TOD 4	12.00 to 18.00 Hrs
TOD 5	18.00 to 22.00 Hrs

- (o) MD integration period shall be 15 min and MD recording shall be with Blocked window method.
- (p) Load survey parameters shall be reconfigured for Total Energy instead of Fundamental Energy.
- (q) Lead PF to be considered as UPF for energy calculation.
- (r) Meter auto reset date shall be first of every month.

Data download capability of Meters

All meters shall have downloading facilities of metered data through Common Meter Reading Instrument (CMRI). CMRI shall be capable of downloading data/information from various makes of AC static energy meters when loaded with the corresponding meter specific downloading software(s) called meter reading instrument programs). The CMRI shall be able to extract information about energy data, load survey data, billing parameters, meter status, meter anomaly and tamper data from the memory of the meter and store for retrieval at a later stage. The meter shall be able to store at least 100 such events on FIFO basis. Vendor shall provide all necessary support for AMR communication purpose.

Calibration LED

Calibration (Left)	LED	Active total
Calibration (Right)	LED	Reactive

Daily Energy Snap

Daily Energy Snap Parameters

Sno	Parameter Name
1	Active Import Total (Q1+Q4)
2	Active Export Total (Q2+Q3)
3	Active Import Fundamental (Without Harmonics) (Q1+Q4)
4	Active Export Fundamental (Without Harmonics) (Q2+Q3)
5	Reactive Import While Active Import – Q1
6	Reactive Export While Active Import – Q4
7	Reactive Import While Active Export – Q2
8	Reactive Export While Active Export – Q3
9	Apparent – While Active Import
10	Apparent – While Active Export
11	Net Reactive High
12	Net Reactive Low

Daily Energy Snap time

Capture time	0 hrs 0 mins
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Logger

General Information

Survey Integration Period	15
Survey Sampling Period	Disabled

Survey Channels

SNo	Parameter Name
1	Active Import Total (Q1+Q4)
2	Active Export Total (Q2+Q3)
3	Active Import Fundamental (Without Harmonics) (Q1+Q4)
4	Active Export Fundamental (Without Harmonics) (Q2+Q3)
5	Reactive Import While Active Import – Q1
6	Reactive Export While Active Import – Q4
7	Reactive Import While Active Export – Q2
8	Reactive Export While Active Export – Q3
9	Apparent – While Active Import
10	Apparent – While Active Export
11	Net Reactive High
12	Net Reactive Low

Instantaneous Parameters

SNo	Parameter Name
1	Mean Voltage
2	Mean Line Current
3	Frequency

Communication and Security

Baud rate on Channel A	9600
Baud rate on Channel B	9600
Baud rate on Channel C	9600
Protocol Channel A	DLMS Mode
Protocol Channel B	Modbus Mode
Protocol Channel C	DLMS Mode
Protocol Channel TCP1	Modbus Mode
Protocol Channel TCP2	TCP DLMS

Event

SNo	Condition
1	Reverse Current direction phase wise
2	Current Unbalance
3	Missing voltage phase wise
4	Voltage Unbalance
5	Invalid Voltage
6	Feeder Fail(All phases missing)
7	Magnet detection
8	Current missing phase wise
9	Over Voltage
10	Under Voltage
11	Power Failure

Special Days

Sno	Special Date	Apply	Day type	Special Day Start
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TOU and Maximum Demand

General Information

Demand Integration Period	15
Demand Sampling Period	Disabled

Energy parameters for Demand Register

SNo	Parameter Name
1	Active Import Total (Q1+Q4)
2	Active Export Total (Q2+Q3)
3	Active Import Fundamental (Without Harmonics) (Q1+Q4)
4	Active Export Fundamental (Without Harmonics) (Q2+Q3)
5	Apparent – While Active Import
6	Apparent – While Active Export

Energy parameters for TOU Register

SNo	Parameter Name
1	Active Import Total (Q1+Q4)
2	Active Export Total (Q2+Q3)
3	Active Import Fundamental (Without Harmonics) (Q1+Q4)
4	Active Export Fundamental (Without Harmonics) (Q2+Q3)
5	Apparent – While Active Import
6	Apparent – While Active Export

Season dates

Sno	Season Start Date	Dow Type	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	01-October	On exact date	1	1	1	1	1	1	1

Day types

Sno	Day Type	Start Time	End Time	Rate Register	MD Register
1	1	00:00	06:00	1	1

2	1	06:00	09:00	2	2
3	1	09:00	12:00	3	3
4	1	12:00	18:00	4	4
5	1	18:00	22:00	5	5
6	1	22:00	24:00	1	1

Billing Dates

Sno	Billing date	Apply	Billing Start
1	01-January	Every year	On exact date
2	01-February	Every year	On exact date
3	01-March	Every year	On exact date
4	01-April	Every year	On exact date
5	01-May	Every year	On exact date
6	01-June	Every year	On exact date
7	01-July	Every year	On exact date
8	01-August	Every year	On exact date
9	01-September	Every year	On exact date
10	01-October	Every year	On exact date
11	01-November	Every year	On exact date
12	01-December	Every year	On exact date

Clock Adjustment

Maximum amount of time change 25 secs

Digital I/O and Alarms

I/O Type:	I/O Description:
3	4 Output and 1 Input

Sno	I/O No	I/O Type	Function	Sub Function
1	1	Fixed Output	Alarm Outputs	Any Phase VT Miss
2	2	Fixed Output	Alarm Outputs	Voltage Unbalance
3	3	Fixed Output	Alarm Outputs	Current Imbalance
4	4	Fixed Output	Healthy Condition	All Phase voltage healthy
5	1	Fixed Input	Time Sync Pulse	1

Measuring

Measuring (Input Parameters)

Meter Wire Type	HV (3P4W)
Primary Line to Line Voltage	110 Volt
Secondary Line to Line Voltage	110 Volt
Primary Current	1 Amp
Secondary Current	1 Amp
Max Current	2 Amp

Display Sequences

Display time outs

Delay for auto return from manual to automatic display cycling sequence	10 Secs
Delay for automatic display cycling sequence	10 Secs
Backlight off duration at end of Automatic display cycling sequence	10 Secs

Configurability of OBIS Code

Display OBIS Code in meter Enabled

Configurability Import/Export with +/- Sign

Import/Export with +/- Sign Enabled

Automatic display cycling sequence

SNo	Display Parameter Name
1	Display test – all segments on

2	Meter serial number
3	Current date from the base time
4	Current, Energy Reg, Active Import Total (Q1+Q4)
5	Current, Energy Reg, Reactive Import While Active Import – Q1
6	Current, Energy Reg, Reactive Export While Active Import – Q4
7	Current, Energy Reg, Apparent – While Active Import
8	Current, Universal MD Reg , Apparent – While Active Import
9	Current, Energy Reg, Active Export Total (Q2+Q3)
10	Current, Energy Reg, Reactive Export While Active Export – Q3
11	Current, Energy Reg, Reactive Import While Active Export – Q2
12	Current, Energy Reg, Apparent – While Active Export
13	Current, Universal MD Reg , Apparent – While Active Export
14	Power factor for consumed energy Hist 1
15	Power factor for exported energy Hist 1
16	Current, Energy Reg, Net Reactive High
17	Current, Energy Reg, Net Reactive Low
18	Hist 1, Energy Reg, Active Import Total (Q1+Q4)
19	Hist 1, TOU Reg 1, Active Import Total (Q1+Q4)
20	Hist 1, TOU Reg 2, Active Import Total (Q1+Q4)
21	Hist 1, TOU Reg 3, Active Import Total (Q1+Q4)
22	Hist 1, TOU Reg 4, Active Import Total (Q1+Q4)
23	Hist 1, TOU Reg 5, Active Import Total (Q1+Q4)
24	Hist 1, MD Reg 1, Apparent – While Active Import
25	Hist 1, MD Reg 2, Apparent – While Active Import
26	Hist 1, MD Reg 3, Apparent – While Active Import
27	Hist 1, MD Reg 4, Apparent – While Active Import
28	Hist 1, MD Reg 5, Apparent – While Active Import
29	Hist 1, Energy Reg, Reactive Import While Active Import – Q1
30	Hist 1, Energy Reg, Reactive Export While Active Import – Q4
31	Hist 1, Energy Reg, Apparent – While Active Import
32	Hist 1, Energy Reg, Active Export Total (Q2+Q3)
33	Hist 1, Universal MD Reg , Apparent – While Active Export
34	Hist 1, Energy Reg, Reactive Export While Active Export – Q3
35	Hist 1, Energy Reg, Reactive Import While Active Export – Q2
36	Hist 1, Energy Reg, Apparent – While Active Export

Manual Displays

Display Page - Main Energy Par.

SNo	Display Parameter Name
1	Display test – all segments on
2	Current date from the base time
3	Power On time in minutes
4	Power Off time in minutes
5	Current, Energy Reg, Active Import Total (Q1+Q4)
6	Current, Energy Reg, Active Export Total (Q2+Q3)
7	Current, Energy Reg, Active Import Fundamental (Without Harmonics) (Q1+Q4)
8	Current, Energy Reg, Active Export Fundamental (Without Harmonics) (Q2+Q3)
9	Current, Energy Reg, Reactive Import While Active Import – Q1
10	Current, Energy Reg, Reactive Export While Active Import – Q4
11	Current, Energy Reg, Reactive Import While Active Export – Q2
12	Current, Energy Reg, Reactive Export While Active Export – Q3
13	Current, Energy Reg, Apparent – While Active Import
14	Current, Energy Reg, Apparent – While Active Export
15	Hist 1, Universal CMD Reg , Active Import Total (Q1+Q4)
16	Hist 1, Universal CMD Reg , Active Export Total (Q2+Q3)
17	Hist 1, Universal CMD Reg , Active Import Fundamental (Without Harmonics) (Q1+Q4)
18	Hist 1, Universal CMD Reg , Active Export Fundamental (Without Harmonics) (Q2+Q3)
19	Hist 1, Universal CMD Reg , Apparent – While Active Import
20	Hist 1, Universal CMD Reg , Apparent – While Active Export
21	Current, Universal MD Reg , Active Import Total (Q1+Q4)
22	Current, Universal MD Reg , Active Export Total (Q2+Q3)
23	Current, Universal MD Reg , Active Import Fundamental (Without Harmonics) (Q1+Q4)
24	Current, Universal MD Reg , Active Export Fundamental (Without Harmonics) (Q2+Q3)
25	Current, Universal MD Reg , Apparent – While Active Import
26	Current, Universal MD Reg , Apparent – While Active Export
27	Hist 1, Energy Reg, Active Import Total (Q1+Q4)
28	Hist 1, Energy Reg, Active Export Total (Q2+Q3)
29	Hist 1, Energy Reg, Active Import Fundamental (Without Harmonics) (Q1+Q4)
30	Hist 1, Energy Reg, Active Export Fundamental (Without Harmonics) (Q2+Q3)

31	Hist 1, Energy Reg, Apparent – While Active Import
32	Hist 1, Energy Reg, Apparent – While Active Export
33	Hist 1, Universal MD Reg , Apparent – While Active Import
34	Hist 1, Universal MD Reg , Apparent – While Active Export
35	Power factor for exported energy Hist 1
36	Power factor for consumed energy Hist 1
37	Current, Energy Reg, Net Reactive High
38	Current, Energy Reg, Net Reactive Low
39	Rising demands, Apparent – While Active Import
40	Rising demands, Apparent – While Active Export

Display Page - Instantaneous Par.

SNo	Display Parameter Name
1	Phase voltage: phase 1
2	Phase voltage: phase 2
3	Phase voltage: phase 3
4	Line current: phase 1
5	Line current: phase 2
6	Line current: phase 3
7	Apparent power: 3-phase
8	Net active power: 3-phase
9	Fundamental active power: 3-phase
10	Reactive power: 3-phase
11	Power factor: 3-phase
12	Number of billing actions (MD resets)
13	Date of billing action (MD reset)
14	Frequency
15	Instantaneous % voltage of all phases

Display Page - High Resolution Par.

SNo	Display Parameter Name
1	Current, High Resolution Energy Reg, Active Import Total (Q1+Q4)
2	Current, High Resolution Energy Reg, Active Export Total (Q2+Q3)
3	Current, High Resolution Energy Reg, Active Import Fundamental (Without Harmonics) (Q1+Q4)
4	Current, High Resolution Energy Reg, Active Export Fundamental (Without Harmonics) (Q2+Q3)
5	Current, High Resolution Energy Reg, Reactive Import While Active Import – Q1
6	Current, High Resolution Energy Reg, Reactive Export While Active Import – Q4
7	Current, High Resolution Energy Reg, Reactive Import While Active Export – Q2
8	Current, High Resolution Energy Reg, Reactive Export While Active Export – Q3
9	Current, High Resolution Energy Reg, Apparent – While Active Import
10	Current, High Resolution Energy Reg, Apparent – While Active Export
11	Current, High Resolution Energy Reg, Net Reactive High
12	Current, High Resolution Energy Reg, Net Reactive Low

Display Page - Last IP Par.

SNo	Display Parameter Name
1	Previous IP (Integration Period) average frequency
2	Hist 1, SIP Energy Reg, Active Import Total (Q1+Q4)
3	Hist 1, SIP Energy Reg, Active Export Total (Q2+Q3)
4	Hist 1, SIP Energy Reg, Active Import Fundamental (Without Harmonics) (Q1+Q4)
5	Hist 1, SIP Energy Reg, Active Export Fundamental (Without Harmonics) (Q2+Q3)
6	Hist 1, SIP Energy Reg, Net Active (Imp – Exp)
7	Hist 1, SIP Energy Reg, Net Reactive (Q1+Q2-Q3-Q4)
8	Hist 1, SIP Energy Reg, Net Reactive High
9	Hist 1, SIP Energy Reg, Net Reactive Low

Display Page - Tamper Information

SNo	Display Parameter Name
1	Present status of voltage related events
2	Present status of current related events
3	Present status of events other then current and voltage
4	Last occurred event
5	Time of last occurred event
6	Date of last occurred event
7	Last restored event
8	Time of last restored event
9	Date of last restored event

10	Event count
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Display Page - TOD Par.

SNo	Display Parameter Name
1	Hist 1, Universal CMD Reg , Apparent – While Active Import
2	Hist 1, Universal CMD Reg , Apparent – While Active Export
3	Current, Universal MD Reg , Apparent – While Active Import
4	Current, MD Reg 1, Apparent – While Active Import
5	Current, MD Reg 2, Apparent – While Active Import
6	Current, MD Reg 3, Apparent – While Active Import
7	Current, MD Reg 4, Apparent – While Active Import
8	Current, MD Reg 5, Apparent – While Active Import
9	Current, Universal MD Reg , Apparent – While Active Export
10	Current, MD Reg 1, Apparent – While Active Export
11	Current, MD Reg 2, Apparent – While Active Export
12	Current, MD Reg 3, Apparent – While Active Export
13	Current, MD Reg 4, Apparent – While Active Export
14	Current, MD Reg 5, Apparent – While Active Export
15	Hist 1, Universal MD Reg , Apparent – While Active Import
16	Hist 1, MD Reg 1, Apparent – While Active Import
17	Hist 1, MD Reg 2, Apparent – While Active Import
18	Hist 1, MD Reg 3, Apparent – While Active Import
19	Hist 1, MD Reg 4, Apparent – While Active Import
20	Hist 1, MD Reg 5, Apparent – While Active Import
21	Hist 1, Universal MD Reg , Apparent – While Active Export
22	Hist 1, MD Reg 1, Apparent – While Active Export
23	Hist 1, MD Reg 2, Apparent – While Active Export
24	Hist 1, MD Reg 3, Apparent – While Active Export
25	Hist 1, MD Reg 4, Apparent – While Active Export
26	Hist 1, MD Reg 5, Apparent – While Active Export

Configuration ID

Configuration ID	TATAREV1
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MD Button Control

Event	Action
MD Button Control Action	No Action

Billing Registers and Control

Sno	Flag Name	Configured
1	Enable MD reset through communication (by third party software)	Yes
2	Enable Event log reset through communication (by third party software)	Yes

Billing Energy Channels

Lag + Lead Quadrant

Active	Total
Apparent	Lag Only in all quadrant
Net Active	Net Active (I-E)

Please read “Lag Only in all quadrant” as “**Lag+Lead** in all quadrant”

Energy Billing Parameters

Sno	Parameter Name
1	Active Import Total (Q1+Q4)
2	Active Export Total (Q2+Q3)
3	Active Import Fundamental (Without Harmonics) (Q1+Q4)
4	Active Export Fundamental (Without Harmonics) (Q2+Q3)
5	Reactive Import While Active Import – Q1
6	Reactive Export While Active Import – Q4
7	Reactive Import While Active Export – Q2
8	Reactive Export While Active Export – Q3
9	Apparent – While Active Import
10	Apparent – While Active Export

11	Reactive Import (Q1+Q2)
12	Reactive Export (Q3+Q4)
13	Net Active (Imp – Exp)
14	Net Reactive (Q1+Q2-Q3-Q4)
15	Net Reactive High
16	Net Reactive Low

Instantaneous parameters for Billing

SNo	Parameter Name
1	Total Harmonic Distortion in voltage [phase 1]
2	Total Harmonic Distortion in voltage [phase 2]
3	Total Harmonic Distortion in voltage [phase 3]
4	Total Harmonic Distortion in current [phase 1]
5	Total Harmonic Distortion in current [phase 2]
6	Total Harmonic Distortion in current [phase 3]

Energy limit Definiton

Reactive high voltage limit	103% of V Nominal
Reactive low voltage limit	97% of V Nominal
Low voltage limit	60% of V Nominal
Hysteresis	5%

Event Persistence Time

Sno	Event	Event type	Occurrence time	Restoration time
1	Reverse Current direction phase wise	Non Cumulative Type	5 mins 0 secs	5 mins 0 secs
2	Current Unbalance	Non Cumulative Type	5 mins 0 secs	5 mins 0 secs
3	Missing v oltage phase wise	Non Cumulative Type	5 mins 0 secs	5 mins 0 secs
4	Voltage Unbalance	Non Cumulative Type	5 mins 0 secs	5 mins 0 secs
5	Invalid Voltage	Non Cumulative Type	5 mins 0 secs	5 mins 0 secs
6	Feeder Fail(All phases missing)	Non Cumulative Type	5 mins 0 secs	5 mins 0 secs
7	Current missing phase wise	Non Cumulative Type	5 mins 0 secs	5 mins 0 secs
8	Over Voltage	Non Cumulative Type	5 mins 0 secs	5 mins 0 secs
9	Under Voltage	Non Cumulative Type	5 mins 0 secs	5 mins 0 secs
10	Power Failure	Non Cumulative Type	5 mins 0 secs	On Power Resume

Power Quality

Phase wise THD voltage events

Parameter	Value
Occurrence Limit	5.0%
Restoration Limit	4.0%
Persistence Time	60 Seconds

Phase wise THD current events

Parameter	Value
Occurrence Limit	8.0%
Restoration Limit	7.0%
Persistence Time	60 Seconds

Voltage swell events

Parameter	Value
Occurrence Limit	110.0% of V Nominal
Restoration Limit	105.0% of V Nominal

Voltage sag events

Parameter	Value
Occurrence Limit	90.0% of V Nominal
Restoration Limit	95.0% of V Nominal

Voltage unbalance(Quality) events

Parameter	Value
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Occurrence Limit	20.0% of V Average
Restoration Limit	20.0% of V Average

Voltage interruption events

Parameter	Value
Occurrence Limit	10.0% of V Nominal
Restoration Limit	20.0% of V Nominal

Factory Master

Clem Variable File Name	L:\Release\R&D\RELEASED\FINAL\CLEM\APEXABT\Prod_use\MASKE300\APEX100\M6X3G08\M6X3G08.v0F
Clem Object File Name	L:\Release\R&D\RELEASED\FINAL\CLEM\APEXABT\Prod_use\MASKE300\APEX100\M6X3G08\M6X3G08.J0F

Miscellaneous

1	Number of Daily Snapshot Days	60
2	Number of Days for Logger	60
3	Number of Parameter Days for Logger	1800
4	For sliding widow, First DIP is fixed window type for all demand time zones	Disable
5	Field configuration of Meter type, Secondary current, I _{max} and Secondary Voltage	Enable
6	Minimum duration for power quality events(Sag,Swell,Unbalance and Interruption) logging(1 to 60sec)	3
7	Maximum duration for power quality counters and events(Sag,Swell,Unbalance and Interruption) logging(1 to 60sec).Min duration value must be less than Max duration	60

Event Limits

Phase wise PT miss

1	Voltage limit for occurrence(% of V nominal)	5
2	Voltage limit for restoration (% of V nominal)	10
3	Line Current limit for occurrence (% of I basic)	10

Voltage unbalance

1	Voltage deviation from average voltage for occurrence(% of average voltage)	10
2	Voltage deviation from average voltage for restoration (% of average voltage)	10

Invalid Voltage

1	Voltage limit for occurrence (% of V nominal)	73
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Phase wise current miss

1	Current limit for occurrence (% of I basic)	1
2	Current limit for restoration (% of I basic)	10
3	Voltage limit for occurrence (% of V nominal)	5

Phase wise current reversal

1	Neutral current limit for software pin derivation (% of I basic) for CT reversal, Open and Bypass	10
2	Current limit 1 for current reversal (% of I basic)(If Neutral current \geq Limit)	5
3	PF limit for CTR	0.1
4	Current limit 2 for current reversal (% of I basic)(If Neutral current $<$ Limit)	10
5	Power limit for CTR (% of P nominal)	-5
6	Export mode current limit (% of I basic)	2

Current imbalance

1	Voltage deviation from maximum limit (% of V maximum)	20
2	Average line current limit (% of I basic)	10
3	Current deviation from max. current for occurrence(% of I basic)	30
4	Current deviation from max. current for restoration (% of I basic)	20

Any phase over voltage

1	Voltage limit for occurrence (% of V nominal)	115
2	Voltage limit for restoration (% of V nominal)	110

Any phase under voltage

1	Voltage limit for occurrence (% of V nominal)	75
2	Voltage limit for restoration (% of V nominal)	80

Feeder fail

1	Voltage limit for occurrence (% of V nominal)	20
2	Voltage limit for restoration (% of V nominal)	50

CT Open / CT Bypass

1	Maximum line current for CT Open occurrence (% of I basic)	2
2	Minimum line current for CT Bypass occurrence (% of I basic)	5
3	Minimum line current limit for restoration (% of I basic)	10

**Magnet Detection
(Occurrence)**

1	Cumulative persistence time count (Seconds)	20
2	Cumulative persistence time window (Seconds)	200

**Magnet Detection
(Restoration)**

1	Non-Cumulative persistence time (Seconds)	20
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Neutral Disturbance

1	Cumulative persistence time window (Seconds)	200
2	Cumulative persistence time count (Seconds)	20
3	High frequency limit (Hz)	55
4	Low frequency limit (Hz)	45
5	DC voltage Limit (V)	50

**Neutral Disturbance
(Restoration)**

1	Non-Cumulative persistence time (Seconds)	20
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SECTION-B

THE TATA POWER COMPANY LIMITED

STANDARD

TECHNICAL SPECIFICATION

FOR

CONTROL AND RELAY PROTECTION SYSTEM FOR SUBSTATION AND
ASSOCIATED EQUIPMENTS

(DOCUMENT NO - ENGG/ ELECT/STD-SPECS/70)



Tata Power

Engineering T & D

Rev. No	Date	Revision History	Prepared By	Checked By	Approved By (HOD)
R0	17-08-2018	First Copy	VK/VAS	SVD	AM
R1	10-06-2019	Revision based on learnings	VK/VAS	AM	PC
R2	31-03-2020	Revised PQR, Function key	VK/VAS	SVD	AM
D	21-11-2020	Addition of reactor protection, Rittal panel & Elmex TB	VK/VAS	SVD	AM
E	18-01-2021	Modification in TYPE-G UFLS	VK/VAS	SVD	AM
F	22-02-2021	Addition of high impedance BF	VK/VAS	SVD	AM
G	27-05-2022	CT cable size, Trafo LV Overflux for alarm, laptop	AS	VK	AM / UGP

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H	11.11.2022	Cybersecurity in IEDs, reduction in panel numbers, removal of transformer alarm relays, removal 3-ph trip relays form line protection, Vendor list	AS	VK	UGP
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2.	Pre-Qualifying Requirements and Approved Vendor List
3.	System Description and Scope
4.	Codes & Standards.
5.	Design Requirements
6.	Layout Requirements for the equipment
7.	Safety & Operational Requirements
8.	Technical Parameters of Equipment including DATA SHEET
9.	Quality Requirements (including SQP and FQP)
10.	Inspection, Testing and Performance Requirements along with Warranty
11.	Mandatory Spares
12.	Data Submission by Bidder
	12.1 With the Bid
	12.2 After award of contract
13.	Annexure 1 – Pre-qualification Requirement Annexure 2 – SQP

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1. INTRODUCTION

The Technical specification covers the complete design, detailed engineering, manufacture, supply, inspection & testing at Bidder's work, packing, transportation, delivery to site, performance testing, commissioning, and handing over of Protection, Providing Technical Support for Protection system for substation equipment. All equipment, system and services covered under this specification shall comply with all current applicable statutory regulations and safety codes in the locality where the Equipment is proposed to be installed. The equipment and systems shall also conform to the latest version of applicable codes and standards on the date of offer made by the Bidder unless otherwise indicated. Nothing in this specification shall be construed to relieve the Bidder of this responsibility.

2. PRE-QUALIFYING REQUIREMENTS AND APPROVED VENDORS LIST

Please refer Annexure-1 for bidders pre-qualifying requirement.

3. SYSTEM DESCRIPTION AND SCOPE

The scope of work shall include but not limited to following:

- 3.1. Design, manufacture, testing at works, combined Protection-Automation FAT performance testing, supply, transport to site, preparation of drawings, Interconnecting Schedule (ICS), relay configurations, services for testing and commissioning of Protection Panels at site with standard engineering practices, IS & IEC standards.
- 3.2. Protection IEDs integration scope by Bidder includes all networking accessories such as switches, LIU, patch panel, I/O boxes, patch cords, communication cables supply, laying & looping of the devices for the procured system.
- 3.3. All the relays in one substation shall be wired in network with an industrial grade computer having necessary software, which will communicate with all relays to display alarms, sequence of event logs, carry out setting changes, configuration logic modifications, down loading & analysis of fault records, monitoring and alarm functions, remote communication

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with the existing DRCA system. The time synchronization for all the IEDs shall be through SNTP. Immediate communication with time stamping shall be ensured.

- 3.4. Preparation relay configuration, relay settings and its approval from Tata Power before integrated FAT shall be in bidder's scope. The FAT shall not be commenced unless relay configuration and settings approved by purchaser team.
- 3.5. Combined Protection, automation and communication FAT for 100% of panels at Bidders factory with Tata Power approved load service relay setting and configuration is in Bidders scope.
- 3.6. Remote end protection CRP or lose relay supply for overhead line / underground cable, testing, commissioning, integration with local and remote end existing protection, automation architecture as mentioned case to case basis in relevant sections shall be in bidders scope.
- 3.7. Preparation of Interconnecting cable schedule (ICS) mentioning each end TB number, cable core, cross section, number of cable required etc with all existing field equipment is in Bidders scope.
- 3.8. For remote end retrofitting – Preparing total CRP drawing with retrofitted relay, getting drawing approval from Tata Power, removal of old relay, matching panel cutout, wiring of new relay and commissioning etc shall be in bidders scope .
- 3.9. Demonstration / testing of the system at Bidder's works as per the approved Tata Power SQP (attached Annexure-2 with the specifications) before dispatch of the system at site (FAT).
- 3.10. The commissioning of the entire system being procured under this requirement as per project schedule shall be in bidder's scope.
- 3.11. The relay setting, configuration tool / software shall be freely available to user during entire duration of relay support. If bidder has licensed version of software, it shall provide at least 10 licenses or licenses equal to as many number of IEDs, whichever is higher for purchasers use.
- 3.12. Numerical relay testing kit required for site commissioning shall be in bidder's scope.

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- 3.13. Bidder to depute people for supervision & validation of commissioning check points & site equipment test results during Installation, testing & commissioning of the protection and automation system as per Tata Power approved Standard Field Quality Plan (attached with the specifications). The technical expert shall be involved until the equipment is commissioned & handed over.
- 3.14. Wherever the system is being commissioned in the existing substations, the complete integration of the new system vis a vis existing system of protection, automation and communication shall be in bidder's scope. Wherever necessary, bidder shall do the site visit and take all the relevant information during pre-bid at bidders cost.
- 3.15. All required man, material, upgradation, replacement, retrofitting etc for seamless integration of new system with existing system shall be in bidder's scope.
- 3.16. Bidder shall adhere to General requirements of Quality Assurance & Inspection (attached with the specifications).
- 3.17. Submission of type test report which is not more than 5 years old.
- 3.18. Bidder must agree for handing over, to Purchaser, all project related drawings in AutoCAD format only. The pdf versions of above drawings shall be submitted through "Wrench" project management software for formal approval process.
- 3.19. It is not the intent of this specification to specify completely herein, all details of design & construction protection, automation and communication system. However, the bidder shall include and supply the required material and resource at any stage of the project for successful commissioning of the system. The equipment shall conform in all respects to high standards of engineering, design & workmanship.
4. **CODES & STANDARDS**
- 4.1. CBIP protection guidelines (Publication No: 274)
- 4.2. The design, manufacture and performance of equipment shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be

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installed. Nothing in this specification shall be construed to relieve vendor of this responsibility.

- 4.3. Unless otherwise specified, equipment shall conform to the latest applicable Indian or IEC Standards as given below:

Sr No	Standard no.	Title
Characteristic, Performance, Accuracy, Burden, Mechanical endurance test		
1	IEC-60255-6	> Thermal requirements > Mechanical requirements > Limiting dynamic value > Accuracy requirements > Rated Burden
2	IEC-60255-11	Interruption to and alternating component in DC aux. Energizing quantity
3	IEC-60255-3, IEC-60255-12, IEC-60255-13	Relay characteristic & Performance test
4	IEC-60255-23	Contact Performance test
Electromagnetic Compatibility type test:		
1	IEC-60255-22-1, Class-III,	1MHz burst immunity test
2	IEC-60255-22-2, Class-III IEC-61000-4-2, Class-III	Electrostatic discharge test Direct application Indirect application
3	IEC-60255-22-4, Class-A	Fast transient / burst immunity test
4	IEC-, 60255-22-5	Surge immunity test
5	IEC-60255-22-7, Class-A	Power frequency immunity test
6	IEC-61000-4-8, Class-V	Power frequency magnetic field Test
7	IEC- 60255-22-3	Radiated electromagnetic field Immunity
9	IEEE/ANSI/C37.90.2	Radiated electromagnetic field Disturbance
10	IEC- 60255-22-3	Immunity to conducted disturbances induced by radio frequency fields test
11	IEC- 60255-25	> Electromagnetic emission tests > Conducted emission test > Radiated emission test
Insulation tests:		
1	IEC- 60255-5	Dielectric test Impulse voltage test Insulation resistance

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Sr No	Standard no.	Title
Environmental tests:		
1	IEC-60068-2-1	Cold test
		Storage test
2	IEC-60068-2-2	Dry heat test
3	IEC-60068-2-3	Damp heat test, steady state
4	IEC-60068-2-30	Damp heat test, cyclic
5	IEC-60068-2-48	Storage temperature test
CE compliance		
1	IEC- 60255-26	Electromagnetic compatibility Requirements
Mechanical tests		
1	IEC- 60255-21-1	Vibration
2	IEC- 60255-21-2	Shock and bump
3	IEC- 60255-21-3	Seismic
Degree of protection test		
1	IEC 60529	Degree of Protection Provided by enclosure test
Safety test		
1	IEC 61010-1	> Single fault condition assessment > Earth bonding impedance test Mechanical resistance to shock and Impact > Rigidity test > Impact hammer test > Protection against electrical shock Protection against the spread of fire
Communication and Cybersecurity Standards		
1	IEC 61850-3 (latest edition) IEC 61850 – 5 to IEC 61850 – 10	Communication networks and systems for power utility automation Part 3: General requirements. Intelligent Electronic Equipment / Numerical Protection Relays / Bay Control Units / Bay Protection Units, Gateways, Transformer Tap controller/ changer, etc. with IEC 61850 communication protocol

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5. **DESIGN REQUIREMENTS**

- 5.1. All the IED's supplied shall have conformal coating as per relevant standards.
- 5.2. Following is the protection function requirement in IEDs as per bay equipment:

Equipment Name	Protection	Remarks	Number of panel per bay (\$)	Approx. Minimum number of Binary Input / Output (\$)
TYPE-A 110 kV / 220 kV Line / Transfer breaker protection	IED-1: IED with Dist (with 1-ph Auto reclose) + Diff + Dir OC/EF + Dir OLTS + LBB + Over voltage + Sync check	Main-1 & 2 IED's shall be from different OEM. For 3 terminal lines, the differential modules shall be provided accordingly. The two-terminal line relays shall be modular type and shall have capability to upgrade to 3-terminal. Empty slots for analog card and FO port shall be kept for future 3-terminal line expansion. Minimum 4 setting groups shall be available in each IED for line protection. For transfer breaker, minimum 06 nos of setting group facility is required.	1	32/24 + (6 nos of signal channels for transmitting binary signals from one end to other end via differential fibre)
	IED-2: IED with Dist (with 1-ph Auto reclose) + Diff + Dir OC/EF + Dir OLTS + LBB + Over voltage + Sync check			32/24 + (6 nos of signal channels for transmitting binary signals from one end to other end via differential fibre)
TYPE-B 110 kV / 220 kV Buscoupler / Bus section breaker	One IED with Directional OC/EF + LBB + Sync check	Minimum 4 setting groups shall be available in IED.	1	8/8
TYPE-C 220-110/33 kV (HV-MV/LV) Auto Transformer / ICT	Group-1: IED-1: IED with Overall Biased Differential + NGT High imp REF + Over fluxing + Thermal O/L + ICT SEF + LV OC + LV LBB + Sync check + HV Dir OC/EF + LBBU	Group-1 & Group-2 IEDs shall be from different manufacturer. The Group-1 & Group-2 IEDs shall be capable handling differential protection between at least 5	2	24/24

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Equipment Name	Protection	Remarks	Number of panel per bay (\$)	Approx. Minimum number of Binary Input / Output (\$)
	Group-1: IED-2: ICT High impedance REF (Phase wise 3-ph protection) + NGT SEF + MV Teed + MV Dir OC/EF + MV LBB + MV OLTS + LV OLTS	winding/breakers along with other functions mentioned for respective IEDs.		24/24
	Group-2: IED-1: IED with Overall Biased Differential + NGT High imp REF + Over fluxing + Thermal O/L + ICT SEF + LV OC + LV LBB + Sync check + HV Dir OC/EF + LBBU			24/24
	Group-2: IED-2: ICT High impedance REF (Phase wise 3-ph protection) + NGT SEF + MV Teed + MV Dir OC/EF + MV LBB + MV OLTS + LV OLTS			24/24
TYPE-D 110/33 kV, 110/22 kV Delta-Star (<u>^Star-Delta</u>) Power transformer	IED-1: Biased Diff + HV Dir OC EF + HT LBB + LV (<u>^HV</u>) Low Imp REF + SEF + LV-1 OC + LV-1 LBB + LV Overflux	Main-1 & 2 IED shall be from different manufacturer. These IEDs shall also be capable handling differential protection between at least 3 winding/breakers along with other functions mentioned for respective IEDs. Transformer devices alarms shall be directly connected to binary input of relays.	2	32/24
	IED-2: Biased Diff + HV Dir OC EF + HT LBB + LV (<u>^HV</u>) Low Imp REF + SEF + LV-2 OC + LV-2 LBB + LV Overflux			32/24
	IED-3: LV OLTS (<u>^NGT High imp REF + NGT SEF</u>)			18/12

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Equipment Name	Protection	Remarks	Number of panel per bay (\$)	Approx. Minimum number of Binary Input / Output (\$)
TYPE-E 110 / 220 kV GIS busbar protection	Scheme-1 - IEDs with busbar Biased differential protection + CT open circuit alarm / blocking + LBBU + End fault detection	Total number of bays covered in this protection is mentioned in respective sections. Bidder shall consider additional 4 number of bays along with mentioned bays for future expansion in respective section during design of bus differential	2	As per requirement of SLD scheme (at least 4 additional bays shall be kept for future expansion)
TYPE-F 110 / 220 kV AIS busbar protection	Scheme-1: IEDs with busbar Biased differential protection + CT open circuit alarm / blocking + LBBU + End fault detection	Scheme-1 & 2 shall be 100% redundant and shall be from different manufacturer. Total number of bays covered in this protection is mentioned in respective sections. Bidder shall consider additional 4 number of bays along with mentioned bays for future expansion in both IED-1 & 2 during design of bus differential protection. The IED-1 & 2 scheme shall be 100% redundant including its lockouts.	4	As per requirement of SLD scheme (at least 4 additional spare bays shall be kept in each IED for future expansion)
	Scheme-2: IEDs with busbar Biased differential protection + CT open circuit alarm / blocking + LBBU + End fault detection			
TYPE-G Under frequency load shedding	IED with 5 stages of Under frequency + 5 stages of Over frequency + 5 stages of df/dt + Auto restoration	IED shall have setting auto changeover facility. Minimum 4 settings group required.	1	18/18
TYPE-H 110 / 220 kV Reverse Power Under	Main-1: IED with 5 stages of Reverse Power protection + Under frequency + 5 stages of Over frequency + 5 stages of df/dt + Auto restoration	Main-1 & 2 IEDs shall be from different manufacturer. Minimum 4 settings group required. Each relay shall have capability to take	1	18/18

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Equipment Name	Protection	Remarks	Number of panel per bay (\$)	Approx. Minimum number of Binary Input / Output (\$)
Frequency Islanding scheme	Main-2: IED with 5 stages of Reverse Power protection + Under frequency + 5 stages of Over frequency + 5 stages of df/dt + Auto restoration	analog inputs from 4 bay CTs for internal CT summation for reverse power calculation based on Section-A.		18/18
TYPE-I 110/220 kV Reactor Protection	IED-1: Biased Differential + Impedance protection + Directional OC & EF + LBBU + Standby EF + Phase wise High impedance REF + Overfluxing + Overvoltage + Undervoltage + Thermal overload	IED-1 & 2 shall be from different manufacturers. IED shall have minimum 4 settings group.	2	32/24
	IED-2: Biased Differential + Impedance protection + Directional OC & EF + LBBU + Standby EF + Phase wise High impedance REF + Overfluxing + Overvoltage + Undervoltage + Thermal overload			32/24
TYPE-J High impedance bus fault protection	Zone-1 IED-1: High impedance bus fault protection + CT supervision alarm & blocking	Total 03 nos of IEDs shall be supplied. IEDs shall have dedicated high impedance protection function in relay.	2	16/16
	Zone-2 IED-2: High impedance bus fault protection + CT supervision alarm & blocking			
	IED-3: Blind zone protection			
Table-1: Details of protection				

(\$ The number of BI/BO specified are minimum and approximate. The number of panels is indicative. The bidder shall consider any additional requirement depending upon the scheme requirement)

- 5.3. Each of the above-mentioned relay shall have at least 5 number of user configurable function keys for making IN/OUT of different functions in the relay through local operation. For remote operation, relay shall be capable of receiving commands of IN/OUT through

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IEC61850 from SCADA. The relay shall have at least 20 nos of user configurable memory-based Set-Reset Flip Flops for IN/OUT of the relay internal functions. Relay shall be capable of achieving complete bi-stable IN/OUT relay type scheme by using function keys and user configuration logics.

- 5.4. All the signals viz. Carrier send, carrier receive, DT send, DT receive, Differential Intertrip, Differential Comm fail, Differential OUT, Earth switch ON status etc shall be routed through differential fibre. There shall be at least 6 digital channels available in differential relay for routing these signals through differential fibre to remote end relay.
- 5.5. Optical modules of all line Differential relays shall support C37.94 protocol and should be integrable with SDH mux's, MPLS devices supporting C37.94 interface. The interface should be capable of transferring simultaneously carrier acceleration, Differential Protection, Direct trip and other protection functionalities on single optical port.
- 5.6. All relays having 3-ph PT input shall have fuse fail function to alarm / block voltage based functions in the relay.
- 5.7. The numerical protection relays shall have the following features:

5.3.1. ACCESS / COMMUNICATION

- i. Local Operating Interface: USB / Ethernet / RS232 Port / Serial Port on Front Panel preferably USB or optically isolated 9-pin DSUB for the configuration and monitoring of the relay locally.
- ii. All protection relays shall be of numerical type (IED's) with fibre optic communication interface compliant to IEC-61850 protocol with dedicated dual ports. It shall be possible to fully utilize the metering, protection and control features of the numerical relays. They shall have programmable logic facility with built-in timers. Apart from the status of operation of the protection functions inbuilt in the relay, it is proposed to utilize the binary inputs of the relay for taking the operation of other non-communicable relays (if any) in the protection panel to SCADA/DCS.

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- iii. The numerical relays shall be selected with suitable number of binary/analog inputs and outputs. The IEC-61850 compliant numerical relays shall in turn be connected to two switches either in a daisy chain mode or connected radially, so that loss of one connection does not result in loss of communication with any device. These switches shall be provided with fibre optic (FO) ports for interconnection with all other switches supplied by others which form part of the IEC-61850 LAN network. Further, communication to the Plant DCS shall be through two nos. gateways supplied by others. Events shall be time stamped in the protective relays with a resolution of 1 ms. Time synchronizing pulse in SNTP format shall be transmitted to all devices in the entire network through any two of the managed Ethernet switches, in each LAN network.
- iv. All other communication parameters shall be user configurable such as baud rate, parity and data bits.
- v. Along with CRP panels, a separate Disturbance Record Control Analysis (DRCA) panel shall be considered by bidder which houses industrial PC, network switches, LIU etc. All the relays in the CRP shall be connected to the DRCA system through a network LIU, patch cords, switches etc. The DRCA system shall have a single software through which IEDs of all OEMs can be communicated for retrieving DR, settings parameterization, and relay configuration. The DR retrieval shall be automatic, and frequency of DR retrieval shall be settable. All the DR shall be time sync with GPS clock. Bidder shall be responsible for Integration of new CRP with DRCA system at each station.
- vi. Establishing communication between CRP relays upto DRCA system, through requisite communication cable and communication accessories is in bidder's scope. This will include supply, installation and testing of communication cable, accessories, local communication network (including fiber splicing) from relay panels to DRCA Panel and final Ethernet connectivity to DRCA system.
- vii. Bidder to consider dedicated Relay port for integration with the DRCA system.

5.3.2. EXTENDED LOADING CAPABILITY

- i. The relay shall retain in non-volatile memory even after DC on/off cycles.

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- ii. A sequence of events record consisting of the latest time-tagged events.
- iii. Fault records with defined pre-& post trigger waveforms of voltage and current measurements, contact input and output status, and relay element conditions.
- iv. The relay shall accept IRIG-B time code synchronization and include a battery-backed time clock to retain date and time during de-energization.

5.3.3. Cybersecurity compliant IEDs:

All IEDs being supplied shall conform to latest cybersecurity standards as per IEC. The IEDs shall also conform to the latest CEA guidelines for Cybersecurity in power sector. During IED model selection, bidder shall select the models with cybersecurity features.

5.3.4. SOFTWARE FOR INTERFACES

User software shall be menu driven and shall be compatible with Windows 10 or higher operating system. Software version for all the IEDs shall be same. Using the software, the user shall be able to view and set the settings, configure the input & output relays and LED's, comparison between two sets of settings, create programmable logic scheme, view on line metering data, event log, download fault events, load files from PC to the relay and relay to PC, and print all settings. The software should allow selective access to various users based on the password used. The master user should be able to assign access of various functions to a user.

5.3.5. INPUT / OUTPUT

- i. The IED shall support both 1A/5A CT secondary connections without changing the hardware. It shall be possible to change the CT secondary rating in parameter settings.
- ii. The field input shall be wired to BI of the relay through high burden aux. relay to prevent mal operation on capacitive discharges in the control cables in the field. Galvanic isolation for field inputs.
- iii. Adequate no of programmable output contacts. Output contacts rated for tripping duty as per IEEE C37.90 standards.

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- iv. All binary input, output, auxiliary relay contacts shall be wired up to TB irrespective of it is used or kept spare.
- v. A relay healthy ALARM contact.
- vi. Relay shall be preferably of modular design for quick replacement and shall have feature of extending I/O's.
- vii. Trip LED indication for each protection function.
- viii. PT Voltage inputs- Rated nominal voltage of 50 V AC to 140 V AC, 50 HZ. Shall withstand 240 V AC continuous and 360 V AC for 10 seconds.
- ix. Current inputs – Rated nominal currents of 5A and/or 1 A at 50 HZ, shall withstand 2 x Ir continuous current and 100 x Ir for 1 sec.

5.3.6. POWER SUPPLY REQUIREMENT

The relay shall operate properly for 85 V AC/DC to 250 V AC/DC and shall withstand 315 V DC or 300 V AC for 1 sec. Rest all the accessories in the panel shall operate at -20% / +10% of rated supply continuously. Station wise AC/DC rated voltages are mentioned in the respective sections.

5.3.7. FEATURES FOR PROPOSED PROTECTION SYSTEM

The protection system shall be built on the latest technology and the bidder must guarantee for supply of spares for at least 15 years. Further the bidder should have full range of manufacture of the system offered.

Wide setting ranges with fine setting steps for each protection shall be available. Details of Protection features

A. Distance Relay Protection 21

The characteristic of Main protective system shall be directional quadrilateral. The maximum operating time of the scheme including carrier/FOP transmitting/receiving time shall not be greater than 25 milli second even during minimum generating condition. The setting range of the relay shall be continuously adjustable and should be suitable for the line data

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furnished. The relay shall have four forward zones and one reverse zone. The relay shall be able to detect load encroachment. The relay shall have power swing blocking, single and three phase tripping and auto reclose features. The power swing blocking shall include choice of all standard/ Transfer trip modes available and the weak in feed tripping feature.

- i. Curves showing variation of operating time for faults in different parts of first zone, especially as the fault position approaches the cut-off point shall be furnished. Operating curves for different source to line impedance ratings shall be furnished. The operating time for Zone 2, Zone 3, Zone 4 and reverse Zone shall be continuously and independently adjustable from 0 to 3 seconds.
- ii. The maximum value of source impedance to line first zone setting impedance at which relays measure accurately shall be stated. The characteristic angle of the measuring element shall be continuously adjustable to match the line angle. Necessary adjustable compensation shall be provided for earth fault relay for correct measurement.
- iii. The protection shall operate instantaneously (SOTF) when circuit breaker is closed on to any type of faults on line.
- iv. The protection system offered shall be suitable to adopt PURCHASER's /Fibre optic communication system. Provision shall be made for receiving the FOP signal and tripping of the breaker. Carrier received annunciation shall also be provided. A carrier cut-off switch shall also be provided to make the carrier in-operative when required. Breaker failure protection commands shall trip remote end breaker by direct transfer trip through a separate channel distinct from the channel used for Main-I and Main-II protections.
- v. The Scheme shall have suitable relay to prevent mal-operation of distance protection scheme in the event of VT secondary fuse blowing out.
- vi. The distance scheme shall also incorporate necessary relay to energies auto-reclosing relays. Auto-reclosing of single pole on single pole tripping due to phase to ground faults shall be provided. Also, facility should be provided for Tripping and auto reclosing of three phases (after Synchro-check) for single phase to earth faults. A selector switch to make

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auto-reclosing scheme inoperative shall also be provided. Auto reclosure shall also be blocked when carrier is out of service.

- vii. For line protection, all the line protection related signals viz. Carrier send, carrier receive, DT send, DT receive, Differential Intertrip, Differential Comm fail, Differential OUT, Earth switch ON status etc shall be routed through differential fibre. There shall be at least 6 digital channels available in differential relay for configuring these signals through differential fibre to remote end relay.
- viii. Bidder to consider control cables for communication between relay panel and multiplexer panel along with services for terminating and testing.

B. Numerical FOP based Line Differential Protection 87L

- i. The relay shall be used with optical fiber. All relay supplied shall be capable of 3 terminal line differential protection.
- ii. Line Differential protection shall be a comparison type unit protection to detect phase and earth faults. As with all unit protection, Line differential scheme shall have an exactly defined zone of operation and tripping shall be without any intentional delay. Supervision facility for FOP shall be provided. The scheme shall not operate for the external faults.
- iii. The interfacing equipment for FOP signalling system required by above scheme shall form a part of protection system itself. As these protections are offering unit protection, it is also required that the protection system offered shall include equipment for both ends of the line. The price quoted shall be for the complete system. The detailed cost break up for the system shall be furnished in the Bid.
- iv. The scheme offered shall also be suitable for single phase tripping and reclose on phase to ground faults as in the case of distance protection. The BIDDER shall furnish technical particular of the system offered. Maximum operating time of protection shall be 25 milli second inclusive of carrier receipt and transmission.
- v. In the absence of FOP, the line differential protection shall be capable of providing Dir. O/C protection the pickup of which can be adjustable.

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- vi. Line differential protection shall be made inoperative when the line is transferred on Transfer breaker.
- vii. Line differential protection will be either on direct fibre Single mode or Multimode through Multiplexer as per the details given in Communication specification. The offered relay optical modules to support driving optical signal to the distance as given in the specification.
- viii. Bidder to consider communication networking accessories such as fibre cables, termination boxes (LIUs), patch cords, conduits and termination services.

C. Power Transformer / Reactor / ICT / Auto transformer Differential Protection 87T

- i. 87T shall be discrete relay having three winding biased differential for power transformer and 4 winding facility for ICT / Auto transformers.
- ii. 87T shall be a biased differential protection and shall be provided with 2nd & 5th harmonic restraint feature.
- iii. Transformer vector group and transformation ratio correction with different CT rated current (1A/5A) shall be settable inside the relays.
- iv. The relay shall have facility to detect CT saturation and open CT with settable blocking facility.

D. Over fluxing Protection (24)

- i. Over fluxing Protection: Over flux protection shall be provided based on Volts/Hertz measurement.
- ii. Overfluxing protection shall take input from LV bus to which transformer is connected.
- iii. Two definite – time and one selectable inverse time curve shall be provided. The inverse time element shall have a settable reset timer to account for thermal effects of repeated violation of the settings.
- iv. The overexciting protection shall operate properly over a range of 20Hz to 60Hz.

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E. High Impedance Differential Protection 64 REF for star winding

- i. The high impedance 64 REF shall be provided with a suitable stabilizing resistor and protective metrosil arrangement. The stabilizing resistor shall be settable over a suitable range like rheostat and shall have sufficient wattage rating.
- ii. This protection shall be provided phase wise in case of ICT, Reactors and auto transformers.

F. Numerical Directional Overcurrent & Earth Fault Protection (67 and 67N)

- i. In addition to Main protection, feeders/lines shall be protected by back up protection numerical directional Numerical (IDMT) over-current relay and earth fault relays.
- ii. It should derive zero sequence voltage and current internally for earth fault protection.
- iii. It shall have a setting range of 50 to 200%. Relay shall have Directional O/C and earth fault feature. The relay characteristic angles shall be settable between 0 to 360 degrees for both phase and earth fault.
- iv. The relay shall have all IEC/ANSI Characteristics with settable forward and reverse direction for all stages.
- v. The relay shall also include a high set instantaneous over-current unit with a continuously adjustable setting range of 500-2000% of rated current. The relays shall have fault disturbance recording and remote communicating facility.

G. LBBU Protection (50Z)

LBBU protection shall be part of main protection. In such a case it should be possible to initiate the built-in LBB protection by external trip relay contacts.

- i. LBBU shall be initiated by bay lockout relay and shall give trip signal to its own breaker and the breakers connected to the same bus, after predetermined time delay through busbar tripping relays.
- ii. The LBB protection gives tripping command to bus bar tripping relay only after ensuring that Main or any other protection has already operated.

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- iii. The relay shall be three phase having an operating time less than 20 milli seconds. The setting range shall be 5 to 100% of rated current. A time delay with a continuously adjustable setting of 0.1 to 1 sec shall be provided
- iv. The relay shall have a continuous thermal withstand capacity to carry two times rated current irrespective of the setting.
- v. The Protection shall be suitably designed for 1-ph as well as 3-ph auto-reclosing.
- vi. LBBU protection shall be provided with remotely operated IN/OUT command through IEC61850.

H. Numerical Non-Directional Over-current & Earth Fault Protection (50/51, 50/51N)

- i. Three phase Numerical (IDMT) over-current relay and numerical (IDMT) earth fault relays shall be provided for phase over-current and earth fault protection.
- ii. It shall have a setting range of 5 to 200%.
- iii. The relay shall have all standard IEC/ANSI characteristics.
- iv. The relay shall also include a high set instantaneous over-current unit with a continuously adjustable setting range of 500-2000% of rated current.

I. Numerical Bus Fault Protection

The bus bar arrangement will be as indicated in the respective single line diagram. The required bus bar differential scheme shall comprise of Numerical Bus Bar System for Z#1 and 2. The IED shall be configured accordingly. Also, the IED shall be suitable for incorporating all bays shown in respective SLD. Accordingly, trip relays with sufficient contacts to be provided bay wise.

The Bus bar protection IN/OUT shall have remote (IEC61850 command based) and local (Function key based) operating facility. Bus bar reset push button shall be illuminated type. End fault protection feature shall be provided.

The bus bar protection shall incorporate feature listed below.

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i. Numerical Bus Fault Differential Relay (87B) Operating Principles:

High speed, low impedance, biased differential relay with percentage bias characteristics and an adjustable setting range of 20% to 100% of the rated current per zone shall be provided. Operating elements on all three phases for both the schemes shall be provided and they shall operate for phase to phase and phase to earth faults. The operating time of the relay at 2 times of the pick-up setting shall not be greater than 15 milli seconds. The relay shall remain stable for external fault conditions and shall not operate on transients. CT saturation due to internal faults and external faults shall not affect the performance of the scheme. The relay shall accept CTs with different ratios. Minimum 16 binary I/P and 16 binary output relays with separate +ve and –ve terminals are required. This relay shall not operate due to normal load flow in the bus bars.

ii. Bus Fault CT Secondary Wiring Supervision feature shall be provided in 87B:

Bus bar protection shall get blocked in case of open / short-circuit on the CT secondary circuit. The alarm for the same shall be provided.

iii. Supervision of Auxiliary DC Supplies:

Supervision scheme shall be provided to supervise of all auxiliary DC supplies and the Scheme shall initiate annunciation on DC supply failure.

J. Overload Trimming

An overload (directional) trimming feature shall be provided for each line and transformer bay. 04 nos. self-reset type trip relays for each bay with flag indication shall be provided for load shedding. The relay shall be capable of 3 out of 3 logic. Local (through function key) and remote (through IEC61850 command) operated IN/OUT shall be configured for OLTS scheme.

K. Under frequency relay

The relay shall have:

i. Minimum no of Setting Group: 04 no

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ii. Minimum no of under frequency stages: 05 no (in each setting group)

iii. Minimum no of over frequency stages: 04 no (in each setting group)

iv. Minimum No of df/dt stages: 05 no (in each setting group)

Requirement of Load Shedding Scheme:

- a. There should be two different settings during normal operation and islanded operation.
- b. The settings shall change either automatically or from single SCADA command
- c. Each stages should have dedicated IN / OUT facility with remote selection.

Auto Restoration Scheme:

The Requirement of Auto Restoration Scheme is as below:

- a. Auto-restoration scheme is to be employed to arrest high frequency variations post islanding.
- b. First auto-restoration scheme should restore the load then the settings of islanded mode shall change over to normal mode
- c. The auto-restoration scheme will be active only for 60 Sec after islanding and it should restore the designated feeder only if that feeder is tripped on islanding.
- d. The load restoration should restore the load on over frequency and rising df/dt together. The restoration should be on three different frequencies.

L. Reverse Power Under frequency relay

Both reverse power and under frequency shall operate simultaneously in one IED.

The relay shall have settings in terms of active / reactive power in primary kW / MW OR in secondary mW / Watts OR in % terms. Power angle shall be settable in degrees from 0 to 360 degrees with step of 1 degrees. The pickup setting step possible shall be 0.1% of rated power or lesser. The stage shall be selectively kept ON / OFF with binary input. Reverse power operate time delay shall be settable between 0.1 to 6000 sec with step of 0.1 sec.

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Under frequency with fixed validation time window shall be settable with 45 Hz to 55 Hz window. The pickup step shall be 0.01 Hz. Under frequency operate time delay shall be settable between 0.1 to 6000 sec with step of 0.1 sec.

Total number of reverse power stages required = 04

Total number of under frequency stages required = 04

M. High Impedance bus fault protection 87HZ BB

- i. In high impedance bus fault protection panel, links for phase wise CT summation for required number of bays shall be made available. CT summation shall be done in bus fault protection panel.
- ii. The operating time of the IED at 2 times of the pick-up setting shall not be greater than 15 milli seconds.
- iii. The relay shall remain stable for external fault conditions and shall not operate on transients. CT saturation due to internal faults and external faults shall not affect the performance of the scheme.
- iv. The IED shall be capable of sensing phased wise bus fault with pickup current ranging from 5% to 100% of rated secondary current.
- v. For Zone-1 & Zone-2, dedicated relays shall be used. Apart from busfault relay, one blind zone protection relay shall also be provided for protecting unprotected zone between bus section breaker and CT.
- vi. The high impedance busfault protection shall be provided with phase wise variable stabilizing resistor and protective metrosil surge protection arrangement. The rating of stabilizing resistor shall be calculated based on CT details and station fault level with safety factor of 2.
- vii. Bidder shall submit the stabilizing resistor and surge protection rating calculations for Tata Powers approval during detail engineering.

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- viii. The IED shall have internal functionality for supervision of open / short / saturated / abnormal CT and shall block the bus fault protection upon sensing it. The CT supervision alarm for the same shall be provided.
- ix. Number of lockouts – Zone wise enough number of high speed (<5ms) latch type lockouts with suitable NO/NC contacts shall be provided. For each feeder at least 4NO & 1 NC contact shall be considered. Lockout supervision shall be provided for each of the bus fault lockouts.

N. General Requirements of Numerical Relay

Numerical relays shall have a data port for local access using a laptop / PC with Windows 10 or higher version software. The numerical relays of same OEM shall have common software version platform. Each relay shall have two dedicated inbuilt Fibre Optic (FO) port which can be used for SCADA applications and relay networking for downloading DR waveforms. The Communication protocol for SCADA shall be IEC61850 and it shall be capable to report with min. 5 clients.

Details of Numerical relay communication ports are as follows:

CommunicationFront: Ethernet port

Rear: Dedicated inbuilt Fibre Optic Port (FO) on IEC 61850 (for integration of relays for SCADA and integration with DRCA System local as well as central)

SNTP protocol support (from SCADA system) with Min.2 clients for Time synchronization.

O. General Relays

- i. Lockout / Tripping Relays (86)

High speed tripping relays shall be provided for trip functions of various protection schemes. The operating time of the relay shall not be more than 10 ms. The pick-up value of the relay shall be in the range of 50 to 60% of rated voltage. Healthiness of the each tripping relays shall be supervised by suitable tripping relay supervision relay. It shall be

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static type. The lockout reset type relays shall be provided with a local and remote reset facility. There should be an illuminated RESET pushbutton for local indication. The illumination lamp shall continuously withstand -20 to +10% rated DC voltage.

ii. Lockout supervision and Trip Circuit Supervision Relays (95)

Each bistable trip/lockout relay operate coil shall be supervised by a separate TSR relay. The TSR relay shall have 4NO contacts for annunciation. For trip circuit or breaker trip coil, pre-closing and post-closing breaker trip coil supervision shall be provided for all circuit breakers. One relay shall be provided for each trip coil and they shall be connected at the end of tripping loop. Action of the relay shall be annunciated. The relays shall have an inherent limit in time delay of 100 to 200 milli seconds to prevent operation due to transients. The relay shall operate satisfactorily for 80 to 110% of rated supply voltage. It shall be static type.

iii. DC Supply Supervision (80)

DC supply of each protection and alarm scheme shall be monitored by no volt relays. The relay on operation shall give annunciation.

Two DC feeders shall cater to DC power requirements for relay panel. Under normal circumstances, one set of trip circuits shall be supplied by one feeder and another set of trip circuit shall be supplied by the second feeder. For this purpose, two sets of DC busbars shall run for entire length of panels. Provision shall be made to feed the entire length of panel from one supply during outage of other supply by manual changeover. The BIDDER shall include the required equipment for the same.

iv. Carrier / Trip transfer relays:

Latched type bi-stable relays for Carrier, trip transfer, transfer breaker etc shall be provided. These shall have local as well as remote set / reset facility from SCADA. These relays shall have sufficient NO and NC contacts.

v. Automatic Self-Monitoring Facility:

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The relay shall have continuous automatic self-monitoring and alarming facilities. The above feature shall not affect the relay availability i.e. when an actual fault occurs in the system during the checking cycle, the above cycle shall be immediately interrupted, and the relay shall check and respond to the system fault. The system shall have the following visual indications for supervision of each command channel.

- a. Input activated at transmit end
- b. Command transmitted
- c. Command received
- d. Equipment in local loop test
- e. Equipment in remote loop test
- f. Test pass
- g. Test fail
- h. General alarm
- i. Equipment in synchronism

P. In-built Fault Distribution Recorder:

Disturbance record shall have 3 sec record time, 0.5 sec pre-fault and 10 memory record with internal/external triggering facility.

5.3.8. General Requirements for Relay Panels

Bidder shall supply standard panels of M/s Rittal make as per following specifications.

Sheet Metal Work

- a. The panel frame shall be fabricated using suitable mild steel structural sections of pressed and shaped cold rolled sheet steel.

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b. Thickness of material (CRCA) shall be 3 mm for load bearing members (front, base frame and gland plate) and 2 mm for non-load bearing members (Back, side, rear, top cover and bottom). Stiffeners shall be provided wherever necessary. The Panels shall be provided with MS Base frame Channel of 75 x 50 mm with anti-vibration pad.

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

d. Cut-Outs shall be without sharp edges.

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

Constructional Features

The panel shall be

a. Of the metal enclosed indoor, floor mounted, Simplex type (W = 800 / 900 mm, D = 800 mm, H = 2300 mm) with single door for front with a separate glass door and fixed rear side. All the devices shall be mounted on internal swing door at the front. The width 800 or 900 will be decided by Tata Power during finalization of internal and outer GA drawing during detail engineering based on ease of operation and maintenance and availability of space in the panel.

b. Made up of the requisite vertical sections suitable to provide a degree of protection of not less than IP 54 as per IS: 2147 when control cabinets are specified for indoor use.

c. Of self-cooled design with adequate louvers on both back doors. 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.

d. Provided with labels on the front and rear indicating the panel designation.

e. Provided with cable entry facilities and removable gland plates at required locations.

f. Provided with neoprene gaskets all-round the perimeter of covers, gland plates, removable covers and doors.

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g. Safety earthing with Tinned copper earth bus of 150 sq.mm (25mmX6mm). Two Nos. earthing terminals shall be provided at each end of panel to connect PURCHASER's earthing conductor.

h. Simplex type panel shall incorporate operating devices only in the front

i. Strip type space heaters of adequate capacity shall be provided for each panel. Heaters shall be complete with rotary type Auto ON-OFF thermal switch, a single pole MCB with overload and short circuit protection, link on the neutral and a thermostat to cut off the heaters at 45 deg C. The space heaters shall be covered with protective mesh. The panels shall have 240V, single phase, 50 Hz, 8 Watt LED light fixtures for interior illumination controlled by ON/OFF switches and 240V, 1 phase, 3 pin receptacles. Power source for interior lighting and receptacle shall be completely independent of control power source. LED type lamp shall be used for cubicle illumination.

j. Panel shall be designed in such a way that all component/ equipment's operate satisfactorily without exceeding their respective maximum permissible temperature rises under temperature conditions prevailing within the cubicles. Reference ambient temperature outside the switchgear cubicles is specified in the specifications.

k. Cable entries shall be from bottom. Suitable removable cable gland plate shall be provided on the cabinet for this purpose. Necessary number of cable glands shall be supplied/fitted on to this gland plate. Cable glands shall be screw-on type and made of brass.

l. Bottom and Gland plate details:

Bottom plate with two opening size 275 mm X 550 mm

Two gland plates of size 315 mm X 590 mm

m. 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 for,

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Exterior: shall be RAL7032, texture finish.

Interior: shall be White glossy finish

Base frame: Black semi glossy

Thickness: 80 Micron for powder coated

n. Each panel shall be provided with necessary arrangement for receiving, distributing, isolating and protection of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with MCBs. Supply monitoring arrangement shall be provided. Potential circuits for relaying and metering shall be protected by MCBs. MCBs shall have aux. contacts for monitoring.

Cabinet Internal Wiring

a. Control cabinets shall be supplied completely wired, ready for PURCHASER's external connections at the terminal blocks. Wiring shall be carried out with multi-stranded FRLS, 1100V grade PVC having oxygen index 29 and temp. index of 250 Deg. Wiring inside the panel shall be kept in plastic trays.

Following sizes of wires shall be used:

CT wiring	2.5 sq.mm	R / Y/ B / Black
PT Wiring	1.5 sq.mm	R / Y/ B / Black
DC wiring	1.5 sq.mm	Grey
1 ph. Ac wiring	1.5 sq.mm	R / Black
Ground	2.5 sq.mm	Green
Annunciation	1.5 sq.mm	Grey

b. All panel internal wires shall be connected at top of the TB or at the left side of TB in case of vertical channel mounting. The other side of the TB shall be left for field wiring. Enough depth and width of vertical and horizontal cable trays shall be provided considering bunch of external cable entry into panel. Cable tray lid shall properly close after routing field cables

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into panel. All wires terminated on relays and TBs shall be with sleeved ring type or 'O' type crimped lugs only. The cable tray carrying field cables shall be minimum 100x80mm size.

c. Ferrules should be provided for wires. Ferrules marked to correspond with the wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wires and shall not fall off when the wire is removed. Spare auxiliary contacts of the relays etc. shall be wired to terminal blocks. All wiring shall be terminated on terminal blocks using crimping type of tinned copper lugs. Insulated sleeves shall be neatly punched and cleaned without affecting access to equipment mounted within the cabinet. Wiring troughs shall be provided for vertical cabinet wiring and for interconnecting wiring between front and rear section of the cabinet.

d. 1.1 kV grade terminal blocks complete with insulated barriers, terminal studs, end plates, washers, nuts and locknuts and identification strips shall be used. All the terminal blocks shall be mounted horizontally on anodized channels at an angle to provide easy access at a height of minimum 250mm from the base. All the TBs shall be of disconnecting type, 1100 V Elmex make, 40 Amp, KLTD4 type. At least 20% spare terminal blocks shall be provided in each group (X1, X2 etc). Terminal blocks for control indication etc. shall be suitable for connecting at least two conductors of PURCHASER's cable of following sizes:

i. Potential and control : 2.5 mm² multistrand copper wire.

ii. CT circuits : 6 mm² multistrand copper wire

e. Terminal blocks shall be numbered for identification and grouped according to function. Engraved white on black labels shall be provided on the terminal blocks, describing the function of the circuit. There shall be a minimum clearance of 250 mm between the first row of terminal blocks and the associated gland plate. Also, the clearance between two rows of terminal blocks shall be a minimum of 100 mm. Terminal blocks shall be provided with transparent acrylic covers.

f. PURCHASER's external cable connections to the control cabinet will be carried out using 1.1 kV grade, stranded copper conductors, PVC insulated, PVC sheathed, armored and PVC jacketed cables. All necessary cable terminating accessories such as packing glands,

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crimp type tinned copper lugs, supporting clamps and brackets, etc. for PURCHASER's cables shall be included in Vendor's scope of supply.

g. For equipment supplied / to be supplied by the PURCHASER, the bidders shall provide suitable cutouts and wiring shall be done up to the terminal blocks as per purchasers requirement.

Labels

All door mounted equipment as well as equipment mounted inside the control cabinets 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 control cabinet as furnished by PURCHASER. Labels shall be made of non-rusting metal. Labels shall have white letters on black or dark blue background. Sizes of labels and lettering are subject to PURCHASER's approval.

Earthing Terminals

- a. Each control cabinet shall be provided with two separate earthing terminals suitable to receive PURCHASER's earthing conductors of size specified.
- b. 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 equal to that of the bus bar or equal to half the size of circuit load current carrying conductor, whichever is smaller.
- c. All instrument and relay case shall be connected to the earth busbar using 1100 grade PVC insulated 2.5 sq.mm stranded tinned copper earthing conductor.
- d. All hinged doors shall be positively connected to the earthing bus terminals, with the help of braided copper conductors of adequate size.
- e. All the earth connections to earth busbar shall be nut bolt type with washer. Screw type connection is not acceptable.

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6. LAYOUT REQUIREMENTS OF EQUIPMENT

5.1 The relay panels shall be designed for keeping it adjacent to each other. All the inter panel wiring, FO cables etc shall be facilitated from inside the panel with a proper rectangular cutout at the top side location. The cutout edges shall be properly insulated so that the edges do not damage the cables. The cables shall be bunched together with a PVC spiral guard.

5.2 The copper tinned earth strip of 25 x 6 mm size in each panel shall be located at the bottom of the panel. It shall have arrangement to connect with adjacent panels with the same dimension material strip on both sides. A suitable cutout shall be made at both sides of panel to make the earth busbar continuous.

5.3 Station specific layout arrangement is mentioned in the respective sections.

7. SAFETY AND OPERATIONAL REQUIREMENTS

7.1 Safety Requirements

All equipment, system and services covered under this specification shall comply with all latest applicable statutory regulations and safety codes in the locality where the Equipment is proposed to be installed. All equipments supplied shall conform to following electrical safety tests as per IEC 61010-1

- > Single fault condition assessment
- > Earth bonding impedance test Mechanical resistance to shock and Impact
- > Rigidity test
- > Impact hammer test

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> Protection against electrical shock Protection against the spread of fire

7.2 Performance Requirements

The performance test of complete Protection Panel installation under this specification shall be carried out at site as required to demonstrate the guarantees.

Purchaser will participate in all performance tests. The Bidder shall notify the performance test schedule two weeks in advance before carrying out the tests.

7.3 The performance test requirements are as follows:

Commissioning Tests

Trial operations and simulations

7.4 Any special equipment, tools and tackles required for the successful completion of the performance tests shall be provided by the Bidder.

7.5 The Bidder shall prepare all test reports, in which the methods followed, instrument readings, graphs, observations, results obtained etc. shall be recorded. Duly signed detailed report shall be submitted to Purchaser's approval within one week time.

7.6 In case of performance test results deviate from the guaranteed values including the specified tolerance, the Bidder shall correct his equipment at no extra cost and repeat the performance tests. Purchase may retain the option of rejecting the equipment, and in the case of such option of rejection being exercised, the Bidder shall replace the entire equipment with new one which will meet the guaranteed parameters.

7.7 PERFORMANCE & GUARANTEE TESTS

7.8 Combined Protection, Automation and Communication Factory Acceptance Test (FAT) shall be carried by Vendor at factory in presence of Inspection Engineer.

7.9 During FAT all the panels, relays, schemes etc shall be 100% tested, simulated and checked. It will be 100% FAT for all the panels. Bidder shall provide sufficient resources during FAT.

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7.10 Routine tests shall be carried out on all associated equipment as per relevant Indian Standards. Protection Panels shall be subjected to following tests:

a. Routine Tests:

b. High Voltage test (2000 Volts for 1 minute)

c. Detailed Testing of all IEDs, detailed scheme checks during factory inspection with approved configuration and load service settings.

d. Verification of wiring as per approved schematic drawings.

e. Type Tests:

7.11 Certified copies of all type test reports as per Indian Standards shall be submitted for approval before technical discussion.

a. Type Test report for IEDs

b. Temperature rise test on power circuits

c. Short time current tests on power circuits.

d. Mechanical Operation (Vibration) test.

e. Verification of the degree of protection as per IS: 2147.

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8 GUARANTEED TECHNICAL PARAMETERS OF EQUIPMENT INCLUDING DATA SHEET

Sl. No.	Description	Tata Power requirement	Bidder compliance
(I)	Relay Panels - General		
1.	Type of Panel (Simplex) with front opening, rear fixed & Rittal make	Yes	
2.	Applicable Standard IS /IEC	IS:2147	
3.	Sheet Steel (Hot Rolled / Cold Rolled)	Cold Rolled	
4.	Thickness of Sheet Steel		
a.	Base (in mm)	MS frame 3mm width and 75 x 50 mm size	
b.	Sides & Tops (in mm)	2mm	
c.	Front and Rear (in mm)	3mm	
d.	Base Channel Provided (Yes / No)	Yes	
e.	Anti-vibration pad provided	Yes	
5.	Degree of Protection Provided	IP54	
6.	Cable Entry (Bottom /Top)	Bottom	
7.	Thickness of Gland Plates (in mm)	3mm	
8.	Accessories Provided (Yes / No)		
a.	MCB for controlling 240 V AC of Panel	Yes	
b.	Cubicle Space Heater with Thermostat	Yes	
c.	Plug Point with ON-OFF switch	Yes	
d.	LED Lightening Fixture with cover and ON-OFF Lighting switch	Yes	
e.	Nameplates front and rear	Yes	
f.	Acrylic labels for each equipment	Yes	
g.	Overall Dimensions of each Panel (L x D x W)	800 / 900 x 800 x 2300	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
9.	Earthing Bus Material & Size	Tinned Copper 150 sqmm (25x6 mm)	
10.	Painting		
a.	Method of Painting	Metal Degreased Pickled Phosphated with two coats of each zinc chromate primer and synthetic enamel paint	
b.	Exterior Shade of Paint	RAL7032 Texture finish	
c.	Interior shade of Paint	White Glossy finish	
d.	Base frame shade of Paint	Black semi glossy	
e.	Thickness of paint	80-micron powder coated	
11.	Design Ambient Temperature	50 deg C	
12.	Terminal Blocks		
a.	Make & Model	Elmex KLTD4	
b.	Disconnecting type which falls with gravity	Yes	
c.	Voltage and Current rating	1.1 kV, 40 A	
d.	Molded inter-terminal barriers provided (Yes / No)	Yes	
e.	Max. conductor size & no. of conductors which each terminal can receive	Two	
f.	Terminal Numbering provided (Yes / No)	Yes	
g.	20% spare terminal provided in each panel each group (Group is X1, X2 etc)	Yes	
13.	Proper cutout provided at top of the panel with proper protection at all edges	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
14.	Internal Panel Wiring	Yes	
a.	Multi-strand copper wires provided (Yes / No)	Yes	
b.	Size & Color of CT wiring	2.5 sqmm R/Y/B/Black phase wise	
c.	Size & Color of PT wiring	1.5 sqmm R/Y/B/Black phase wise	
d.	Size & Color of DC Wiring	1.5 sqmm Grey	
e.	Size & Color of Annunciation Wiring	1.5 sqmm Grey	
f.	Size & Color of Earthing Wiring	2.5 sqmm Green	
15.	Control Voltage (in Volts)	As per station details in relevant sections	
16.	IED make shall be any of the three Vendors: Hitachi 650 (except REL650 for distance prot) and 670 series, Schneider (Micom 40 series), GE (MICOM series 40 and Multilin), and SIEMENS (Siprotec-4 & 5 Series) (YES/NO)	Yes	
17.	Substation Protection, automation and communication Vendor shall be one only. Bidders for the package shall be: Hitachi, SIEMENS and GE (YES/NO)	Yes	
18.	Each of the numerical relay has at least 5 nos of user configurable function keys	Yes	
19.	Each of the numerical relay has 20 nos of memory-based user configurable Set-Reset Flip Flops	Yes	
20.	Relay can take soft pulse type commands through IEC61850 for IN/OUT functionality	Yes	
21.	Louvers with wire mesh protection are provided on back doors of CRP	Yes	
22.	Trip relays and Auxiliary relay shall be Hitachi, GE make only (YES/NO)	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
	Relay Panels – Specific		
A.	110 / 220 kV LINE or TRANSFER BREAKER CRP panels		
a.	No. of Relay Panels per bay	1 nos	
b.	IED-1 and IED-2 of different OEM provided as per Table-1 specs. (Yes/No)	Yes	
c.	For 3-terminal lines, both Main-1 & 2 IED are capable of 3 terminal line differential protection (Yes/No)	Yes	
d.	For two terminal line, modular type of relay provided which can be converted into 3-terminal relay with additional software/hardware	Yes	
e.	Numerical IED-1 with TYPE-A Table-1 function's (Mention Relay Model / Order code / MLFB No and quantity)	Bidder mention to	
f.	Numerical IED-2 TYPE-A Table-1 function's (Mention Relay Model / Order code / MLFB No and quantity)	Bidder mention to	
g.	Wherever specified, the bidder is ready to match IED-1 & 2 with lines remote end IEDs	Yes	
h.	12 nos (6NO) Fast acting (<10 ms), flag type Single phase trip relays for Main 1 & 2 for single phase Auto reclosure requirement (Yes/No)	Bidder mention to	
i.	OLTS trip relay (02 nos with 14NO each) (Mention Make, model of aux relay)	Bidder mention to	
j.	Self reset type Direct trip send and Direct trip receive aux. relays (Per bay 2 set) (Mention Make, model of aux relay)	Bidder mention to	
k.	Control switch (TNC) for Breaker close open operation (Per bay 1 set)	Yes	
l.	Breaker status Close Red lamp & breaker Open Green lamp provided for each bay	Yes	
m.	DC supervision relay Provided (1 no. Per MCB group set)	Yes	
n.	Bkr TC-1 and 2 pre and post close supervision relay (Per bay 2 set)	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
o.	Bus PT Selection relay scheme (Per bay 1 set)	Yes	
p.	DC selector (Source-1/2/Independent) switch provided (Yes / No) (Per bay 1 set)	Yes	
q.	Bay Own / Transfer aux relay for transferring DTS/DTR, CS/CR etc (Per bay 2 set)	Yes	
r.	MFM meter of SATEC PM130EH Plus provided (Per bay 02 nos)	Yes	
s.	Transfer breaker bay relays are considered with 06 nos of setting groups	Yes	
B.	110/220 kV Bus Coupler / Bus section CRP panels		
a.	No. of Relay Panels for Bus Coupler bay	1 No	
b.	1 no. IED provided as per Table-1 specs (Yes/No)	Yes	
c.	IED with TYPE-B Table-1 functions (Mention Relay Model / Order code / MLFB No)	Bidder mention	to
d.	01 number Fast acting (<10 ms) Latched type trip relay + TSR + illuminated PB etc. (Mention Type of relay, Make & Model number)	Bidder mention	to
e.	Control switch (TNC) for Breaker close open operation (Per bay 1 set)	Yes	
f.	Breaker status Close Red lamp & breaker Open Green lamp provided for each bay	Yes	
g.	DC supervision relay Provided (1 no. Per MCB group set)	Yes	
h.	Bkr TC-1 and 2 pre and post close supervision relay (Per bay 2 set)	Yes	
i.	Bus PT Selection relay scheme (Per bay 1 set)	Yes	
j.	DC selector (Source-1/2/Independent) switch provided (Yes / No) (Per bay 1 set)	Yes	
k.	MFM meter of SATEC PM130EH Plus provided (Per bay 02 nos)	Yes	
C.	220-110/33 kV Auto Transformer / ICT CRP panel		
a.	No. of Relay Panels for per AT/ICT (2 nos.)	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
b.	IED-1, 2, 3 & 4 are provided as per Table-1 specs	Yes	
c.	IED 1 as per TYPE-C Table-1 functions (Mention Relay Model / Order code / MLFB No)	Bidder mention to	
d.	IED 2 as per TYPE-C Table-1 functions (Mention Relay Model / Order code / MLFB No)	Bidder mention to	
e.	IED 3 as per TYPE-C Table-1 functions (Mention Relay Model / Order code / MLFB No)	Bidder mention to	
f.	IED 4 as per TYPE-C Table-1 functions (Mention Relay Model / Order code / MLFB No)	Bidder mention to	
g.	06 nos (11NO/3NC) Fast acting (<10 ms) Latched type Trip relays for Gr 186A, B (110 kV), 286A, B (220 kV), 86 (LV-1) and 86 (LV-2) + TSR + illuminated Reset PB (Mention Relay make, Model, order code)	Bidder mention to	
h.	20 nos (8NO) High burden, Self reset flag type Fast acting (<10 ms) Trip relay relays for Transformer device trouble (Mention Relay make, Model, order code)	Bidder mention to	
i.	Control switch (TNC) for Breaker close open operation (one per breaker)	Yes	
j.	Breaker status Close Red lamp & breaker Open Green lamp provided for each breaker	Yes	
k.	OLTS trip relay (04 nos.) (Mention Make, model of aux relay)	Bidder mention to	
l.	DC supervision relay Provided (1 no. Per MCB group set)	Yes	
m.	Bkr TC-1 and 2 pre and post close supervision relay (Per breaker 2 x 3 = 6 set)	Yes	
n.	Bay Own / Transfer aux relay for transferring trip and related signals (Per bay 2 set)	Yes	
o.	MFM meter of SATEC PM130EH Plus provided (Per breaker 01 nos)	Yes	
D.	110/33, 110/22 kV Power Transformer (with one or two LV windings) CRP panel		

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Sl. No.	Description	Tata Power requirement	Bidder compliance
a.	No. of Relay Panels for per Transformer	2 nos	
b.	IED-1 & 2 of different make provided as per Table-1 TYPE-D specs. (Yes/No)	Yes	
c.	IED-3 of provided as per Table-1 TYPE-D specs.	Yes	
d.	IED 1 as per TYPE-D Table-1 functions (Mention Relay Model / Order code / MLFB No)	Bidder mention to	
e.	IED 2 as per TYPE-D Table-1 functions (Note: Even if the specific transformer has only one LV breaker, bidder shall provide LV-2 related protection for future expansion)	Bidder mention to	
f.	Both IEDs can be readily used as 3-winding differential relay	Yes	
g.	IED 3 as per TYPE-D Table-1 functions (Mention Relay Model / Order code / MLFB No)	Bidder mention to	
h.	4 nos (11NO/3NC) Fast acting (<10 ms) Latched type Trip relays for Gr A, B, LV-1 & 2 + TSR + illuminated reset PB etc (Mention Relay Model, order code)	Bidder mention to	
i.	20 nos (8NO) High burden Self reset flag type Fast acting (<10 ms) Trip relay relays for Transformer device trouble (Mention Relay make, Model, order code)	Bidder mention to	
j.	Control switch (TNC) for Breaker close open operation (Per bay 3 set)	Yes	
k.	Breaker status Close Red lamp & breaker Open Green lamp provided for each breaker	Yes	
l.	2 nos (14NO) OLTS trip relay (Mention Make, model of aux relay)	Bidder mention to	
m.	DC supervision relay Provided (1 no. Per MCB group set)	Yes	
n.	Bkr TC-1 and 2 pre and post close supervision relay (Per breaker 2 x 3 = 6 set)	Yes	
o.	Bay Own / Transfer aux relay for transferring trip and related signals (Per bay 2 set)	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
p.	MFM meter of SATEC PM130EH Plus provided (Per breaker 01 no)	Yes	
E. 110kV or 220kV Reactor			
a.	No. of Relay Panels for per Reactor	2 nos	
b.	IED-1 & 2 of different make provided as per Table-1 TYPE-I specs. (Yes/No)	Yes	
c.	IED 1 as per TYPE-I Table-1 functions (Mention Relay Model / Order code / MLFB No)	Bidder mention to	
d.	IED 2 as per TYPE-I Table-1 functions (Mention Relay Model / Order code / MLFB No)	Bidder mention to	
e.	4 nos (11NO/3NC) Fast acting (<10 ms) Latched type Trip relays for Gr A, B + TSR + illuminated reset PB etc (Mention Relay Model, order code)	Bidder mention to	
f.	20 nos (8NO) High burden Self reset flag type Fast acting (<10 ms) Trip relay relays for Transformer device trouble (Mention Relay make, Model, order code)	Bidder mention to	
g.	Control switch (TNC) for Breaker close open operation	Yes	
h.	Breaker status Close Red lamp & breaker Open Green lamp provided for each breaker	Yes	
i.	DC supervision relay Provided (1 no. Per MCB group set)	Yes	
j.	Bkr TC-1 and 2 pre and post close supervision relay (Per breaker 2 x 3 = 6 set)	Yes	
k.	Bay Own / Transfer aux relay for transferring trip and related signals	Yes	
l.	MFM meter of SATEC PM130EH Plus provided	Yes	
F. 110 / 220 kV GIS Bus Bar Protection			
a.	Low Impedance biased differential Type (Yes /No)	Yes	
b.	IED provided as per Table-1 TYPE-E specs (Yes/No)	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
c.	Busbar relay with number of bays shown in respective SLD + additional 4 spare bays considered for each bus differential application (Yes / No)	Yes	
d.	No. of Relay Panels	Minimum 2 or as per scheme requirement	
e.	IED Details (Mention Relay Model / MLFB No / order code)	Bidder to mention	
f.	Centralized or Distributed	Bidder to mention	
g.	End fault Protection feature with Auxiliary relays provided	Yes	
h.	LBBU function with externally trigger through BI provided	Yes	
i.	(Number of bays shown in SLD + 4 additional) (11NO/3NC) Fast acting (<10 ms) Latched type trip relays with + TSR + illuminated reset PB (Per bay 1 sets)	Yes	
j.	Suitable quantity, SCADA and manual operated bay zone selection scheme (Bay in Zone-1 or 2 or continuous zone) at appropriate stations necessary for scheme completion are provided	Yes	
k.	CT supervision operated lamp with reset push button provided for each zone	Yes	
l.	DC supervision relay Provided (1 no. Per MCB group set)	Yes	
G. 110 / 220 kV AIS Bus Bar Protection			
a.	Both Scheme-1 & 2 are based on low Impedance biased differential protection (Yes /No)	Yes	
b.	Scheme-1 & 2 with different make provided as per Table-1 TYPE-F specs (Yes/No)	Yes	
c.	Each Busbar relay with number of bays shown in respective SLD + additional 4 spare bays considered for application (Yes / No)	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
d.	No. of Relay Panels (2 nos for Scheme-1 with related aux/trip relays and 2 nos for Scheme-2 and related aux/trip relays)	4	
e.	Scheme-1 IEDs as per TYPE-F Table-1 functions (Mention Relay Model / MLFB No / order code)	Bidder mention to	
f.	Scheme-2 IEDs as per TYPE-F Table-1 functions (Mention Relay Model / MLFB No / order code)	Bidder mention to	
g.	Scheme-1 IEDs Centralized or Distributed	Bidder mention to	
h.	Scheme-2 IEDs Centralized or Distributed	Bidder mention to	
i.	End fault Protection feature with Auxiliary relays provided for both IED-1 & 2	Yes	
j.	LBBU function with externally trigger through BI provided in each IED-1 & 2	Yes	
k.	For Scheme-1: Per bay 1 set (11NO/3NC) Fast acting (<10 ms) Latched type trip relays with + TSR + illuminated reset PB	Yes	
l.	For Scheme-2: Per bay 1 set (11NO/3NC) Fast acting (<10 ms) Latched type trip relays with + TSR + illuminated reset PB	Yes	
m.	Suitable quantity, SCADA and manual operated bay zone selection scheme (Bay in Zone-1 or 2 or continuous zone) at appropriate stations necessary for scheme completion are provided	Yes	
n.	CT supervision operated lamp with reset push button provided for each zone each IED	Yes	
o.	DC supervision relay Provided (1 no. Per MCB group set)	Yes	
H.	Under Frequency Load Shedding Scheme CRP panel		
a.	No. of Relay Panels (1 no)	1 no	
b.	No. of protection IEDs for UFLS offered	1	
c.	IED provided as per TYPE-G Table-1 spec (Yes/No)	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
d.	IED with TYPE-G Table-1 functions (Mention Relay Model / MLFB No / order code)	Bidder to mention	
e.	No. of Trip relays offered (08 nos high burden, self-reset, flag type RXMH2 or Equivalent 6NO each) Shall be self-reset type	Yes	
f.	Auto restoration scheme as given in the specs considered (Yes/No)	Yes	
g.	DC supervision relay (1 no. per MCB group)	Yes	
I.	110/220 kV Reverse power under frequency CRP panel		
a.	No. of Relay Panels	1 no	
b.	IED-1 & 2 offered as per TYPE-H Table-1 specs	Yes	
c.	IED-1 with TYPE-H Table-1 functions (Mention Relay Model / MLFB No / order code)	Bidder to mention	
d.	IED-2 with TYPE-H Table-1 functions (Mention Relay Model / MLFB No / order code)	Bidder to mention	
e.	Latched type trip relay (4 nos) with 14 contacts + TSR + illuminated reset PB	Yes	
f.	DC supervision relay (1 no. per MCB group)	Yes	
J.	High impedance bus fault protection		
a.	No. of Relay Panels	2 no	
b.	Number of IEDs (Zone-1, 2 & Bind zone)	03 nos	
c.	Scheme has considered each Busbar relay with number of bays shown in respective SLD + additional 4 nos spare bays	Yes	
d.	Zone-1 IEDs as per TYPE-J Table-1 functions (Mention Relay Model / MLFB No / order code)	Bidder to mention	
e.	Zone-2 IEDs as per TYPE-J Table-1 functions (Mention Relay Model / MLFB No / order code)	Bidder to mention	
f.	Blind zone IEDs as per TYPE-J Table-1 functions (Mention Relay Model / MLFB No / order code)	Bidder to mention	
g.	CT supervision operated lamp with reset push button provided for each zone each IED	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
h.	DC supervision relay Provided (1 no. Per MCB group set)	Yes	
i.	Suitable number of lockouts are provided (4NO+1NC per feeder)	Yes	
j.	Variable stabilizing resistor range considered as per specs	Yes	
(III)	Other		
1.	Warranty for 5 Years from supply of material (including IEDs, Trip and Auxiliary relays) (Yes/No)	Yes	
2.	Any additional number of IEDs, Aux relays etc for proper completion of scheme is considered by bidder during bid stage itself	Yes	
3.	Offer given as per specification and datasheet for CRP panel System and no deviation taken (Yes/No).	Bidder to mention	
4.	Protection Panel integrated FAT for 100% of panels shall be carried out with approved relay configuration and load service relay setting. (Yes/No)	Yes	
5.	3 terminal line differential 87L protection Communication architecture with BOM considered for all 220 / 110 kV lines (Yes/No)	Yes	
6.	DRCA system with industrial PC and its related accessories, LIU, switches, patch cords etc as mentioned in Automation specs considered per station	Yes	
7.	Type Test Report Submitted for all IEDs (Yes/No)	Yes	
8.	Bidder Meets Qualification Requirement given in Specs (Yes/No)	Bidder to mention	
9.	Preferred Vendor List: Deviation taken (Yes/No)	Bidder to mention	
10.	One Laptop per substation: HP make, 16GB RAM, 500GB SSD, Core i7, 2 USB ports, 1 HDMI port, 9-pin serial port along with standard accessories and laptop carrying bag (1 number per receiving station)	Yes	

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Sl. No.	Description	Tata Power requirement	Bidder compliance
11.	All relay software's along with relevant data models, Gera types and connectivity packages are pre-installed in the laptop	Yes	
12.	In case of licensed software, bidder agrees to provide at least 10 nos of licenses or as many number of IEDs whichever is higher for purchasers use	Yes	
(IV)	Spares		
1.	01 nos of each type, model number, order code, MLFB IED per substation as lose spare relay shall be supplied	Bidder to supply	
2.	01 nos per substation, high speed (11NO/3NC) (<10 ms) latched type lockout + TSR + Push button shall be supplied	Bidder agrees	
3.	01 nos per substation of high speed (4NO) (<10ms), flag type self-reset type relay shall be supplied	Bidder agrees	
4.	01 nos per substation trip coil supervision relays shall be supplied	Bidder agrees	
5.	01 nos per substation of transformer trouble trip high burden relays (8NO), flag type shall be supplied	Bidder agrees	
6.	01 nos per substation of OLTS trip (14NO) type relays shall be supplied	Bidder agrees	
7.	01 nos per substation of TNC switches shall be supplied	Bidder agrees	
8.	01 number per substation of PT selector switch scheme set shall be supplied	Bidder agrees	
9.	01 nos per substation RED & GREEN lamps for breaker status monitoring shall be provided	Bidder agrees	
10.	1 nos per substation of SATEC make 130EH Plus model meter shall be supplied	Bidder agrees	

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9 QUALITY REQUIREMENTS (QAP & SQP)

9.1 To ensure that a well-engineered and contractually compliant system is produced, **Bidder shall adhere to Approved Tata power SQP** for the preparation of all contract deliverables. The program shall provide for early detection of actual or potential deficiencies, timely and effective corrective action, and a method of tracking all such deficiencies.

9.2 QUALITY REQUIREMENTS: Bidder to prepare and submit Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) for approval of Owner to ensure that a well-engineered and contractually compliant system is produced. The program shall provide for early detection of actual or potential deficiencies, timely and effective corrective action, and a method of tracking all such deficiencies.

9.3 Tata Power Standard Quality Plan (SQP) and Field Quality Plan (SFP) are attached with this specification defining minimum inspection and testing requirements during shop and site inspection respectively. Bidder to ensure that these requirements are compiled in MQP and FQP submitted for approval.

Factory Acceptance Test (FAT)

a) The FAT at factory shall be done with simulation, testing of relays, scheme checks on 100% of panels including automation and communication products. The vendor shall provide enough resources if owner sends more than one team for simultaneous inspection of number of panels.

b) Owner approved MQP shall be referred for shop inspection. The purpose is to ensure that the Bidder has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab.

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- c) The purpose of Factory Acceptance Testing is to ensure trouble free installation at site. Prior to release for shipment of the equipment the Purchaser or his representative will witness Factory Acceptance Test (FAT) in which the system is checked against the specifications.
- d) Type and routine tests certificates shall be furnished. Tests for components shall be as per relevant standard specifications and approved MQP.
- e) System tests shall be performed on the completely assembled system. Type, routine and optional tests covered in the approved MQP and this specification shall be conducted in addition to the system tests.
- f) Bidder shall incorporate all FAT comments prior to despatch. After Bidder confirms that all changes have been incorporated, Purchaser's Office will issue Despatch Clearance.
- g) The Test Reports as well as Test Certificates of OEM, third party, Bidder shall be submitted for approval / verification.
- h) FAT and Despatch Clearance by the Purchaser shall not relieve the Bidder from complete responsibility for the total system and its performance subsequently.
- 10 INSPECTION, TESTING AND PERFORMANCE REQUIREMENTS ALONG WITH WARRANTY
- a) Bidder should follow owner approved MQP and specification requirements.
- b) All type test reports of IEDs, aux relays and all equipment's installed in CRP panel as per IEC & IS standards mentioned specs in the shall be submitted for purchaser review along with technical bid.

Performance Guarantee Parameters

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CONTROL AND RELAY PROTECTION SYSTEM FOR SUBSTATION AND ASSOCIATED EQUIPMENTS		

- a) Satisfactory operation of the system offered shall be guaranteed for 5 years from the date of taking over of system by purchaser after SAT including trouble-free & intervention-free operation.
- b) Bidder shall undertake to repair or replace any part, which is defective or unequal to the rated duties due to faulty materials, design or workmanship.

Warranty

- a) Bidder shall warrant that the equipment hardware is free of defects in material and workmanship or faults in design, in so far as the equipment fails to meet the requirements of this technical specification, for a period of 60 months from the date of final acceptance by the purchaser after completion of 30 days trouble free operation.
- b) With respect to defects in equipment part, Bidder's liability is to make good by replacing the faulty equipment. It is the responsibility of the Bidder to replace the faulty equipment within 30 working days.
- c) The Bidder will cover the cost associated with the shipping of defective or failed items during warranty period. The new equipment, parts shall be delivered free of charge.
- d) Bidder shall extend all warranties / guarantees to the purchaser, provided by sub-Vendors, of duration longer than that in this specification

11 MANDATORY SPARES

Bidder to provide substation wise list of Mandatory spares required for trouble free operation of CRP panels, if any.

12 TOOLS AND TACKLES

Bidder to provide relevant tools and tackles for condition monitoring / maintenance of CRP panels, if any.

13 DATA SUBMISSION BY BIDDER

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12.1 Tender Purpose

Bidder shall submit the following information along with the Technical Bid of Sub-Station Protection and Automation Specific Submissions

12.1.1 Bidder shall provide the technical offer including data sheets, architecture etc., of hardcopies and soft copies for the technical evaluation. All datasheets of the BOM items shall be enclosed along with the technical offer. **In absence of technical data sheet, architecture drawing, detailed bill of material, detail GTP etc, the offer submitted by the bidder may not be considered.**

12.1.2 Dully filled in schedules, listed in section 'C'.

12.1.3 Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP)

12.1.4 System Architecture Drawing

12.1.5 Catalogues of the equipment's offered

12.1.6 The attached Bill of Materials (BOM) and datasheets enclosed with the specification are indicative. The Bidders are expected to submit the detailed BOM mentioning the quantity, make, model and warranty.

12.1.7 Product life cycle document for all supplied equipment.

12.1.8 Confirmation on lifetime, spares, manufacturing, onsite & Offsite technical support of the supplied equipment for the next 15 years

12.1.9 List of major relevant experiences of the Principal, Collaborator and the Product respectively.

12.1.10 Technical support facilities including qualified man-power, testing tools and instruments and integration facilities available within India.

12.1.11 The Bidder shall give an undertaking to provide full range of local services (including hardware and software maintenance, modifications and upgrade support) for the life of the delivered Sub-Station Automation system including Communication interfaces.

12.1.12 Bidder to submit all relevant test certificates for evaluation

12.2 After award of Contract

The following documents shall be submitted for Purchaser's approval during detailed engineering through Wrench system (Web based system of TATA Power). All drawings will

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be reviewed, commented and approved by TATA Power through Wrench system. Bidder shall nominate document manager for this activity and TATA Power will provide training on the same.

12.2.1 System Architecture Drawing

- a. Network connections
- b. Protocol used
- c. Type of interconnecting cable
- d. All IED's, workstations, gateways, network switches, etc.

12.2.2 Panel GA and Complete wiring diagram along with Trip matrix

12.2.3 Finalization of relay settings and configuration in consultation with Tata Power representative as per approved drawing and scheme

12.2.4 Detail Bill of Material listing; equipment designation, make, type ratings, etc. of all the equipment's supplied

12.2.5 Hardware and Software Specification & Manuals for all the equipment supplied including that of Third parties

12.2.6 Functional Design Document, Guaranteed technical, availability and reliability parameters

12.2.7 FAT & SAT procedures

12.2.8 DRCA I/O List as configured with address details

12.2.9 Interconnection Schedule (ICS) - Protection, Automation and Communication

12.2.10 All interoperability tables

12.2.11 Calculation for power supply, fuses/MCB, stabilizing resistors etc.

12.2.12 Logic Diagram (Hardware & Software)

12.2.13 Technical / Operator's Manual

12.2.14 IP addressing chart for all the IED's, network switches which are connected to the network

12.2.15 Other documents as may be required / applicable during detailed engineering

12.2.16 All drawings and data shall be annotated in English.

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	CONTROL AND RELAY PROTECTION SYSTEM FOR SUBSTATION AND ASSOCIATED EQUIPMENTS	

- 12.2.17 Bidder shall furnish four (4) hardcopies (plus 3 soft copies on reliable media) of all drawings along with manuals (Administration, Operation & Maintenance, Troubleshooting and Installation), Technical catalogues, Test Certificates and Acceptance Test Reports along with delivery.
- 12.2.18 Two copies of the internal test report, FAT and SAT documents with test protocol formats shall be submitted for approval. Approved FAT and SAT documents are one of the prerequisites of commencement of FAT and SAT. Bidder shall also furnish Original plus one copy of all System Software (OS and standard RTU/Gateway and other related software) along with delivery.
- 12.2.19 Bidder shall submit the final as built drawings & documents on AutoCAD & PDF format.
- 12.2.20 All licenses shall be valid for the entire lifecycle of the system supplied.
- 12.2.21 This list is indicative and will be finalized post award before the start of detailed engineering as MDL (Master Document List).

Annexure-1

Bidders Prequalifying Requirements for Protection, Automation & Communication System


S No	Parameter	Tata Power Requirement	Documents To be submitted by Vendor to ascertain meeting of Pre-qualification requirement
1	2	3	4
1	Infrastructure	Bidder must be an OEM of Protection relays, Sub-station Automation and Communication system, having manufacturing facility / assembly in India.	Self-undertaking to be submitted in this regard. Tata Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.
2	Supply and Experience	<p>The bidder should have supplied minimum 20 nos. Protection, Automation and Communication systems for 110 kV and above sub-stations with at least 10,000 Input-Output Points (of Gateways) for each project. The system supplied should have been in satisfactory commercial operation for a minimum period of 05 years as on scheduled date of the bid opening.</p> <p>Bidder shall offer latest software on open architecture and should have supplied these at least for 5 projects in last 2 years. Protection and Sub-Station Automation must be from the same OEMs.</p> <p>Indian Subsidiaries of global companies having plant in India are also eligible to bid if the qualification requirements stated above are met independently or in combination with the parent company. Declaration from parent company needs to be submitted.</p>	<p>Supply List & Performance Certificates from the utilities / clients</p> <p>Self-undertaking to be submitted in this regard. TATA Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.</p>
3	Type Test	<p>The bidder shall submit Type test reports obtained from NABL/ International Accredited Lab for the equipment / material offered. The type tests should have been conducted on the equipment / material of the same design.</p> <p>The type tests should have been conducted within 5 years prior to the date of bid opening. Time period for type test may be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC).</p> <p>In case the type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, then 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 despatch of the equipment / material.</p>	<p>Type Test Report.</p> <p>Undertaking that there is no change in design / material of construction (MOC) if Type Test Report older than 5 years but less than 10 years prior to date of bid opening has to be considered (if applicable)</p> <p>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 despatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, (if applicable)</p>
4	Commercial Capability	[REDACTED]	Copy of audited Balance Sheet and P&L Account to be submitted in this regard.
5	EPC Experience (if applicable)	<p>In case the package involves installation & commissioning of the equipment / material, then the bidder shall have the following experience:</p> <p>a) He should have successfully completed one single order of value (80% of estimated value of similar work in last three years) OR</p> <p>b) He should have successfully completed two single orders of value (50% of estimated value of similar work in last three years) OR</p> <p>c) He should have successfully completed three single orders of value (40% of estimated value of similar work in last three years).</p>	Performance Certificates from the utilities / clients

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Arshad 20/2/20

TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing				
TPQAIT-QAXX-00-EX-SQP-083 REV.0	STANDARD QUALITY PLAN FOR RELAY PROTECTION and AUTOMATION PANEL		Date of Issue:		
<p>STANDARD QUALITY PLAN FOR RELAY PROTECTION and AUTOMATION PANEL</p>					
		<i>R. K. Raju</i> 06/09/2015	<i>CRB</i> 6/9/2015	<i>SGP</i> 6/9/2015	
0	Initial Submission.	RP	CRB (Head QAI- E)	SGP Chief (QAIT)	
Revision No.	Reason for revision	Prepared By & Date	Checked By & Date	Approved By & Date	Issued by & Date
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The Tata Power Company Limited
Corporate Engineering-Quality Assurance Inspection & Testing



TPQAIT-QAXX-00-EX-SQP-083
REV.0

**STANDARD QUALITY PLAN FOR
RELAY PROTECTION and AUTOMATION PANEL**

Date of Issue:

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED		TYPE / METHOD OF CHECK	REMARKS
1	2	3		4	5
1.0	Raw Material:	(Generally in-line with technical specification, drawing and datasheet)			
1.1	CRCA/ HRCA Sheet steel	1	As per IS 513 & approved specification	Test to be carried out by component supplier, TCs to be reviewed by main supplier.	All items TCs to be reviewed by main supplier and to be submitted to TATAPOWER as per requirement.
1.2	IEDs / Numerical relays, (Auxiliary relays, Tripping relays, Trip circuit supervision relays).	1	Type, Rating, Size, Functional test, Software licenses for IEDs, Engineering & Maintenance tools as per approved specification and relevant standards.	Checks To be carried out by Main Supplier.	
1.3	Transducer, Indicating meters (Analog / Digital), Multi Function energy Meter, Cable, Push button, Switches, Annunciations, Test Switches, Hooter, Electronic bell etc.	1	Checks as per Relevant Standards & Specifications	Accuracy test to be carried out by component supplier, TCs verification and visual checks to be done by Main Supplier.	
1.4	CPU, Monitor, Gateway, Disturbance Recording System, Network Switch, Remote terminal unit, BCU, BCPU, Interface modules, Power supply module, Temperature scanner, DC to DC converter, fibre optic cable/ Patch cords, Printer, Modem , Line Interface Unit, Communication converter	1	Visual checks, Type , Rating, Model no, Hardware specification checks, software specification checks & power ON / boot test for CPU, Functional checks including power consumption check for RTU. Software licenses for RTU, Gateway, BCU, BCPU, Engineering & Maintenance tools and Disturbance Record System	Checks to be carried out by main supplier.	
2.0	INPROCESS INSPECTION: (Generally in line with manufacturer standard)				
2.1	Panel Fabrication	1	Dimensional Conformity, Bend Angle, Profile, Deburring & slag removal.	Test to be carried out by panel manufacturer, Verification by main supplier.	Verification of records by TATA POWER.
		2	Surface preparation checks		
		3	Surface Finish, Paint Shade, Finishing, Coating thickness.		
2.2	Panel Assembly test	1	Wiring checks, panel assembly checks as per drawing.	Test to be carried out by main supplier.	
		2	Visual & Dimension checks.		
		3	BOM checks, component lay out checks as per manufacturing drawing		

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS	
1	2	3	4	5	
3.0 FINAL TESTING: (Testing & Measurement as per IS 8623-1/2/3 by main supplier)					
3.1	Routine Tests	1	Visual, Dimension, Paint shade checks and Mounting of all equipment w.r.to GA, BOM, Rating, Type, Make of components, Model no.	As per drawing	Customer Hold Point. (All fully assembled panels shall be lined up for the final testing)
		2	Metal sheet thickness, Coating thickness measurement	TC verification	
		3	Verification of wiring, terminals, lugging, Ferruling, Continuity Check, Metallic tag plate, Colour coding of wires & TB, Earthing, Fuses.	Testing & Measurement as per scheme requirement, relevant standards & specification. (By Main supplier)	
		4	Logic & Functional checks- Sequential Operation (for set of panel, interpanel wiring shall be completed as per scheme)		
		4.1	Configuration checks of IEDs		
		4.2	Integrated checks for Protection and Automation (SAS) as per approved configuration.		
		4.3	Logic checks for control circuit with all interlocks - Local Control		
		4.4	Logic checks for control circuit with all interlocks - Remote Control		
		4.5	Functional checks for supervision and measurement circuit.		
		4.6	Functional checks for indication and annunciation circuit.		
		4.7	Functional checks BCU, BCP, RTU, Gateway and DR System.		
4.8	Functional test for door limit switch, thermostat, heater circuit & auxiliary circuit.				
4.9	Functional check for time synchronization of gateway, DR System and IEDs.				
4.10	Event, DR, IO checks, from protection to SCADA terminal.				
5	Secondary injection tests on relays, meters, transducers				
6	Insulation resistance test on power & control circuits				
7	High voltage test on power & control circuit. (2 kV for 1 min between all terminals & earth)				
8	Integration test for Relays, MFM (Multi Functional Meters), Condition Monitoring IEDs & SAS on open communication protocol				
9	Check communication with DCS or SCADA system for remote operations.				
10	TTB checks, wiring gauge check for CT & PT wires, super flexible cable verification.				
11	Earthing continuity checks with earth Bus bar and earthed apparatus.				



The Tata Power Company Limited
Corporate Engineering-Quality Assurance Inspection & Testing




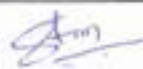
TPQAIT-QAXX-00-EX-SQP-083
REV.0

**STANDARD QUALITY PLAN FOR
RELAY PROTECTION and AUTOMATION PANEL**

Date of Issue:

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED		TYPE / METHOD OF CHECK	REMARKS
1	2	3		4	5
3.2	Performance and Acceptance test	1	Redundancy requirement with a given communication architecture.	Testing & Measurement as per scheme requirement, relevant standards & specification.	
		2	Scheme acceptance based on IEC 61850 Goose messaging.		
		3	Response time in a worst loading condition.		
		4	Sequence of event logging, Disturbance Recorder collection & time synchronization.		
		5	Remote monitoring of relay parameterization and DR collection.		
		6	Inter operability test (if applicable)		
3.3	TYPE Test	1	IP Degree Verification as per IEC 62271-200 clause no 6.7.1	TC verification as per specific IEC/IS standard. Tests to be conducted as per mutual agreement	Valid TYPE tests certificate not older than 5 year is pre-requisite.
		2	Any other special / type test as per technical specifications		
Any Separate Type/ Design validation tests shall be carried out in accordance with TATA POWER specification/ PO or as per mutually agreed in MQP.					
4.0	Document review & issuance of IRN				
4.1	PACKING & PRE-SHIPMENT.	1	Visual Verification.	Measurement & Visual by Main supplier	
		2	Quantity Verification & Packing in cartons		
		3	One hard copy of the as built drawing along with shipping		
		4	Identification.		
4.2	DISPATCH.	Issue of Release note / MDCC.		Customer Hold Point.	
NOTE	A) ALL MATERIAL SHALL BE AS PER APPROVED DRAWING/ DATA SHEET.				
	B) STATUTORY REQUIREMENTS WILL BE COMPLIED BY THE CONTRACTOR.				
	C) TATA POWER / ITS REP IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED, IF REQD, SAME SHALL BE TRANSFERRED BY TATA POWER / ITS REP ONLY FOR MATERIAL TRACEABILITY.				
	D) FINAL INSPECTION OF THE MAJOR ACTIVITIES ARE WITNESSED BY CLIENT AND IT IS HOLD POINT (AT THE DISCRETION TATA POWER)				
	E) MANUFACTURER SHALL PREPARE AND SUBMIT COMPLETE MANUFACTURING QUALITY PLAN IN PRESCRIBED FORMAT OR THEIR REGULAR FORMAT INDICATING THEIR REGULAR PRACTICES, TAKING CARE OF MINIMUM REQUIREMENT AS INDICATED ABOVE.				
	F) INSPECTION OF THE MAINTAINCE SPARES SHALL BE OFFERED ALONG WITH THE MAIN SUPPLY AS PER THE INSPECTION STAGES OF 1 TO 4.				
	G) CALIBRATION CERTIFICATES OF THE EQUIPMENT USED FOR TESTING SHALL BE PROVIDED FOR REVIEW.				
	H) TATA POWER RESERVES THE RIGHT TO DEMAND / VERIFY/ AUDIT/ WITNESS ANY OF THE CHECK POINTS MENTIONED IN THE SCOPE OF SUPPLIER.				
	I) AS PER SPECIFICATION PROPER PAINTING & PACKING SHALL BE ENSURED BY VENDOR BEFORE SHIPMENT TO AVOID ANY TRANSIT DAMAGE.				
Meant for (Internal Circulation / External – Stakeholders Circulation)					

TATA POWER		The Tata Power Company Limited Corporate Engineering-Quality Assurance & Inspection		 TATA	
TPQA&I-QAXX-00-EX-SQP-371 REV.0		STANDARD QUALITY PLAN FOR SCADA SYSTEM.		Date of Issue: 15-10-2018	
Sr. No	COMPONENT / OPERATION	CHARACTERISTICS TO BE CHECKED	TYPE / METHOD OF CHECK	REMARKS	
1	2	3	4	5	
1.0 MATERIAL: (As per technical specification/ drawings/ approved data sheet).					
1.1	Sheet Steel, CRCA	Thickness, dimensional, surface finish, bend test/ mechanical tests & Chemical Analysis.	MTC & Report verification as per approved datasheet/ specification & inward material inspection by system supplier.	Correlated manufacturer TC & Inspection report verification by Tata Power.	
1.2	Server, Ethernet switch, HMI, Workstation, Terminal Server, RTU, BCU, Gateway, Interposing Relays, Firewall, Multi-Function Meters, Media Converters & Power supply.	1. BOM verification, 2. Configuration checks, 3. Warranty clauses. 4. Cyber security checks (wherever applicable).			
1.3	Control Cables & its accessories.	Type & rating of cable, Color check, No. of Strands , Conductor resistance, shielding, dimensional checks, HV test, Insulation resistance; FRLS tests.			
1.4	Fibre Optic Cable, Patch Cords, Fibre Optic Termination equipment and Fibre Management Panel.	Wavelength, Type (SM/MM), Length, Interface Ports.			
1.5	Fibre Multiplexer, Protection Coupler, PLCC, WAN Network Switch.	BOM verification, Configuration and Functional checks			
1.6	GPS system (As applicable)	Type & Make. Range & Functional checks.			
2.0 INPROCESS INSPECTION: (Generally in line with manufacturer standard).					
2.1	Cabinet Assembly of system.	Visual & Dimensional checks. Check for Mounting of components, labeling, dressing, ferruling & wiring continuity, gland plate installation and earthing. Check compatibility of interface modules & SCADA system. HV test on internal wiring at 2kV & IR test.	Testing & Measurement to be carried out by manufacturer.	Verification of Records by Tata Power.	
3.0 FINAL TEST & INSPECTION: (As per approved drawings/ data sheet, technical specification and relevant standards) - Customer Hold Point (CHP)					
3.1	Acceptance Test	BOM, Visual & Dimensional checks. Check for panel thickness, paint shade & thickness, ferruling, continuity, color coding of panel wires & Terminal Blocks. Check for isolation between electronic component grounding & panel grounding. Check for power up sequence test. Check behaviour of modules during UV or O/V. System architecture & configuration check for server, its license, Hardware components, DR (Disturbance Recorder) collector & DR analysis system, firewall, power supply and other interface modules. Functional & Integration tests for hardware & software operations. Check for integrated testing of IEDs (Intelligent Electronic devices) with Gateway.	Testing & measurement as per approved GA drawing, specification/ datasheet/ FAT procedure.	CHP	



	Acceptance Test	Verification of database as per I/O list, interlock logics, etc. Check Time synchronization of SCADA system (including HMI & ethernet switches), IEDs & Gateway with GPS system. Check time stamping of alarms & events. Check for Mimics & Displays, Reports & Trends. Check for redundancy of SCADA & communication system. Check for IED parameterization (i.e. communication & configuration of IEDs through softwares). Simulation for verification of specified automatic download of DR to DR collector.	Testing & measurement as per approved GA drawing, specification/ datasheet/ FAT procedure.	CHP
3.2	Type tests	1. IP class for the enclosure, 2. Burn-in test / System to run for 48hrs. 3. Compatibility test of H/W & S/W for Gateway, SCADA, Communication system & IEDs. 3. Protocol (PICS, MICS (Protocol & Model Implementation Conformance Statement) documents for IEC 61850/MODBUS/IEC103/IEC104 compliance) compatibility test for Gateway & IEDs.	Verification of TC/ as indicated in specifications.	Valid type test certificates not older than 5yrs. To be submitted.
4.0 QUALITY DOSSIER:				
4.1	Document Review & Issuance of IRN	Review of Quality Dossier along with Index & software licence.	Customer Hold Point (CHP)	
<p>N O T E</p> <p>A) STATUTORY REQUIREMENTS SHALL BE COMPLIED BY THE CONTRACTOR. B) THIS DOCUMENT IS INDICATIVE & IS WITH MINIMUM QUALITY CHECKS. ANY ADDITIONAL CHECKS/QUALITY REQUIREMENT (INCLUDING ADDITIONAL TYPE/ DESIGN VALIDATION TESTS) AS PER TECHNICAL SPECIFICATIONS/ PO/ CONTRACT REQUIREMENT, SHALL BE DISCUSSED & ADDED IN THE MANUFACTURING QUALITY PLAN. C) TATA POWER / ITS REP IDENTIFICATION STAMP ON MATERIALS SHALL BE PRESERVED, IF REQD, SAME SHALL BE TRANSFERRED BY TATA POWER / ITS REP ONLY FOR MATERIAL TRACEABILITY. D) INSPECTION & TEST ACTIVITIES SHALL BE WITNESSED BY CLIENT AND IS HOLD POINT (AT THE DISCRETION OF TATA POWER). E) MANUFACTURER SHALL PREPARE AND SUBMIT COMPLETE MANUFACTURING QUALITY PLAN IN PRESCRIBED FORMAT OR THEIR REGULAR FORMAT INDICATING THEIR REGULAR PRACTICES, TAKING CARE OF MINIMUM REQUIREMENT AS INDICATED ABOVE. F) INSPECTION OF THE MAINTAINANCE SPARES SHALL BE OFFERED ALONG WITH THE MAIN SUPPLY AS PER THE INSPECTION STAGES 1 TO 4. G) CALIBRATION CERTIFICATES OF THE EQUIPMENT USED FOR TESTING SHALL BE PROVIDED FOR REVIEW. H) AS PER SPECIFICATION PROPER PAINTING, PACKING & PRESHIPMENT CHECKS SHALL BE ENSURED BY SUPPLIER BEFORE SHIPMENT TO AVOID ANY TRANSIT DAMAGE. I) TATA POWER RESERVES THE RIGHT TO DEMAND / VERIFY/ AUDIT/ WITNESS ANY OF THE CHECK POINTS MENTIONED IN THE SCOPE OF SUPPLIER.</p>				
0	FIRST ISSUE	 Shruti Marathe	 C R Bhonslay	 S. Simha
Rev. No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date

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TATA POWER

GENERAL REQUIREMENTS OF QUALITY ASSURANCE & INSPECTION

[SHALL BE A PART OF GENERAL TECHNICAL CONDITION]

Document No.: TPQAIT-QAXX-00-GN-QSP-214



Rev 02 Dated 19/05/2017	DP /RP/RG/PU <i>al</i>	SKJ/ RM/CRB <i>SD 19/05/17</i>	SS <i>Soumitra 19/05/17</i>
Rev 01 Dated 21/07/2016	SKJ / DP	RG	SS
Rev 00 Dated 21/04/2015	RG / SKJ / PU	SS	SS
Revision no. & Date	Prepared By	Reviewed By	Approved by

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1.0 PURPOSE

Purpose of these requirements is to provide uniform general requirements for implementation of Quality Management System for projects being executed by OWNER.

2.0 SCOPE

2.1 Scope of these requirement covers pre-requisites of the Bidder's/ Supplier's/ Contractor's Quality Management System (QMS) applicable for all phases of contract execution including design, procurement, manufacture, testing, erection and commissioning, applicable other services and further to establish specific factors for which control shall be carried and put into continuing operation by the Bidder/ Supplier /Contractor to ensure that all supplies and services comply with the contract requirements.

2.2 The required/specified reliability & other characteristics of quality should initially be "designed in" and then "built in". It is emphasized that satisfactory product and system performance can be achieved only through strict control of all design, manufacturing and erection/installation processes as well as test and inspection.

2.3 During bid stage itself, BIDDER shall submit requisite documents to demonstrate that as a supplier/ contractor they have well defined and implemented QMS. They shall also establish that their QMS is taking care of their sub-supplier/agencies, and continually improve its effectiveness in accordance with the requirements of their QMS as per ISO 9001, or any other quality standard.

BIDDER shall submit a project specific organization chart defining the permanent positions responsible for QMS accompanied by a brief description of each position's function and responsibility.

3.0 DEFINITION

- **OWNER**

Tata Power or its subsidiaries/ JV partners.

- **Bidder**

An organization/ agency, who propose to submit their offer against RFQ/enquiry floated by OWNER. Only successful bidder will be converted to supplier/ contractor on award of contract by OWNER.

- **Supplier / Contractor**

An organization referred as Supplier/ contractor, who execute the contract awarded by Contracts department of OWNER. It also covers the Agency involved in execution of site/ field activities or provides services (as a contractor) when awarded by Contracts department of OWNER. A Supplier can also be a manufacturer for part of supply for his in-house products.

- **Sub-Supplier/ Sub-vendor**

An organization, who manufactures, supplies the system or equipment or item and provides services to the supplier. It also covers manufacturer who manufactures and supplies the equipment or its components or items to the sub-suppliers to complete the system supply. It

should also cover the agencies which also support execution of main supplier by providing qualified manpower/ services.

- **Third Party Inspection Agency (TPIA)**

An third party organization or any neutral agency mutually agreed, deputed for conducting inspection or quality surveillance activities on case to case basic.

- **Inspection Agency (IA)**

An organization or any agency deputed by OWNER for conducting inspection or quality surveillance activities on behalf of OWNER on case to case basic.

- **Inspection Categorization Plan (ICP)**

This document shall categorize the Quality Plan and Inspection scope of all equipment/ items in the package. This will also include the schedule for submission and approval of all Quality related documents.

- **Standard Quality Plan (SQP)/ Standard Field Quality Plan (SFP)**

SQP shall comprise of minimum basic requirements of all tests/checks to be carried out during manufacturing to meet/ conform technical requirement. SQP may be in the form of Inspection & Test Plan (ITP)/ Technical Specification as part of Bid Document.

Similarly SFP shall comprise of minimum basic requirements of all field tests/checks to be carried out during execution of the project.

- **Manufacturing Quality Plan (MQP)**

MQP shall comprise of all tests/ checks indicated in standard Quality Plan (SQP) and tech specifications. It shall also include any additional quality checks/ tests required as per discussions (pre & post bid) to be followed during manufacturing of particular item/ equipment.

- **Field Quality Plan (FQP)**

FQP shall detail out the activities and steps to be performed at project site and shall be followed from receipt of material to pre-commissioning stage. FQP shall be prepared by contractor and to be submitted to OWNER at post award stage of contract for owner's approval.

- **Hold Point/ Customer hold point (CHP)**

A check point for an activity mentioned in approved MQP/ FQP, which requires inspection/ verification, and acceptance by the OWNER or its representative for this stage before any further work is permitted.

Supplier shall not process beyond a CHP without written acceptance & clearance of that activity by OWNER in writing

- **Witness Point**

A check point for an activity mentioned in the approved MQP/ FQP, which will be witnessed by OWNER or its representative.

Supplier will obtain consent from OWNER to proceed for further work, in case OWNER or its representative is not able to attend the activity within notification period.

- **Review / Verification Point**
A check point for an activity mentioned in the approved MQP/ FQP that requires review of document/ test record by OWNER or its representative performed by the Supplier for acceptance.
- **Test Report Record**
Such reports / record are document prepared by Supplier/ Sub-Supplier for test/ check conducted indicating details / types of test including test results, relevant codes etc.
- **Inspection Report (IRT)**
Such report which covers details of all the checks / activities carried out as per approved MQP. It also covers details of the observations and NCRs during those checks / inspection.
- **Inspection Release Note (IRN)**
IRN is a document issued on standard format after successful quality checks/inspection and confirming to compliances of all observations and NCs if any).
- **Non Conformity Report (NCR)/ Quality Correction Action Report (QCAR)**
It is a report on deviation/ non-compliance with respect to the requirements laid down in the PO/ Technical Specification, MQP, Codes & standards. NCR shall be applicable during inspection at Shop as well during site Audits and QCAR shall be applicable for site inspection / surveillance.

4.0 QUALITY ASSURANCE PROGRAMME

To ensure that the equipment and services under the scope of contract whether manufactured or performed within the Bidder/ Supplier /Contractor's works or at his sub-vendor's premises or at site or at any other place of work are in accordance with the specifications, the Bidder/ Supplier/ Contractor shall adopt suitable project specific QMS based on his organization's Quality Management System, regular practice, statutory requirements and as specified for this specific contract and submit the same for approval of OWNER, to control such activities at all points, as necessary. Such program shall be outlined by the Bidder/ Supplier/ contractor. Any deviation with respect to all above requirements (as specified in SQP, SFP, Technical specification as minimum quality requirements) shall be brought out clearly in the bid stage by bidder.

5.0 SUPPLIER QUALITY MANAGEMENT SYSTEM (QMS)

- 5.1 All materials, components and equipment covered under the contract including bought outs shall be procured, manufactured and tested at all the stages, as per a comprehensive Quality Assurance Programme. It is the Bidder/ Supplier / Contractor's responsibility to draw up and implement such program duly approved by the OWNER.
- 5.2 All items/equipment in the scope of the contract shall be classified into categories according to the criticality or other attributes of items/ equipment. A detailed proposal addressing vendor approvals and quality control of all such items/ equipment shall be proposed to OWNER for approval.
- 5.3 The detailed quality plans for shop manufactured items and for field activities including civil works (if applicable) shall be drawn up by the Bidder/ Supplier / Contractor separately.

All shop quality plans and field quality plans shall be submitted to OWNER for approval prior to start of manufacturing activities and site activities respectively.

- 5.4 Manufacturing quality plans shall detail out various tests/ inspections to be carried out as per the requirement of the specification, standards mentioned therein, quality practices and procedures followed by Supplier's/ his sub vendor's quality control department. MQP shall be prepared by manufacturer and submitted through supplier post award stage of contract for owner's approval. OWNER approved MQP to be referred during manufacturing & shop inspection. Typical format of Manufacturing Quality Plan is enclosed as **Exhibit A**.
- 5.5 Field quality plans shall detail out for all equipment, the quality practices and procedures etc. to be followed by the execution agency, during various stages of site activities right from receipt of materials/ equipment at site to commissioning stage covering receipt, storage, erection & pre-commissioning tests. It shall comprise of all tests / checks indicated in SFP & Technical Specification including any additional quality checks / tests required as per discussions (pre & post bid). It shall also take care of minimum basic requirement of OEM/manufacturer (as the execution agency may not be part of OEM/manufacturer). OWNER approved FQP is to be referred during execution of work. FQP shall have 5 stages: Receipt, Storage, Pre-erection/ pre fabrication, Erection/ Execution and pre commissioning checks with categorization of checks as Critical (Cr), Major (Mj) and Minor (Mn). Typical format of Field Quality Plan is enclosed as **Exhibit B**.
- 5.6 In these approved manufacturing and field quality plans, OWNER shall identify "Customer Hold Points" & "Witness Points". "Customer Hold Points" are test/checks which shall be carried out in presence of the OWNER's Engineer or its authorized representative and beyond which the work shall not proceed without consent of OWNER/ its authorized representative in writing. "Witness Points" are tests/checks which shall be carried out in presence of the OWNER's Engineer or its authorized representative but the work can proceed to next operation/ stage in case OWNER's Engineer doesn't attend on the mutually agreed date. The above procedure shall be applicable to the Bidder/ Supplier / Contractor's bought out equipment/ items also.
- 5.7 All the critical & major items shall be procured from the sub-vendors approved by OWNER by supplier/vendor/contractor. Detailed list of such sub-vendors offered by supplier/vendor/contractor shall be submitted not later than 7 days after the LOI/ Placement of order whichever is earlier and shall be frozen within 15 days of submission. Request for additional sub-vendors shall not be entertained from the Bidder/ Supplier / Contractor after the sub-vendor list is finalized and frozen. Only in case of Force Majeure Condition, Supplier/ contractor shall establish such condition and propose new/ alternative source. Contractor / supplier shall provide requisite documents for consideration of OWNER. OWNER has right to accept/ reject based on review of details. If required, physical assessment shall be made before conveying such decision. Delays arising out of such exercises shall be entirely to the account of Supplier/ Contractor and shall not relieve him from any obligation, duty or responsibility under the contract. For intended manufacturer/ sub-vendors/ sub-suppliers, details to be submitted are indicated below:
- i. Rating, Range / type etc. of equipment/ item for proposed approval.
 - ii. Organisational structure including QA/QC inspection dept with man power & qualification details.
 - iii. In house design / R&D capability.
 - iv. List of sub-vendors for critical/ major bought out items.

- v. In-coming material inspection plan and Manufacturing Quality Plan.
- vi. In house manufacturing facilities, including process flows.
- vii. In house Testing facilities (including Type testing).
- viii. Experience (Past Track Record) list for last 3 yrs for similar product.
- ix. Performance certificates issued by other customers.
- x. Certification of/ by reputed agencies (ISO/ ASME/ CE/ UL/API/ etc) & also approval certificates from other customers etc.
- xi. Quality Manual.
- xii. Assessment report by contractor/ supplier and their own experience.

5.8 **Non Conformance Report (NCR) / Quality Correction Action Report (QCAR)**

Wherever the non-conformity is found during inspection either by Supplier or OWNER or its representatives, NCR / QCAR shall be issued in prescribed format. Manufacturer /Supplier shall indicate the Correction / CAPA and submit these NCRs/QCARs to OWNER or its representative for their review & resolution. Till such time identified item/equipment will be kept under quarantine. Upon satisfactory completion of the rectification work, final acceptance of the item/equipment shall be documented on the NCR/QCAR format.

Supplier has to close all NCR / QCAR in systematic & time bound manner including all corrective and preventive actions. Job shall progress only after effective resolution of NCR / QCAR.

Note: If OWNER observes that any material or equipment is unacceptable with respect to potential safety, reliability, interchangeability or workmanship, OWNER shall issue a non-conformance report NCR / QCAR in this regard to the Supplier/ Contractor. Such NCR/QCAR shall be dealt as above.

- 5.9 No material shall be dispatched from the Bidder's/ Supplier's/ Contractor's /manufacturer's works before the dispatch instruction is given in writing by the owner. subsequent to pre-dispatch inspection including verification of records of all previous tests/ inspections by OWNER/ authorized representative. Any such item/material dispatched by party without clearance from OWNER shall be at suppliers risk & cost only. No IRN/ dispatch clearance shall be issued for the same as post facto.
- 5.10 OWNER or its nominated representative reserves the right to carry out quality audit/ quality surveillance of the systems and procedures of the Bidder/ Supplier/ Contractor's or their sub-vendor's Quality Management System and control activities without prior intimation. The Bidder/ Supplier/ Contractor shall provide all necessary assistance to OWNER or its nominated representative to carry out such audit/ surveillance.
- 5.11 The Bidder/ Supplier/ Contractor shall be responsible for providing, controlling, calibrating, and maintaining the 'measuring & test equipment' required by them for demonstrating compliance of supplies within contract requirements at shop and at site. All the measuring instruments shall be calibrated at periodic intervals determined by Bidder/ Supplier/ Contractor/ sub-vendor on the basis of his suitability, purpose and usage as per the system adopted by him for calibration of such measuring and test equipment. However, in no case, shall the interval between successive calibrations be more than 12 months. All measuring and test instruments shall have valid calibration certificates and calibration data shall be made available to OWNER or its nominated representative on demand.

- 5.12 Quality surveillance/ approval of the results of the tests and inspection shall not, however, prejudice the right of the OWNER to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Bidder/ Supplier / Contractor in ensuring complete conformance of the materials/ equipment supplied to relevant specification, standard, data sheets, drawings etc.
- 5.13 For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable. Inspection of all mandatory spares and commissioning spares shall be in line with the approved MQP of respective equipment/ item. Interchangeability Certificate shall also be part of quality records for all spares.
- 5.14 **Statutory Inspection**
Supplier to ensure that Equipment/ items which fall under statutory requirements of country where the equipment will be installed, shall be inspected by statutory authority like IBR etc. In case of imported items, statutory inspection will be carried out by the agency as nominated by Statutory Authority or Statutory authority of the country of origin. Original certificates endorsed by statutory authorities shall be submitted to project manager as identified in the contract.
Such items shall also be offered to OWNER for inspection irrespective of country of origin.
- 5.15 **Failure to Pass Tests**
If any item/ equipment fail to pass any test, the Bidder/ Supplier shall rectify or replace the same and, unless OWNER agrees to dispense with repetition of the test, shall repeat the test following a further notice. The cost and expense of any such retest shall be fully borne by the Bidder/ Supplier only.
- 5.16 Major repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the OWNER/ its authorized representative.
- 5.17 All tests shall be carried out to the satisfaction of the OWNER/ its authorized representative either in their presence or as agreed by OWNER. All reports/ protocols, site and shop inspection reports shall be developed specific to the requirements of the project which is acceptable to OWNER. The same shall be applicable to erection testing and pre-commissioning reports and protocols also.
- Only tested, inspected and accepted (by owner) material as listed in PO / ICP shall be dispatched to project site.** Any diversion of such accepted material without any prior approval shall be considered as deviation/ breach of contract and a minimum penalty of 5 times the cost of inspection will be levied.
- 5.18 Approval of any concession shall be the prerogative of the OWNER and approval of concession for a particular case shall not be set as a precedent.

- 5.19 All the equipment shall be of proven design and type tested. Valid type test reports shall be furnished to engineering for review and acceptance prior to offering equipment for inspection.
- 5.20 All documents/ reports/ records shall be issued either in English language or bilingual with English.

6.0 INSPECTION CATEGORIZATION PLAN, WELDING & NDT REQUIREMENT

6.1 Inspection Categorization Plan (ICP)

This document shall be prepared by supplier and to be submitted to OWNER for approval in attached standard format for all package items within 15 days of award of contract.

The schedule shall be prepared considering that all MQP should be approved at-least 15 days prior to start of any manufacturing activity and FQP with related procedures shall be finalized at least 15 days prior to dispatch schedule/ site mobilization.

ICP, MQP, FQP and related procedures shall form part of Master Drawing List (MDL)

All the items/equipment in the scope of the contract shall be classified into categories (A/ B/ C) according to the criticality or other attributes of items / equipment. A detailed proposal addressing vendor approvals and quality control of all such items /equipment shall be proposed to OWNER by the Supplier/ Contractor for approval.

Category “A”: Manufacturing Quality Plan (MQP) shall be approved by TATA POWER. Stage &/ or Final Inspection including document review by EPC Contractor and TATA POWER (or its appointed Inspection Agency) as per approved MQP.

Category “B”: Manufacturing Quality Plan (MQP) shall be approved by Tata Power. Stage &/ or Final Inspection including document review by EPC contractor or Tata Power (in case no EPC Contractor) as per approved MQP. Inspection report of EPC contractor/ Supplier with supporting documents review by Tata Power.

Category “C”: Supplier shall carry out inspection as per their regular practice/ standard manufacturing quality plan. Supplier shall submit test report and COC to EPC Contractor/ Tata Power for approval/acceptance. COC shall be in standard format of Tata Power.

6.2 Welding & Non-Destructive Testing (applicable for shop as well project site)

6.2.1 Bidder / Supplier/ Contractor shall submit the following documents in requisite copies for review and approval of OWNER/ its authorized representative at least FOUR weeks prior to commencing fabrication/ manufacturing and finalize before start of job. All such submissions shall be made in ENGLISH language only.

- i. Welding procedures together with the relevant procedure qualification records.
- ii. Non-destructive testing procedures.
- iii. Heat treatment procedures.
- iv. Any other special procedure (as applicable) proposed to be used during project execution
Welding procedures and welders’ qualifications in accordance with the latest revision of ASME Boiler & Pressure Vessels Code, Section IX, (structural welding as per AWS D1.1)

or equivalent standard covering all essential & non- essential variables shall be acceptable to OWNER.

- 6.2.2 Only qualified welders shall be deployed. Welders shall be qualified as per approved WPS in presence of OWNER/ its authorized representative. Electrode/ welding rod used at project site shall be of owners approved. Supplier/ Contractor shall take prior approval.
- 6.2.3 Weld repair procedures are subject to approval of the OWNER. No welding is permitted on C.I. Castings. OWNER reserves the right to examine and witness acceptance tests, prior to and following weld repairs and subsequent post weld heat treatment, mechanical tests etc, at the material manufacturer/ Supplier works.
- 6.2.4 Should any of these welds prove to be defective on inspection, the number of welds to be tested in that system shall be twice that of originally selected. Should any of the second incremental welds prove to be defective, then 100 % of the welds in that system/ group shall be tested.
- 6.2.5 NDT operators shall be qualified in accordance with an agreed nationally accredited scheme such as the Personnel Certification in Non-destructive testing (PCN) scheme and shall be certified to level II or higher of that system.
- 6.2.6 Plate thickness $\geq 32\text{mm}$ (for structure), Plate thickness $\geq 25\text{mm}$ (for pressure vessel), Forging / Bar dia. $\geq 40\text{mm}$ (finished) shall be UT tested.

7.0 INSPECTION AT SHOP

7.1 Inspection Scope

The scope of inspection shall be as per Witness/ Hold Point as defined in approved MQP/ SQP. Supplier has to ensure that all applicable and agreed approved Drawings, Data Sheet etc. are available for any inspection and equipment used for measurement are calibrated. Supplier shall intimate all such cases in advance (as inspection rolling plan) and also through inspection call as per contract agreement.

7.2 Inspection Coordination

Supplier has to identify single point contact for coordination of the entire inspection activities on behalf of Supplier/ sub-supplier. Supplier to ensure that monthly and 3 monthly rolling inspection plan are prepared and submitted in advance to OWNER by 1st working day of each month for effective inspection coordination.

7.3 Inspection Request

7.3.1 Depending upon the stages of inspection as agreed in manufacturing quality plan, supplier to send Inspection Requests (in OWNER standard format & through system) to OWNER Project Manager for inspection activities to be attended at supplier's / sub-supplier's premises. Supplier to submit all relevant approved reference documents (MQP, Drawings/ Data Sheet etc.) along with inspection request. Supplier has to give sufficient advance notice, as defined below for inspection of any stage. The date of receipt of inspection call by OWNER will hold good.

7.3.2 The minimum advance notice period for inspection shall be given below:

- i. Inspection within INDIA : 7 Days
- ii. Overseas (Outside India) Inspection : 30 Days

Supplier to strictly adhere the above mentioned minimum advance notice period.

7.3.3 Supplier shall plan the inspection visits required in a manner so as to achieve maximum inspection stages attended with minimum possible inspection visits/ time where-in more than one external inspection agencies are involved for single inspection activity, inspection by all agencies may be done concurrently.

7.4 Inspection Methodology

7.4.1 Suppliers shall ensure internal inspection before offering inspection to OWNER or its representative. Internal test certificates and previous stage inspection reports to be made available during inspection.

7.4.2 During inspection, Supplier to produce copies of the latest revision of the approved MQP along with drawings, Data Sheet, Standard and accepted type test reports as indicated in approved MQP / agreement to ensure that the inspection is carried out as per the latest revision and approved documents. **If required, Supplier to arrange the necessary codes and standards for reference purposes.**

In case inspection cannot be completed or undertaken due to reasons such as non-readiness of material, back up documents, false inspection call etc. then such reason shall be recorded in Inspection Report. **If Supplier fails to offer the item / equipment for inspection as per the agreed date, he is liable to pay for the time and expenses for the abortive visit of the OWNER or its representative.**

7.4.3 All inspection related documents i.e. mill test reports, Supplier inspection/ tests reports, all inspection/ tests carried out including other records such as stress relieving charts, radiographic reports and other non-destructive testing records in accordance with provision of contract shall be submitted in original form. All such reports shall be duly endorsed/ certified by the main supplier.

7.4.4 Results of Tests and copies of Inspection Report, Test reports, original material test certificates (MTCs), calculations, performance curves etc. shall be promptly made available to the OWNER or its appointed representative by the Supplier, in accordance with this document and shall form part of the subsequent Manufacturers Test Record Book in accordance with the requirements of this document.

7.4.5 Supplier to ensure that all the materials are properly identified/ coded to confirm traceability and correlation purposes.

7.4.6 Supplier shall take special care including packing to protect the final painting and finish product (equipment / item) during handling, transportation, storage and execution stage so that there is no damage occur. In case of any such damage, joint inspection to be carried out at site and necessary action to be taken.

7.4.7 Supplier to ensure finish product is properly identified after completion of inspection and are suitably recorded in Inspection Report by inspection engineer.

7.5 **Inspection Report & Clearance**

7.5.1 **Inspection Report (IRT)**

All inspection visits by OWNER or its appointed agency shall be supported by an inspection report as per the standard format (sample enclosed). Any shortcoming observed w.r.t. approved MQP/ Drawing/ Data Sheet / specification etc. shall be recorded as NCR. IRT shall have detail references of all such NCRs. All such inspection report / NCR shall be jointly signed by supplier and Inspection Engineer. IRT shall be issued to all concern including Supplier and Sub-supplier/ Manufacturer.

7.5.2 **Inspection Release Note (IRN)**

IRN shall be issued only after satisfactory completion of Inspection by OWNER as defined below IRN shall be issued by Tata Power (QA&I dept) thru system in the standard format as closure of particular inspection.

IRN for Category 'A' item (as defined in ICP) shall be issued only after ensuring inspected Equipment / Item meets the requirements of the applicable documents and all NCs have been closed to the satisfaction of Owner. IRN shall be issued in the standard format as closure of particular inspection.

Similarly for Category 'B' items (as defined in ICP) IRN shall be issued after review of inspection report, compliance report and required applicable documents as per approved MQP & Closure of NCs if any are verified and accepted to the satisfaction of Tata Power.

For Category 'C' items (as defined in ICP), IRN shall be issued after review of original manufacturer test certificates, Certificate of Conformance (CoC) from supplier/contractor in Tata Power standard format and required applicable documents as per MQP approved by main supplier / as per their standard procedure are verified and accepted

7.6 **Material Dispatch Clearance Certificate (MDCC)**

Supplier shall obtain dispatch clearance (MDCC) from Project / Plant based on IRN prior to dispatch of any billable material / equipment/ item from manufacturer place to our project site / plant. One set of Quality Dossier (hard copy) for which MDCC has been issued, shall be sent to project site along with material / equipment/ item.

MDCC is not required for material / equipment/ item/ Part supply which are dispatched from one sub-supplier works to another sub-supplier/ supplier works for further assembly and testing (to make it billable). However, clearance in the form of Inspection Report (IRT) is needed in this regard.

8.0 **QUALITY DOSSIER (FOR SUPPLY PORTION) [Package wise]**

Supplier shall compile and submit all stage and final inspection reports as per approved MQP, duly reviewed and endorsed by inspection engineer for reference and records of OWNER. Documents shall be submitted with-in 4 weeks of issuance of final MDCC

Dossier shall consist of following documents, as minimum:

- i. Index Sheet
- ii. Approved bill of material of package.

- iii. All Approved documents (MQP, Drawings & Data Sheet etc.)
- iv. MDCC, IRN & IRT along with all closed NCR of all items.
- v. Factory Acceptance Test (FAT) reports.
- vi. Raw material and bought out item MTC's
- vii. Test Reports corresponding to IRT & MQP.
- viii. Supplier internal inspection reports as per MQP.
- ix. Copy of Statutory and IBR certificates as applicable.

Note:

- 1. Each package compilation shall be done on the basis of unit wise and common systems.
- 2. Each volume/ dossier shall be spiral/ hard bounded. Each sheet of dossier to have running numbers.
- 3. One hard copy (in addition to the dossier dispatch with material / equipment/ item) and 2 Soft copies of documents to be submitted as final dossier.

9.0 FQC DURING CONSTRUCTION AND PRE-COMMISSIONING.

- 9.1 Supplier Quality Management System is applicable for field activities also and for his further sub agencies deputed at project / plant. Refer clause no: 5.0 (applicable part). Supplier/ Contractor shall deploy sufficient no of QA/ QC persons to take care of daily activities as per agreed/ approved Quality documents. Some of such activities are detailed below. Also QA/ QC head shall regularly co-ordinate with OWNERs FQC team.
- 9.2 Raising of inspection calls on regular basis for various activities as indicated in approved FQP/ other document, carrying out inspection activities along with OWNER's execution / FQC department and maintaining the records duly signed by all concerned.
- 9.3 Various inspection/ quality assurance procedures/ methods at different stages of erection and pre-commissioning will be as per OWNERs approved field quality plans/ codes/ IBR and other statutory provisions and as per OWNER's engineer's instructions.
- 9.4 Preparation of quality assurance log sheets and protocols, welding logs, NDE and post weld heat treatment records, testing & calibration records and other quality assurance documentation as per OWNER's engineer's instructions is within the scope of work/ specification. These records shall be submitted to OWNER for approval from time to time.
- 9.5 A daily logbook of all measurements and testing/ calibration should be maintained by contractor on the job inspection details for various equipment.
- 9.6 All the workers of contractor / sub contractor/it's agencies shall carry identity cards as per the Performa prescribed by OWNER. Only workers duly authorized by OWNER shall be engaged on the work.
- 9.7 Contractor shall provide all the measuring and monitoring devices (MMD) required for completion of the work satisfactorily. These MMDs shall be calibrated & conform to job requirement in respect of measurement range, accuracy level & any other specification.

- 9.8 Re-work necessitated on account of use of invalid MMD shall be entirely to the contractor's account. Contractor shall be responsible to take all corrective actions, including resource augmentation if any, as specified by OWNER to make-up for the loss of time.

OWNER's FQC team / QAI representative will have the right to carry out Surveillance Audit of supplier/contractor and their agencies including their store without any prior intimation.

- 9.9 Regular Internal audit shall be conducted by supplier/ contractor QA/QC team of their agencies and their other dept. Such audit reports shall be made available whenever ask for by OWNER FQC team. OWNERs FQC/ QA&I have the right to carryout 2nd party audit of supplier/ contractor and their agencies as per predefined Audit schedule.

In course of work OWNER may counter/ finally check the measurements with their own MMDs. Contractor shall render all assistance in conduct of such counter check/ final measurements.

9.10 **Communication**

Direct, formal communication between the SUPPLIER's field QC and OWNER's field QC representative is mandatory. All inspection activities as per field quality plan shall be intimated to OWNER in the form of Request for Inspection (RFI) at least 24 hrs. in advance with intimation to OWNER execution group.

Whenever any major issues / deviations related to design or fabrications are noticed, the same shall be immediately informed to OWNER's field QC by supplier's field QC/ Supplier Project Head. On completion of above activity, joint inspection reports/ protocol shall be made and circulated to concern agencies. Any part of work at the site shall not be **covered up or made inaccessible** without the OWNER Representative's prior approval in the form of joint protocol or otherwise.

SUPPLIER/ Contractor's in-progress inspection reports, log book, follow up/ punch out sheets; records of all DT & NDT etc. shall be made available to OWNER field QC during the course of the work. At the end of the work, SUPPLIER/ Contractor's standard inspection reports, check off sheets, radiographs, master copy of loop diagrams, electrical testing data sheets, etc. shall be handed over to OWNER in an organized and agreed format. SUPPLIER/ Contractor shall verify that all of the required documentation of the equipment has been received and placed in the equipment files. The SUPPLIER/ Contractor is responsible for obtaining any outstanding documentation from his sub-supplier/ agencies.

9.11 **Dealing with open Punch Points NCR/QCAR:**


All open points in the form of observations, non-conformities (NCR, QCAR etc.) that are not responded / closed in time as well as, those were not put up by supplier/ Contractor for resolution/ agreement to OWNER, the same will be considered as violation of contractual obligations and will be dealt suitably during closure of contract. Penalty clauses (if any) shall be applicable as per contract.

Supplier/ Contractor's Performance rating will be impacted as per prevailing policy of OWNER in this regard.

10.0 ATTACHMENT

1. Exhibit A – MQP Format
2. Exhibit B – FQP Format
3. Exhibit C – Shop Inspection Request Format
4. Exhibit D – ICP Format
5. Exhibit E – IRN Format
6. Exhibit F – Suggested MDCC Format
7. Exhibit G – RFI Format (For Site Inspection Request)
8. Exhibit H – NCR Format
9. Exhibit I – QCAR Format
10. Exhibit J – Weekly Progress Report format

Exhibit - A

Supplier Logo	THE TATA POWER COMPANY LIMITED	 TATA TATA POWER Document No Page 1 of 1
Supplier Document No	PROJECT NAME Supplier Name & Address	

Document Title: MANUFACTURING QUALITY PLAN (MQP)

Document No:

Consultant:

EPC Contractor:


Manufacturer Name & Address:

R1					
R0					
Revision	Date	Reason for Revision	Prepared By	Checked By	Approved By



Manufacturing Quality Plan for		Document No. <i>(As given by PDM, Tata Power)</i>										
Manufacturer Name & Address		Date & Revision										
PACKAGE NAME		Page .. of										
Supplier Logo												
Supplier Document No												
SR. NO.	COMPONENT Description / Activity	CHARACTERISTICS	TYPE OF CHECK	EXTENT OF CHECK	REF. DOCUMENT / ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS		
1	2	3	4	5	6	7	M	S/C	O	8	9	
	1.0 MATERIAL:									P	R	R
	2.0 IN-PROCESS INSPECTION:											
	3.0 FINAL INSPECTION:											
	4.0 ISSUANCE OF IRN (BY REVIEWING OF QUALITY DOSSIER)											
<p>N O T E</p> <p>a). Statutory requirements will be complied by the contractor/ Supplier.</p> <p>b). Material samples drawn for check testing will be witnessed by TATA POWER or its representative.</p> <p>c). For stage inspections, copies of relevant documents will be furnished to TATA POWER for review.</p> <p>e). The extent of check for manufacturer shall be 100%.</p> <p>f). Column 6 will be as per TATA POWER approved drawings / data sheets / contract documents wherever applicable.</p> <p>g). All instruments shall have valid calibration certificate with traceability to national level.</p>												
<p>Legends: M – Manufacturer, S – Supplier C – EPC Contractor, O – Owner (Tata Power), P – Perform, W – Witness, R – Documents Review, H – Hold point, Rw (%) – Random Witness</p>												

Exhibit - B

	TATA POWER CO. LTD. (QA, I & T DEPARTMENT)	DIVISION:
	FIELD QUALITY PLAN	Document No. :-
		Rev : Date :

Document Title: FIELD QUALITY PLAN (FQP)

Document No:

Consultant:

EPC Contractor:

Contractor's Name & Address:

Rev No.	Date	Reason for Revision	Approvals		
			Prepared By	Checked By	Approved By





Doc. No.:

STANDARD FQP FOR

Date of Issue:

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
<p>N O T E</p> <p>A) STATUTORY REQUIREMENTS WILL BE COMPLIED WITH BY THE CONTRACTOR. B) FOR STAGES WITNESSED / DOCUMENTS REVIEWED BY TATA POWER, COPIES OF RELEVANT DOCUMENTS WILL BE FURNISHED TO TATA POWER. C) TATA POWER / ITS REP. IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED / GOT TRANSFERRED BY TATA POWER / ITS REP AT APPROPRIATE STAGES. (IF REQUIRED). D) THE EXTENT INDICATED IN COLUMN 6 IS IN CONTRACTOR'S SCOPE. TATA POWER MAY INSPECT AS PER THIS COLUMN OR RANDOM SAMPLES AT ITS DISCRETION. E) COLUMN 7 WILL BE AS PER TATA POWER APPROVED DRAWINGS / DATA SHEETS / CONTRACT DOCUMENTS WHEREVER APPLICABLE F) INSTRUMENTS FOR LEAK TESTS AND PERFORMANCE TESTS WILL HAVE VALID CALIBRATION CERTIFICATE WITH TRACEABILITY TO NATIONAL LEVEL.</p>								
<p>Critical Category is HOLD point.</p> <p>This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing is permitted., 24 Hrs advance notice to be given to TATA POWER FQC. Contractor /sub contractor shall not process activity beyond HOLD point without written permission by TATA POWER FQC. This activity shall be performed by Main & Sub- Contractor (Execution + FQC) & witnessed jointly by TATA POWER (Execution + FQC). (Surveillance by Head FQC / Project Head).</p>								
<p>Major Category is Witness point.</p> <p>This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing. 24 Hrs advance notice to be given to TATA POWER (Execution) . Contractor /sub contractor shall not process activity beyond Witness point without written permission by TATA POWER (Execution). This activity shall be performed by Main and Sub- Contractor (Execution + FQC) & witnessed by TATA POWER Execution & Surveillance by FQC.</p>								
<p>Minor Category is Review point.</p> <p>This activity required review of documents by TATA POWER for the compliance & acceptance. However 24 Hrs advance intimation to be given to TATA power (Execution). This activity shall be performed by Main and Sub- Contractor (Execution +FQC) . (Surveillance by Execution / Project Head).</p>								
<p>TATA POWER reserves the right to carryout surveillance at any point of time through FQC.</p>								



Doc. No.:

STANDARD FQP FOR

Date of Issue:

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9

STORAGE TYPE:

TYPE-1: OPEN AREA & ABOVE GROUND ON WOODEN PLANK WITH SLOPE FOR WATER DISPOSITION.

TYPE-2: OPEN AREA & ABOVE GROUND ON WOODEN PLANK (WITH SLOPE FOR WATER DISPOSITION) AND COVERED WITH TARPAULIN.

TYPE-3: OPEN SHED WITH FULLY FORMED FLOORING/CEMENT FLOORING.

TYPE-4: COVERED SHED/STORE ROOM ON RACKS & IDENTIFIED LOCATION.

TYPE-4A: CLOSED CHAMBER WITH TEMPERATURE & HUMIDITY CONTROL.

NOTE: Items/equipments having shelf life like paints, alumina, desiccant etc. are to be stored seperately for identification purpose.

Rev. No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date	Issued By.
R0	ISSUE FOR USE				

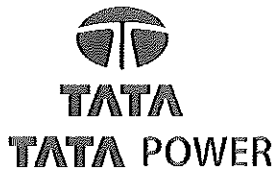
Confidential and Proprietary – The Tata Power Company Limited

Exhibit - C

Tata Power QA&I

Request No:

Date:



Corporate Engineering – QA&I

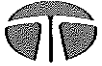
Factory Inspection Request Format

Project Name:	
Main Supplier	
Package Name:	
Tata Power P. O. / LOI No.	Date
Item / Equipment offered for inspection:	
Inspection Category:	A / B / C
Sub-supplier (Manufacturer) name & PO Number:	
Type of Inspection: (Please mention the stage number of MQP which will be completed during this inspection)	Stage / Final
Proposed Date of Inspection:	
Place of Inspection: (Please give completed address where material will be inspected, attach route map if required)	
Contact Person for this Inspection along with Mobile No.:	
MQP Doc. No. : Rev. No.: MQP Approval Status:	Yes / No
Inspection Reference Document No: (Drawing/ Data Sheet etc.) approval status	Yes / No
Tata Power PO Item numbers / Billing Breakup No./ Tag No. (as applicable) and quantity to be inspected: (Please attach separate list if necessary)	
Current Manufacturing Status (in brief) of item / equipment being offered in this Inspection:	

We hereby confirm that the items have been fully inspected / tested by us, all stages of inspection as per approved MQP have been done and all material test certificates, Q.C. records, approved Drawing / Data Sheet, test reports and valid calibration reports of measuring / testing instruments with traceability are ready with us.

(Signature)

[Name & Designation of Contractor's Representative]

Supplier Logo Supplier Document No.	THE TATA POWER COMPANY LIMITED	 TATA TATA POWER Document No Page 1 of 1
	PROJECT NAME	
	Supplier Name & Address	
	ICP - PACKAGE NAME	

Document Title: INSPECTION CATEGOROZATION PLAN (ICP)

Document No:

Consultant:


EPC Contractor:

Supplier:

R1					
R0					
Revision	Date	Reason for Revision	Prepared By	Checked By	Approved By

Document No: Given as per procedure of Tata Power



Supplier Logo Supplier Document No.	THE TATA POWER COMPANY LIMITED	 TATA TATA POWER Document No Page 1 of 1
	PROJECT NAME	
	Supplier Name & Address	
	ICP - PACKAGE NAME	

Sl. No.	Item Description	Imported / Domestic	Manufacturing / Bought Out	Manufacturing Quality Plan No. (No. given as per TATA Power Procedure)	Inspection Category	First Schedule Submission Date*	Final Approval Date*
1	Example: PUMP				A / B / C		
2							
3							
4							
5							
6							

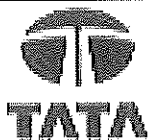
*Dates indicated are for monitoring purposes of Tata Power Quality Team.

Category "A"	Definition: Manufacturing Quality Plan (MQP) shall be approved by TATA POWER. Stage &/ or Final Inspection including document review by EPC Contractor and TATA POWER (or its appointed Inspection Agency) as per approved MQP.
Category "B"	Definition: Manufacturing Quality Plan (MQP) shall be approved by Tata Power. Stage &/ or Final Inspection including document review by EPC contractor or Tata Power (in case no EPC Contractor) as per approved MQP. Inspection report of EPC contractor/ Supplier with supporting documents review by Tata Power.
Category "C"	Definition: Supplier shall carry out inspection as per their regular practice/ standard manufacturing quality plan. Supplier shall submit test report and COC to EPC Contractor/ Tata Power. COC shall be in standard format of Tata Power.
Note:	<ol style="list-style-type: none"> Any item which is not appearing in above list, however, identified during detailed engineer, same need to be categorized as above. If supplier is not able to submit test report for any Category "C" item, same needs to be finalize during ICP approval.

Document No: Given as per procedure of Tata Power



Exhibit - E



TATA POWER COMPANY LIMITED

Corporate Engineering-QAIT

Inspection Release Note

IRN No:

Date:

Project / Plant:	
Tata Power PO No.:	Date:
Supplier / Sub-Supplier:	Location:

Material / Equipment Details:

PO Item / BBU No.	DESCRIPTION OF ITEM / EQUIPMENT	Tag / ID No. / S. No.	QUANTITY CLEARED EARLIER	OFFERED QUANTITY (Current Lot)	ACCEPTED QUANTITY (Current Lot)

Reference Inspection Report (s):

Identification:

NCR Status: OPEN CLOSED NIL

Comments (if any):

Results of Inspection:

Documents reviewed and certify that Inspection carried out as per the approved MQP / Engineering Documents/ Drawings.
Above Equipment/ Item (s) cleared for issuance of MDCC.

<p>Document Reviewed By*:</p> <p>Name: _____ Signature: _____</p> <p>Issue Date: _____</p> <p>Inspection Date (s): _____</p> <p>Inspected By: _____</p>	<p>Approved By:</p> <p>Name: _____</p> <p>Date: _____</p>
---	--

Note:

1. Issuance of this report and acceptance of NC, if any are without prejudice to contractual obligations of the Supplier / manufacturer and does not absolve him from obligations and guarantees set forth in purchase order documents issued by Tata Power.
2. **This is Tata Power internal communication.** Project Manger/ Officer / User to ensure contractual, commercial & projects requirements before issuing Material Dispatch Clearance Certificate (MDCC) to contractor/vendor.
* If inspection is attended by QA&I engineer, issuance of IRN will be done by same engineer.



THE TATA POWER COMPANY LIMITED

MATERIAL DISPATCH CLEARANCE CERTIFICATE

TATA POWER

MDCC REFERENCE:			DATE:	
PROJECT				
P.O. REF.				
PACKAGE		QAI&T "Clearance For MDCC" REF No.		
SUPPLIER		SUB-SUPPLIER		

Dispatch clearance is hereby given for following equipment/ items:

Sr. No	PO Item No./ BBU	Item Description	Unit	Quantity	Identification/ S. No./ Remarks

PACKING AND DISPATCH INSTRUCTIONS			SUBMIT FOLLOWING TO TATA POWER			
1	Complete assembly with drive, base plate, accessories etc.		1	Quality Dossier	7	As built drawings.
2	Protect machined surfaces against corrosion.		2	Erection, O&M manual.	8	Calibration reports.
3	Blank nozzles and other openings.		3	T.C. for performance / leak tightness / balancing.		
4	Complete painting, affix name plates, tag no., sr. no., etc.		4	Performance calculations, curves.		
5	Pack to prevent damage/ deterioration in handling, transit & storage		5	Guarantee certificates.	9	Dispatch details.
6	Paint dispatch markings and weight.		6	Manufacturing Test Records/ Test Certificates/ COC		


(Please tick above Packing & Dispatch instructions and Documents Requirements as applicable)

Special Dispatch Instructions (If any):

	Prepared By:	Approved By:
Signature		
Name		
Designation		
Date		

NOTES:

- Acceptance / release of the above items is without prejudice to the terms and conditions of the contract and does not relieve the CONTRACTOR/ SUPPLIER of his guarantees and responsibilities to supply the items in accordance with the specifications, approved drawings, data sheets and other relevant contract documents / conditions.
- CONTRACTOR/ SUPPLIER shall comply with the packing and dispatch instructions and documentation requirements given above.

	Field Inspection Requisition		Requisition No.:
	Project :		Date:
	Name of package & Unit No:		
	Agency:		
	Sub Agency:		
INSPECTION/ TEST REQUISITION DETAILS			
1. FQP No. with Rev. & Category of Approval			
2. Test reference of FQP			
3. Category of Test nas per FQP			
4. Applicable Drawing No. with Rev:			
5. Location			
Date and time for inspection / test			
7. Open QCAR/NCR No. (if any) & date against this item/equipment			
It is hereby certified that all previous tests / checks are cleared and no QCAR other than above is pending against this item / equipment			
(Signature) Agency Representative		(Signature) OWNER (Execution)	
8. Post Inspection/ Test (Joint Protocol) : ACCEPTED / NOT ACCEPTED / ACCEPTED WITH CONDITION			
Brief Description:			
(Signature) Agency Representative	(Signature) OWNER (Execution)	(Signature) OWNER (FQC)	



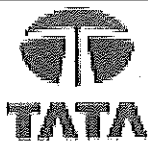

	TATA POWER COMPANY LIMITED	Corporate Engineering - QAIT
	Non Conformity Report	NCR No: Date
Project / Plant:		
Tata Power PO No.		Package/Equipment:
Supplier:		Location:
Inspection Report Reference:		Date of issuance of NCR:
Reference Documents: (QA Manuals, Specification, Procedure, Drawing, etc.)		
Requirements as per approved documents, codes and standards:		
Details of NC (Provide complete description, i.e. what, where, how many , item no. etc):		
Root Cause Analysis:		
Corrective Action Proposed:		Preventive Action Proposed:
Supplier Representative Sign. / Date		Tata Power / TPIA Representative Sign. / Date
Engineering Review & Approval for proposed corrective action:		
Engg. Representative Sign. / Date		
Corrective Action Taken:		
Supplier Representative Sign. / Date		
Verification of Correction Action:		
Tata Power / TPIA Representative Sign. / Date		



Exhibit - I

	TATA POWER COMPANY LIMITED	Corporate Engineering-QAI&T
	Quality Corrective Action Report (QCAR)	Doc No.: QAI & T /QCAR Rev.0 Date : 10/09/12

Project / Plant:		Report No.:	
Supplier/Package/Equipment:		EPC Contractor:	
Date of observation:		Date of issuance of QCAR:	
Discipline: Mechanical		Mechanical/Electrical /Civil/C&I: Civil (Structural Work's)	
From		Email ID	
To		Email ID	

Quality Observations :

Supplier Sign /Date & Time	EPC Contractor Sign /Date & Time		TATA POWER COMPANY LTD	
	Construction Rep	QA/QC Rep	Construction Rep	QC Rep.

Root Cause Analysis :

Corrective Action Proposed :	Preventive Action Proposed :

Supplier Sign /Date & Time	EPC Contractor Sign /Date & Time		TATA POWER COMPANY LTD	
	Construction Rep	QA/QC Rep	Construction Rep.	QC Rep.

Engineering Review & Approval for proposed corrective action: (Applicable: YES/NO)

Tata Power Engg. Rep.
Sign. / Date & Time

Corrective Action Taken:

Supplier Sign /Date & Time	EPC Contractor Sign /Date & Time		TATA POWER COMPANY LTD	
	Construction Rep	QA/QC Rep	Construction Rep.	QC Rep.

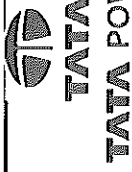
Verification of Correction & Preventive Action:

Tata Power Head- Construction.
Sign. / Date & Time

Tata Power Head- QC
Sign. / Date & Time

Copy to HOD -QAI&T, Mumbai.







Name of the Project
 FQC Team
 Name of the Project
 Weekly Field Quality Report (00/00/2015 - 00/00/2015)

FIELD QUALITY REPORT (CIVIL/ MECH./ELECT.)

A. FIELD INSPECTIONS										
Sl. No.	Contractor/ Dept.	Work Area	FQ Activity/Test	UOM	Recd.	Acc.	Rep/Rej	Hold	Observations/Remarks	
B. RA BILLS / GRN CLEARANCES										
Sl. No.	Contractor/ Dept.	Package	Description	UOM	Recd.	Acc.	Rep/Rej	Hold	Observations/Remarks	
C. QCAR'S RAISED / AUDIT / DELTAS										
Sl. No.	Contractor/ Dept.	Package	Description	Date	Observations/Remarks					
D. MEETINGS - INTERNAL AND WITH CONTRACTORS										
Sl. No.	Contractor/ Dept.	Package	Date of meeting	Description						
E. AREAS OF CONCERN										
Sl. No.	Contractor/ Dept.	Package	Description							
F. OTHER ACTIVITIES										
Sl. No.	Contractor/ Dept.	Package	Description							

Note: Areas of concern/highlights shall also include long pending and critical non-conformities.

	THE TATA POWER COMPANY LIMITED Corporate Engineering - Quality Assurance & Inspection.	
TPQA&I-QAXX-00-EX-ICP-342 REV.0	Standard ICP – Transmission Receiving Station.	Date of Issue: 18-Jan-2018.

Note: This document is prepared, discussed and finalized for internal consumption/reference of QA&I dept. persons and not to be attached as per specification/contract document.

Sl. No.	Item Description	Imported / Domestic	Manufacturing / Bought Out	Manufacturing Quality Plan No. (No. given as per Tata Power Procedure)	Inspection Category	First Schedule Submission Date*	Final Approval Date*
ELECTRICAL:							
1	EHV GIS (110KV & ABOVE)				A		
2	ICT / POWER TRANSFORMER.				A		
3	EHV GIS CONTROL & PROTECTION PANELS.				A		
4	MV GIS PANELS (33/22/11KV)				A		
5	CABLES (3.3KV TO 220KV).				A		
6	SURGE ARRESTOR (110KV & ABOVE).				A	AS APPLICABLE.	
7	BUS DUCT (SPBD/NSPBD/IPBD)				A		
8	SCADA SYSTEM				A		
9	RTU PANELS.				A		
10	MULTIPLEXER SYSTEM/ FIBRE OPTIC SYSTEM.				A		
11	MV GIS SUBSTATION AUTOMATION SYSTEM				A		
12	AC DISTRIBUTION BOARD (MAIN ACDB)				A		
13	METERING PANEL FOR MV SYSTEM				A		
14	STATION/ AUXILIARY TRANSFORMER.				A	Class B, below 250KVA.	



TATA POWER

THE TATA POWER COMPANY LIMITED
Corporate Engineering - Quality Assurance & Inspection.



TPQA&I-QAXX-00-
EX-ICP-342 REV.0

**Standard ICP – Transmission Receiving
Station.**

Date of Issue:
18-Jan-2018.

15	DG SET.				A	Class B, below 50KVA.
16	DC BATTERY CHARGER				A	
17	BATTERY BANK.				B	
18	LT CABLES (POWER, CONTROL & INSTRUMENTATION)				B	CLASS C, IF INDIVIDUAL CABLE QUANTITY IS LESS THAN 1000 MTR.
19	UPS - PARALLEL REDUNDANT				B	
20	Sub AC DISTRIBUTION BOARD (SUB-ACDB)				B	
21	DC DISTRIBUTION BOARD (MAIN & SUB-DCDB)				B/A	
22	EMLDB, MLDB & RPDB				B	
23	VENTILATION MCC				B	
24	LT MOTORS FOR FIRE PUMPS				B	
25	CABLE SUPPORT, TRAYS, CLAMPS ETC				B	CLASS C, IF QUANTITY IS LESS THAN 100 MTR.
26	CABLE TERMINATION kits. (11KV to 220KV)			Not Applicable	C	
27	EARTHING AND LIGHTNING MATERIAL			Not Applicable	C	
28	LIGHTING, SWITCH SOCKETS, RECEPTACLES, JB'S ETC				C/B	
29	Communication/ EPABX system.				C/B	
MECHANICAL:						
30	EOT CRANE & GIRDER.				A/B	Cat. B up to 3 Ton.

TATA POWER

THE TATA POWER COMPANY LIMITED
Corporate Engineering - Quality Assurance & Inspection.



TPQA&I-QAXX-00-
EX-ICP-342 REV.0

**Standard ICP – Transmission Receiving
Station.**

Date of Issue:
18-Jan-2018.

31	DIESEL ENGINE				A		
32	FIRE FIGHTING PUMPS – MAIN (ELEC & DIESEL).				A		
33	WRAPPING COATING				A		
34	JOCKEY AND BOOSTER				B		
35	ELECTRIC HOIST.				B		
36	LIFTS				B		
37	SUMP PUMPS (10 to 30 Kw)				B	Cat. C, if Pump<10KW	
38	CONDUITS/ RACEWAYS.			Not Applicable	C		
39	MONO RAILS			Not Applicable	C		
40	CHAIN PULLEY BLOCK			Not Applicable	C		
FIRE DETECTION & PROTECTION SYSTEM:							
41	FIRE MCC PANEL				A		
42	PLC PANEL FOR FIRE FIGHTING				A		
43	DELUGE VALVE				A	Cat.B for UL stamped.	
44	SINGLE/DOUBLE HEADED HYDRANT VALVE + GATE VALVE/ GLOBE VALVE/ CHECK VALVE/ NRVs' (above 50mm).				B		
45	FIRE ALARM SYSTEM				B		
46	DIESEL ENGINE CONTROL PANEL				B		
47	PRESSURE RELIEF VALVE				B		
48	BALL VALVE- SS/GM				B		
49	HV SPRAY NOZZLE				B		

TATA POWER

THE TATA POWER COMPANY LIMITED
Corporate Engineering - Quality Assurance & Inspection.



TPQA&I-QAXX-00-
EX-ICP-342 REV.0

**Standard ICP – Transmission Receiving
Station.**

Date of Issue:
18-Jan-2018.

50	MV SPRAY NOZZLE				B		
51	ALARM CONTROL VALVE				B		
52	DELUGE VALVE LOCAL CONTROL PANEL (DVLCP)				B		
53	BRANCH PIPE WITH NOZZLE				B		
54	STRAINER - Y TYPE				B		
55	BUTTERFLY VALVE				B		
56	AIR RELEASE VALVE				B		
57	SIAMESE CONNECTION				B		
58	FITTINGS & FLANGES				B		
59	FIRE BRIGADE INLET				B		
60	PENDENT / UPRIGHT SPRINKLER FOR SPRINKLER SYSTEM. (K5.6/ K11.2 @ 68 Deg C)				B		
61	SKID MOUNTED DELUGE CABINET			Not Applicable	C		
62	FLOW METER			Not Applicable	C		
63	PRESSURE GUAGE			Not Applicable	C		
64	FLOW SWITCH			Not Applicable	C		
65	QBD			Not Applicable	C		
66	HOSE CABINET			Not Applicable	C		
67	FIRE HOSE WITH COUPLING			Not Applicable	C		
68	HOSE REEL ASSEMBLY			Not Applicable	C		
69	PRESSURE TRANSMITTER			Not Applicable	C		
70	PRESSURE SWITCH			Not Applicable	C		

TATA POWER**THE TATA POWER COMPANY LIMITED**
Corporate Engineering - Quality Assurance & Inspection.TPQA&I-QAXX-00-
EX-ICP-342 REV.0**Standard ICP – Transmission Receiving Station.**Date of Issue:
18-Jan-2018.

71	PIPES (IS 1239, IS 3589 & MS AS APPLICABLE)			Not Applicable	C	Cat B for SS Pipes.
72	SOLENOID VALVE			Not Applicable	C	
73	LIMIT SWITCH			Not Applicable	C	
74	LEVEL INDICATOR			Not Applicable	C	
75	LEVEL TRANSMITTER-ULTRASONIC			Not Applicable	C	
76	LEVEL SWITCH			Not Applicable	C	
77	ORIFICE PLATE/ RESTRICTER.			Not Applicable	C	
78	FIRE EXTINGUISHER			Not Applicable	C	

HVAC SYSTEM:

79	PACKAGE AIR COMPRESSOR.				A	
80	VENTILATION & AC SYSTEM - FANS (EXHAUST AND PRESSURE) etc.				B	
81	VENTILATION & AC SYSTEM AHU UNIT				B	
82	VENTILATION & AC SYSTEM – OTHERS (DUCTING, INSULATION MATERIAL, LOUVERS ETC)			Not Applicable	C	
83	WINDOW / SPLIT AC.			Not Applicable	C	

CIVIL ITEMS:

84	FIRE DOOR				B	
85	ALUMINIUM COMPOSITE PANEL (ACP) SHEETS ALONG WITH ASSEMBLY.				B	

TATA POWER

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Corporate Engineering - Quality Assurance & Inspection.



TPQA&I-QAXX-00-EX-ICP-342 REV.0

Standard ICP – Transmission Receiving Station.

Date of Issue:
18-Jan-2018.

86	FERRO CEMENT WATER TANK				B		
87	METAL STORAGE TANK				B		
88	HUME PIPE			Not Applicable	C		
89	FOUNDATION BOLTS			Not Applicable	C		
90	STRUCTURAL STEEL			Not Applicable	C		
91	ACID RESISTANCE TILES/ BRICKS.			Not Applicable	C		
92	METAL ROLLING SHUTTER			Not Applicable	C		
93	SLIDING DOORS			Not Applicable	C		
94	PRE-CAST CONCRETE PRODUCTS			Not Applicable	C		
95	PVC WATER STOPS & WATER PROOF MEMBRANES.			Not Applicable	C		
96	CLADDING/ DECKING GI SHEETS.			Not Applicable	C		

E-SECURITY:

97	BOOM BARRIER, TURNSTILE.				A		
98	CCTV CAMERA WITH COMPONENTS AND ACCESSORIES.			Not Applicable	C		
99	IP BASED CONTROLLER WITH PANEL.			Not Applicable	C		
100	SMART CARD READERS.			Not Applicable	C		
101	SERVER, MONITOR.			Not Applicable	C		
102	OTHER COMPONENTS, HARDWARE.			Not Applicable	C		
103	SOFTWARE.			Not Applicable	C		

*Dates indicated are for monitoring purposes of Tata Power Quality Assurance & inspection Team.

TATA POWER**THE TATA POWER COMPANY LIMITED**
Corporate Engineering - Quality Assurance & Inspection.

TPQA&I-QAXX-00-EX-ICP-342 REV.0

Standard ICP – Transmission Receiving Station.Date of Issue:
18-Jan-2018.

Category "A"	Manufacturing Quality Plan (MQP) shall be approved by Tata Power. Stage &/ or Final Inspection including document review by EPC Contractor and Tata Power (or its appointed Inspection Agency) as per approved MQP.
Category "B"	Manufacturing Quality Plan (MQP) shall be approved by Tata Power. Stage &/ or Final Inspection including document review by EPC contractor or Tata Power (in case no EPC Contractor) as per approved MQP. Inspection report of EPC contractor/ Supplier with supporting documents review by Tata Power.
Category "C"	Supplier shall carry out inspection as per their regular practice/ standard manufacturing quality plan. Supplier shall submit test report and COC to EPC Contractor/ Tata Power. COC shall be in standard format of Tata Power.

1. Above Categorisation is based on the criticality of the equipment/ item as approved by Owner.
2. Any item which is not appearing in above list, however, identified during detailed engineering, same need to be categorized as above.
3. If supplier is not able to submit test report for any Category "C" item, same needs to be finalize during ICP approval.
4. Above classifications, A/B/C may change during detailed discussion with vendor/ contractor based on manufacturers' name proposed.

0	First Issue.	SR/SPS/PU/18.01.18	CRB/RGM/SJ/ 29.01.18	SS
Rev. No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date

Doc. No.: TE/SP/0006/FY25 Rev: A Date: 12.06.2024	INSTALLATION OF NEW 33 kV GIS BAYS AT KALYAN, VIKHROLI AND SAKI RSS	Section-C Page 19 of 21
	33 kV GIS Package for Kalyan, Vikhroli and Saki	

C- SCHEDULES

Please refer annexure C.

Annexure C

C1 - SCHEDULE OF QUANTITIES & PRICES					
S No	Description	Unit	Unit Price	Taxes	Total Price
Bidders to attach copy of unpriced copy of price schedule					
Seal of the Company			Signature		
Date			Name		
			Designation		

C2 - PROJECT TIME SCHEDULE							
Bidders to attach copy of Project schedule							
Seal of the Company			Signature				
Date			Name				
			Designation				
Note: The bidder shall indicate schedule of milestones and also attach/furnish a detailed bar chart identifying customer inputs.							

C3- SCHEDULE OF DEVIATIONS FROM TECHNICAL SPECIFICATIONS

--	--	--	--

All deviations from this specification, shall be set out by the Bidders, indicating clause no and page in this schedule. Unless **specifically** mentioned in this schedule, the tender shall be deemed to conform to the purchaser's specifications:

S No	Clause No	Details of Deviations with Justifications			

We confirm that there are no deviations apart from those detailed above.

Seal of the Company	Signature

Date	Name

	Designation

C4- SCHEDULE OF DEVIATIONS FROM GENERAL & SPECIAL CONDITIONS OF CONTRACT

All deviations from this specification, shall be set out by the Bidders, indicating clause no and page in this schedule. Unless ***specifically*** mentioned in this schedule, the tender shall be deemed to conform to the purchaser's specifications:

S No	Clause No	Details of Deviations with Justifications				
We confirm that there are no deviations apart from those detailed above.						
Seal of the Company		Signature				
Date		Name				
		Designation				

C5- SCHEDULE OF DRAWINGS & DOCUMENT SUBMISSION				
S No	Title of Drawing / Document	Target Date of Submission	For Information / Review / Approval	Remarks
1.0	Overall Dimensions			
1.1				
1.2				
2.0	Layout			
2.1				
2.2				
3.0	SLD / P&ID			
3.1				
3.2				
4.0	GA of Equipment / Skids			
4.1				
4.2				
5.0	O&M Manual			
5.1				
5.2				
Seal of the Company			Signature	
Date			Name	
			Designation	
<p>Note: The titles of drawings / documents listed out in the schedule are examples. The bidder shall list out all relevant drawings / documents.</p>				

C6- SCHEDULE OF RECOMMENDED SPARES

As part of the proposal, the BIDDER shall indicate below the list of recommended spares for three 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	Quantity recommended per unit of equipment	Unit price	Total price	Delivery period from date of LOI	Remarks
Seal of the Company						Signature			
Date						Name			
						Designation			

C8 - SCHEDULE OF PLACES OF MANUFACTURE, TESTS AND 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
Date		Name
		Designation

C9- SCHEDULE OF MANDATORY SPARES

The Bidder shall indicate the price for the mandatory spares specified in Section-A.

Sr. No.	Equipment tag no.	Description of spare	Material of construction	Part no	Quantity included per unit of equipment	Unit price	Total price	Delivery period from date of LOI	Remarks
Seal of the Company						Signature			
Date						Name			
						Designation			

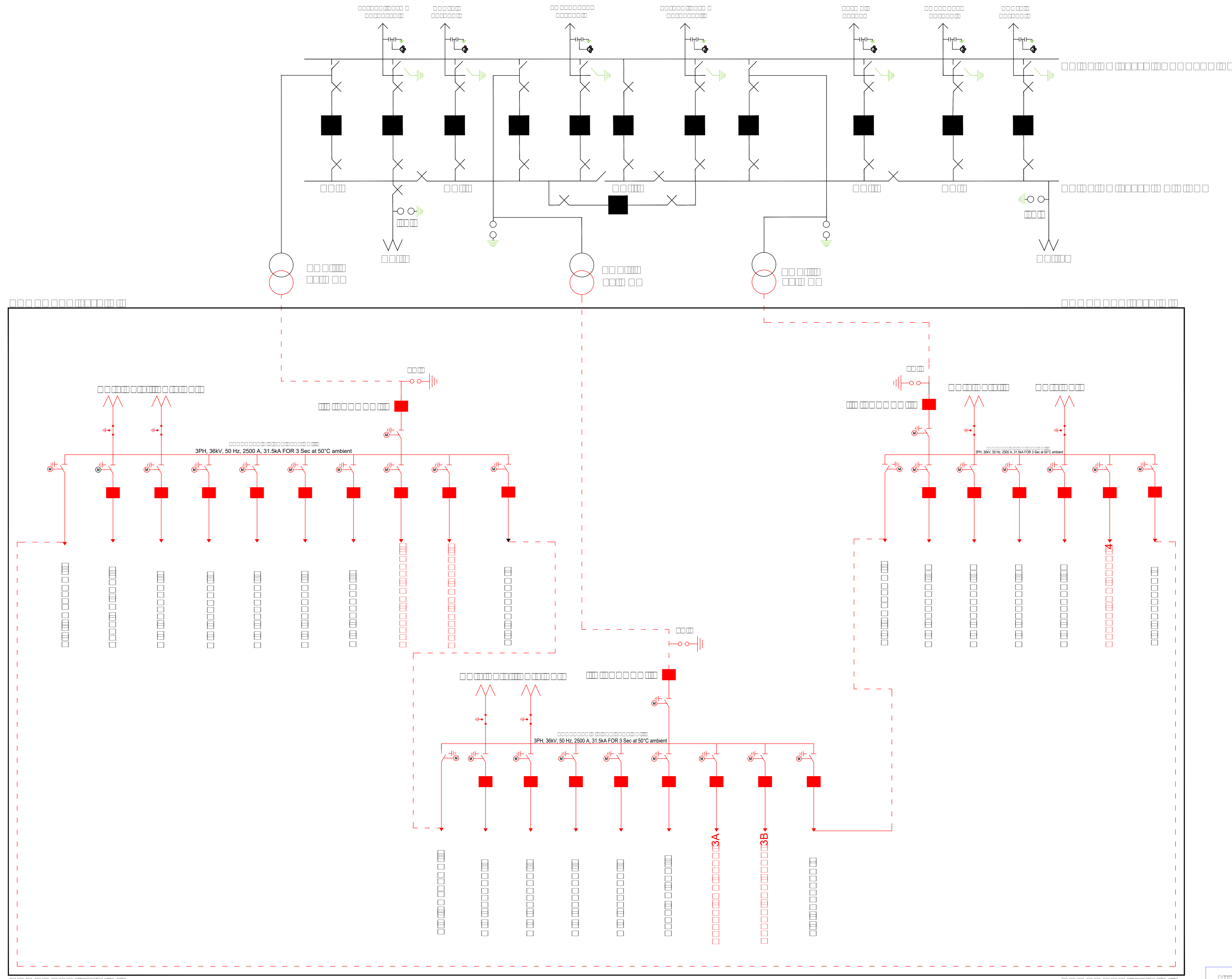
Doc. No.: TE/SP/0006/FY25 Rev: A Date: 12.06.2024	INSTALLATION OF NEW 33 kV GIS BAYS AT KALYAN, VIKHROLI AND SAKI RSS	Section-D Page 20 of 21
	33 kV GIS Package for Kalyan, Vikhroli and Saki	

D- DRAWINGS AND DOCUMENTS

D1 TENDER PURPOSE

D2 AFTER AWARD OF CONTRACT

Annexure 1 - Proposed Kalyan 22kV SLD



SYMBOL/ ABBREVIATION	EQUIPMENT NAME
	CIRCUIT BREAKER
	DISCONNECTOR WITH EARTHING SWITCH
	ISOLATOR (CLOSE)
	ISOLATOR (OPEN)
	ISOLATOR (WITH GROUNDING)
	EARTHING SWITCH
	CABLE HEAD
	LIGHTNING ARRESTER
	BUS VT + IID
	POWER TRANSFORMER
	BUS PT
	UNDERGROUND CABLE
	OVT

36kV SWITCHGEAR BASIC DATA	
STANDARD	IEC 62271-200
HIGHEST SYSTEM VOLTAGE	36kV
NOMINAL OPERATING VOLTAGE	33kV
RATED FREQUENCY	50Hz
POWER FREQUENCY WITHSTAND VOLTAGE / BIL	36/70/170kVp
RATED BUSBAR CURRENT	2500A at 50DEG C AMBIENT TEMPERATURE
RATED SHORT CIRCUIT CURRENT / MAKE CURRENT	31.5kA / 78.5kAP
RATED SHORT CIRCUIT CURRENT DURATION	3 sec
INTERNAL ARC CLASSIFICATION (IAC) TYPE	IAC AFLR
INTERNAL ARC CLASSIFICATION (IAC) CURRENT	31.5kA
INTERNAL ARC CLASSIFICATION (IAC) TIME	1 sec
DEGREE OF PROTECTION - LV COMPARTMENT	IP4X
DEGREE OF PROTECTION - GAS TANK	IP65
MV PHASE DESIGNATION	A,B,C
AMBIENT TEMPERATURE	50 DEG C
ALTITUDE	<1000M

OVERALL SINGLE LINE DIAGRAM

TATA POWER

THE TATA POWER COMPANY LIMITED

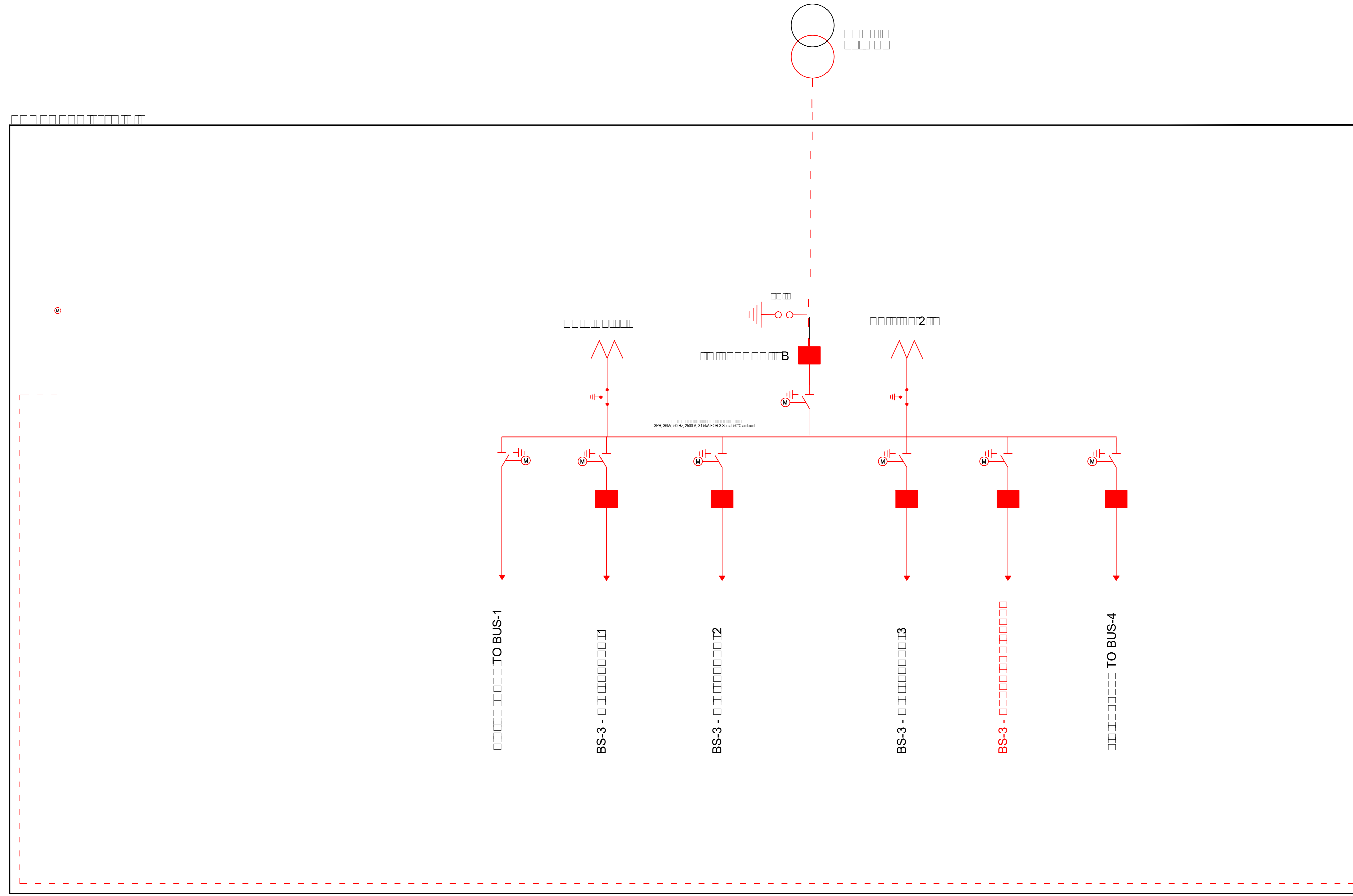
Project Name	
Client Name	
Location	
Scale	
Revision	

Notes and specifications for the SLD diagram, including details on equipment ratings and installation requirements.

Equipment ID	Description	Rating	Location
CB1	Circuit Breaker	31.5kA	Busbar 1
DIS1	Disconnector	33kV	Busbar 1
ISO1	Isolator	33kV	Busbar 1
ISO2	Isolator	33kV	Busbar 1
ISO3	Isolator	33kV	Busbar 1
ISO4	Isolator	33kV	Busbar 1
ISO5	Isolator	33kV	Busbar 1
ISO6	Isolator	33kV	Busbar 1
ISO7	Isolator	33kV	Busbar 1
ISO8	Isolator	33kV	Busbar 1
ISO9	Isolator	33kV	Busbar 1
ISO10	Isolator	33kV	Busbar 1
ISO11	Isolator	33kV	Busbar 1
ISO12	Isolator	33kV	Busbar 1
ISO13	Isolator	33kV	Busbar 1
ISO14	Isolator	33kV	Busbar 1
ISO15	Isolator	33kV	Busbar 1
ISO16	Isolator	33kV	Busbar 1
ISO17	Isolator	33kV	Busbar 1
ISO18	Isolator	33kV	Busbar 1
ISO19	Isolator	33kV	Busbar 1
ISO20	Isolator	33kV	Busbar 1
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ISO22	Isolator	33kV	Busbar 1
ISO23	Isolator	33kV	Busbar 1
ISO24	Isolator	33kV	Busbar 1
ISO25	Isolator	33kV	Busbar 1
ISO26	Isolator	33kV	Busbar 1
ISO27	Isolator	33kV	Busbar 1
ISO28	Isolator	33kV	Busbar 1
ISO29	Isolator	33kV	Busbar 1
ISO30	Isolator	33kV	Busbar 1
ISO31	Isolator	33kV	Busbar 1
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ISO37	Isolator	33kV	Busbar 1
ISO38	Isolator	33kV	Busbar 1
ISO39	Isolator	33kV	Busbar 1
ISO40	Isolator	33kV	Busbar 1
ISO41	Isolator	33kV	Busbar 1
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ISO85	Isolator	33kV	Busbar 1
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ISO90	Isolator	33kV	Busbar 1
ISO91	Isolator	33kV	Busbar 1
ISO92	Isolator	33kV	Busbar 1
ISO93	Isolator	33kV	Busbar 1
ISO94	Isolator	33kV	Busbar 1
ISO95	Isolator	33kV	Busbar 1
ISO96	Isolator	33kV	Busbar 1
ISO97	Isolator	33kV	Busbar 1
ISO98	Isolator	33kV	Busbar 1
ISO99	Isolator	33kV	Busbar 1
ISO100	Isolator	33kV	Busbar 1

Annexure 3 - Proposed 22kV Saki Bus section-3 SLD

22kV Saki Bus section - 3



LEGEND:

SYMBOL/ ABBREVIATION	EQUIPMENT NAME
[Red Square]	CIRCUIT BREAKER
[Circle with 'E']	DISCONNECTOR WITH EARTHING SWITCH
[Symbol]	ISOLATOR (600)-CLOSE
[Symbol]	ISOLATOR (600)-OPEN
[Symbol]	ISOLATOR (600)-WITH GROUNDING
[Symbol]	EARTHING SWITCH
[Symbol]	CABLE HEAD
[Symbol]	LIGHTNING ARRESTER
[Symbol]	BUS VT + I1D
[Symbol]	POWER TRANSFORMER
[Symbol]	BUS PT
[Dashed Line]	UNDERGROUND CABLE
[Symbol]	OVT

36kV SWITCHGEAR BASIC DATA


STANDARD	IEC 62271-200
HIGHEST SYSTEM VOLTAGE	36kV
NOMINAL OPERATING VOLTAGE	33kV
RATED FREQUENCY	50Hz
POWER FREQUENCY WITHSTAND VOLTAGE / BIL	36/70/170kVp
RATED BUSBAR CURRENT	2500A at 50DEG C AMBIENT TEMPERATURE
RATED SHORT CIRCUIT CURRENT / MAKE CURRENT	31.5kA / 78.5kAP
RATED SHORT CIRCUIT CURRENT DURATION	3 sec
INTERNAL ARC CLASSIFICATION (IAC) TYPE	IAC AFLR
INTERNAL ARC CLASSIFICATION (IAC) CURRENT	31.5kA
INTERNAL ARC CLASSIFICATION (IAC) TIME	1 sec
DEGREE OF PROTECTION - LV COMPARTMENT	IP4X
DEGREE OF PROTECTION - GAS TANK	IP65
MV PHASE DESIGNATION	A,B,C,
AMBIENT TEMPERATURE	50 DEG C
ALTITUDE	<1000M

1. [Symbol]
2. [Symbol]
3. [Symbol]
4. [Symbol]
5. [Symbol]

[Symbol]		[Symbol]		[Symbol]	
[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]
[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]
[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]
[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]
[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]

33kV GIS BUS SECTION - 3 AT SAKI RSS [Symbol]

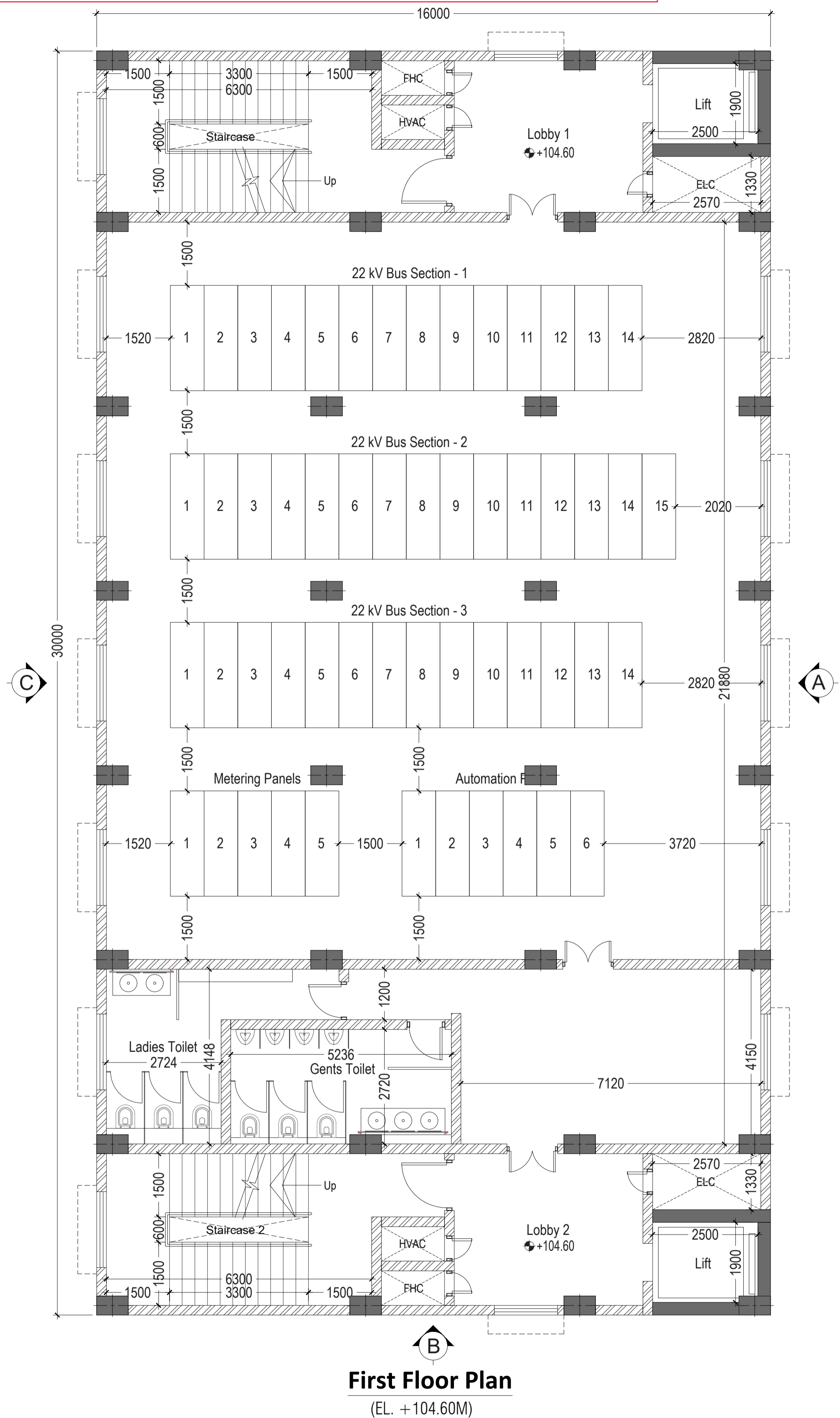
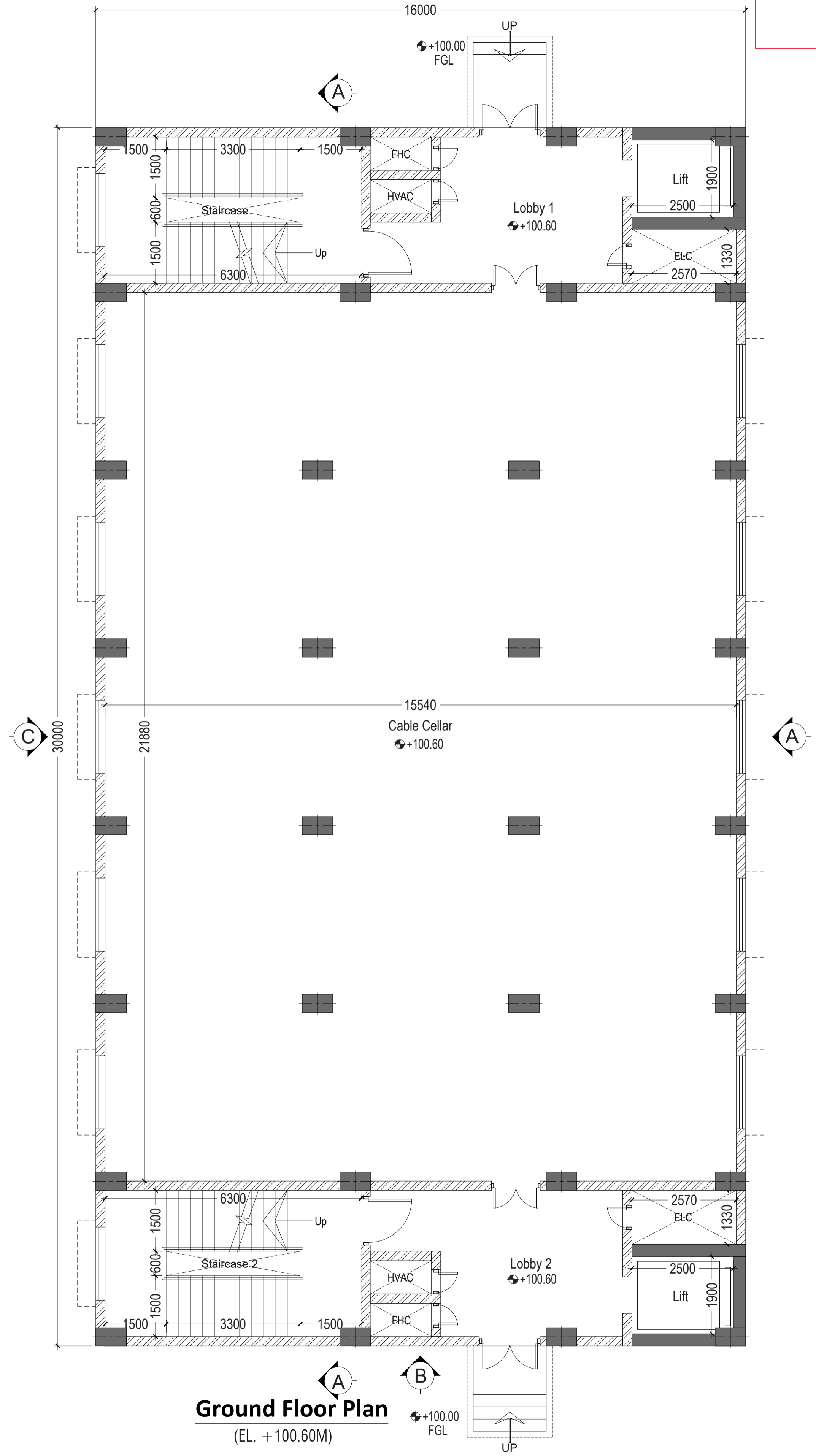
OVERALL SINGLE LINE DIAGRAM


THE TATA POWER COMPANY LIMITED

[Symbol]	[Symbol]	12 [Symbol]
[Symbol]	[Symbol]	[Symbol]
[Symbol]	[Symbol]	[Symbol]

Annexure 4 - Proposed Kalyan Plan layout

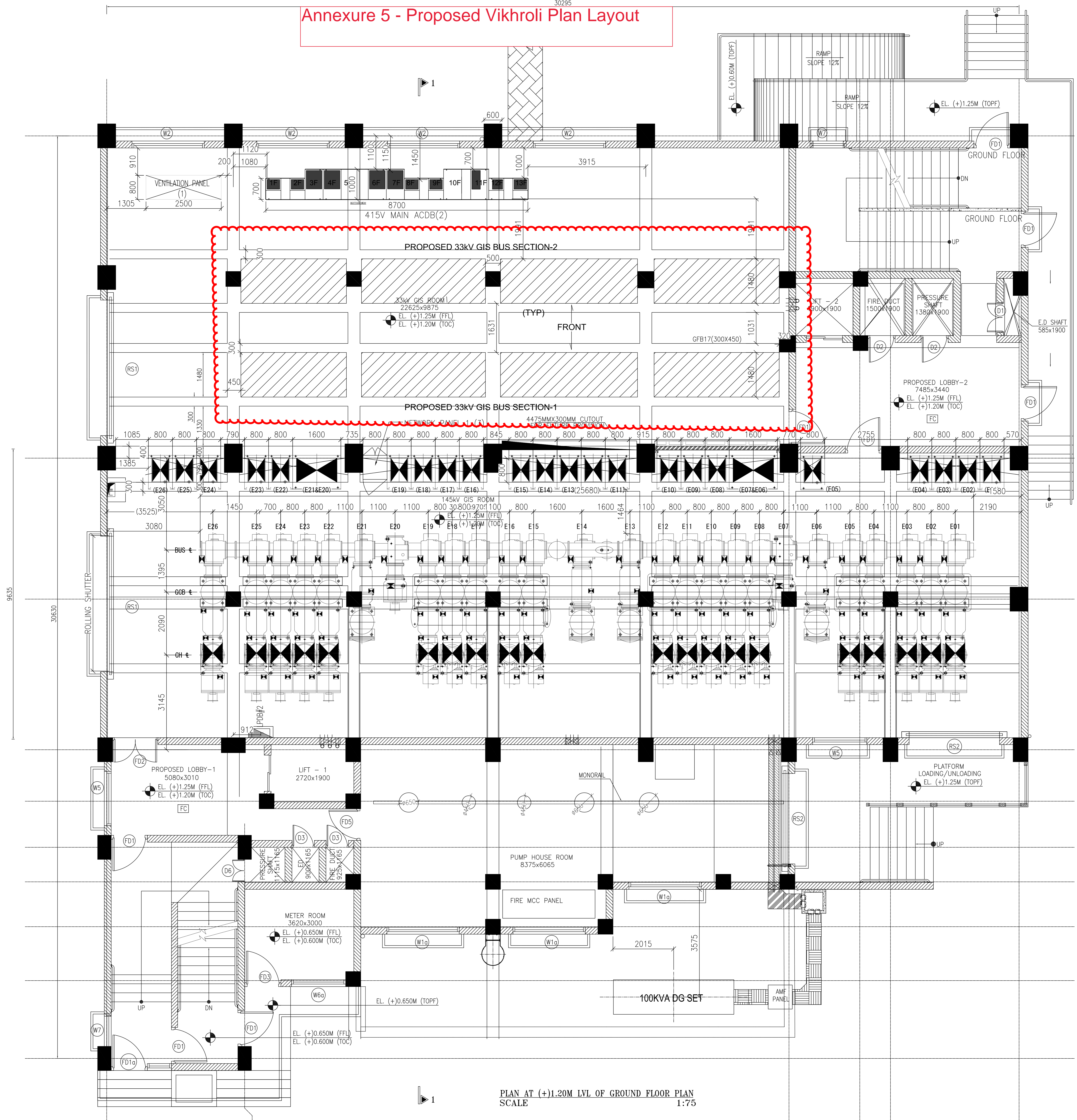
Annexure- 33 B_Floor Plan



DEPT	SIGNATURE	DATE	REV	REVISIONS	DIN	CLEARED						APPD	DATE	REV	REVISIONS	DIN	CLEARED						APPD	DATE	REV	REVISIONS	DIN	CLEARED															
						CHL	ELC	I & C	MEDH	P & L	AUTOM						CHL	ELC	I & C	MEDH	P & L	AUTOM						CHL	ELC	I & C	MEDH	P & L	AUTOM										

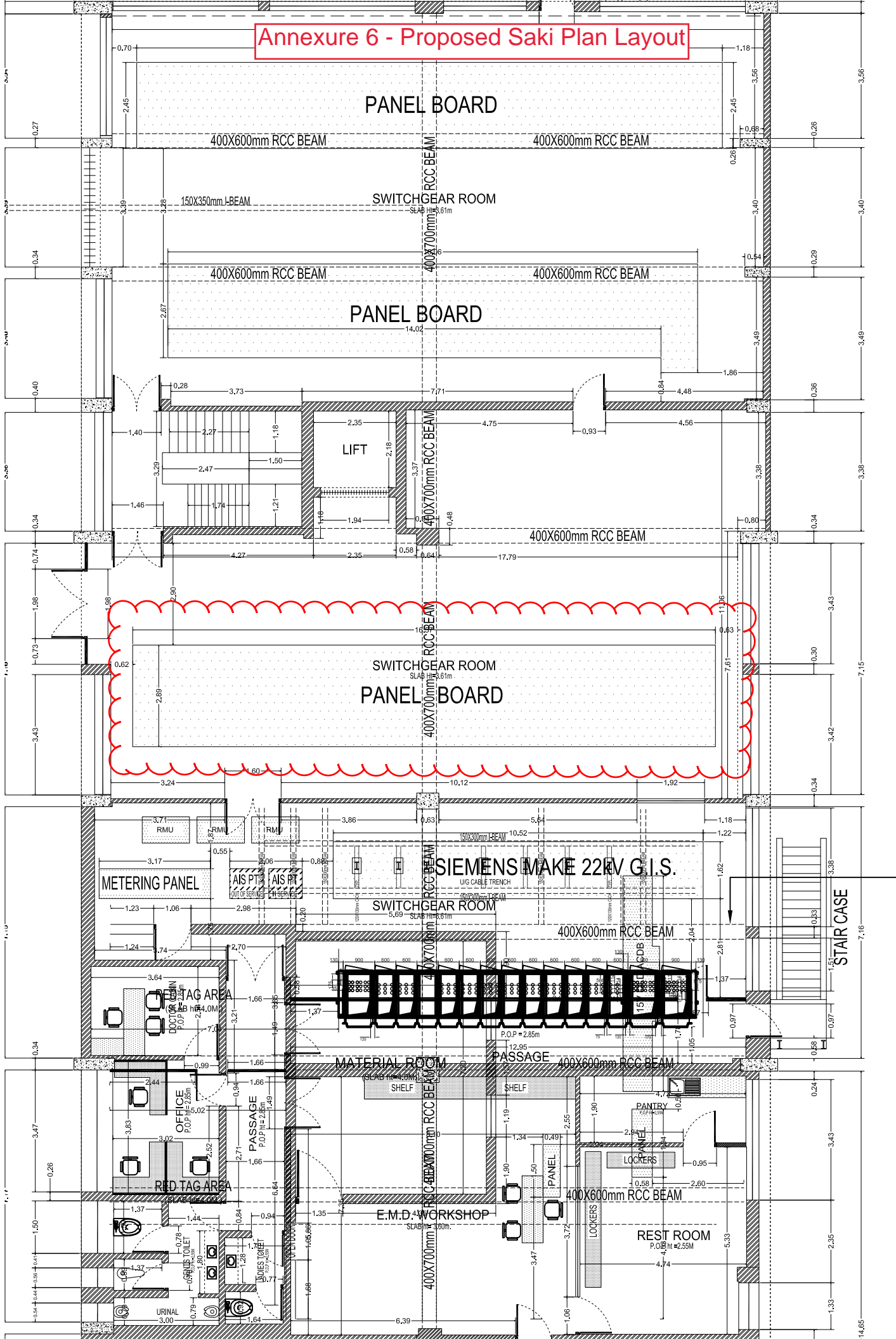
Project: PROPOSED 22 KV R/S AT KALYAN	
TITLE: GROUND FLOOR PLAN & FIRST FLOOR PLAN	
	THE TATA POWER COMPANY LIMITED
SCALE: NTS	APPROVED: _____
DRAWN: AC	DATE: (REV. 0 ISSUE) 00/00/0000
CHECKED: MK	DATE: (CURRENT REV) 08/04/2022
REVIEWED: SC	DATE: _____
DWG. NO.: PE00000-KAL-00-A1-002	REV.: P0

Annexure 5 - Proposed Vikhroli Plan Layout



PLAN AT (+)1.20M LVL OF GROUND FLOOR PLAN
SCALE 1:75

Annexure 6 - Proposed Saki Plan Layout



Doc. No.: TE/SP/0006/FY25 Rev: A Date: 12.06.2024	INSTALLATION OF NEW 33 kV GIS BAYS AT KALYAN, VIKHROLI AND SAKI RSS	Section-E Page 21 of 21
	33 kV GIS Package for Kalyan, Vikhroli and Saki	

ANNEXURE E - BILL OF MATERIAL

	Configuration Laptop																	
A25	Laptop for relay configuration and relay settings with following configuration: HP make 15.6 inch, 16GB RAM, 500GB SSD, Core i5, with licensed copy of Windows10 OS or higher, 2 number of USB ports, 1 ethernet port, 1 HDMI port and 1 serial port along with standard laptop carrying back-sack with pre installed relay licensed softwares	Lot	1	1	1													
B	Automation System																	
B 1.0	33kV GIS Sub-Station Automation Design, Engineering, Supply, Supervision, Erection, Integrated Testing & Commissioning (Lump sum) work and contract of 33kV Substation Automation System. Refer all of scope of work and specific requirements given in SAS Specification Sub-Station Automation System). SAS Vendor shall indicate or flag additional requirement if any, before bidding only and no cost variation will be allowed after award of contract.Vendot to co-ordinate with peer switchgear team,sub-vendors etc.,and provide the complete integrated SAS solution. Bidder shall refer the RFP & technical specification for more details.																	
B 1.1	Redundant Gateway for 33/22 kV system (RTU based hardware only) a) To be supplied with prewired panel with IP54 class (Rittal make), bottom side cable entry, size : 2300 mm x 800 mm x 800 mm, having swing frame and both side opening with accessories b) Managed L3 Ethernet Switch for Station level Communication Communication Ports: 24 PORT L3 switch W/100/1000 MBPS, with Combination of 8 FO & 16 Copper Ports, Mounting Arrangement: To be mounted in Gateway panel, Qty: Minimum 2 Nos	Set	1	1	0							NA	NA	NA	NA			
B 1.2	Pre-wired Miscellaneous RTU Panel I/O Requirement: with 160DI, 80 DO, 32 AI with Auxiliary relay for each Digital Output Mounting: To be supplied with prewired panel (Rittal make) size : 2300 mm x 800 mm x 800 mm, both side opening)	Set	1	1	0							NA	NA	NA	NA			
B 1.3	Configuration Laptop Hardware: 64 Bit with Latest processor, 6Core, 2.30 GHz to 4.70GHz, 512GB PCIe SSD or better, 32 GB RAM, DDR4 , NVIDIA T600 8GB GDD R6, DVD RW, 1no Ethernet port, 4 USB Ports & HDMI, 15.6" Display with 1 no. serial to USB converter Software: Microsoft Windows compatible with latest version of configuration software, Standard edition microsoft Office License pack, Trend micro (Apex one) Anti-virus, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU, Gateway, Configuration Software and protocol analyzer	Set	1	1	0							NA	NA	NA	NA			
B 1.4	Managed L2 Ethernet Switch for 33 kV BCPU & other IEDs communication and integration with Gateway Mounting Arrangement: DIN Rail/Rackmouted in Switchgear based on feasibility To be mounted in Dummy Panel / Switchgear/ Separate Network Panel (Adjacent to the switchgear) along with cable termination accessories. (Bidder shall refer the specification for more details) Qty: Minimum 2 Nos. of Switches with FO & Copper ports for each bus-section and as per distribution of GIS panels and shall be based on Bidder's offered solution. Each Switch shall have 20% spare FO and Cu ports. (Bidder to consider quantity of L2 Switches / 1 Set / Station based on No. of Bus Sections and GIS Panel Layout of the respective station) 1 Set = 2 nos of Ethernet Switch	Set	3	4	1							NA	NA	NA	NA			
B 1.5	Networking Accessories Networking accessories for integration of BCPUs, Gateway, Condition monitoring devices : All required networking accessories like LIU, patch panel (for each Ethernet switch), patch chords (Fibre optic, UTP) of suitable length, The connectors will be selected to match that of the IEDs and SFPs on the switches, Conduits for all non-armoured cables, I/O boxes with Quad face plate, 24 Port Patch panels for each L2/L3switch, RJ45 connectors etc. Bidder to consider 20% of spare qty of each component. (Bidder to consider quantity of Networking Accessories for each station) (1 Lot / Station)	Lot	1	1	1							NA	NA	NA	NA			
B 1.6	GPS Receiver with minimum 4 nos. NTP/SNTP Ports, Standalone Frequency, time and Date displays with Surge arrester & Redundant Antenna	Set	1	1	0							NA	NA	NA	NA			
B 1.7	Armoured CAT6 UTP Cable (1 Lot = 500 metres)	Lot	3	4	1							NA	NA	NA	NA			
B 1.8	4P X 0.36 Sq. mm armoured multistrand pair, overall shielded, for integration of MFM and other IEDs (1Lot =500 mtrs)	Lot	3	4	1							NA	NA	NA	NA			

METERING SYSTEM BILL OF QUANTITY						
METERING PANELS						
SUPPLY						
Sr. No.	Description	Nos/set	Qty			Price quoted by bidder in INR
			Kalyan	Vikhroli	Saki	
A	SECURE MAKE APEX 150 METERS					
1	Supply and mounting of Secure make APEX 150 meters in Prewired Metering panels mentioned in point B (Prewired Metering panels)	Nos	5	26	3	
B	PREWIRED METERING PANELS					
1	Design, Engineering, Manufacturing, Inspection, loading, Supply, Transport, Unloading at site, Storage, Erection, Testing, Commissioning of Prewired metering panels	Nos	3	11	2	
C	COMMUNICATION ACCESSORIES					
1	Supply and connection of Serial Device server (Make Moxa, Model – Nport 5232)	Nos	2	2	2	
4	Supply, laying, termination and connection of Armoured CAT6 (Twisted pair cable) between meters to communication panel	mtrs	80	80	80	
SERVICES						
1	Services for preparation of cable schedule and ICS, Installation, testing and commissioning of all material mentioned under supply scope		LS	LS	LS	
SPARES						
1	Secure make APEX 150 meters	Nos	1	1	1	
2	TTB	Nos	1	1	1	

UFLS SYSTEM BILL OF QUANTITY					
SUPPLY: Protection system					
Sr. No.	Description	Qty. Set/Nos.			Price quoted by bidder in INR
		Kalyan	Vikhroli	Saki	
1	Completely pre-wired Simplex control Type-G Protection panel comprising of protection schemes and accessories as per specification along with IEDs, its networking accessories between IED to gateway, IED to DRCA system, relevent LIUs, switches, patch cords etc. for successful commissioning of underfrequency load shedding scheme.	3 sets	1 Set	NA	
3	Proection Relay integration with SCADA & DRCA system at above mentioned stations: Ethernet Swtiches, Converters, Communciation Cables (FO & UTP) and Networking accessories like LIU, patch panel (for each Ethernet switch), Pre-fabricated Patch cords (Fibre optic, UTP) of suitable length, Conduits for all non-armoured cables, I/O boxes with Quad face plate, RJ45 connectors etc.	1 lot	1 lot	NA	
Spares					
1	IED of each model number/ order code/ MLFB shall be supplied as spares	1 lot		NA	
2	Auxilliary trip relay	1 each type		NA	
Services					
1	Services for preparation of cable schedule and ICS, commissioning of protection, automation and communication system along with appropriate human resources, numerical relay testing kit for relay panel commissioning and integration of relays with SCADA, DRCA system to view disturbance record and parameterization from remote	LS		NA	

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

Tender Reference: CC25NP019

Document Date: 27th June 2024

Section E.1: Special conditions of contract

CONFIDENTIAL

Supply and Services of 33KV GIS along associated equipment at Kalyan, Vikhroli and Saki Receiving station in Mumbai. Ref. no.: CC25NP019	THE TATA POWER COMPANY LIMITED	
	E.1 SPECIAL CONDITIONS OF CONTRACT	SHEET 1 OF 4

Sr. No.	TOPIC	PRINCIPLES OF TERMS & CONDITIONS
1	GENERAL	<p>The following Special Conditions of Contract (SCC) shall supplement the General Terms and Conditions – Supply & Service.</p> <p>Wherever there is a conflict, the provisions herein shall prevail over those in the “General Terms and Conditions – Supply & Service”.</p>
2	CONTRACT PRICE AND CONTRACT STRUCTURE	<p>The Bid shall remain valid for 180 days from the due date of submission of the bid. Price submitted as part of E-auction / Negotiation shall remain valid for 90 days from date of E-auction / Negotiation.</p> <p>Notwithstanding clause above, Tata Power 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.</p> <p>Bidders to quote for the package on Firm Price basis. The prices and unit rates shall remain firm and fixed till the commissioning of the project, and no price variation is applicable.</p> <p>This tender consists of 03 different lots (33kv GIS at Kalyan, 33KV GIS at Vikhroli and 33KV GIS at Saki).</p> <p>Technical and Commercial evaluation of each Lot (Kalyan, Vikhroli & Saki) shall be done independently. Accordingly, award decision shall be made for each lot.</p>
3	COMMENCEMENT / EFFECTIVE DATE (Note: It is to be noted that commencement date, effective date and notice to proceed are one and the same.)	<p>The Vendor will commence work / manufacturing of equipment on issue of Letter of Award (LOA) / Firm Purchase Order by TATA POWER and notice to proceed by the Order Manager.</p> <p>No equipment/material shall be delivered without specific dispatch clearance from project Manager TATA POWER.</p>

Supply and Services of 33KV GIS along associated equipment at Kalyan, Vikhroli and Saki Receiving station in Mumbai. Ref. no.: CC25NP019	THE TATA POWER COMPANY LIMITED	
	E.1 SPECIAL CONDITIONS OF CONTRACT	SHEET 2 OF 4

4	CONTRACT PERFORMANCE BANK GUARANTEE	<p>This is further to the General Terms & Conditions – Supply Clause 9.0 / General Terms & Conditions-Services-Clause 10;</p> <p>Successful Vendor shall submit a CPBG cum PBG of 10% of Contract Value in format specified by Tata Power within 15 days from the placement of confirmed Purchase Order.</p> <p>This CPBG cum PBG shall be valid till warranty period with additional claim period of 6 months.</p>
5	TERMS OF PAYMENT	<p>This is further to General Terms & Conditions – Supply Cl. 6.0 and General Terms and conditions-Services Cl 8.0 respectively.</p> <ol style="list-style-type: none"> 1) No Advance Payment. 2) Supply: 80% of supply cost shall be payable against supply on pro-rata basis. 3) Remaining 20% of supply cost shall be payable upon commissioning and handover of the project and submission of as built drawing. 4) If Commissioning is delayed due to reasons attributable to Tata Power, then balance 20% of supply part shall be paid within 90 days from scheduled date of Commissioning against submission of CPBG cum PBG. 5) Service: 100% of payment upon commissioning. (Pro-rata basis). 6) Payment Credit period is 90 days. 7) Safety Retention shall be as per safety Terms and Conditions (Enclosed as Annexure to GTC) as applicable. 8) All payments against supply and services are subject to acceptance of material/services, submission of error free invoice copy in ARIBA portal, submission of unconditional CPBG cum PBG (as per clause 4 of SCC above) and unconditional acceptance/signing of the PO/Contract agreement. 9) Income tax and any other statutory recoveries as applicable shall be recovered from Contractor monthly running bills and TDS certificate for the deductions shall be furnished.

Supply and Services of 33KV GIS along associated equipment at Kalyan, Vikhroli and Saki Receiving station in Mumbai. Ref. no.: CC25NP019	THE TATA POWER COMPANY LIMITED	
	E.1 SPECIAL CONDITIONS OF CONTRACT	SHEET 3 OF 4

6	FREIGHT & INSURANCE	This is as per General Terms and conditions-Supply clause 5, and Services Clause 12, - Complete Freight and Insurance will be in Vendor's scope.
7	LIQUIDATED DAMAGES FOR DELAYS, NON – PERFORMANCE & OVERALL CAP	This is further to General Terms & Conditions – Supply Clause 10.0. and General Terms & conditions-Services clause 11 In the event of delay, LD shall be levied at 1% of Contract value per week of delay or part thereof subject to maximum of 10% of Contract value.
8	WORK COMPLETION PERIOD	Supply: a) Drawing submission/approval shall be completed within 06 weeks from the date of award (Bidder shall submit the complete drawings within 04 weeks from date of award and Tata Power shall approve the drawing and provide manufacturing clearance within 02 weeks from date of receipt of complete drawing) b) Material shall be delivered at site within 05 months from date of manufacturing clearance. Service: Installation, testing and commissioning shall be completed within 02 months from date of supply or site handover.
9	WARRANTY PERIOD	Warranty period for equipment shall be 05 years from date of commissioning.
10	Total Compliance to TCOC, safety Terms & Conditions and International Safety standards	Tata Power Contractor Safety Terms and Conditions is enclosed as Annexure to the GTC. Vendor shall have to abide fully without any deviation.
11	BID SUBMISSION (In Ariba)	Bidders are requested to submit their offer in line with this Tender document, instructions given in "Tender Notice and instructions to Bidders"

Supply and Services of 33KV GIS along associated equipment at Kalyan, Vikhroli and Saki Receiving station in Mumbai. Ref. no.: CC25NP019	THE TATA POWER COMPANY LIMITED	
	E.1 SPECIAL CONDITIONS OF CONTRACT	SHEET 4 OF 4

12	TPSDI Training	<p>To improve work safety and to ensure that all work force deployed at owner premises have the right orientation / induction and skills training before they undertake any work, the Vendor shall accordingly plan and enrol his and sub-contractors work force to the respective skills / crafts training (Levels L1/L2/L3) offered by TPSDI.</p>
13	Special note for Statutory requirements related to contract workmen	<p>In addition to all prevailing admin / statutory approvals Vendor to take special note of following</p> <p>All employees should submit medical fitness on Form No 6. ESIC / PF is mandatory for all employees deputed for the project. Police Verification / Indemnity Bond to be produced for all employees working at site.</p>
14	Reverse Auction	<p>Tata Power reserves the right to go for Reverse Auction (RA) for price negotiation and discover the most competitive price on ARIBA portal, Tata Power's official e-tendering platform. This will be decided after techno-commercial evaluation of the bids. Bidders need to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case Tata Power decides to go for RA. Only those bidders who are techno-commercially qualified shall be eligible to participate further in RA process.</p> <p>However, the original H1 bidder (whose price bid is the highest post techno-commercial evaluation) shall not be allowed to participate in further RA process provided minimum three techno-commercially qualified bids are available.</p> <p>Date and time of e-auction will be intimated through E-Tender system to Authorized Person of eligible Bidders. Provided minimum three techno-commercially qualified bids are available.</p>

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

Tender Reference: CC25NP019

Document Date: 27th June 2024

CONFIDENTIAL

Section E.2: Price bid format

E.2 Price bid format- CC25NP019 : Supply & Services for 36KV GIS alongwith associated equipment for Kalyan Receiving Station

Srno.	Material Description	Qty	UOM	Basic price	Total Basic Price
1	Incomers (2500A)	3	Nos.		0
2	Tie Breaker (2500A)	3	Nos.		0
3	Tie Isolator (2500A)	3	Nos.		0
4	Outgoing (1250A)	13	Nos.		0
5	Capacitor Bank feeder (1250A)	5	Nos.		0
6	Station Transformer feeder (1250A)	2	Nos.		0
7	Bus PT (1 set include 3 nos.)	6	Set		0
8	Surge arrestor (1 set = 3 nos.)	3	Set		0
9	33 kV Dummy Panels (to suit civil structural layout at site)	3	Nos.		0
10	Dummy plugs for Incomer terminals (for Type - III - Cable terminals- set of 4 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	12	Set		0
11	Dummy plugs for Tie breaker terminals (for Type - III - Cable terminals- set of 4 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	12	Set		0
12	Dummy plugs for Tie isolator terminals (for Type - III - Cable terminals- set of 4 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	12	Set		0
13	Dummy plugs for out going feeder terminals (for Type - III - Cable terminals- set of 2 no. plugs for each phase, 1 Set= 3nos. Dummy plugs, one for each phase)	26	Set		0
14	Dummy plugs for capacitor bank feeder terminals (for Type - III - Cable terminals- set of 2 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	10	Set		0
15	Dummy plugs for station transformer feeder terminals (for Type - III - Cable terminals- set of 2 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	4	Set		0
16	Voltage plug	1	Set		0
17	Current plug	2	Set		0
18	Spares for 33 kV GIS: As per section-B table	1	Lot		0

19	GIS Cable terminations- (1 set = 3 phase) 1Cx 630 sqmm XLPE Copper cable - For I/C	12	Set		0
20	GIS Cable terminations- (1 set = 3 phase) 1Cx 630 sqmm cable - Tie breaker	12	Set		0
21	GIS Cable terminations- (1 set = 3 phase) 1Cx 630 sqmm cable - Tie isolator	12	Set		0
22	GIS Cable terminations- (1 set = 3 phase) 1Cx 400 sqmm XLPE Aluminum cable - Outgoing feeders	26	Set		0
23	GIS Cable terminations- (1 set = 3 phase) 3Cx 400 sqmm cable - Cap banks	10	Set		0
24	GIS Cable terminations- (1 set = 3 phase) 3Cx 400 sqmm cable - Station transformer	4	Set		0
25	Separate panel with control TNC switches mounted for breaker and isolator close open along with 1. breaker & isolator status indicating lamps 2. SLD mimic to be shown with above control switches	3	Lot		0
26	Laptop for relay configuration and relay settings with following configuration: HP make 15.6 inch, 16GB RAM, 500GB SSD, Core i5, with licensed copy of Windows10 OS or higher, 2 number of USB ports, 1 ethernet port, 1 HDMI port and 1 serial port along with standard laptop carrying back-sack with pre installed relay licensed softwares	1	EA		0
27	Redundant Gateway for 33/22 kV system (RTU based hardware only) a) To be supplied with prewired panel with IP54 class (Rittal make), bottom side cable entry, size : 2300 mm x 800 mm x 800 mm, having swing frame and both side opening with accessories b) Managed L3 Ethernet Switch for Station level Communication Communication Ports: 24 PORT L3 switch W/100/1000 MBPS, with Combination of 8 FO & 16 Copper Ports, Mounting Arrangement: To be mounted in Gateway panel, Qty: Minimum 2 Nos	1	Set		0

28	<p>Pre-wired Miscellaneous RTU Panel I/O Requirement: with 160DI, 80 DO, 32 AI with Auxiliary relay for each Digital Output Mounting: To be supplied with prewired panel (Rittal make) size : 2300 mm x 800 mm x 800 mm, both side opening)</p>	1	Set		0
29	<p>Configuration Laptop Hardware: 64 Bit with Latest processor, 6Core, 2.30 GHz to 4.70GHz, 512GB PCIe SSD or better, 32 GB RAM, DDR4 , NVIDIA T600 8GB GDD R6, DVD RW, 1no Ethernet port, 4 USB Ports & HDMI, 15.6" Display with 1 no. serial to USB converter Software: Microsoft Windows compatible with latest version of configuration software, Standard edition microsoft Office License pack, Trend micro (Apex one) Anti-virus, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU, Gateway, Configuration Software and protocol analyzer</p>	1	Set		0
30	<p>Managed L2 Ethernet Switch for 33 kV BCPU & other IEDs communication and integration with Gateway Mounting Arrangement: DIN Rail/Rackmouted in Switchgear based on feasibility To be mounted in Dummy Panel / Switchgear/ Separate Network Panel (Adjacent to the switchgear) along with cable termination accessories. (Bidder shall refer the specification for more details) Qty: Minimum 2 Nos. of Switches with FO & Copper ports for each bus-section and as per distribution of GIS panels and shall be based on Bidder's offered solution. Each Switch shall have 20% spare FO and Cu ports. (Bidder to consider quantity of L2 Switches / 1 Set / Station based on No. of Bus Sections and GIS Panel Layout of the respective station) 1 Set = 2 nos of Ethernet Switch</p>	3	Set		0

31	<p>Networking Accessories</p> <p>Networking accessories for integration of BCPU's, Gateway, Condition monitoring devices : All required networking accessories like LIU, patch panel (for each Ethernet switch), patch chords (Fibre optic, UTP) of suitable length, The connectors will be selected to match that of the IEDs and SFPs on the switches, Conduits for all non-armoured cables, I/O boxes with Quad face plate, 24 Port Patch panels for each L2/L3switch, RJ45 connectors etc.</p> <p>Bidder to consider 20% of spare qty of each component. (Bidder to consider quantity of Networking Accessories for each station) (1 Lot / Station)</p>	1	Lot		0
32	GPS Receiver with minimum 4 nos. NTP/SNTP Ports, Standalone Frequency, time and Date displays with Surge arrester & Redundant Antenna	1	Set		0
33	Armoured CAT6 UTP Cable (1 Lot = 500 metres)	3	Lot		0
34	4P X 0.36 Sq. mm armoured multistrand pair, overall shielded, for integration of MFM and other IEDs (1Lot =500 mtrs)	3	Lot		0
35	4P X 0.36 Sq. mm unarmoured multistrand pair, overall shielded, for integration of MFM and other IEDs (1 Lot = 250 metres)	3	Lot		0
36	8 Core Armoured Multi-mode Fibre Optic Cable (1 Lot = 500 metres)	3	Lot		0
37	<p>Satellite Workstation for SCADA</p> <p>Power Supply : 230V AC</p> <p>To be supplied with operator workstation with hardware viz dual headed LED monitor,Optical Keyboard & Mouse and latest windows OS, Software's with Antivirus Trend Micro (Apex one) with three-year subscription & Standard MS office latest version</p> <p><i>(Refer Automation specification for More details)</i></p>	1	nos		0
38	Temperature & Humidity Transmitter and integration with gateway on RS485 Modbus RTU	2	Nos		0

39	Automation mandatory Spares (As per the Spares list indicated in the SAS Specification)	1	Set		0
40	<p>Installation and Commissioning Services</p> <p>a) Design, Engineering, Installation, Testing and Commissioning of Sub-station Automation System as per SOW.</p> <p>b) Co-ordination with switchgear team & other sub vendors.</p> <p>c) Preparation of interconnecting cable schedule, Cable laying and termination, continuity check of all power, communication and field cables,</p> <p>d) Powering up of all supplied materials and Configuration of all supplied equipment</p> <p>e) Commissioning and integration of all supplied equipment as per the approved architecture</p> <p>f) All BCPUs, MFM looping and Condition Monitoring Units and Integration with New/Existing Gateway</p> <p>g) Testing and Integration of BCPUs with existing DRCA System, Firewall and Analysis system as per the approved architecture and testing up to Central DR System</p> <p>h) I/O testing, Pre- SAT testing, testing with Purchaser's Unified SCADA System</p> <p>i) Integrated FAT & SAT for Hardware and Software</p> <p>j) Final As built Document & Drawings Submission in AutoCAD & Pdf format.</p> <p>k) Extended warranty for Hardware & Software inclusive of patch management and software upgradation for the period of 5 Years</p>	1	Lot		0
41	Services of M/s Kalkitech for configuration, integration with both local DRCA System of the respective station & Centralised DRCA system.	1	Lot		0
42	<p>Training: (Sub-Station Automation & 3rd party items)</p> <p>05 Engineers x 3 man-days (15 mandays) at Vendor's work</p>	1	Lot		0
43	Completely pre-wired Simplex control Type-G Protection panel comprising of protection schemes and accessories as per specification along with IEDs, its networking accessories between IED to gateway, IED to DRCA system, relevent LIUs, switches, patch cords etc. for successful commissioning of underfrequency load shedding scheme.	3	Sets		0

44	Protection Relay integration with SCADA & DRCA system at above mentioned stations: Ethernet Switches, Converters, Communication Cables (FO & UTP) and Networking accessories like LIU, patch panel (for each Ethernet switch), Pre-fabricated Patch cords (Fibre optic, UTP) of suitable length, Conduits for all non-armoured cables, I/O boxes with Quad face plate, RJ45 connectors etc.	1	Lot		0
45	IED of each model number/ order code/ MLFB shall be supplied as spares	1	Lot		0
46	Auxilliary trip relay	1	Lot		0
47	Services for preparation of cable schedule and ICS, commissioning of protection, automation and communication system along with appropriate human resources, numerical relay testing kit for relay panel commissioning and integration of relays with SCADA, DRCA system to view disturbance record and parameterization from remote	1	Lot		0
48	Supply and mounting of Secure make APEX 150 meters in Prewired Metering panels mentioned in point B (Prewired Metering panels)	5	Nos		0
49	Design, Engineering, Manufacturing, Inspection, loading, Supply, Transport, Unloading at site, Storage, Erection, Testing, Commissioning of Prewired metering panels	3	Nos		0
50	Supply and connection of Serial Device server (Make Moxa, Model – Nport 5232)	2	Nos		0
51	Supply, laying, termination and connection of Armoured CAT6 (Twisted pair cable) between meters to communication panel	80	Meters		0
52	Services for preparation of cable schedule and ICS, Installation, testing and commissioning of all material mentioned under supply scope	1	Lot		0
53	Secure make APEX 150 meters	1	No		0
54	TTB	1	No		0
				Total Amount Without GST	-
				GST-18%	-
				Total Amount with GST	-

Note: Above description shall be read in conjunction with the Technical specification and BOQ.

E.2 Price bid format- CC25NP019 : Supply & Services for 36KV GIS alongwith associated equipment for Vikhroli Receiving Station

Srno.	Material Description	Qty	UOM	Basic price	Total Basic Price
1	Incomers (2500A)	4	Nos.		0
2	Tie Breaker (2500A)	5	Nos.		0
3	Tie Isolator (2500A)	3	Nos.		0
4	Outgoing (1250A)	25	Nos.		0
5	Capacitor Bank feeder (1250A)	2	Nos.		0
6	Station Transformer feeder (1250A)	1	Nos.		0
7	Bus PT (1 set include 3 nos.)	8	Set		0
8	Surge arrestor (1 set = 3 nos.)	4	Set		0
9	33 kV Dummy Panels (to suit civil structural layout at site)	4	Nos.		0
10	Dummy plugs for Incomer terminals (for Type - III - Cable terminals- set of 4 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	16	Set		0
11	Dummy plugs for Tie breaker terminals (for Type - III - Cable terminals- set of 4 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	20	Set		0
12	Dummy plugs for Tie isolator terminals (for Type - III - Cable terminals- set of 4 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	12	Set		0
13	Dummy plugs for out going feeder terminals (for Type - III - Cable terminals- set of 2 no. plugs for each phase, 1 Set= 3nos. Dummy plugs, one for each phase)	50	Set		0
14	Dummy plugs for capacitor bank feeder terminals (for Type - III - Cable terminals- set of 2 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	4	Set		0
15	Dummy plugs for station transformer feeder terminals (for Type - III - Cable terminals- set of 2 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	2	Set		0
16	Voltage plug	1	Set		0
17	Current plug	2	Set		0
18	Spares for 33 kV GIS: As per section-B table	1	Lot		0

19	GIS Cable terminations- (1 set = 3 phase) 1Cx 630 sqmm XLPE Copper cable - For I/C	16	Set		0
20	GIS Cable terminations- (1 set = 3 phase) 1Cx 630 sqmm cable - Tie breaker	20	Set		0
21	GIS Cable terminations- (1 set = 3 phase) 1Cx 630 sqmm cable - Tie isolator	12	Set		0
22	GIS Cable terminations- (1 set = 3 phase) 1Cx 400 sqmm XLPE Aluminum cable - Outgoing feeders	50	Set		0
23	GIS Cable terminations- (1 set = 3 phase) 3Cx 400 sqmm cable - Cap banks	4	Set		0
24	GIS Cable terminations- (1 set = 3 phase) 3Cx 400 sqmm cable - Station transformer	2	Set		0
25	Separate panel with control TNC switches mounted for breaker and isolator close open along with 1. breaker & isolator status indicating lamps 2. SLD mimic to be shown with above control switches	4	Lot		0
26	Laptop for relay configuration and relay settings with following configuration: HP make 15.6 inch, 16GB RAM, 500GB SSD, Core i5, with licensed copy of Windows10 OS or higher, 2 number of USB ports, 1 ethernet port, 1 HDMI port and 1 serial port along with standard laptop carrying back-sack with pre installed relay licensed softwares	1	EA		0
27	Redundant Gateway for 33/22 kV system (RTU based hardware only) a) To be supplied with prewired panel with IP54 class (Rittal make), bottom side cable entry, size : 2300 mm x 800 mm x 800 mm, having swing frame and both side opening with accessories b) Managed L3 Ethernet Switch for Station level Communication Communication Ports: 24 PORT L3 switch W/100/1000 MBPS, with Combination of 8 FO & 16 Copper Ports, Mounting Arrangement: To be mounted in Gateway panel, Qty: Minimum 2 Nos	1	Set		0

28	<p>Pre-wired Miscellaneous RTU Panel I/O Requirement: with 160DI, 80 DO, 32 AI with Auxiliary relay for each Digital Output Mounting: To be supplied with prewired panel (Rittal make) size : 2300 mm x 800 mm x 800 mm, both side opening)</p>	1	Set		0
29	<p>Configuration Laptop Hardware: 64 Bit with Latest processor, 6Core, 2.30 GHz to 4.70GHz, 512GB PCIe SSD or better, 32 GB RAM, DDR4 , NVIDIA T600 8GB GDD R6, DVD RW, 1no Ethernet port, 4 USB Ports & HDMI, 15.6" Display with 1 no. serial to USB converter Software: Microsoft Windows compatible with latest version of configuration software, Standard edition microsoft Office License pack, Trend micro (Apex one) Anti-virus, Configuration & maintenance software tools, Diagnostic tools. Logic building Application of RTU, Gateway, Configuration Software and protocol analyzer</p>	1	Set		0
30	<p>Managed L2 Ethernet Switch for 33 kV BCPU & other IEDs communication and integration with Gateway Mounting Arrangement: DIN Rail/Rackmouted in Switchgear based on feasibility To be mounted in Dummy Panel / Switchgear/ Separate Network Panel (Adjacent to the switchgear) along with cable termination accessories. (Bidder shall refer the specification for more details) Qty: Minimum 2 Nos. of Switches with FO & Copper ports for each bus-section and as per distribution of GIS panels and shall be based on Bidder's offered solution. Each Switch shall have 20% spare FO and Cu ports. (Bidder to consider quantity of L2 Switches / 1 Set / Station based on No. of Bus Sections and GIS Panel Layout of the respective station) 1 Set = 2 nos of Ethernet Switch</p>	4	Set		0

31	<p>Networking Accessories</p> <p>Networking accessories for integration of BCPU's, Gateway, Condition monitoring devices : All required networking accessories like LIU, patch panel (for each Ethernet switch), patch chords (Fibre optic, UTP) of suitable length, The connectors will be selected to match that of the IEDs and SFPs on the switches, Conduits for all non-armoured cables, I/O boxes with Quad face plate, 24 Port Patch panels for each L2/L3switch, RJ45 connectors etc.</p> <p>Bidder to consider 20% of spare qty of each component. (Bidder to consider quantity of Networking Accessories for each station)</p> <p>(1 Lot / Station)</p>	1	Lot		0
32	GPS Receiver with minimum 4 nos. NTP/SNTP Ports, Standalone Frequency, time and Date displays with Surge arrester & Redundant Antenna	1	Set		0
33	Armoured CAT6 UTP Cable (1 Lot = 500 metres)	4	Lot		0
34	4P X 0.36 Sq. mm armoured multistrand pair, overall shielded, for integration of MFM and other IEDs (1Lot =500 mtrs)	4	Lot		0
35	4P X 0.36 Sq. mm unarmoured multistrand pair, overall shielded, for integration of MFM and other IEDs (1 Lot = 250 metres)	4	Lot		0
36	8 Core Armoured Multi-mode Fibre Optic Cable (1 Lot = 500 metres)	4	Lot		0
37	<p>Satellite Workstation for SCADA</p> <p>Power Supply : 230V AC</p> <p>To be supplied with operator workstation with hardware viz dual headed LED monitor,Optical Keyboard & Mouse and latest windows OS, Software's with Antivirus Trend Micro (Apex one) with three-year subscription & Standard MS office latest version</p> <p><i>(Refer Automation specification for More details)</i></p>	1	nos		0
38	Temperature & Humidity Transmitter and integration with gateway on RS485 Modbus RTU	2	Nos		0

39	Automation mandatory Spares (As per the Spares list indicated in the SAS Specification)	1	Set		0
40	<p>Installation and Commissioning Services</p> <p>a) Design, Engineering, Installation, Testing and Commissioning of Sub-station Automation System as per SOW.</p> <p>b) Co-ordination with switchgear team & other sub vendors.</p> <p>c) Preparation of interconnecting cable schedule, Cable laying and termination, continuity check of all power, communication and field cables,</p> <p>d) Powering up of all supplied materials and Configuration of all supplied equipment</p> <p>e) Commissioning and integration of all supplied equipment as per the approved architecture</p> <p>f) All BCPUs, MFM looping and Condition Monitoring Units and Integration with New/Existing Gateway</p> <p>g) Testing and Integration of BCPUs with existing DRCA System, Firewall and Analysis system as per the approved architecture and testing up to Central DR System</p> <p>h) I/O testing, Pre- SAT testing, testing with Purchaser's Unified SCADA System</p> <p>i) Integrated FAT & SAT for Hardware and Software</p> <p>j) Final As built Document & Drawings Submission in AutoCAD & Pdf format.</p> <p>k) Extended warranty for Hardware & Software inclusive of patch management and software upgradation for the period of 5 Years</p>	1	Lot		0
41	Services of M/s Kalkitech for configuration, integration with both local DRCA System of the respective station & Centralised DRCA system.	1	Lot		0
42	<p>Training: (Sub-Station Automation & 3rd party items)</p> <p>05 Engineers x 3 man-days (15 mandays) at Vendor's work</p>	1	Lot		0
43	Completely pre-wired Simplex control Type-G Protection panel comprising of protection schemes and accessories as per specification along with IEDs, its networking accessories between IED to gateway, IED to DRCA system, relevent LIUs, switches, patch cords etc. for successful commissioning of underfrequency load shedding scheme.	1	Set		0

44	Protection Relay integration with SCADA & DRCA system at above mentioned stations: Ethernet Switches, Converters, Communication Cables (FO & UTP) and Networking accessories like LIU, patch panel (for each Ethernet switch), Pre-fabricated Patch cords (Fibre optic, UTP) of suitable length, Conduits for all non-armoured cables, I/O boxes with Quad face plate, RJ45 connectors etc.	1	Lot		0
45	IED of each model number/ order code/ MLFB shall be supplied as spares	1	Lot		0
46	Auxiliary trip relay	1	Lot		0
47	Services for preparation of cable schedule and ICS, commissioning of protection, automation and communication system along with appropriate human resources, numerical relay testing kit for relay panel commissioning and integration of relays with SCADA, DRCA system to view disturbance record and parameterization from remote	1	Lot		0
48	Supply and mounting of Secure make APEX 150 meters in Prewired Metering panels mentioned in point B (Prewired Metering panels)	26	Nos		0
49	Design, Engineering, Manufacturing, Inspection, loading, Supply, Transport, Unloading at site, Storage, Erection, Testing, Commissioning of Prewired metering panels	11	Nos		0
50	Supply and connection of Serial Device server (Make Moxa, Model – Nport 5232)	2	Nos		0
51	Supply, laying, termination and connection of Armoured CAT6 (Twisted pair cable) between meters to communication panel	80	Meters		0
52	Services for preparation of cable schedule and ICS, Installation, testing and commissioning of all material mentioned under supply scope	1	Lot		0
53	Secure make APEX 150 meters	1	No		0
54	TTB	1	No		0
				Total Amount Without GST	-
				GST-18%	-
				Total Amount with GST	-

Note: Above description shall be read in conjunction with the Technical specification and BOQ.

E.2 Price bid format- CC25NP019 : Supply & Services for 36KV GIS alongwith associated equipment for Saki Receiving Station

Srno.	Material Description	Qty	UOM	Basic price	Total Basic Price
1	Incomers (2500A)	1	Nos.		0
2	Tie Breaker (2500A)	1	Nos.		0
3	Tie Isolator (2500A)	1	Nos.		0
4	Outgoing (1250A)	3	Nos.		0
5	Capacitor Bank feeder (1250A)	1	Nos.		0
6	Bus PT (1 set include 3 nos.)	2	Set		0
7	Surge arrester (1 set = 3 nos.)	1	Set		0
8	33 kV Dummy Panels (to suit civil structural layout at site)	1	Nos.		0
9	Dummy plugs for Incomer terminals (for Type - III - Cable terminals- set of 4 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	4	Set		0
10	Dummy plugs for Tie breaker terminals (for Type - III - Cable terminals- set of 4 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	4	Set		0
11	Dummy plugs for Tie isolator terminals (for Type - III - Cable terminals- set of 4 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	4	Set		0
12	Dummy plugs for out going feeder terminals (for Type - III - Cable terminals- set of 2 no. plugs for each phase, 1 Set= 3nos. Dummy plugs, one for each phase)	6	Set		0
13	Dummy plugs for capacitor bank feeder terminals (for Type - III - Cable terminals- set of 2 no. plugs, 1 Set= 3nos. Dummy plugs, one for each phase)	2	Set		0
14	Voltage plug	1	Set		0
15	Current plug	2	Set		0
16	Spares for 33 kV GIS: As per section-B table	1	Lot		0
17	GIS Cable terminations- (1 set = 3 phase) 1Cx 630 sqmm XLPE Copper cable - For I/C	4	Set		0
18	GIS Cable terminations- (1 set = 3 phase) 1Cx 630 sqmm cable - Tie breaker	4	Set		0

19	GIS Cable terminations- (1 set = 3 phase) 1Cx 630 sqmm cable - Tie isolator	4	Set		0
20	GIS Cable terminations- (1 set = 3 phase) 1Cx 400 sqmm XLPE Aluminum cable - Outgoing feeders	6	Set		0
21	GIS Cable terminations- (1 set = 3 phase) 3Cx 400 sqmm cable - Cap banks	2	Set		0
22	Separate panel with control TNC switches mounted for breaker and isolator close open along with 1. breaker & isolator status indicating lamps 2. SLD mimic to be shown with above control switches	1	Lot		0
23	Laptop for relay configuration and relay settings with following configuration: HP make 15.6 inch, 16GB RAM, 500GB SSD, Core i5, with licensed copy of Windows10 OS or higher, 2 number of USB ports, 1 ethernet port, 1 HDMI port and 1 serial port along with standard laptop carrying back-sack with pre installed relay licensed softwares	1	EA		0
24	Managed L2 Ethernet Switch for 33 kV BCPU & other IEDs communication and integration with Gateway Mounting Arrangement: DIN Rail/Rackmouted in Switchgear based on feasibility To be mounted in Dummy Panel / Switchgear/ Separate Network Panel (Adjacent to the switchgear) along with cable termination accessories. (Bidder shall refer the specification for more details) Qty: Minimum 2 Nos. of Switches with FO & Copper ports for each bus-section and as per distribution of GIS panels and shall be based on Bidder's offered solution. Each Switch shall have 20% spare FO and Cu ports. (Bidder to consider quantity of L2 Switches / 1 Set / Station based on No. of Bus Sections and GIS Panel Layout of the respective station) 1 Set = 2 nos of Ethernet Switch	1	Set		0

25	<p>Networking Accessories Networking accessories for integration of BCPU's, Gateway, Condition monitoring devices : All required networking accessories like LIU, patch panel (for each Ethernet switch), patch chords (Fibre optic, UTP) of suitable length, The connectors will be selected to match that of the IEDs and SFPs on the switches, Conduits for all non-armoured cables, I/O boxes with Quad face plate, 24 Port Patch panels for each L2/L3switch, RJ45 connectors etc. Bidder to consider 20% of spare qty of each component. (Bidder to consider quantity of Networking Accessories for each station) (1 Lot / Station)</p>	1	Lot		0
26	<p>Armoured CAT6 UTP Cable (1 Lot = 500 metres)</p>	1	Lot		0
27	<p>4P X 0.36 Sq. mm armoured multistrand pair, overall shielded, for integration of MFM and other IEDs (1Lot =500 mtrs)</p>	1	Lot		0
28	<p>4P X 0.36 Sq. mm unarmoured multistrand pair, overall shielded, for integration of MFM and other IEDs (1 Lot = 250 metres)</p>	1	Lot		0
29	<p>8 Core Armoured Multi-mode Fibre Optic Cable (1 Lot = 500 metres)</p>	1	Lot		0
30	<p>Satellite Workstation for SCADA Power Supply : 230V AC To be supplied with operator workstation with hardware viz dual headed LED monitor,Optical Keyboard & Mouse and latest windows OS, Software's with Antivirus Trend Micro (Apex one) with three-year subscription & Standard MS office latest version <i>(Refer Automation specification for More details)</i></p>	1	nos		0
31	<p>Temperature & Humidity Transmitter and integration with gateway on RS485 Modbus RTU</p>	2	Nos		0
32	<p>Automation mandatory Spares (As per the Spares list indicated in the SAS Specification)</p>	1	Set		0

33	<p>Installation and Commissioning Services</p> <p>a) Design, Engineering, Installation, Testing and Commissioning of Sub-station Automation System as per SOW.</p> <p>b) Co-ordination with switchgear team & other sub vendors.</p> <p>c) Preparation of interconnecting cable schedule, Cable laying and termination, continuity check of all power, communication and field cables,</p> <p>d) Powering up of all supplied materials and Configuration of all supplied equipment</p> <p>e) Commissioning and integration of all supplied equipment as per the approved architecture</p> <p>f) All BCPUs, MFM looping and Condition Monitoring Units and Integration with New/Existing Gateway</p> <p>g) Testing and Integration of BCPUs with existing DRCA System, Firewall and Analysis system as per the approved architecture and testing up to Central DR System</p> <p>h) I/O testing, Pre- SAT testing, testing with Purchaser's Unified SCADA System</p> <p>i) Integrated FAT & SAT for Hardware and Software</p> <p>j) Final As built Document & Drawings Submission in AutoCAD & Pdf format.</p> <p>k) Extended warranty for Hardware & Software inclusive of patch management and software upgradation for the period of 5 Years</p>	1	Lot		0
34	Services of M/s Kalkitech for configuration, integration with both local DRCA System of the respective station & Centralised DRCA system.	1	Lot		0
35	<p>Training: (Sub-Station Automation & 3rd party items)</p> <p>05 Engineers x 3 man-days (15 mandays) at Vendor's work</p>	1	Lot		0
36	Supply and mounting of Secure make APEX 150 meters in Prewired Metering panels mentioned in point B (Prewired Metering panels)	3	Nos		0
37	Design, Engineering, Manufacturing, Inspection, loading, Supply, Transport, Unloading at site, Storage, Erection, Testing, Commissioning of Prewired metering panels	2	Nos		0
38	Supply and connection of Serial Device server (Make Moxa, Model – Nport 5232)	2	Nos		0

39	Supply, laying, termination and connection of Armoured CAT6 (Twisted pair cable) between meters to communication panel	80	Meters		0
40	Services for preparation of cable schedule and ICS, Installation, testing and commissioning of all material mentioned under supply scope	1	Lot		0
41	Secure make APEX 150 meters	1	No		0
42	TTB	1	No		0

Total Amount Without GST	-
GST-18%	-
Total Amount with GST	-

Note: Above description shall be read in conjunction with the Technical specification and BOQ.

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

Tender Reference: CC25NP019

Document Date: 27th June 2024

Section E.3: General Terms Condition-Supply

CONFIDENTIAL

The Tata Power Company Limited is hereunder referred to as the "Purchaser" or "Company". The person, firm or company selling the goods, the subject of this purchase order is referred to as "Vendor" or "Contractor". The subject of this purchase order is hereinafter referred to as the "Material(s)" or "Goods".

The Contract shall mean the contract as derived from the following:

1. Purchase Order (with 'Commercial Notes' and Annexures to the Purchase Order referred thereon)
2. Technical Specifications.
3. General Terms & Conditions

The documents including all reference document (s) and Annexures forming the Contract are to be read together as a whole and are to be taken as mutually explanatory.

1. Price:

Unless otherwise specifically stipulated, the price shall be firm and shall not be subject to escalation for any reason till the validity of this Contract.

Unless otherwise specifically stipulated, the price shall be inclusive of road/ rail worthy water-proof packing & forwarding charges up to effecting delivery at FOT/ FOR despatch point, GST and shall also be inclusive of inland freight, terminal taxes and entry taxes as leviable on the transportation or entry of goods into any local area limits pursuant to the Contract.

2. Taxes and Duties:

- 2.1 The Contract Price shall be inclusive of all taxes, duties, including but not limited to GST or any local taxes, levies imposed by State/Central/Local governments
- 2.2 Taxes as mentioned in the Contract Price or Price Schedule shall be paid to the contractor subject to the Contractor complying with all the statutory requirements and furnishing the relevant documents including error free invoices containing detailed break-up of the taxes
- 2.3 However the payment of GST or local levies shall be restricted to the total amount as indicated in the price schedule.
- 2.4 Any duties, levies or taxes not mentioned in Contract Price or Price Schedule but applicable as per any statute (s) shall be deemed to be

Rev. date: 25 July 2017

included in the Contract price and shall be to the account of the Contractor.

- 2.5 Any statutory variation in duties, levies or taxes if applicable and specified in this Contract till the scheduled date for supply of Goods and limited to direct invoices of the Contractor shall be to the account of Purchaser. The Contractor shall have the obligation to provide the necessary documentary evidence / supporting by way of gazetted notifications etc. to prove the change in such levies or taxes between the due date of submission of the Bid and the scheduled date of supply of goods to claim the difference.
- 2.6 The Contractor shall pass on to the Purchaser all the benefits of either reduction in tax rates, exemptions, concessions, rebate, set off, credits etc. or introduction of new tax rates exemptions, concessions, rebate, set off, credits etc. pertaining to all taxes, duties, imposts, fees and levies in respect of the supplies of Goods or performance of obligations under the contract. This would specifically include reduction of tax rates as a result of statutory changes or judicial rulings.
- 2.7 Any other taxes, levies and duties not mentioned in Contract Price or Price Schedule but applicable as per any statute (s) or introduction (omission) of new taxes, levies and duties shall be deemed to be included in the Contract Price and shall be to the account of the Contractor.
- 2.8 For facilitating availment of a credit, set-off, rebate, drawback or like benefit available to the Purchaser, the Contractor will facilitate the Purchaser by providing the necessary documentary and/or procedural support. In any process of assessment or re-assessment, of taxes payable by the Purchaser. Wherever expressly agreed the purchaser would provide the statutory form 'C' to the seller for availing the concessional rate of Central sales tax.
- 2.9 The Contractor shall bear and pay all the costs, liabilities, levies, interest, penalties in respect of non-compliances of any legal requirements as per various statutory provisions. The contractor shall keep the owner indemnified at all times from any tax liability, interest, penalties or assessments that may be imposed by the statutory authorities for non-compliances or non-observation of any statutory requirements by the Contractor.
- 2.10 Purchaser shall pay the invoices to the Vendor after necessary deductions as prescribed under the applicable law, income - tax or other

deductions under the State Tax laws as may be applicable to the Contract.

3 Packing details:

Packing details: The material must be packed in suitable packing to suit the mode of transport and to ensure its safe receipt at point of delivery. Any damage to material noticed at the time of delivery at site, due to improper packing or any other reason whatsoever shall be the responsibility of the Vendor. Such damaged goods shall be replaced within 14 days from intimation from the Purchaser.

4 Transportation and Unloading at Site:

The Vendor shall deliver the Material(s) at site/ Stores as per the delivery address specified in the Purchase order. The unloading at delivery shall be organised by the Purchaser unless otherwise specified. The receipt of the material/ equipment is subject to inspection and rejection if Material(s) is found unsatisfactory or any of the clauses under this purchase order are violated.

5 Insurance:

Unless otherwise specified, Purchaser will be responsible to obtain transit insurance for the Material(s). The Vendor shall intimate the Order Manager (as mentioned in the Purchase Order) along with Invoice, packing list, the Railway Receipt/Truck or Lorry Receipt etc. immediately after the consignment is booked, at the e-mail id mentioned in the Purchase order.

6 Payment Terms:

100% payment shall be made within 60 days from the receipt and acceptance of the material at the Consignee Stores/ Site/ Location as per the Contractual terms and conditions herein.

7 Bills and invoice:

The tax invoices should contain the details to comply with the GST Law. The supplier shall:

- i) Furnish (electronically) and communicate to the Owner, the details of Goods or Services supplied by the 10th of the month succeeding the said tax period,
- ii) Upon discovery of any discrepancy, rectify it and shall pay the tax and interest thereof,
- iii) Furnish the returns (electronically), for the inward and outward supplies of

Goods and/or Services, before the specified dates as per the GST Law,
iv) Communicate the tax paid, credits etc. as and when credited.

v) The Invoice should clearly state the description of the goods, quantity, sale price, tax %, and tax amount;

vi) The Invoice should be signed by an Authorized Signatory.

Bills/Invoices in the name of The Tata Power Company Ltd. with packing lists in triplicate shall be forwarded along with the equipment.

Contractor to furnish GST Registration no. in all invoices as well as Purchaser's (Tata Power's) GST no.

8 Transfer of Title and risk:

The transfer of property and risk of Material(s) shall be deemed to take place as follows:

a. For delivery F.O.R. or F.O.T. despatch point: Transfer of property on handing over the Material(s) to the carrier against receipt of clean Railway Receipt/Truck or Lorry Receipt and such receipt having been handed over to Purchaser. However, the risk of loss shall pass to the Purchaser on delivery of goods at the specified destination.

b. In case the Material(s) are procured by the Vendor from sub-vendors on receipt of duly endorsed documents of title to the goods.

9 Contract Performance Bank Guarantee (In case applicable):

9.1 The Vendor shall within 15 days of issue of this Purchase Order furnish an unconditional irrevocable bank guarantee duly stamped and strictly as per the prescribed format of the Purchaser from any nationalized bank or any scheduled bank having a branch in Mumbai and approved by the Purchaser for a sum equivalent to 10% of the Total value of Order valid for a period not less than 6 months from the expiry of the Warranty period.

9.2 Irrespective of the performance demonstrated as part of the Factory Acceptance Tests Take-over tests / Performance Tests etc, the Purchaser may call for re-validation of performance of the system during the performance guarantee period by conducting fresh performance tests if in its opinion, the

system is not able to deliver the designed performances based on its operational performance results. If the equipment fails to prove the performance during such performance tests, the Purchaser may allow the Vendor to either rectify the system by addition / modification of equipment etc at the Vendor's costs & risk to restore the performance levels. Failure to rectify the system to achieve the designed performance levels may result in imposition of penalties including revocation of the Performance Bank Guarantee and forfeiture of the entire amount under the Performance Guarantee.

- 9.3 In case the Vendor fails to furnish the requisite Bank Guarantee as stipulated above, then the Company shall have the option to terminate the contract besides other contractual remedies.

10 Price reduction:

- 10.1 The Vendor agrees that time of supply of Material(s) is of prime importance. If the Vendor fails to supply Material(s) before the respective scheduled / fixed date for supply. Company may without prejudice to any other right or remedy available to the Company: -

10.1.1 Recover from the Vendor ascertained and agreed, genuine pre-estimate liquidated damages, and not by way of penalty, a sum equivalent to 1% (of total value of order) per week or part thereof for each week's delay, beyond the scheduled supply date each subject to maximum of 10% of the total order value, even though the Company may accept delay in supply after the expiry of the scheduled supply date. The Company may, at its discretion, set off the aforesaid amounts from any other amounts owed by the Company to the Vendor or recover such amounts in other manner as may be permissible under applicable laws.

10.1.2 Arrange to get supply from elsewhere on account and at the sole risk of the Vendor, such decision of the Company being final and binding on the Vendor; or

10.1.3 Terminate the contract or a portion of supply of the supply work thereof, and if so desired, arrange for the supply in default by the Vendor to be attained from elsewhere at the sole risks and costs of the Vendor.

10.2 Liquidated damages for performance shortfall (if applicable) shall be specified in the Technical Specifications.

10.3 The Liquidated Damages referred in this clause 10 may be recovered by the Company from the Vendor as set off against any monies owed by the Company to the Vendor or in any other manner permissible under applicable laws.

11 Warranties:

11.1 Materials and Workmanship: Vendor shall fully warrant that all the stores, equipment and component supplied under the order shall be new and of first class quality according to the specifications and shall be free from defects (even concealed fault, deficiency in design, materials and workmanship).

11.2 Should any defects be noticed in design, material and/or workmanship within 12 months after the Material(s) or any portion thereof as the case may be have been commissioned or for 24 months from the date of delivery, whichever period concludes earlier. Purchaser shall inform Vendor and Vendor shall immediately on receipt of such intimation, depute their personnel within 7 days to investigate the causes of defects and arrange rectification/ replacement/modification of the defective equipment at site, without any cost to Purchaser within a reasonable period. If the Vendor fails to take proper corrective action to repair/replace defects satisfactorily within a reasonable period, Purchaser shall be free to take such corrective action as may be deemed necessary at Vendor's risk and cost after giving notice to the Vendor, including arranging supply of the Goods from elsewhere at the sole risk and cost of the Vendor.

11.3 In case defects are of such nature that equipment shall have to be taken to Vendor's work for rectification etc., Vendor shall take the equipment at his costs after giving necessary undertaking or security as may be required by Purchaser. After repair Vendor shall deliver the equipment at site on freight paid basis. Any taxes applicable in relation to this repair shall be to the Vendor's account. All risks in transit to and fro shall be borne by the Vendor.

11.4 Equipment or spare parts thereof replaced shall have further warranty for a period of 12 months from the date of acceptance.

12 Quality, Testing, inspection, installation:

12.1 All Material(s) supplied under this Contract shall be new and unused.

- 12.2 Wherever a specific Quality Assurance Plan is provided with the Request for Quotation (RFQ) or agreed as part of the commercial/ technical discussions, the same shall be binding on the Vendor.
- 12.3 The material shall be inspected
- At consignee end by Purchaser.
 - At factory premise of the Vendor/ sub-vendor by Purchaser or third party duly nominated by Purchaser. The Vendor shall extend all necessary co-operation to Purchaser/ third party inspector carrying out the inspection. The Inspector(s) shall have the right to carry out the inspection or testing, which will include inspection and testing of the raw materials at manufacturers shop, at fabricators shop and at the time of actual despatch before and/or after completion of packing.
- 12.4 The Vendor will inform Purchaser at least eight (8) days in advance of the exact place, date and time of tendering the Material(s) for required inspection and provide free access to the Inspector(s) during normal working hours at Vendor's or his/ its sub-Suppliers works, and place at the disposal of the Inspector(s) all useful means for undertaking the Inspection, checking the results of tests performed, marking the Material(s), getting additional tests conducted and final stamping of the Material(s).
- 12.5 Even if the inspection and tests are fully carried out, the Vendor shall not be absolved from its responsibilities to ensure that the Material(s), raw materials, components and other inputs are supplied strictly to conform and comply with all the requirements of the Contract at all stages, whether during manufacture and fabrication, or at the time of Delivery as on arrival at site and after its erection or start up or consumption, and during the defect liability period. The inspections and tests are merely intended to prima facie satisfy Purchaser that the Material(s) and the parts and components comply with the requirements of the Contract.
- 12.6 *All costs associated with the inspection shall be included in cost of Material(s).*
- 12.7 Original material test certificate/ performance test certificate/ fitment certificate/ test reports etc. relevant/ applicable as per the specifications/ standards shall be dispatched along with the material supply failing which the material may be rejected.
- 13 Rejection:**
- 13.1 Rejected goods shall be removed and replaced within 14 days of the date of communication of rejection.
- 13.2 Claim in respect of breakage/shortages in any cases shall be referred on the Vendor within ninety (90) days from the date of receipt of Goods by the Purchaser which shall be replaced/made good by the Vendor at his own cost. All risk of loss or damage to the material shall be upon the Vendor till it is delivered to the purchaser/consignee.
- 14 General Indemnity:**
- The Vendor shall indemnify and keep the Purchaser indemnified from and against any and all claims, costs, liabilities (financial), litigations, compensations, judgments, expenses or damages (including attorney's fees and other related expenses) arising out of any breach or alleged breach of any of the conditions of this Contract, performance of the obligations hereunder, or any representation or misrepresentation made by the Vendor or any third party with regard to the subject of this Contract.
- 15 Indemnity against IPR:**
- The equipment, system, drawings, and other materials that shall be supplied against the order will become the Purchaser's property. Without limitation of any liability of whatsoever nature, the Purchaser shall be indemnified and kept indemnified against any claim for infringement or breach of any of the statues, rules & regulations by the use of or sale of any article or material supplied by the Vendor. The indemnity shall include any infringement of patent, trade mark, design, copyright or other property rights whether in Country of Origin, or elsewhere resulting from the Vendor's design, manufacture, use, supply or re-supply & would also cover use or sale of any article or material supplied by the Vendor to the Purchaser under the Purchase Order. The Indemnity shall cover any claim/action taken by a third party either directly against the Purchaser or any claim/action made against the Vendor & where under the Purchaser is made liable. The

Indemnity shall be for losses, damages, and costs including litigation costs, attorney fees etc incurred by the Purchaser in relation to the Purchase Order.

16 Latent Defects Liability period (if applicable):

Notwithstanding the inspections, acceptance tests, quality checks etc carried out by the Vendor and witnessed/accepted by the Purchaser, the Vendor shall further warrant the equipment for any latent defects in its design, material or workmanship against the specifications set forth and shall make good any such defects by way of repair or replacement of the part or whole of the defective product at its own cost & risks as and when such latent defects are observed and intimated by the Purchaser and intimated to the Vendor within 36 months of completion of warranty period.

17 Force Majeure:

- 17.1 In the event of either party being rendered unable by force majeure to perform any obligation required to be performed by it under this Contract the relative obligation of the party affected by such force majeure shall, after notice under this articles be suspended for the period during which such cause lasts. The term 'Force Majeure' as employed herein shall mean acts of God, wars (declared or undeclared), riots or civil commotion, fire, floods, and acts and regulations of the Government of India or State Government or any of the statutory agencies. Both the party shall pay to the other party, the amount payable upon the date of the occurrence of such force majeure.
- 17.2 Upon the occurrence of such cause and upon its termination, the party alleging that it has been rendered unable as aforesaid, thereby shall notify the other party in writing immediately but not later than twenty four (24) hours of the alleged beginning and ending thereof giving full particulars and satisfactory evidence in support of the claims.
- 17.3 During the period, the obligations of the parties are suspended by force majeure, the contractor shall not be entitled to payment of any rate.
- 17.4 In the event of the force majeure conditions continuing or reasonably expected to continue for a period more than thirty (30) days, Purchaser shall have the option of terminating the contract by giving seven (7) days notice thereof to the contractor.

18 Variation:

Except for any provisions in this Purchase Order, any change /modification to the terms and conditions of this Order can be issued only by Purchaser or with the prior written approval from Purchaser.

19 Termination

- 19.1 The Contract shall be deemed to be terminated on completion of delivery of Material(s)
- 19.2 Termination of Default by Vendor:
Purchaser may terminate the contract at any time if the Vendor fails to carry out any of his obligations including timely delivery under this Contract. Prior to termination, the Vendor shall be advised in writing of the causes of unsatisfactory performance to be improved upon 15 days of the receipt of notice. In case, if the Vendor fails to bring about the improvement to the satisfaction of the Purchaser, then the order shall be terminated.
- 19.3 Without prejudice to the rights and remedies available to Purchaser, Purchaser may terminate the Contract or part thereof with immediate effect with written notice to the Vendor if,:
- 19.3.1 The Vendor becomes bankrupt or goes into liquidation.
- 19.3.2 The Vendor makes a general assignment for the benefit of creditors.
- 19.3.3 A receiver is appointed for any substantial property owned by the Vendor.
- 19.3.4 The Vendor has misrepresented to Purchaser, acting on which misrepresentation Purchaser has placed the Purchase Order on the Vendor.

The Vendor/ Contractor shall not be entitled to any further payment under the Contract if the Contract is terminated. If the order is terminated under clause 19.2 and 19.3, the Vendor shall not be entitled to any further payment, except that, if Purchaser completes the supply of Material(s) and the costs of completion are less than the Total Order value, the Purchaser shall pay Vendor an amount properly allocable to supply of Material(s) fully performed by Vendor prior to termination for which payment was not made to Vendor. In case, the cost of completion of Material(s) exceed the total Order value, the additional cost incurred by Purchaser for such completion shall be paid by the Vendor.

19.4 Purchaser shall be entitled to terminate the Contract at its convenience, at any time by giving thirty (30) Days prior notice to the Contractor. Such notice of termination shall specify that termination is for Companies convenience and the date upon which such termination becomes effective. Upon receipt of such notice, the Contractor shall proceed as follows:

- 19.4.1 cease all further work, except for such work as may be necessary and instructed by the Company/ Company's representative for the purpose of protecting those parts of the supplies already manufactured;
- 19.4.2 stop all further sub-contracting or purchasing activity, and terminate Sub-contracts;
- 19.4.3 handover all Documents, equipment, materials and spares relating to the supply of goods prepared by the Contractor or procured from other sources up to the date of termination for which the Contractor has received payment equivalent to the value thereof; and
- 19.4.4 handover those parts of the supplies manufactured by the Contractor up to the date of termination.

Upon termination pursuant to clause 19.4, the Vendor shall be entitled to be paid the full value on the Material(s) delivered in accordance with the Contract.

19.5 The Contractor shall not be released from any of his obligations or liabilities accrued under the Contract on termination. For the avoidance of doubt, the termination of the Contract in accordance with this clause shall neither relieve the Contractor of his accrued obligations for Warranty or his accrued liability to pay (liquidated) damages for Delay nor shall entitle him to reduce the value of Performance Security.

20 Sub letting and assignment:

The contractor shall not without prior consent in writing of the Purchaser, sublet, transfer or assign the contract or any part thereof or interest therein or benefit or advantage thereof in any manner whatsoever, provided nevertheless that any such consent shall not relieve the contractor from any obligation, duty or responsibility under the contract.

21 Dispute Resolution:

Dispute or differences arising out or relating to this Order shall be resolved amicably by the parties. Failing such amicable resolution of dispute / differences either party may refer the matter to arbitration of a Sole Arbitrator to be appointed jointly by both the parties. The award of the Arbitrator shall be final, binding and conclusive on the parties. The venue for arbitration shall be Mumbai. The Arbitration proceedings will be governed and regulated by the provisions of Indian Arbitration and Conciliation Act, 1996 as amended from time to time and the rules framed there under.

22 Governing laws

This Contract shall be construed in accordance with and governed by the Laws of India without giving effect to any principle of conflict of law.

23 Jurisdiction

This Contract and the transaction contemplated herein shall be subject to the exclusive jurisdiction of the competent Courts in Mumbai only.

24 Limitation of Liability

Notwithstanding anything contained in the Contract, the Contractor's aggregate liability under this Contract shall be limited 100% of the Total order value. This shall however, exclude liability arising pursuant to clause 2.8- tax indemnity, clause 14- General Indemnity, clause 15- Indemnity against IPR, clause 25 – Confidentiality and liabilities arising due to wilful misconduct, gross negligence, third party claims and corrupt acts attributable to the Vendor.

25 Confidentiality:

The Vendor shall use the Confidential Information of the Purchaser only in furtherance of this Contract and shall not transfer or otherwise disclose the Confidential Information to any third party. The Vendor shall (i) give access to such Confidential Information solely to those employees with a need to have access thereto; and (ii) take the same security precautions to protect against disclosure or unauthorized use of such Confidential Information that the party takes with its own confidential information but, in no

event, shall a party apply less than a reasonable standard of care to prevent such disclosure or unauthorized use.

26 Consequential Damages:

Unless otherwise specified, neither Party shall be responsible for and nor shall be liable to the other Party for indirect/consequential losses and damages suffered by such Party including for loss of use, loss of profit whether such liability or claims are based upon any negligence on the part of the other Party or its employees in connection with the performance of the Purchase Order.

27 New Legislation (The Micro, Small and Medium Enterprise Development Act 2006)

- a. This Act has been enacted and made effective from 2nd October 2006. The Interest on Delayed Payments to Small Scale and Ancillary Industrial Undertaking Act, 1993 is repealed.
- b. Vendor is requested to inform the purchaser if vendor fall under The Micro, Small and Medium Enterprises Development Act, 2006 legislation and provide the purchaser, registration number and date to enable purchaser to take necessary care. The vendors are also requested to mention the same on their invoice / bill.

28 Relation between parties:

The Purchase Order shall be entered into on a principal-to-principal basis only. The Purchase order shall not be construed as a partnership or an association of persons. There is no agent and principal relationship between the parties. Each party shall be responsible for its own conduct. The Vendor shall ensure at all times that all the work carried out under this contract either by its own person or through any of its sub-Vendors shall be always done under its own direct supervision.

29 Environment / ISO 14001 Certification:

The Vendor to confirm whether their organization is ISO 14001 certified. If not, the Vendor must certify that the handling, use and disposal of their product / by-products conform to practices consistent with sound environmental management and local statutes. The Vendor shall ensure that all the wastes are disposed in environmental friendly way with strict compliance to applicable laws including

adherence to MoEF guidelines with respect to disposal of batteries, lead waste, copper cables, ash, waste oil, e-waste etc which shall be disposed through MoEF approved parties only. The Vendor shall also be responsible to collect and recycle all the e-waste generated at the end of the product life cycle at its own costs and risks as per the MoEF guidelines/ orders.

30 Tata Code of Conduct

The Purchaser abides by the Tata Code of Conduct in all its dealing with stake holders and the same shall be binding on the Purchaser and the Vendor for dealings under this Purchase Order. A copy of the Tata Code of Conduct is available at our website: <http://www.tatapower.com/aboutus/code-of-conduct.aspx>. The Vendor is requested to bring any concerns regarding this to the notice of our Chief Ethics Officer on the e-mail ID: cecounsellor@tatapower.com.

31 Responsible Supply Chain Management:

The Purchaser is committed for a cleaner environment and respect of Human rights through its Responsible Supply Chain Management policy. The Vendor is required to comply with all the environment & Human rights related laws, including emission norms, Labour and environmental regulations. The Purchaser encourages its Vendors/ Contractors/ Business partners to pay more attention to green design, green supply, green production, green logistics and green packaging in performing their business obligations.

The Vendor is required to abide by the Tata Power Corporate Environment policy, Energy Conservation and Corporate Sustainability Policy.

A copy of the Responsible Supply Chain Management Policy along with Environment policy, Energy Conservation policy, Sustainability policy, Health & Safety policy and Human Rights policy is available at website: <http://www.tatapower.com/sustainability/policies.aspx>.

Vendor/Bidder is required to completely fill the attached "Supplier Sustainability Questionnaire" in support of their Green Supply Chain Management initiatives and submit the same with their offer.

The Owner recognizes that diversity in the workplace positively impacts business. The Owner is committed to help people from SC/ST background either by helping them to become entrepreneurs or by engaging workforce from SC/ST community under the contracts agreed herein. To encourage engaging SC/ST community, the owner may consider on the merit to incentivize the Contractor by paying additional 1% of the service contract portion if the number of SC/ST workforce engaged in the contract exceeds 30% of the total deployed strength and 2%, if the strength goes beyond 50%. While the Contractor will assist the workforce so engaged to become self-reliant in meeting the work expectation, the Owner may also volunteer its training resources to the extent possible to improve their employability. The Contractor shall maintain the proper documentation of such category of the workforce engaged and the owner may consider to pay the incentive after its verification.

The Owner may also consider extending price preference of 5% in the bid evaluation for an order value up to Rs.50 Lacs, provided the company is owned by a person from SC/ST community having minimum 50% holding in the company.

32 Vendor rating

You are requested to ensure compliance to the terms of the individual orders with regards to timely delivery, provision of all applicable documents / challans / test certificate, quality of the material etc. Your performance with respect to the said factors will be taken into consideration for future business.

33 Vendor Feedback:

- 33.1 In this dealing Vendors feedback is important for the purchaser to improve its processes. If vendor have to report any grievance, problem or require any clarification, information, vendor is requested to contact purchaser at email ID: CC_CUSTOMERFEEDBACK@tatapower.com
- 33.2 Vendor is requested to ensure compliance to the terms of the individual orders with regards to timely delivery, provision of all applicable documents / challans / test certificate, quality of the material etc. Vendor performance with

respect to the said factors will be taken into consideration for future business.

34 Non-Waiver:

Failure of Purchaser or its representatives to insist upon adherence to any of the terms or conditions incorporated in the Contract or failure or delay to exercise any right or remedies herein or by law accruing, or failure to promptly notify the Vendor in the event of breach or the acceptance of or the payment of any Material(s) hereunder or approval of any design or Material(s) shall not release the Vendor and shall not be deemed a waiver of any right of Purchaser to insist upon the strict performance thereof or of any of its rights or remedies as to any such Material(s) regardless of when the Material(s) are shipped, received or accepted not shall any purported oral modification or revisions of the Contract by Purchaser or its representative(s) act as waiver of the terms hereof.

35 Repeat Order:

Purchaser may place the repeat order for 100% of ordered quantities within a span of 6 months from the date of issue of this Purchase Order & Vendor shall execute it at same rates, terms and conditions.

36 Severability

If any provision of this Contract is invalid, unenforceable or prohibited by law, this Contract shall be considered divisible as to such provision and such provision shall be inoperative and shall not be part of the consideration moving from any Party hereto to the others, and the remainder of this Contract shall be valid, binding and of like effect as though such provision was not included herein.

ESG FRAMEWORK FOR BUSINESS ASSOCIATES

Tata Power's Sustainability philosophy sits at the core of its Business Strategy. Tata Power Sustainability Model has an overarching objective of 'Leadership with care' with key elements of 'Care for the Environment'; 'Care for the Community'; 'Care for our Customers / Partners' and 'Care for our People'. These sustainability objectives encompass the Environmental, Social and Governance objectives driven as integrated elements.

Tata Power, together with its stakeholders is determined to achieve sustainable growth while creating shared value for all.

As a part of future ready roadmap, Tata Power has targeted following as our Environment, Social and Governance priorities:

- Being Carbon Net Zero before 2045
- Growing Clean capacity (80% by 2030)
- Customer centricity
- Becoming water neutral before 2030
- Achieving zero waste to landfill before 2030
- No net loss of biodiversity before 2030
- Positively impacting 80 million lives by 2027

In order to create a sustainable business ecosystem, Tata Power expects that all its Business Associates (BA) which includes its suppliers, vendors, consultants and service providers to align to its ESG and sustainability commitments.

Tata Power encourages improved efficiencies and scaling up of green initiatives through technology and innovation taking us farther on the journey of reducing carbon emissions and preparing the entire eco-system towards products and services that would have net positive impact on the environment and communities that we operate in.

The Vendors/ bidders wishing to associate with Tata Power are expected to share their own sustainability and ESG journey. We at Tata Power promote all Business Associates to have a sustainable procurement policy for their supplier and service providers to contribute to our integrated approach in achieving a sustainable supply chain. The BA is encouraged to carry out the assessment of their sub-contractors and sub-vendors on sustainability readiness so that they are aware of the expectation/ business requirement.

The Vendor/ Bidder shall fill-in the 'Environment, Social and Governance Compliance Screening Questionnaire for Business Associates' attached at Annexure-I and submit the same along with the Bid in Ariba online platform.

Responsible Supply Chain Management:

Tata Power is committed for a cleaner environment and respect of Human rights through its Responsible Supply Chain Management policy.

Tata Power Business Associate (BA) shall comply with all the environment & Human rights related laws, including emission norms, Labour and environmental regulations.

Tata Power encourages its BA to focus on green design, green supply, green production, green logistics and green packaging in performing their business obligations. The BA is expected to abide by the Tata Power Corporate Environment policy, Energy Conservation and Corporate Sustainability Policy (enclosed with this document as Annexure-II).

The BA is expected to:

- Strive towards Conservation of Energy, Water, Resources and optimize transportation of Men & Materials to minimize environmental impact and reduce carbon footprint.
- Carry out the assessment of materials used for construction, operation & maintenance, consumables and accordingly phase out those materials which are environmentally hazardous.
- Be cognizant that diversity in the workplace positively impacts business.
- Promote affirmative action by supporting people from SC/ ST background by engaging workforce from SC/ ST community under the contracts agreed herein.
- Share the commitment of 'No child labour', 'No forced labour', Non-discrimination on the basis of caste, colour, religion, gender, disability, maternity or pregnancy or any other factor unrelated to the requirements of the job
- Pay the wages or remuneration to the workforce, personnel deployed in compliance to all applicable laws and regulations.
- Provide its employees/ deployed labor with an employment environment that is free of physical or psychological harassment.
- Carry out the assessment of their Sub-contractors on their Sustainability Readiness so that they are aware of the above expectation/ standards
- To ensure usage of suitable package material which is more environmentally sustainable. Further the packing material shall be recycled to the extent possible. The material used for packing is expected to suit the mode of transport and to ensure its safe receipt at point of delivery.

Waste Disposal:

The BA is expected to follow best practices for disposal of waste, few of which are listed below:

- Have a detailed project plan that includes 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. 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.
- Have purchase policy to encourage the procurement of material with recycled and minimum packaging of goods during delivery and appropriate means for site-to-site transportation of materials to avoid damage and litter generation.
- Ensure that the residents living near the site are kept informed about proposed working schedule and timings/ duration of any abnormal noise full activity that is likely to happen.
- 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.

Water Management:

The BA is expected to follow best practices for water management, few of which include a management and monitoring system for water withdrawals and consumption, procedures to reduce water usage or reuse/recycle water, and pretreatment of wastewater before disposal.

Compliance to Law:

The BA shall adhere to responsible business practices and comply with the provision of all the Statutory Acts Applicable. Special attention of the BA is drawn towards the compliance of provision of the following statutes: (along with the latest amendments/additions, as applicable):

- The Child Labour (Prohibition and Regulation) ACT, 1986.
- The Contract Labour (Regulation and Abolition) ACT, 1970.
- The Employee's Pension Scheme, 1995.
- The Employee's Provident Funds and miscellaneous provisions Act, 1952.
- The Employees State Insurance Act, 1948.
- The Equal Remuneration Act, 1976.
- The Industrial Disputes Act, 1947.
- The Maternity Benefit Act, 1961.
- The Minimum Wages Act, 1948.
- The Payment of Bonus Act, 1965
- The Payment of Gratuity Act, 1972.
- The Payment of Wages Act, 1936.
- The Shops & Establishment Act, 1954.
- The Workmen's Compensation Act, 1923.
- The Employer's Liability Act, 1938.
- and any other applicable statutory act

Social Accountability (SA 8000):

Tata Power expects its BAs to follow guidelines of SA 8000:2014 on the following aspects

- Child Labour
- Forced or Compulsory Labour
- Health & Safety
- Freedom of Association & Right to Collective Bargaining
- Discrimination
- Disciplinary Practices
- Working Hours
- Remuneration
- Management System

Health and Safety

The BA is expected to ensure the health and safety of his and his Sub-contractor's staff and labour. The BA shall, in collaboration with and according to the requirements of the local health authorities, ensure that medical staff, first aid facilities, sick bay and ambulance service are available at the accommodation and on the Site at all times, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics. The BA shall maintain records and make reports concerning health, safety and welfare of persons deployed, and damage to property, as the Owner's Representative may reasonably require. The BA shall be responsible for the medical treatment / hospitalization of his and his Sub-contractor's staff/ labour.

The BA shall appoint a qualified Safety officer at the Site to be responsible for maintaining the safety, and protection against accidents, of all personnel on the Site. Such Safety officer shall have the authority to issue instructions and take protective measures to prevent accidents.

The BA shall comply in toto with the Tata Power's Contractor Safety Terms & Conditions, Health Safety & Environment Manual while working on Tata Power Site/ Services/ Contracts.

Grievance Mechanism

The BA is expected to have grievance procedures that allow stakeholders to anonymously bring environmental and/or work-related violations and/or concerns to the attention of management. In addition, the BA is expected to have procedures for examining reports of environmental and/or work-related violations or concerns and/or privacy complaints.

Data Protection

The BA is expected to have a formal process to address data security or privacy issues.

ANNEXURE-I



Sr. No.	Question Description	Response (Y/N)	Remarks
Organization			
1	Does your Company have Sustainability Policy at Organization Level? If Yes, Please attach		
2	Do you have sustainable procurement policy in place for your own suppliers? If Yes, Please attach		
3	Does your company do regular assessment of its suppliers on ESG parameters?		
4	Are there ESG risks, or negative impacts identified in your supply chain		
Governance			
1	Is diversity taken into consideration when appointing board members/ senior management? Do you have an independent director/s?		
2	Has your company taken initiatives to ensure ethical practices at workplace? Please share the details, Policies etc.		
3	Does your company have a formal process to address data security or privacy issues? Please share the details, Policies etc.		
4	Does your company have grievance mechanism for stakeholder issues and track resolution?		
Environment/ Planet			
1	Does your company have Environmental Policy? If Yes, Please attach		
2	Do you have a formal process for waste management including solid wastes, liquid wastes and hazardous waste?		
3	Does your company track greenhouse gas emission? Also, what percentage of own consumption comes from the renewable energy?		
4	Does your company have a formal process for water management including monitoring of water consumption and withdrawals, and if applicable, pretreatment of wastewater?		
Green Technology/ Innovation			
1	Are your facility/ Product/ Services provided by you is based on green design, green production, green packaging or green logistics considerations? Please elaborate.		
2	Do your products or services have any environmental or social features or benefits (e.g. environmental/energy certification, ecolabels, fair trade certification, etc.)?		
Social/ People			
1	Does you facility/ Company have written personnel policies in place Are you an equal opportunity employer?		
2	Please describe any formal programme / campaign in place to promote company involvement with the community (volunteering, etc.). What is the percentage of profit spend on community activities?		
3	Does your company have a written Health & Safety Policy or Program? If Yes, Please attach		
Certifications: Does your company have following certifications (valid till date-please mention validity)			
1	ISO9001 accreditation		
2	SA8000 or equivalent		
3	ISO 14001 certification		
4	ISO 18001/45001 or equivalent		
5	ISO/IEC 27001 or equivalent		
6	Any Other (Please specify)		

Signature

Business Associate Name

ANNEXURE-II

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

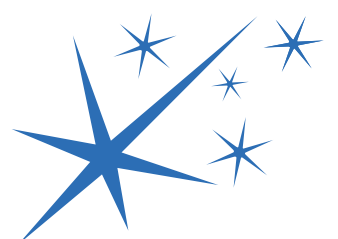
- We will uphold the values of honesty, partnership and fairness in our relationship with stakeholders
- We shall provide and maintain a clean, healthy and safe working environment for employees, customers, partners and the community
- We will strive to consistently enhance our value proposition to the 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: 15th June, 2018



Supplier Code of Conduct

Tata Power follows the Tata Code of Conduct (TCoC) and the Whistle blower Policy and expect all its Suppliers to adhere to the same principles. “Supplier” here means any business, company, corporation, person or other entity that provides, sells or seeks to sell, any kind of goods or services to Tata Power, including the Supplier’s employees, agents and other representatives. The suppliers are expected to adhere to the following Do’s and Don’ts:

Do’s

1. The Suppliers shall be committed to supplying products and services of high quality that meet all applicable standards and laws, including product packaging, labelling and after-sales service obligations.
2. Comply with all applicable laws and regulations, both in letter and in spirit, in all the territories in which it operates.
3. Strive to provide a safe, healthy and clean working environment for its employees.
4. Strive for environmental sustainability, particularly with regard to the emission of greenhouse gases, consumption of water and energy and the management of waste and hazardous materials.
5. The Supplier shall represent our company (including Tata brand) only with duly authorised written permission from our company.
6. Safeguard the confidentiality on the use of intellectual property, information and data of the Company.
7. Gifts and hospitality given or received should be modest in value and appropriate as per Company Policy.
8. The assets of Tata Power shall be employed primarily and judiciously for the purpose of conducting the business for which they are duly authorised.
9. All actual or potential conflicts due to financial or any other relationship with a Tata Power employee shall be disclosed.

Don’ts

1. The Supplier shall not make unfair or misleading statements about the products and services of competitors.
2. Children shall not be employed at workplaces.
3. Forced labour shall not be used in any form.
4. The Suppliers shall neither receive nor offer or make, directly or indirectly, any illegal payments, remunerations, gifts, donations or comparable benefits that are intended, or perceived, to obtain uncompetitive favours for the conduct of its business with Tata Power.

Reporting Violations

The Supplier shall notify the Company regarding any known or suspected improper behaviour of other suppliers or employees relating to its dealings with Tata Power, by email to: cecounsellor@tatapower.com.

The same can also be raised through our 3rd party ethics helpline facility:

1. Email id: tatapower@ethics-line.com ; Website: www.tip-offs.com
2. Helpline numbers: Toll free - 0008001004382 and 0008001008277. Also accessible at normal domestic call rates within India: +91-11-71279005
3. Postal address: Deloitte Touche Tohmatsu India LLP
c/o Arjun Rajagopalan, Partner (Ethics Helpline Services)
19th Floor, 46 - Prestige Trade Tower, Palace Road,
High Grounds, Bengaluru, Karnataka – 560001

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

Tender Reference: CC25NP019

Document Date: 27th June 2024

Section E.4: General Terms Condition-Service

CONFIDENTIAL

The Tata Power Company Limited is hereunder referred to as the "Owner" or "Company". The person, firm or company offering the services, the subject of this order is referred to as "Contractor". The subject of this order is hereinafter referred to as the "Work".

"Sub-Contractor" means any person named in the Contract as a Sub-contractor, sub-vendor, manufacturer or supplier for a part of the Works or any person to whom a part of the Works has been subcontracted and the legal successors in title to such Person, but not any assignee of such Person.

The Contract shall mean the contract as derived from the following:

1. Work Order (with 'Commercial Notes' and Annexures to the Work Order referred thereon)
2. Scope of Work.
3. General Terms & Conditions - Service

The documents including all reference document (s) and Annexures forming the Contract are to be read together as a whole and are to be taken as mutually explanatory, provided however, in the event of any inconsistency or discrepancy between the aforementioned documents, the order of precedence in interpretation of the documents shall be as set out above. For the avoidance of doubt, it is clarified that the terms set forth in the Work Order (with 'Commercial Notes' and Annexures to the Work Order referred thereon) shall take precedence over the terms set out in the Scope of Work, which shall in turn take precedence of the terms set out in the General Terms & Conditions – Service.

1. Contractor's obligation:

- 1.1 Contractor warrants that it is a competent, qualified and experienced contractor, equipped, organised and financed to perform and complete the services in the operating area in an efficient and professional manner and capable of meeting all the requirements of the Contract.
- 1.2 The Contractor has the overall responsibility of executing the contract, conducting Planning, Job Scheduling, Maintenance Planning, Maintenance Job Scheduling, executing the Work and maintenance jobs as per the Scope of work & schedule.
- 1.3 Except to the extent that it may be legally or physically impossible or create a hazard to safety, the Contractor shall comply with the Owner's representative(s) instructions and directions on all matters relating to the Work.
- 1.4 Contractor shall at all times have full responsibility for control of the Equipment and for the direction and supervision of operations being carried out under the Contract.
- 1.5 In the performance of the Work, Contractor shall be and act as an independent Contractor fully responsible and accountable for the proper execution of its responsibilities, obligations and

liabilities under this Contract and for its own acts and the acts of its Sub-Contractors and the Personnel. Owner's supervision, examination or inspection of the (performance of the) Work or omission to carry out the same shall not be construed in any manner whatsoever as relieving Contractor from its responsibilities, obligations or liabilities under this Contract.

- 1.6 Contractor shall submit list of tools & tackles with details of make, year of manufacturing, valid certification to the Project Manager/ User for their approval.

Project Manager may during the execution of project inspect & verify that the tools & tackles are as per the qualification requirements approved by him and will have right to seek replacements in case of any discrepancies. The Contractor shall always comply with such directives.

- 1.7 Contractor shall engage Tata Power Skill Development Institute (TPSDI) certified labour force at the site for execution of the job. Requirement & fees for TPSDI certification shall be as per Company Policy.
- 1.8 Contractor shall take full responsibility for the protection and security of Owner's materials and equipment while such materials and equipment are temporarily stored in Contractor's facility or otherwise in Contractor's custody.
- 1.9 All notices, instructions, information, and other communications given by the Contractor to Owner under the Contract shall be given to the Order Manager/ Owner's representative, except as otherwise provided for in this Contract.
- 1.10 The Contractor shall make its own arrangements for movement of personnel and equipment, within and outside the sites / units / offices at the various locations covered by the Contract.
- 1.11 The Contractor shall acquire in its name all permits, approvals, and/or licenses from all local, state, or national government and other statutory authorities and/or public service undertakings that are necessary for the performance of the Contract.
- 1.12 Neither the Contractor nor its personnel shall during the term of this Contract, engage in any business or professional activities in India/abroad which would conflict with the activities assigned to them under this Contract.

2. Service Warranties:

Contractor warrants that all services performed for or on behalf of Owner will be performed in a competent,

workmanlike manner and shall be free from faults and defects. Said warranties shall be in addition to any warranties of additional scope given by Contractor to Owner. None of said warranties and no other implied or express warranties shall be deemed is claimed or excluded unless evidenced by a change notice or revision issued and signed by Owner's authorized representative.

3. Compliance of Local Laws:

Contractor shall be responsible and shall comply with the provision of all the Statutory Acts Applicable. Special attention of the Contractor is drawn towards the compliance of provision of the following statues: (along with the latest amendments/additions, as applicable):

- a) The Child Labour (Prohibition and Regulation) ACT, 1986.
- b) The Contract Labour (Regulation and Abolition) ACT, 1970.
- c) The Employee's Pension Scheme, 1995.
- d) The Employee's Provident Funds and miscellaneous provisions Act, 1952.
- e) The Employees State Insurance Act, 1948.
- f) The Equal Remuneration Act, 1976.
- g) The Industrial Disputes Act, 1947.
- h) The Maternity Benefit Act, 1961.
- i) The Minimum Wages Act, 1948.
- j) The Payment of Bonus Act, 1965
- k) The Payment of Gratuity Act, 1972.
- l) The Payment of Wages Act, 1936.
- m) The Shops & Establishment Act, 1954.
- n) The Workmen's Compensation Act, 1923.
- o) The Employer's Liability Act, 1938.
- p) and any other applicable statutory act

Site Specific requirements shall be as Annexure at I. The compliance to these Site Specific requirements shall not absolve the Contractor of its obligation to comply with the Owner's Contractor Safety Management Policy.

4. Owner's Obligation:

- 4.1 The order manager (As specified in the 'Commercial Notes') shall have the authority to represent Owner on all day-to-day matters relating to the Contract or arising from the Contract. All notices, instructions, orders, certificates, approvals, and all other communications under the Contract shall be given by the order manager, except as otherwise provided for in this Contract. The order manager may appoint the Engineer-In-Charges for different areas for monitoring the work progress, inspections and signing of bills.

- 4.2 Owner shall ensure the availability of site access, all information and/or data to be arranged/ supplied by Owner to the Contractor for execution of the Work . The terms on which the Contractor shall be allowed access to the site shall be specified by the Owner prior to commencement of the execution of the Work and thereafter shall be governed in accordance with such policies as the Owner may provide in writing to the Contractor from time to time.

5. Contractor's/ Sub-contractor's employees:

- 5.1 The Contractor shall engage appropriately qualified persons to provide the services with the prior approval of Owner. Owner may withhold such approval for any reason whatsoever.

- 5.2 The Contractor hereby represents and warrants that:

- i) the personnel are duly qualified, and are, and will remain, sufficiently qualified, careful, skilful, diligent and efficient to provide the services to Owner; and
- ii) the Services will be rendered carefully, skilfully, diligently and efficiently, and to the professional standard reasonably expected by Owner of a contractor qualified and experienced in providing services substantially the same as the Services.

- 5.3 The Contractor must ensure that the Contractor's personnel conduct themselves in a proper manner and comply with the procedures and all policies, regulations and directives of Owner including any occupational, health and safety policies and the relevant prevailing laws and regulations in the Country of operations and specifically in the area where Work is being executed.

- 5.4 Owner may inform the Contractor to immediately remove Contractor's personnel from the relevant premises in the event of misconduct or incompetence on the part of the Personnel. The Contractor shall at all times remain liable for all acts and/or omissions of its Personnel.

- 5.5 It is made clear that no relationship of Owner and employee is created between Owner and the Contractor's resident engineers, employees and no claim for employment of any such personnel shall be tenable or entertained.

6. Title of Property:

- 6.1 Unless otherwise provided in this order or agreed to in writing, property of every description including but not limited to all tooling, tools, equipment and material furnished or made available to Contractor, title to which is

in Owner, and any replacement thereof shall be and remain the property of Owner. Such property other than material shall not be modified without the written consent of Owner. Such property shall be plainly marked or otherwise adequately identified by Contractor as being owned by Owner and shall be safely stored separately and apart from Contractor's property.

6.2 Contractor shall not use such property except for performance of work hereunder or as authorized in writing by Owner. Such property while in Contractor's possession or control shall be listed in writing and kept in good condition, shall be held at Contractor's risk, and shall be kept insured by Contractor, at its expense, in an amount equal to the replacement cost with loss payable to Owner. To the extent such property is not material consumed in the performance of this order, it shall be subject to inspection and removal by Owner and Owner shall have the right of entry for such purposes without any additional liability whatsoever to Contractor. As and when directed by Owner, Contractor shall disclose the location of such property, prepare it for shipment and ship it to Owner in as good condition as originally received by Contractor, reasonable wear and tear excepted.

7. Work Completion schedule:

Contractor shall plan and execute the Work in accordance with a detailed schedule mutually agreed upon by the Parties (Owner and Contractor).

8. Contract Price and Payment:

8.1 The Contract Price shall be a firm & fixed Contract Value for the Work inclusive of all the taxes, levies & duties and shall remain firm till the validity of this contract.

8.2 Unless Specifically stated elsewhere in the contract, the Contractor is solely liable for payment of , and warrants that it will pay, or ensure the payment of all taxes imposed, assessment made in relation to the Work.

8.3 An amount as stated in the table below shall be retained towards Contractor's safety performance against every RA bill:

Contract Value	Retention Amount (%)
Upto Rs. 10 lakhs	2.5
Above Rs. 10 lakhs and below Rs. 50 lakhs	2
Above 50 lakhs and upto Rs. 10 Crores	1.5
Above Rs. 10 Crores	1

Rev. date: 25 Jul 2017

The above mentioned safety retention shall be over and above any other retentions/ deferred payments as may have been specifically agreed in the Contract.

8.4 For Contract Price Rs. 1 crores or above and Contract Completion Schedule 12 months or more, the above safety retention will be released half yearly against the Safety Performance Score (methodology for evaluation enumerated in the Safety Terms & Conditions attached as Appendix to this General Terms & Condition) which will be evaluated by the Order Manager every month. For all other contracts, the above said safety retention shall be released along with the final settlement only at the end of the contract period.

8.5 The Owner shall have the right to stop any work which in its opinion is not meeting the safety standards/ guidelines of the Owner and good engineering practice. The Contractor shall not be eligible for and shall not be granted any extension in Completion Schedule due to such stoppage of work by the Owner.

8.6 The above retention towards safety shall not absolve the Contractor of its liabilities including statutory liabilities towards safety violations, injury or death (whether by accident or otherwise). An amount between Rs. 5 to 50 lakhs as deemed appropriate by Owner's appointed Committee for incident investigation and/ or as determined by statutory authorities (whichever higher), will be payable by the Contractor in case of such severe incidents of injury leading to loss of property or partial/ permanent disablement (e.g. loss of limb/s, vision etc.) or death.

8.7 Notwithstanding anything else stated in the Contract, the Contractor shall be liable for termination without any notice and without recourse to Owner in case of three (3) or more severe safety violations. There shall be no termination fees/ compensation payable to Contractor for such termination.

8.8 In case the Contractor achieves 100% on the Safety Performance Score, the Contractor shall be awarded a discretionary bonus of 1% of invoiced value subject to a maximum of Rs. 50 lakhs towards Safety Performance.

8.9 Payment shall be released within 60 days of submission of error free invoice with supporting documents duly certified by the Order Manager/ Engineer-in-Charge after deducting taxes at source as prescribed under the applicable law, income – tax or other deductions under the state value added tax laws . If such payment release

day falls on a holiday of Owner, payment will be released on the next working day. Against deduction of statutory taxes, tax deduction certificates where ever applicable shall be issued as per the applicable provisions of the statute. The Order Manager may recover any amount wrongly paid in excess in any previous bills certified by him.

8.10 *Mode of Payment:* All payments shall be made direct to the Contractor or his authorized representative in the shape of RTGS or Electronics Transfer method, on certification of the Order Manager/Engineer-in-Charge and on compliance of contractual terms & conditions.

9. **Taxes and Duties:**

9.1 The Contract Price shall be inclusive of all taxes, duties, including but not limited to Customs duty, GST or any local taxes, levies imposed by State/Central/Local governments.

9.2 Taxes as mentioned in the Contract Price or Price Schedule shall be paid to the contractor subject to the Contractor complying with all the statutory requirements and furnishing the relevant documents including error free invoices containing detailed break up of the taxes.

9.3 The tax invoices should contain the details to comply with the GST Law. The supplier shall:

- i) Furnish (electronically) and communicate to the Owner, the details of Goods or Services supplied by the 10th of the month succeeding the said tax period,
- ii) Upon discovery of any discrepancy, rectify it and shall pay the tax and interest thereof,
- iii) Furnish the returns (electronically), for the inward and outward supplies of Goods and/or Services, before the specified dates as per the GST Law,
- iv) Communicate the tax paid, credits etc. as and when credited.
- v) The Invoice should clearly state the description of the goods, quantity, sale price, tax %, and tax amount;
- vi) The Invoice should be signed by an Authorized Signatory.

Bills/Invoices in the name of The Tata Power Company Ltd. with packing lists in triplicate shall be forwarded along with the equipment.

Contractor to furnish GST Registration no. in all invoices as well as Purchaser's (Tata Power's) GST no.

9.4 However the payment of tax shall be restricted to the total amount as indicated in the price schedule.

9.5 Any statutory variation in duties, levies or taxes if applicable and specified in this Contract till the scheduled date for completion of Work and limited to direct invoices of the Contractor shall be to the account of Owner. The Contractor shall have the obligation to provide the necessary documentary evidence / supporting by way of gazetted notifications etc. to prove the change in such levies or taxes between the due date of submission of the Bid and the scheduled date of completion of work to claim the difference.

9.6 The Contractor shall pass on to the Owner all the benefits of either reduction in tax rates, exemptions, concessions, rebate, set off, credits etc. or introduction of new tax rates exemptions, concessions, rebate, set off, credits etc. pertaining to all taxes, duties, imposts, fees and levies in respect of the supplies of Goods or performance of obligations under the contract. This would specifically include reduction of tax rates as a result of statutory changes or judicial rulings.

9.7 Any other taxes, levies and duties not mentioned in Contract Price or Price Schedule but applicable as per any statute (s) or introduction (omission) of new taxes, levies and duties shall be deemed to be included in the Contract Price and shall be to the account of the Contractor.

9.8 For facilitating availment of a credit, set-off, rebate, drawback or like benefit available to the Owner, the Contractor will facilitate the Owner by providing the necessary documentary and/or procedural support. In any process of assessment or re-assessment, of taxes payable by the Owner,

9.9 The Contractor shall bear and pay all the costs, liabilities, levies, interest, penalties in respect of non-compliances of any legal requirements as per various statutory provisions. The contractor shall keep the owner indemnified at all times from any tax liability, interest, penalties or assessments that may be imposed by the statutory authorities for non-compliances or non-observation of any statutory requirements by the Contractor.

9.10 All formalities required under statutes, for availing any concessions under relevant tax laws shall be adhered to by the Contractor.

9.11 Deduction at source: Recovery at source towards income tax calculated at the rate prescribed from time to time under the Income Tax Act 1961 and other relevant sections of Income Tax Act shall be made from the bills of the Contractor and the amount so recovered shall be

deposited with the Income Tax Department. Necessary TDS certificate to this effect will be issued to the Contractor in the prescribed proforma.

- 9.12 If any other taxes / duties / cess etc are to be recovered at source as per government regulations / Legislation from time to time, the same shall be recovered from the bills payable to the Contractor. Necessary receipt to this effect will be issued to the Contractor in this regard as per the applicable legislation.

10. Contract Performance Guarantees (If applicable)

The Contractor shall within 15 days of issuance of this Order/Contract furnish an unconditional irrevocable bank guarantee duly stamped, strictly as per the prescribed format of Owner from any nationalized bank or any scheduled bank having a branch in Mumbai and approved by the Owner for a sum equivalent to 10% of the Total Contract Price valid for the Contract Period and with a claim period of not less than 6 months from the completion of Contract Period. The issuing bank should be advised to send a direct confirmation of issue of bank guarantee to Owner.

In case the Contractor fails to furnish the requisite Bank Guarantee as stipulated above, then the Owner shall have the option to cancel the Contract besides other contractual remedies.

11. Price Reduction:

- 11.1 In case the Contractor fails to deliver the service/ Complete the work as per the agreed Completion Schedule including intermediate milestones (if applicable), the Owner shall recover from Contractor, as ascertained and agreed Liquidated Damages, and not by way of penalty, a sum equivalent to 1% of the Contract Value per week of delay. The Liquidated Damages referred above may be recovered by the Owner as set off against any amounts payable by the Owner to the Contractor or in any other manner in accordance with applicable laws.
- 11.2 The overall cap on liquidated damages shall be limited to 10% of the Contract Price.

12. Insurance

- 12.1 The Contractor agrees to indemnify and protect Owner against all liability, claims or demands for injuries or damages to any person or property growing out of the performance of this order/ Contract.
- 12.2 The Contractor further agrees to furnish evidence of insurance showing that Contractor has and will maintain adequate insurance coverage during the life of this Contract/ order in the opinion of Owner, including but not

limited to comprehensive general liability insurance. Such evidence of insurance must set forth the name of the insurer, policy number, expiration date, and limits of liability. Compliance by Contractor with insurance requirements does not in any way affect Contractor's indemnification of Owner under Indemnification clause

13. Indemnification:

The Contractor shall indemnify, save harmless and defend the Owner and keep the Owner indemnified from and against any and all claims, costs, liabilities (financial), litigations, compensations, judgments, expenses or damages (including attorney's fees and other related expenses) arising out of any breach or alleged breach of any of the conditions of this Contract including compliance to statutory laws of provisioned under clause 3, performance of the obligations hereunder, or any representation or misrepresentation made by the Contractor or by any third party in respect of death or bodily injury or in respect to loss or damage to any property with regard to the subject of this Contract.

14. Indemnity against IPR:

The equipment, system, drawings, and other materials that shall be supplied against the Contract will become the Owner's property. Without limitation of any liability of whatsoever nature, the Owner shall be indemnified and kept indemnified against any claim for infringement or breach of any of the statues, rules & regulations by the use of or sale of any article or material supplied by the Contractor. The indemnity shall include any infringement of patent, trade mark, design, copyright or other property rights whether in Country of Origin, or elsewhere resulting from the Contractor's design, manufacture, use, supply or re-supply & would also cover use or sale of any article or material supplied by the Contractor to the Owner under the Contract. The Indemnity shall cover any claim/action taken by a third party either directly against the Owner or any claim/action made against the Contractor & where under the Purchaser is made liable. The Indemnity shall be for losses, damages, and costs including litigation costs, attorney fees etc incurred by the Owner in relation to the Contract.

15. Free Issue Material:

Wherever contracts envisage supply of Free Issue Material (FIM) by the Owner to the contractor for fabrication/ use in service performance, such Free Issue Material shall be safeguarded by an insurance policy to be provided by the Contractor at his own cost for the full value of such materials and the insurance policy shall cover the following risks specifically and shall be valid for six months beyond the Contract Validity date :

RISKS TO BE COVERED: Any loss or damage to the Owner's materials due to fire, theft, riot, burglary,

strike, civil commotion, terrorist act, natural calamities etc. and any loss or damage arising out of any other causes such as other materials falling on Owner's materials.

The amount for which insurance policy is to be furnished shall be indicated in the respective Contract.

Free Issue material (FIM) will be issued to the Contractor only after receipt of the Insurance Policy from the Contractor. The contractor shall arrange collection of the FIM from the Owner's premises and safe transportation of the same to his premises at his risk and cost. Notwithstanding the insurance cover taken out by the Contractor as above, the Contractor shall indemnify the Owner and keep the Owner indemnified to the extent of the value of free issue materials to be issued till such time the entire contract is executed and proper account for the free issue materials is rendered and the left over/surplus and scrap items are returned to the Owner. The contractor shall not utilize the Owner's free issue materials for any job other than the one contracted out in this case and also not indulge in any act, commission or negligence which will cause/result in any loss/damage to the Owner and in which case, the Contractor shall be liable to the Owner to pay compensation to the full extent of damage/loss. The Contractor, shall be responsible for the safety of the free issue materials after these are received by them and all through the period during which the materials remain in their possession/control/custody. The Free issue materials on receipt at the Contractor's works shall be inspected by them for ensuring safe and correct receipt of the material. The contractor shall report the discrepancies, if any, to the Owner within 5 days from the date of receipt of the material. The contractor shall take all necessary precautions against any loss, deterioration, damage or destruction of the FIMs from whatever cause arising while the said materials remain in their possession/custody or control. The free issue materials shall be inspected periodically at regular intervals by the Contractor for ensuring safe preservation and storage, the Contractor, shall also not mix up the materials in question with any other goods and shall render true and proper account of the materials actually used and return balance remaining unused material on hand and scrap along with the final product and if it is not possible within a period of one month from the date of delivery of the final product/ completion of Service covered by this Contract. The Contractor shall also indemnify the Owner to compensate the difference in cost between the actual cost of the free issue material lost/damaged and the claim settled to the Owner by the insurance company.

16. Relation between parties:

The Contract shall be entered into on a principal-to-principal basis only. The Contract shall not be construed as a partnership or an association of persons. There is no agent and principal relationship between the parties. Each party shall be responsible for its own conduct. The Contractor shall ensure at all times that all the work carried out under this contract

either by its own person or through any of its sub-Vendors shall be always done under its own direct supervision.

17. Safety:

Contractor shall comply with all legal and statutory provisions including all rules and regulations pertaining to Safety, Health and the Environment and will be responsible for all legal liabilities arising due to any of their acts or of their personnel.

The Contractor shall comply with the Owner's Contractor Safety Policy and Safety Terms and Conditions. Any misconduct and/ or violation with respect to the Owner's Contractor Safety Policy and Safety Terms and Conditions or any other legal and statutory provisions pertaining to Safety, Health and Environment shall be dealt with as per the Safety Terms and Conditions.

Prior to commencement of any work at site Contractor shall submit an undertaking in writing to adhere to and comply with all the provisions of Owner's Contractor Safety Code of Conduct.

The Contractor shall have a valid ISO 14001/ OHSAS certification. In absence of the same, the Contractor shall obtain the same within 6 months from the date of the Effective Date of Contract.

18. Suspension of Work

Owner may instruct Contractor at any time to suspend performance of the Work or any part thereof with a notice of 7 days for whatever reason. Provided Contractor is not in default under this Contract subject to Articles 1 and 5 inclusive, the Contractor shall be paid a mutually agreed fee, if any, necessarily incurred by Contractor as a direct consequence thereof of suspension and the Project Completion Schedule may be revised accordingly.

Without prejudice to any other rights Owner may have under this Contract or at law if Contractor is in default under this Contract, Owner may instruct Contractor to suspend performance of the Work or any part thereof by giving 7 days notice till such default has been corrected to the satisfaction of Owner. Also Liquidated Damages in accordance with Clause 11 shall continue to be applicable during such period until the default is cured. The costs incurred by the Contractor for such correction shall be to the Contractor's account, and furthermore no payment shall become due to the Contractor. Any cost incurred due to non - performance of the Contractor by the Owner shall be charged to the Contractor.

19. Change Management:

Owner shall have the right at any time to order any change in the Work in accordance with the following procedure. Contractor shall furnish to Owner upon request as soon as reasonably possible but no later

than five (5) days following the request, a written statement specifying:

- (a) the increase or decrease, as the case may be, in the costs of the Work which will result from a change in the Work as requested by Owner,
- (b) any effect such change in the Work may have on any other provision of this Contract originating from either parties, and
- (c) such other details as Owner may require.

Any change in costs shall be reasonably related to the proportional change in the Work and any other costs incurred by Contractor. If Owner agrees to Contractor's statement Owner shall notify Contractor thereof in writing in the form of a change order, whereupon the change in the Work shall be incorporated in the Work and immediately implemented. In the event that the change relates to a reduction in Work, the work in question shall not be undertaken pending the issue of an appropriate Change Order.

20. Governing Laws

This Contract shall be construed in accordance with and governed by the Laws of India without giving effect to any principle of conflict of law.

21. Jurisdiction

This Contract and the transaction contemplated herein shall be subject to the exclusive jurisdiction of the competent Courts in Mumbai only.

22. Dispute settlement:

Dispute or differences arising out or relating to this Order shall be resolved amicably by the parties. Failing such amicable resolution of dispute / differences either party may refer the matter to arbitration of a Sole Arbitrator to be appointed jointly by both the parties. The award of the Arbitrator shall be final, binding and conclusive on the parties. The venue for arbitration shall be Mumbai. The Arbitration proceedings will be governed and regulated by the provisions of Indian Arbitration and Conciliation Act, 1996 as amended from time to time and the rules framed there under.

23. Force majeure:

- 23.1 In the event of either party being rendered unable by force majeure to perform any obligation required to be performed by it under this Contract the relative obligation of the party affected by such force majeure shall, after notice under this articles be suspended for the period during which such cause lasts. The term 'Force Majeure' as employed herein shall mean acts of God, wars (declared or undeclared), riots or civil commotion, fire, floods, and acts and regulations of the Government of India or State Government or any of the statutory agencies. Both the party

shall pay to the other party, the amount payable upon the date of the occurrence of such force majeure.

- 23.2 Upon the occurrence of such cause and upon its termination, the party alleging that it has been rendered unable as aforesaid, thereby shall notify the other party in writing immediately but not later than twenty four (24) hours of the alleged beginning and ending thereof giving full particulars and satisfactory evidence in support of the claims.

- 23.3 During the period, the obligations of the parties are suspended by force majeure; the contractor shall not be entitled to payment of any rate.

- 23.4 In the event of the force majeure conditions continuing or reasonably expected to continue for a period more than thirty (30) days, Owner shall have the option of terminating the contract by giving seven (7) days notice thereof to the contractor.

24. Sub letting and Assignment

The contractor shall not, without prior consent in writing of the Owner, sublet, transfer or assign the contract or any part thereof or interest therein or benefit or advantage thereof in any manner whatsoever, provided nevertheless that any such consent shall not relieve the contractor from any obligation, duty or responsibility under the contract.

25. Limitation of Liability:

Notwithstanding anything contained in the Contract, the Contractor's aggregate liability under this Contract shall be limited 100% of the Total Contract value. This shall exclude liability arising pursuant to clause 3- Compliance to Local Laws, clause 9.10, clause 14- Indemnity against IPR, clause 13- Indemnity, clause 26 – Confidentiality, liability arising due to loss of or damage to the Free Issue Material (FIM) issued by Owner to Contractor for completion of the Work and liability arising due to wilful misconduct, gross negligence, third party claims and corrupt acts attributable to the Contractor.

26. Confidentiality:

The Contractor shall use the Confidential Information of the Owner only in furtherance of this Contract and shall not transfer or otherwise disclose the Confidential Information to any third party. The Contractor shall (i) give access to such Confidential Information solely to those employees with a need to have access thereto; and (ii) take the same security precautions to protect against disclosure or unauthorized use of such Confidential Information that the party takes with its own confidential information but, in no event, shall a party apply less than a reasonable standard of care to prevent such disclosure or unauthorized use.

27. Termination:

27.1 The Contract shall be deemed to be terminated on completion of the Contract period.

27.2 Termination of default by Contractor:
Owner may terminate the contract at any time if the Contractor fails to carry out any of his obligations under this Contract. Prior to termination, the Contractor shall be advised in writing of the causes of unsatisfactory performance to be improved upon 15 days of the receipt of notice. In case, if the Contractor fails to bring about the improvement to the satisfaction of the Owner, then the Contract shall be terminated.

27.3 Without prejudice to the rights and remedies available to Owner, Owner may terminate the Contract or part thereof with immediate effect with written notice to the Contractor if:

27.3.1 The Contractor becomes bankrupt or goes into liquidation.

27.3.2 The Contractor makes a general assignment for the benefit of creditors.

27.3.3 A receiver is appointed for any substantial property owned by the Contractor.

27.3.4 The Contractor is in breach of any representation or warranty made to the Owner by the Contractor.

The Contractor shall not be entitled to any further payment under the Contract if the Contract is terminated. If the order is terminated under clause 27.2 and 27.3, the Contractor shall not be entitled to any further payment, except that, if Owner completes the Work and the costs of completion are less than the Contract Price, the Owner shall pay Contractor an amount properly allocable to services fully performed by Contractor prior to termination for which payment was not made to Contractor. In case, the cost of completion of Work exceeds the Contract Price, the additional cost incurred by Owner for such completion shall be paid by the Contractor.

27.4 Owner shall be entitled to terminate the Contract at its convenience, at any time by giving thirty (30) Days prior notice to the Contractor. Such notice of termination shall specify that termination is for Companies convenience and the date upon which such termination becomes effective. Upon receipt of such notice, the Contractor shall proceed as follows:

27.4.1 cease all further work, except for such work as may be necessary and instructed by the Owner/ Owner's representative for the purpose of preserving and protecting Work already in progress and protect

materials, facilities and equipment on the Work Site or in transit;

27.4.2 stop all further sub-contracting or purchasing activity, and terminate Sub-contracts;

27.4.3 handover all Documents, equipment, materials and spares relating to the portion of Work already executed by the Contractor or procured from other sources up to the date of termination for which the Contractor has received payment equivalent to the value thereof; and

27.4.4 handover those parts of the supplies manufactured/ work executed by the Contractor up to the date of termination.

Upon termination pursuant to clause 27.4, the Contractor shall be entitled to be paid (a) all sums properly due to the Contractor under the Contract up to the date of termination; and (b) any direct and substantiated charges already incurred or committed for cancellation of the procurement of third party goods or services which were to have been supplied by the Contractor in connection with this Contract provided that the Contractor shall use its best endeavours to minimise such charges

25.5 The Contractor shall not be released from any of his obligations or liabilities accrued under the Contract on termination. For the avoidance of doubt, the termination of the Contract in accordance with this clause shall neither relieve the Contractor of his accrued obligations for Warranty or his accrued liability to pay (liquidated) damages for Delay nor shall entitle him to reduce the value of Performance Security.

28. Consequential Damages:

Unless otherwise specified, neither Party shall be responsible for and nor shall be liable to the other Party for indirect/consequential losses and damages suffered by such Party including for loss of use, loss of profit whether such liability or claims are based upon any negligence on the part of the other Party or its employees in connection with the performance of the Contract.

29. Environment / ISO 14001 Certification:

The Contractor to confirm whether their organization is ISO 14001 certified. If not, the Contractor must certify that the handling, use and disposal of their product / by-products conform to practices consistent with sound environmental management and local statutes. The Contractor shall ensure that all the wastes are disposed in environmental friendly way with strict compliance to applicable laws including adherence to MoEF guidelines with respect to disposal of batteries, lead waste, copper cables, ash, waste oil, e-waste etc which shall be disposed through MoEF approved

parties only. The Contractor shall also be responsible to collect and recycle all the e-waste generated at the end of the product life cycle at its own costs and risks as per the MoEF guidelines/orders.

30. Non-Exclusive Agreement

This Contract is non-exclusive and Owner reserves the right to engage other contractors to perform similar or identical work. Contractor shall accord such other contractors adequate opportunity to carry out their contracts and shall accomplish the Work in co-operation with those contractors and with Owner, in accordance with such instructions as may be issued by the Owner from time to time.

31. Severability

In the event that any of the provisions, or portions or applications thereof, of this Contract are held to be unenforceable or invalid by any court or arbitration panel of competent jurisdiction, Contractor and Owner shall negotiate an equitable adjustment to the provisions of the Contract with a view towards effecting the purpose of the Contract and the validity and enforceability of the remaining provisions, or portions or applications thereof, shall not be affected thereby.

32. Housekeeping & Removal of scrap:

The Contractor shall be responsible for keeping the areas of his work at site, neat and tidy throughout the period of his work. All excess material/ spares/ consumables taken by Contractor, as well as the scrapped items and wooden logs/ crates/ planks shall be returned, from time to time, to the Stores, and transported/ unloaded by Contractor's personnel at the place shown by Order Manager/Engineer-in charge.

The Contractor shall so arrange that all the scrap generated during the progress of his work, is separated into two categories, viz.

- i) Saleable scrap like steel, copper or other metals, etc., and,
- ii) Others, which have nil or negligible resale value, like insulation material, jute, debris, etc. (or as directed by the Order Manager/Engineer-in charge).

The saleable scrap shall be shifted to and unloaded at a central place as per directions of the Stores-in charge, while the other scraps shall be shifted to other locations as per directions from Order Manager/Engineer-in Charge, or as per terms of the order.

The Contractor shall arrange to remove the scrap on regular basis, or even on daily basis, depending upon the requirement, to keep the area around his workplace neat and tidy. In case, it is observed that the

Contractor is not carrying out regular cleaning of his areas of work, or, is not returning the excess materials/ scrap, etc., to the Stores, Owner reserves the right to arrange the same through other sources, and back-charge the Contractor the cost of doing so, along-with overheads, by deducting the amount from Contractor's bills.

Contractor's final bill will be cleared by Owner only after confirming that proper clearing of his areas of work has been completed by the Contractor, and same is certified by the Order Manager/ Engineer in-charge

33. 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 at our website: <http://www.tatapower.com/aboutus/code-of-conduct.aspx>. The Contractor is requested to bring any concerns regarding this to the notice of our Chief Ethics Officer on the e-mail ID: cecounsellor@tatapower.com.

34. Responsible Supply Chain Management:

The Owner is committed for a cleaner environment and respect of Human rights through its Responsible Supply Chain Management policy. The Contractor is required to comply with all the environment & Human rights related laws, including emission norms, Labour and environmental regulations. The Owner encourages its Vendors/ Contractors/ Business partners to pay more attention to green design, green supply, green production, green logistics and green packaging in performing their business obligations.

The Contractor is required to abide by the Tata Power Corporate Environment policy, Energy Conservation and Corporate Sustainability Policy.

A copy of the Responsible Supply Chain Policy along with Environment policy, Energy Conservation policy, Sustainability policy, Health & Safety policy and Human Rights policy is available at website: <http://www.tatapower.com/sustainability/policies.aspx>.

Contractor/Bidder is required to completely fill the attached "Supplier Sustainability Questionnaire" in support of their Green Supply Chain Management initiatives and submit the same with their offer.

The Owner recognizes that diversity in the workplace positively impacts business. The Owner is committed to help people from SC/ST background either by helping them to become entrepreneurs or by engaging workforce from SC/ST community under the contracts agreed herein. To encourage engaging SC/ST community, the owner may consider on the merit to incentivize the Contractor by paying additional 1% of

the service contract portion if the number of SC/ST workforce engaged in the contract exceeds 30% of the total deployed strength and 2%, if the strength goes beyond 50%. While the Contractor will assist the workforce so engaged to become self-reliant in meeting the work expectation, the Owner may also volunteer its training resources to the extent possible to improve their employability. The Contractor shall maintain the proper documentation of such category of the workforce engaged and the owner may consider to pay the incentive after its verification.

The Owner may also consider extending price preference of 5% in the bid evaluation for an order value up to Rs.50 Lacs, provided the company is owned by a person from SC/ST community having minimum 50% holding in the company.

35. Vendor rating:

You are requested to ensure compliance to the terms of the individual orders with regards to timely delivery, provision of all applicable documents / challans / test certificate, quality of the material etc. Your performance with respect to the said factors will be taken into consideration for future business.

36. Vendor Feedback:

34.1 In this dealing Vendors feedback is important for the purchaser to improve its processes. If Contractor have to report any grievance, problem or require any clarification, information, Contractor is requested to contact purchaser at email ID: CC_CUSTOMERFEEDBACK@tatapower.com

34.2 Contractor is requested to ensure compliance to the terms of the individual orders with regards to timely delivery, provision of all applicable documents / challans / test certificate, quality of the material etc. Contractor performance with respect to the said factors will be taken into consideration for future business.

37. Non-Waiver:

Failure of Owner or its representatives to insist upon adherence to any of the terms or conditions incorporated in the Contract or failure or delay to exercise any right or remedies herein or by law accruing, or failure to promptly notify the Contractor in the event of breach or the acceptance of or the payment of any Material(s) hereunder or approval of any design or Material(s) shall not release the Contractor and shall not be deemed a waiver of any right of Owner to insist upon the strict performance thereof or of any of its rights or remedies as to any

such Material(s) regardless of when the Material(s) are shipped, received or accepted not shall any purported oral modification or revisions of the Contract by Owner or its representative(s) act as waiver of the terms hereof.

ESG FRAMEWORK FOR BUSINESS ASSOCIATES

Tata Power's Sustainability philosophy sits at the core of its Business Strategy. Tata Power Sustainability Model has an overarching objective of 'Leadership with care' with key elements of 'Care for the Environment'; 'Care for the Community'; 'Care for our Customers / Partners' and 'Care for our People'. These sustainability objectives encompass the Environmental, Social and Governance objectives driven as integrated elements.

Tata Power, together with its stakeholders is determined to achieve sustainable growth while creating shared value for all.

As a part of future ready roadmap, Tata Power has targeted following as our Environment, Social and Governance priorities:

- Being Carbon Net Zero before 2045
- Growing Clean capacity (80% by 2030)
- Customer centricity
- Becoming water neutral before 2030
- Achieving zero waste to landfill before 2030
- No net loss of biodiversity before 2030
- Positively impacting 80 million lives by 2027

In order to create a sustainable business ecosystem, Tata Power expects that all its Business Associates (BA) which includes its suppliers, vendors, consultants and service providers to align to its ESG and sustainability commitments.

Tata Power encourages improved efficiencies and scaling up of green initiatives through technology and innovation taking us farther on the journey of reducing carbon emissions and preparing the entire eco-system towards products and services that would have net positive impact on the environment and communities that we operate in.

The Vendors/ bidders wishing to associate with Tata Power are expected to share their own sustainability and ESG journey. We at Tata Power promote all Business Associates to have a sustainable procurement policy for their supplier and service providers to contribute to our integrated approach in achieving a sustainable supply chain. The BA is encouraged to carry out the assessment of their sub-contractors and sub-vendors on sustainability readiness so that they are aware of the expectation/ business requirement.

The Vendor/ Bidder shall fill-in the 'Environment, Social and Governance Compliance Screening Questionnaire for Business Associates' attached at Annexure-I and submit the same along with the Bid in Ariba online platform.

Responsible Supply Chain Management:

Tata Power is committed for a cleaner environment and respect of Human rights through its Responsible Supply Chain Management policy.

Tata Power Business Associate (BA) shall comply with all the environment & Human rights related laws, including emission norms, Labour and environmental regulations.

Tata Power encourages its BA to focus on green design, green supply, green production, green logistics and green packaging in performing their business obligations. The BA is expected to abide by the Tata Power Corporate Environment policy, Energy Conservation and Corporate Sustainability Policy (enclosed with this document as Annexure-II).

The BA is expected to:

- Strive towards Conservation of Energy, Water, Resources and optimize transportation of Men & Materials to minimize environmental impact and reduce carbon footprint.
- Carry out the assessment of materials used for construction, operation & maintenance, consumables and accordingly phase out those materials which are environmentally hazardous.
- Be cognizant that diversity in the workplace positively impacts business.
- Promote affirmative action by supporting people from SC/ ST background by engaging workforce from SC/ ST community under the contracts agreed herein.
- Share the commitment of 'No child labour', 'No forced labour', Non-discrimination on the basis of caste, colour, religion, gender, disability, maternity or pregnancy or any other factor unrelated to the requirements of the job
- Pay the wages or remuneration to the workforce, personnel deployed in compliance to all applicable laws and regulations.
- Provide its employees/ deployed labor with an employment environment that is free of physical or psychological harassment.
- Carry out the assessment of their Sub-contractors on their Sustainability Readiness so that they are aware of the above expectation/ standards
- To ensure usage of suitable package material which is more environmentally sustainable. Further the packing material shall be recycled to the extent possible. The material used for packing is expected to suit the mode of transport and to ensure its safe receipt at point of delivery.

Waste Disposal:

The BA is expected to follow best practices for disposal of waste, few of which are listed below:

- Have a detailed project plan that includes 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. 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.
- Have purchase policy to encourage the procurement of material with recycled and minimum packaging of goods during delivery and appropriate means for site-to-site transportation of materials to avoid damage and litter generation.
- Ensure that the residents living near the site are kept informed about proposed working schedule and timings/ duration of any abnormal noise full activity that is likely to happen.
- 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.

Water Management:

The BA is expected to follow best practices for water management, few of which include a management and monitoring system for water withdrawals and consumption, procedures to reduce water usage or reuse/recycle water, and pretreatment of wastewater before disposal.

Compliance to Law:

The BA shall adhere to responsible business practices and comply with the provision of all the Statutory Acts Applicable. Special attention of the BA is drawn towards the compliance of provision of the following statutes: (along with the latest amendments/additions, as applicable):

- The Child Labour (Prohibition and Regulation) ACT, 1986.
- The Contract Labour (Regulation and Abolition) ACT, 1970.
- The Employee's Pension Scheme, 1995.
- The Employee's Provident Funds and miscellaneous provisions Act, 1952.
- The Employees State Insurance Act, 1948.
- The Equal Remuneration Act, 1976.
- The Industrial Disputes Act, 1947.
- The Maternity Benefit Act, 1961.
- The Minimum Wages Act, 1948.
- The Payment of Bonus Act, 1965
- The Payment of Gratuity Act, 1972.
- The Payment of Wages Act, 1936.
- The Shops & Establishment Act, 1954.
- The Workmen's Compensation Act, 1923.
- The Employer's Liability Act, 1938.
- and any other applicable statutory act

Social Accountability (SA 8000):

Tata Power expects its BAs to follow guidelines of SA 8000:2014 on the following aspects

- Child Labour
- Forced or Compulsory Labour
- Health & Safety
- Freedom of Association & Right to Collective Bargaining
- Discrimination
- Disciplinary Practices
- Working Hours
- Remuneration
- Management System

Health and Safety

The BA is expected to ensure the health and safety of his and his Sub-contractor's staff and labour. The BA shall, in collaboration with and according to the requirements of the local health authorities, ensure that medical staff, first aid facilities, sick bay and ambulance service are available at the accommodation and on the Site at all times, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics. The BA shall maintain records and make reports concerning health, safety and welfare of persons deployed, and damage to property, as the Owner's Representative may reasonably require. The BA shall be responsible for the medical treatment / hospitalization of his and his Sub-contractor's staff/ labour.

The BA shall appoint a qualified Safety officer at the Site to be responsible for maintaining the safety, and protection against accidents, of all personnel on the Site. Such Safety officer shall have the authority to issue instructions and take protective measures to prevent accidents.

The BA shall comply in toto with the Tata Power's Contractor Safety Terms & Conditions, Health Safety & Environment Manual while working on Tata Power Site/ Services/ Contracts.

Grievance Mechanism

The BA is expected to have grievance procedures that allow stakeholders to anonymously bring environmental and/or work-related violations and/or concerns to the attention of management. In addition, the BA is expected to have procedures for examining reports of environmental and/or work-related violations or concerns and/or privacy complaints.

Data Protection

The BA is expected to have a formal process to address data security or privacy issues.

ANNEXURE-I



Sr. No.	Question Description	Response (Y/N)	Remarks
Organization			
1	Does your Company have Sustainability Policy at Organization Level? If Yes, Please attach		
2	Do you have sustainable procurement policy in place for your own suppliers? If Yes, Please attach		
3	Does your company do regular assessment of its suppliers on ESG parameters?		
4	Are there ESG risks, or negative impacts identified in your supply chain		
Governance			
1	Is diversity taken into consideration when appointing board members/ senior management? Do you have an independent director/s?		
2	Has your company taken initiatives to ensure ethical practices at workplace? Please share the details, Policies etc.		
3	Does your company have a formal process to address data security or privacy issues? Please share the details, Policies etc.		
4	Does your company have grievance mechanism for stakeholder issues and track resolution?		
Environment/ Planet			
1	Does your company have Environmental Policy? If Yes, Please attach		
2	Do you have a formal process for waste management including solid wastes, liquid wastes and hazardous waste?		
3	Does your company track greenhouse gas emission? Also, what percentage of own consumption comes from the renewable energy?		
4	Does your company have a formal process for water management including monitoring of water consumption and withdrawals, and if applicable, pretreatment of wastewater?		
Green Technology/ Innovation			
1	Are your facility/ Product/ Services provided by you is based on green design, green production, green packaging or green logistics considerations? Please elaborate.		
2	Do your products or services have any environmental or social features or benefits (e.g. environmental/energy certification, ecolabels, fair trade certification, etc.)?		
Social/ People			
1	Does you facility/ Company have written personnel policies in place Are you an equal opportunity employer?		
2	Please describe any formal programme / campaign in place to promote company involvement with the community (volunteering, etc.). What is the percentage of profit spend on community activities?		
3	Does your company have a written Health & Safety Policy or Program? If Yes, Please attach		
Certifications: Does your company have following certifications (valid till date-please mention validity)			
1	ISO9001 accreditation		
2	SA8000 or equivalent		
3	ISO 14001 certification		
4	ISO 18001/45001 or equivalent		
5	ISO/IEC 27001 or equivalent		
6	Any Other (Please specify)		

Signature

Business Associate Name

ANNEXURE-II

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

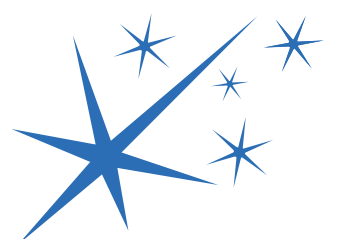
- We will uphold the values of honesty, partnership and fairness in our relationship with stakeholders
- We shall provide and maintain a clean, healthy and safe working environment for employees, customers, partners and the community
- We will strive to consistently enhance our value proposition to the 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: 15th June, 2018



Supplier Code of Conduct

Tata Power follows the Tata Code of Conduct (TCoC) and the Whistle blower Policy and expect all its Suppliers to adhere to the same principles. “**Supplier**” here means any business, company, corporation, person or other entity that provides, sells or seeks to sell, any kind of goods or services to Tata Power, including the Supplier’s employees, agents and other representatives. The suppliers are expected to adhere to the following Do’s and Don’ts:

Do’s

1. The Suppliers shall be committed to supplying products and services of high quality that meet all applicable standards and laws, including product packaging, labelling and after-sales service obligations.
2. Comply with all applicable laws and regulations, both in letter and in spirit, in all the territories in which it operates.
3. Strive to provide a safe, healthy and clean working environment for its employees.
4. Strive for environmental sustainability, particularly with regard to the emission of greenhouse gases, consumption of water and energy and the management of waste and hazardous materials.
5. The Supplier shall represent our company (including Tata brand) only with duly authorised written permission from our company.
6. Safeguard the confidentiality on the use of intellectual property, information and data of the Company.
7. Gifts and hospitality given or received should be modest in value and appropriate as per Company Policy.
8. The assets of Tata Power shall be employed primarily and judiciously for the purpose of conducting the business for which they are duly authorised.
9. All actual or potential conflicts due to financial or any other relationship with a Tata Power employee shall be disclosed.

Don’ts

1. The Supplier shall not make unfair or misleading statements about the products and services of competitors.
2. Children shall not be employed at workplaces.
3. Forced labour shall not be used in any form.
4. The Suppliers shall neither receive nor offer or make, directly or indirectly, any illegal payments, remunerations, gifts, donations or comparable benefits that are intended, or perceived, to obtain uncompetitive favours for the conduct of its business with Tata Power.

Reporting Violations

The Supplier shall notify the Company regarding any known or suspected improper behaviour of other suppliers or employees relating to its dealings with Tata Power, by email to: cecounsellor@tatapower.com.

The same can also be raised through our 3rd party ethics helpline facility:

1. Email id: tatapower@ethics-line.com ; Website: www.tip-offs.com
2. Helpline numbers: Toll free - 0008001004382 and 0008001008277. Also accessible at normal domestic call rates within India: +91-11-71279005
3. Postal address: Deloitte Touche Tohmatsu India LLP
c/o Arjun Rajagopalan, Partner (Ethics Helpline Services)
19th Floor, 46 - Prestige Trade Tower, Palace Road,
High Grounds, Bengaluru, Karnataka – 560001

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

Tender Reference: CC25NP019

Document Date: 27th June 2024

CONFIDENTIAL

Section E.5: Annexure to GTC

The Tata Power Company Ltd	TPC ^{ODL}		TPN ^{ODL}	Appendix 3 to CSCC Safety Terms and Conditions
Document No. TPSMS/GSR/STC/009 REV 05	TPS ^{ODL}	TATA TATA POWER	TPW ^{ODL}	Date of Issue: 01/08/2023

Appendix 3: Safety Terms and Conditions

Reason for Change	Date of Last Revision	Prepared By	Reviewed By	Approved by
Inclusion of Odisha Discom and periodic Revision	<u>10-Jan-2021-R4</u>	All Discom and CFT members	Debi Prasad Acharya (Head-Safety-Odisha Discom)	Suresh H Khetwani (Chief safety and Environment)

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1.0 Objective:

The Objective of Safety Terms and Conditions is to apprise the Business Associates about various critical procedures of the Tata power Division/Discoms and the expectations from the BA to implement such procedures without fail. Certain terms and conditions are also mentioned to ensure a safe work atmosphere round the year. Refer Contractor's Safety Code of Conduct- Document no TPSMS/GSP/ CSM/015

2.0 Scope:

This procedure applies to all operating and project sites of The Tata Power Company Ltd and Group companies including new businesses like Electric Vehicle charging, Home Automation, Microgrid, Roof top solar etc. This Code of Conduct also applies to all operating and project sites of four Odisha Discoms and New business based on mutually agreed timeline for implementation. R5

3.0 Safety Organization & Responsibilities

3.1 Contractor Site Management and Supervision

Each Contractor will be responsible for fulfilling all statutory and safety requirements as per the laws of the land and not limited to Factory Act, Electricity Act, Electricity Rules and Regulations, Shop and Establishment Act etc.

Each Contractor shall provide at least one competent full-time safety supervisor for workforce of every 50 workers or less than that. When workforce ranges to 500, the contractor must provide at least one qualified safety officer (This may be subjected to change as per applicable act). Thus, for work force of 500 workers there will be one qualified safety officer and 10 safety supervisors. For every 500 additions in workforce, the contractor must add 1 safety officer and 10 safety supervisors. The Order Manager or Safety Department of the Tata Power Division /Discoms will review and approve the appointment of all safety officers and supervisors. The safety supervisors/officers will work with the guidance from Tata Power Division /Discoms Safety Department and align themselves with Tata power Division/Discom safety requirements.

For O&M related AMC activities, minimum one qualified safety officer to be deployed for each Division of the Discoms.

Qualified safety officer means he or she has completed PDIS or ADIS from a recognized institute.

Site Safety Officer/Safety Supervisor / Safety Coordinator shall be interviewed by the Order Manager/ Safety head of the Tata Power Division/Discom and then gate passes shall be issued if the interview is successful.

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Site Manager of Contractor/Subcontractor is responsible, and will be held accountable, for the safety of their own workforce as well as that of sub-contractors. He should also ensure that all equipment, materials, tools, and procedures remain in safety compliance at job site.

Responsibility of Site manager includes, but not limited to:

- 3.1.1 Holding officer/supervisors accountable for safety and actively promote safe work performance.
- 3.1.2 Participate in and cooperate with all safety program requirements to be implemented to meet Tata Power Division /Discoms safety objectives
- 3.1.3 Ensure timely reporting of safety incidents, near misses, unsafe acts, and conditions.
- 3.1.4 Identify the training needs of BA employees and maintain all safety training documents.
- 3.1.5 Provide Safety Performance Report at an agreed frequency.
- 3.1.6 Stopping of unsafe work (Acts and/or Conditions) immediately. Work to start only after corrective actions are implemented.
- 3.1.7 Ensure and participate in daily toolbox talk for all the jobs.
- 3.1.8 Ensure that only tested and certified tools and equipment are issued to the workers and being used at the site.

3.2 Contractor Supervisors and General Staff.

Contractors' site supervisors and general staff members in charge of job site functions such as field engineering, warehousing, purchasing, costing, and scheduling etc. are responsible for the safe performance of the work of those they supervise. They must set an example for their fellow employees by being familiar with applicable sections of the Site Safety program and ensuring that all site activities are performed with SAFETY as the primary objective.

Each site supervisor is responsible and will be held accountable for identifying, analyzing, and eliminating or controlling all hazards through implementation of an aggressive, pro-active Health, Safety and Environmental Program. Each supervisor will proactively participate in the Safety program by observing, correcting, and recording unsafe acts and conditions at plant / sites.

3.3 Contractor Workforce

- 3.3.1 Contractors shall provide adequate quality and quantity of manpower as mutually agreed. (R5)
- 3.3.2 All the contractor employees shall attend "SHE L0(Other than new business and Odisha Discom)/L1 Foundation Course in Safety". Depending on the critical procedure in job employees shall also be required to attend "SHE L2 course of critical/high risk operations". All Supervisors shall be required to attend "SHE L3 Supervisory Training". All the above trainings will be conducted by TPSDI/Skill development institute of Disco, or other equivalent institute approved by Tata Power.

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- 3.3.3 Contractor employees shall be required to attend any other additional training if suggested by Order manager or Site Safety Head. The cost of such additional training shall be borne by the Vendor.
- 3.3.4 Contractor / Vendor shall mobilize their manpower well in advance to complete the training through TPSDI/Sill development Institute.
- 3.3.5 The Vendor / BA shall arrange or bear the conveyance and food expenses incurred during training of BA employees in Odisha Discom. (R5)
- 3.3.6 The validity of the training L1, L2 and L3 is 3 years. There will be competency assessment as Revalidation test in every three months for Tata Power Division and six months for Odisha Discom till one year from implementation of CSCC.(R5) Those who fail in the competency assessment shall undergo training again.
- 3.3.7 Supervisors/Welder/Electricians/Line man /Fitters /Radiographers/Riggers engaged by the contractor shall have valid competency certificates issued by authorized agency/Institute.
- 3.3.8 Contractor workforce must make safety a part of their job by following safety rules and regulations and by using all safeguards and safety equipment. They must take an active part in the Safety programs for the Site.
- 3.3.9 Every member of the workforce is expected to report for work without influence of any Drug/Alcohol. Failure to comply with this requirement shall result in immediate termination of employees under the influence of drug and alcohol plus show cause notice/penalty to the vendor.
- 3.3.10 All employees shall report hazardous conditions, practices and behaviours in their work areas and correct wherever possible.
- 3.3.11 Workforce is responsible for active participation in safety and health programs, suggestion systems, trainings and reporting of unsafe act/practices, Unsafe conditions incidents and injuries to their supervisors.

3.4 Vendor/Contractor/sub-contractor

- 3.4.1 Vendors/Contractor shall always comply with and ensure that their workforce comply with all site safety rules and regulations. Specifically, with applicable provisions of the Site Safety Management Plan and all statutory safety rules and regulations.
- 3.4.2 After receiving the work order/ purchase order vendor/contractor/bidder shall not appoint Sub-contractor without safety assessment of the sub-contractor through safety concurrence group Under Contractor Safety Code of Conduct. Penalty of 5% of contract value will be applicable to the contractor if subcontractor is appointed without the permission of SCG and without evaluation through CSCC process.

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4.0 Tools and Tackles(R5)

- 4.1 Tools & Tackles used to carry out the job shall be checked and inspected by Order Manager and safety Officer.
- 4.2 Vendor must submit a valid Certificate from Competent person under the Factories Act 1948 and State Factories Rule for all Lifting Tools and Tackles (like Hoist, D Shackles, chain Block, wire ropes etc.).
- 4.3 All Electrical Hand Tools must be tested for leakage of current by a person /agency authorized by Tata Power Division /Discoms. Electrical power must be taken though RCCB of 30mA. Electrical hand tools should not have cord more than 3 meters in length. If power source is at > 3 meters, extension boards with RCCB of 30 mA and ON/OFF switch, shall be used.
- 4.4 Removal or inclusion of tools any new tool /tackles / machinery / equipment at site should only be done with concurrence of the order Manager / Head Safety.

5.0 Site Safety Rules and Procedures:

The work in the safest possible manner can only happen when it has been carefully planned and all applicable procedures are followed. The Tata Power Safety Procedures are derived from Tata Power best practices and the applicable Government acts regulations. In each case, the most stringent regulation is used. All safety rules and procedures developed from time to time shall be mandatorily followed by the vendor and his employees while working at Site.

6.0 Critical safety Rules and Procedures: Following is the list of Tata Power's critical Safety Rules and Procedures. Contractor shall refer to approved Rules and Procedures for detailed requirements and ensure conformance

6.1 Lock Out and Tag Out Procedure.

This procedure is intended to be used for the protection of Personnel while servicing or performing maintenance on distribution network/ equipment / pipeline / vessel / process systems. This is a general procedure that shall be used as the minimum requirements for isolation of equipment, pipelines, machines, system from all possible sources of hazardous energy and / or material such as Steam, Hot Water, Compressed Air, any other process fluid / chemical energy /Mechanical energy or Electrical energy. For complete procedure kindly refer Procedure Document No. **TPSMS/CSP/LOTO/001**

6.2 Excavation Safety (Shoring and Sloping) Procedure

This procedure is developed to cover the safe practices required for shoring and sloping in excavation and trenching jobs. This procedure is developed to establish mandatory requirements for practices to protect personnel, property and equipment from hazards associated with above activities. For complete procedure kindly refer Procedure Document No **TPSMS/CSP/EXS/002**

6.3 Confined Space Entry Procedure:

This procedure outlines the steps required to perform the confined space entry and to protect personnel from the hazards of entering and conducting operations in confined spaces. For complete procedure kindly refer Procedure Document No – **TPSMS/CSP/CSE/003**.

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6.4 Working at Height Procedure:

This procedure describes the rules and procedures to protect employees from the hazards of working at heights. This procedure is developed to cover the safe practices required for Working at Heights. This procedure is developed to establish mandatory requirements for practices to protect personnel from hazards associated in this area. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/WAH/004.

6.5 Heavy Equipment Movement Safety Procedure.

Heavy equipment lifting and movement is an activity involving loading, unloading, storage and movement from one place to another including lifting and erection or repairing of equipment with cranes or hoists. Material, machinery and equipment handling operations are being carried out by large capacity cranes and hoists, which make the job safer and faster. This procedure addresses the hazards and precautions associated with such equipment and their use. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/HEMS/005.

6.6 Mobile Crane Safety Procedure.

Mobile cranes are responsible for many incidents, injuries. Falling loads from mobile cranes pose a severe hazard to operators and nearby workers and property. Many types of cranes, hoists, and rigging devices are used for lifting and moving materials. To maintain safe, appropriate standards must be adhered to and only qualified and licensed individuals shall operate these devices. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/MCS/006.

6.7 Scaffold Safety Procedure.

This procedure is developed to provide information on the safe erection, use, dismantling and maintenance of access scaffolding in the workplace. It is developed to establish mandatory requirements for practices to protect personnel from hazards associated with erection, use and dismantling of scaffolds. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/SCAF/007.

6.8 Permit to Work Procedure.

Given the inherent hazards of the power generation and distribution industry, a significant number of TATA POWER operations and installations are critical. Work Permit (WP) System is an essential element in controlling the workplace risks in an effective manner. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/PTW/008.

6.9 Job Safety Analysis (JSA) Procedure.

This objective of this procedure is to have a task-based risk assessment process in place that identifies, evaluates and controls the risks associated with work activities, and as a result, prevents those involved in the task or those potentially affected by the task, from being harmed. For complete procedure kindly refer Procedure Document No- TPSMS/CSP/JSA/009 REV 01.

6.10 Electrical Safety Procedure.

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The objective of these standards is to specify minimum mandatory requirements and advisory guidance for identifying and controlling hazards to ensure 'Zero Harm' regarding operation maintenance and testing of electrical equipment. For complete procedure kindly refer Procedure Document No- TPSMS/CSP/ELEC/010

6.11 Fire Safety Management Procedure.

Objective of This standard is to specify the minimum mandatory requirements and advisory guidelines to ensure prevention of fire related incidents and managing / controlling their impacts if they do occur. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/ELEC/011

6.12 Hazard Identification & Risk Assessment (HIRA) Procedure(R5):

Objective of this procedure is to define guidelines for Hazard identification, Risk assessment and determination of controls. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/HIRA/012.

6.13 Management Of Change (MOC) Procedure(R5):

The objective of this document is to establish the procedures necessary to ensure that HSE risks are managed to an acceptable level in Tata Power Management of Change (MOC) process. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/MOC/013.

6.14 Pre-Start-up Safety Review (PSSR) Procedure(R5).

Objective of this procedure is to provide guidelines for safe initial startup of a new facility or restart of a modified facility. The PSSR process verifies that the new/modified facility meets the original design and operating parameters. The intent is to prevent incidents caused by inadequate, incomplete, unauthorized design, construction, installation, and/or commissioning. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/MOC/014.

6.15 Road Safety procedure(R5):

To provide Safety Rules for road travel management and safe usage of all types of vehicles viz. passenger/ commercial, owned/ hired by company, driven by employees or contractors. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/RSP/015.

7.0 General safety Rules and Procedure:

7.1 Lift (Elevator) Safety Procedure:

To provide safe operating procedure for taking control of lift car before entering and existing the pit of OTIS make elevators. For complete procedure kindly refer Procedure Document No – TPSMS/GSP/LIFT/001,

7.2 Working on conveyor belt Procedure:

This procedure is developed to cover the safe practices required for Working on live equipment and to protect personnel from hazards associated with it. For complete procedure kindly refer Procedure Document No – TPSMS/GSP/CONV/003

7.3 Batteries Handling & Disposal(R5)

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To provide procedure for recycling and / or safe disposal of used / waste batteries in compliance with all legislation. For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/HAZM/003**

7.4 Material Handling and Storage Procedure:

The purpose of this document is to provide procedures to assist the safe handling of materials (manual handling and mechanical handling). For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/MATL/004**.

7.5 Office Safety Procedure(R5):

The objective is to provide a safe working environment to those working in office premise, who may be exposed to emergency situations and other chronic / cumulative risks that may arise due to various reasons of unsafe act, unsafe condition, fire and or pandemic crisis like COVID-19 etc. For complete procedure kindly refer Procedure Document No - **TPSMS/GSP/OFS/006**

7.6 Earth Leakage Circuit Breaker (ELCB) Testing Procedure(R5):

The objective of this procedure is to define the minimum requirements for testing of Earth Leakage Circuit Breaker (ELCB). For complete procedure kindly refer Procedure Document No - **TPSMS/GSP/ELCB/008**.

7.7 Occupational Health & Safety Legal Compliance Procedure(R5):

Objective of this procedure is provide guidelines for compliance of Occupational Health & Safety (OH&S) legal requirements and all ratified protocols and agreements are incorporated in Tata Power Safety Management System (SMS). For complete procedure kindly refer Procedure Document No - **TPSMS/GSP/LEGL/009**.

7.8 Incident Reporting & Investigation Procedure(R5):

Objective of this procedure is to outline the process for reporting, recording and investigating an incident, recommending corrective and preventive actions and to communicate the lessons learned to prevent recurrence of similar incidents. For complete procedure kindly refer Procedure Document No - **TPSMS/GSP/IRI/011**.

7.9 Contractor Safety Management Procedure.

The purpose of this document is to engage with contractors in a way to create safe work environment for everyone working for Tata Power. For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/CSM/015**.

7.10 Tree Trimming Procedure(R5):

The objective of this procedure is to define guidelines and minimum requirements for Tree trimming. For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/TTRM/017**

7.11 Safe Lone Working Procedure(R5):

Objective of this procedure is to lay down guidelines for reduction and safe managing of any additional risk arising from lone working. For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/LONE/019**.

7.12 Good Housekeeping(5S) Procedure(R5):

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Objective of this procedure is to explain the meaning, importance and provide guidelines for implementation of Good Housekeeping(5S) at workplaces across organization. For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/GHK/022**.

7.13 Personal Protective Equipment(R5):

This procedure describes the basic requirements, applicability, minimum specifications of Personal Protective Equipment (PPE). For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/PPE/023**.

7.14 Process Safety Management Procedure(R5):

The objective of this document is to provide a standardized & uniform guideline to implement Process Safety Management in Tata Power, its JVs, and subsidiaries to prevent or minimize the consequences of releases of toxic, flammable, pressurized or uncontrolled chemicals/Steam/Water or any other material which may result in toxic, fire, explosion, burn or flood like situation. For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/PSM/024**

The above procedures will be updated time to time and the updated version of the procedures as well as any additional critical procedure will be available on official website of Tata Power (www.tatapower.com) for your reference.

8.0 Training and Capability Building.

Safety Training and capability building of workforce is a major component of safety management program. All training required must be provided and documented as specified by Tata Power and Indian Regulations. Tata Power Division /Discoms Safety department will audit contractors training and related documentation to assure its adequacy.

8.1 Tata power Odisha Discom Site Safety Orientation.R5

All Tata Power contractor and subcontractor workforce is required to attend Site Safety Orientation Training to receive a Safety Training Card, which is required to obtain a Gate Pass to the site, prior to entry. This Safety Orientation Course will be for duration of minimum half day. The information provided during the orientation will include, but is not limited to following:

- 8.1.1 Job rules, personal safety, and conduct
- 8.1.2 Hazard's reporting
- 8.1.3 Reporting of injuries
- 8.1.4 Emergency procedures
- 8.1.5 Safety Activities and Program including disciplinary measure and incentives.
- 8.1.6 Critical safety procedure relevant to the job

8.2 Capability Building:

- 8.2.1 All Tata Power contractor and subcontractor workforce is required to attend L1 Training to receive a Safety Training Card, which is required to obtain a Gate Pass to the site, prior to entry.
- 8.2.2 Appropriate practical training such as SHE L1, L2& L3 is given to ensure that a jobholder, either supervisor or worker, is competent to do his/her job safely. The skill training is provided through TPSDI, and other agencies authorized

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by Tata Power on the list of 15 critical Safety procedures mentioned under safety procedures. Duration of course is as specified by Division/Discom

- 8.2.3** Contractor shall ensure that concerned workmen are provided with adequate training before he/she is allowed to execute the work. An evaluation test will be conducted after the completion of the training. Those employees who meet the minimum required competency will be provided with Certificate (Card), which will be valid for 3 years, post which the workmen have to reappear for assessment.
- 8.2.4** If the workman is not able to qualify the assessment, he/she will be given 3 additional attempts to clear in 3-month time failing which he/she will not be allowed to work in the Division /Discoms.
- 8.2.5** After expiry of Certificate or Training /Competency Card again one day recertification of L1, L2 and L3 skill training will be provided. R7.
- 8.2.6** Quarterly /Half yearly(For Odisha and New business) Revalidation Test - "SHE L1 Revalidation test" will be conducted for the contractor's employees to revalidate their safety awareness and knowledge.
- 8.2.7** Order Manager and Safety In charge of the Division/Site /Plant will conduct a Competency Assessment of all workforces, going to be deployed at site / plant for high-Risk job.
- 8.2.8** The Contactor shall bear the conveyance and food expenses of his staff for attending training sessions and capability building sessions in new business-like Odisha Discom.
- 8.2.9** The Contactor shall bear the entire cost of L1/L2/L3, the costs towards training, salaries/wages, boarding and lodging of his staff for attending training sessions and capability building sessions. These trainings are offered on nominal chargeable basis payable by Contractor and rates shall be decided by TPSDI from time to time in case of training through TPSDI. Generally, L0 is of one day, L1 is for 2 days for each critical procedure and L3 is for one day. Around Rs 700+GST is approx. cost /Day/Candidate. -R5
- 8.2.10** Competency assessment of all critical workforce to be carried out for all who has taken L2 training. R5

9.0 Recognition to the Prior Learning in Safety-R5

If "Order Manager" recommends and "Head of the Safety Department of Discom" is satisfied with the safety knowledge and competency of the employee of contractor, a test may be conducted by Tata power Skill development Institute/ other recognized institute to assess the prior learning in safety. If employees of the contractors pass in such test, he will be exempted from appearing in SHE L1 training. This assessment is on nominal chargeable basis and rates are decided by TPSDI from time to time.

10.0 Safety performance retention(R5) and Safety Performance Evaluation: 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. This is as per CSCC Document no TPSMS/GSP/ CSM/015

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This safety retention shall be waived for Contractors who have either submitted a Contract Performance Bank Guarantee or have a retention from each running bill for an amount not less than 10% of each bill subject to the express undertaking / understanding that if there are any deductions required to be made for safety non-performance as per the Safety Performance Score, then Tata Power shall recover any such deductions against safety non-performance directly from the monthly bills / final settlement as the case may be failing which it shall be within its right to recover such sum from accounts payable or the CPBG or the retention of the Contractor available with Tata Power for the said contract or any other contract between the Contractor and Tata Power.

11.0 Pre-Employment and Periodic Medical check-up:

Contractor shall arrange to conduct a pre-employment and periodic medical check-up for its entire workforce by Tata Power medical officer or Tata Power authorized medical officer. The contractor shall be able to produce the certificate prior to the employment. The contractor shall also organize to conduct periodical medical checkup (six monthly) for the following category of employees:

- Drivers (Check for Vision & Hearing)
- HEM Equipment Operators (Check for Vision & Hearing)
- Workforce working at Height (Check for Vision, Hearing, Vertigo & Height Phobia)
- Workforce Handling the hazardous substances - Coal, ash and chemicals (Chest X-ray and Lung Function T)
- Workforce in high Noise area (> 90 Decibel), Check for Hearing
- Workforce handling radiography equipment for conducting NDT.
- Workforce, working in specific areas requiring specific medical attention should conduct the medical tests test as laid down in the respective Site Safety Management Plan.

12.0 Other Conditions:

- 12.1. The manpower/vehicles/Tools & Tackles/Equipment provided shall be as per mutually agreed SLA.
- 12.2. No Supervision No work policy should strictly be followed.
- 12.3. Test Before Touch must be ensured every time a job is being carried out in electrical network.
- 12.4. HIRA /JSA as per the job scope must be prepared in detail and submitted along with Site Safety Plan by the successful bidder.
- 12.5. Personal protective equipment (PPE) must always be checked before use to ensure that they are in good condition and clean. Replace them if necessary.
- 12.6. All relevant PPE shall be provided by the vendor while working at the site.
- 12.7. Housekeeping shall be maintained all the time while execution of work. All the unwanted material shall be removed from the site at the end of the day's work. Old/damaged parts if taken out of the system shall be kept at

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identified placed and it shall be shifted to scrap yard or disposed of as per instruction of order manager.

- 12.8. Site Safety Plan shall be prepared by successful bidder along with order manger. Appendix 1 to be filled by successful bidder and submitted to Tata Power safety in-charge, before mobilization of team at site and start of the work.
- 12.9. The Owner or Proprietor of BA must visit worksite at least once in a month and meet Order Manager every month. In case of incidents, the Owner or Proprietor of BA is required to attend Time Out Meetings to understand the gaps that contributed to the incident.

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General Safety Conditions for various contracts Specific to Odisha Discom(R5)

13.0. Safety Conditions for maintenance of STS (Sub Transmission System) Network.

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:

- Availability of Discharge Rods - Minimum 6 Nos. in each maintenance vehicle, fit for purpose and in good conditions and defective rods are removed from service.
- Availability of Neon tester - Minimum one Neon Tester in each Maintenance Vehicle, in good and working condition and defective or non-standard neon testers are removed from service.
- Electrical hand Gloves - Minimum two sets of 33 KV and two sets of 11 KV in maintenance vehicles.
- The BA linemen must be having required ELBO certification for the voltage level involved.
- BA shall provide Safety Policy, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not employ a new workman without training and issue of ID card.
- BA shall conduct safety audits & inspections as per Discom procedures.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom 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 safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to approved by Discom Safety Department.
- BA shall ensure to depute Safety Staff for managing safety in worksites. In case the BA has been awarded work in more than one area power system, then the following safety structure will be adopted.
- Safety manager and Safety engineer must be having PDIS or ADIS.

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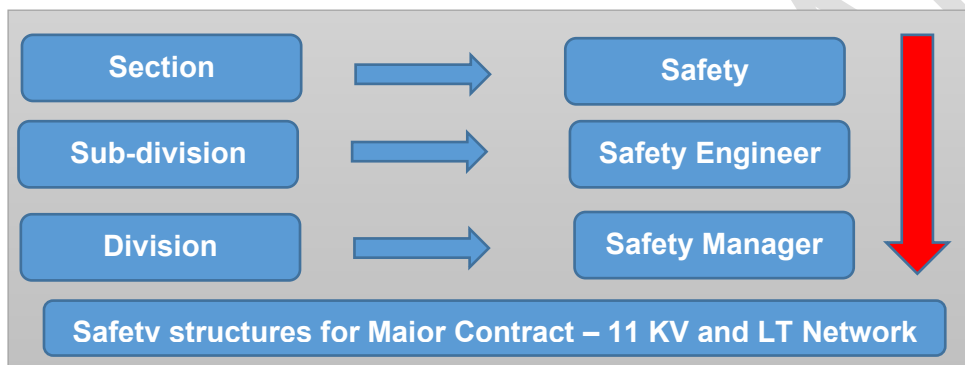
14.0 Safety Conditions for maintenance of 11 KV and LT Network.

A BA awarded a major contract work of maintenance of 11 KV and LT Network in area of a power system will be required to fulfil the following conditions:

- Availability of Discharge Rods - Minimum 6 Nos. in each PSS/FCC and maintenance vehicle, fit for purpose and in good conditions and defective rods are removed from service.
- Availability of Neon tester - Minimum one Neon Tester in each PSS/FCC/ Maintenance Vehicle, in good and working condition and defective or non-standard neon testers are removed from service.
- Electrical hand Gloves - Minimum two sets of 33 KV and two sets of 11 KV in each PSS/Maintenance vehicles and two sets of LT hand gloves at each FCC.
- The BA linemen must be having required ELBO certification for the voltage level involved.
- BA shall provide Safety Policy, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not engage new workman without training and issue of ID card.
- PSS operator shall not be involved in maintenance activities.
- BA shall conduct safety audits & inspections as per Discom procedures.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA to ensure that all LT complaints are routed through Call Centre and recorded in FCC. Rectification of fault shall be done only after call centre logging and with the knowledge of BA supervisor.
- No one will work alone or unsafely under public pressure or otherwise.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.

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- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom 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 safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to approved by Discom Safety Department.
- BA shall ensure to depute Safety Staff - One safety supervisor per section, One safety engineer per sub-division and one safety manager per Division Safety manager and Safety engineer must be having PDIS or ADIS.



15.0 Safety Conditions for the major contract work in Civil Projects:

A BA awarded a major contract work of / in civil project will be required to fulfil the following safety conditions:

- BA shall provide Safety Policy, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not employ a new workman without training and issue of ID card.
- BA shall conduct safety audits & inspections as per Discom procedures.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.

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- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom 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 safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to approved by Discom Safety Department.
- BA shall refer Construction Safety Manual of the Discom for details.
- BA shall ensure to depute a Safety Supervisor (for workforce up to 100 at site) / a safety engineer (for workforce up to 250 at site) / safety manager (for more than two safety engineers) for managing safety at the project site. In case the BA has been awarded more than one major contracts, then the following safety structure will be adopted.
- Safety Engineers and Safety Managers must be having PDIS or ADIS.



16.0 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, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not employ a new workman without training and issue of ID card.
- BA shall conduct safety audits & inspections as per Discom procedures.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.

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- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom 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 safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to be approved by Discom Safety Department.
- BA shall ensure to depute a Safety Supervisor for managing safety at worksite.
- The BA for the RRG work shall depute one Safety supervisor.



17.0 Safety Conditions for Major Projects in Distribution Network

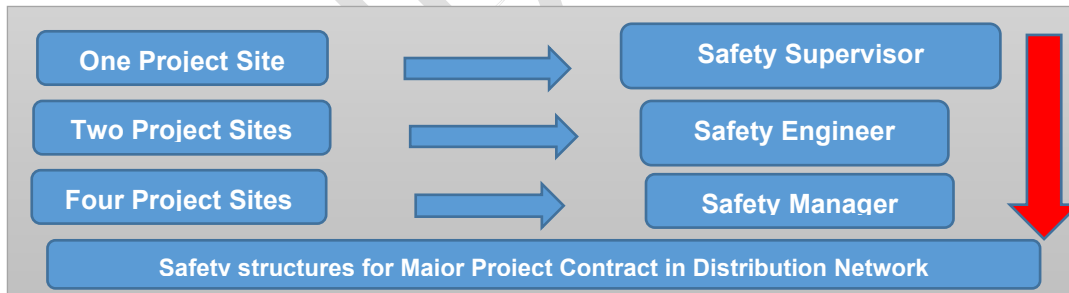
A BA awarded a major Projects in Distribution Network shall be required to fulfil the following conditions:

- Availability of Discharge Rods - Minimum 6 Nos. for each project site, fit for purpose and in good conditions and defective rods are removed from service.
- Availability of Neon tester - Minimum one Neon Tester in each project site, in good and working condition and defective or non-standard neon testers are removed from service.
- Electrical hand Gloves - Minimum one sets of 33 KV, 11 KV and LT in each project site.
- The BA linemen must be having required ELBO certification for the voltage level involved.
- BA shall provide Safety Policy, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not employ a new workman without training and issue of ID card.
- BA shall conduct safety audits & inspections as per Discom procedures.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.

- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.

Sr. No	Type of Audit	Frequency
1	Tool Bag and PPE audit	Weekly
2	First Aid Box Maintenance Record	Fortnightly
3	Fire Extinguisher Record(Applicable for the BA involved in major construction works and have storage of flammable material at worksite)	Monthly
4	Safety Talk Register	Weekly
5	Site Safety Audit	Daily

- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom 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.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to approved by Discom Safety Department.
- BA shall ensure to depute Safety Staff for managing safety in worksites. One safety supervisor per project site or 100 persons, one safety engineer for 2 project sites of 250 persons, and one safety manager for four project sites or 500 persons.
- Safety manager and Safety engineer must be having PDIS or ADIS.



18.0 Schedule of Safety Audits by BA Safety Staff

Safety Undertaking of BA 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

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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 and shall be valid till the date of termination of the said contract by either party. 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 Discom to achieve its goal of Zero for 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 Discom specifically. , failing which Discom 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.
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, but any such replacement shall be only with the prior concurrence of the Discom representative.

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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 Discom 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 Discom / 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 Discom or to which Discom 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 Discom for any near miss or safety violations, accidents, which are attributable to fault of Contractor.

DEPONENT

VERIFICATION

Verified aton this _Day of _____20__ that the contents of the above affidavit are true and correct and nothing material has been concealed therefrom

ANNEXURE TO
Appendix 3: Safety Terms and Conditions
(Document No - TPSMS/GSR/STC/009 REV 05)

***(Excerpts of Tata Power Safety Code of Conduct as relevant for
Safety Terms & Conditions)***

(A) Definitions

- **Order Manager/Engineer in charge:** Order Manager/Engineer in charge is the Tata Power-Division /DISCOM representative, who has the ownership of the given job.
- **Site Safety Management Plan:** It is the safety plan agreed between Contractor and Tata Power-Division/DISCOM. It will contain the entire job specific safety requirement and will be signed by the contractor.
- **Contractor/Business Associate/Vendor (BA):** An individual or a company that provides services to Tata Power-Division/DISCOM under a signed contract.
- **Emergency:** It is a serious, unexpected, or dangerous situation requiring immediate action, which may result in *loss of life*, 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 and approved by adequate authority of MB level or above.
- **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 AI-ML, expert for transmission and distribution network, expert for civil works, expert on transformers, expert for PSCC, expert for equipment overhaul etc.
- **CEO/Chief/Head of division/Unit/Utility:** Business in charge who is overall custodian of the Tata Power-Division/DISCOM.
- **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 14 of this document.
- **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.
- **Low Risk Jobs:** Any job or its activities are considered as Low or Very low risk while Order manager calculated it by applying “Tata Power Hazard Identification and Risk Analysis” procedure and found it under Low or Very Low category.

(B) Safety performance retention(R7):

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. (R7)

Risk Category-(R7)	Contract Value	Retention Amount (%)
<i>Very high/High risk job/ Medium Risk jobs</i>	Up to 10 Lakhs	2.5
<i>Very high/High risk job/ Medium Risk jobs</i>	10 – 50 Lakhs	2
<i>Low/Very Low Risk jobs</i>	10 – 50 Lakhs	1
<i>Very high/High risk job</i>	0.5 to 10 Cr	2
<i>Medium Risk jobs</i>	0.5 to 10 Cr	1.5
<i>Low/Very Low Risk jobs</i>	0.5 to 10 Cr	1
<i>Very high/High risk job</i>	>10 Cr	1.5
<i>Medium Risk jobs</i>	>10 Cr	1

This safety retention shall be waived for Contractors who have either submitted a Contract Performance Bank Guarantee or have a retention from each running bill for an amount not less than 10% of each bill subject to the express undertaking / understanding that if there are any deductions required to be made for safety non-performance as per the Safety Performance Score, then Tata Power shall recover any such deductions against safety non-performance directly from the monthly bills / final settlement as the case may be failing which it shall be within its right to recover such sum from accounts payable or the CPBG or the retention of the Contractor available with Tata Power for the said contract or any other contract between the Contractor and Tata Power.

(C) Safety Performance Evaluation & Responsibility of Business Associate / Contractor:

During the time of job execution, regular site inspection will be carried out by the Tata Power-Division / DISCOM officials to evaluate monthly safety performance of the contractor and monthly score will be maintained by the Order Manager. Violations will be dealt as per **CSM F12 Safety Violation Penalty Criteria**.

1. During the progress of the work, concerned site Supervisor/Engineer/Safety representative will visit and inspect the work site regularly and evaluate the safety performance of the contractor based on matrix **Appendix 13** and apply the Consequence management policy/Penalty criteria as applicable.
2. The evaluation criteria include Lead Indicators such as percentage of workers trained in TPSDI, inspection of critical equipment. Lag indicators such as Fatalities, LWDC and man-days lost.
3. In case of job stoppage due to safety violations / unsafe observations at the site, no time extension from PO completion date shall be given to the contractor, if such delays are attributable to contractor.
4. 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 by Division Chief/CEO. This charge is over and above the retention amount. The committee will finalize penalty amount based on factors such as advice by statutory authorities, contract value and impact of accident etc.

5. Order Manager, Head of Business and functional Chief have the authority to terminate the contract as per **CSM F12 Safety Violation Penalty Criteria** Through contract department.

(D) Other Appendices are attached,

Appendix 6: CSM F6 - Safety Competency Assessment Form (Template).

(This is to be filled by Bidder and submit to Tata Power as part of bid submission).

Appendix 8: CSM F8 - PPE requirements-(R7)

Appendix 9: CSM F9 - Site Safety Management Plan / Method Statement (Template)

Appendix 12: CSM F12 - Safety Violation Penalty Criteria

Appendix 13: Checklist To Be Used During Site Visit

Appendix 14: Indicative List of High-Risk Jobs

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Appendix 8: CSM F8 - PPE requirements-(R7)

The Contractor shall ensure that the following PPE of Approved standards shall be always available and shall be used by his employees with no exception whatsoever. • PPE shall be conforming to BIS/DGMS/DIN specifications, in good condition and shall be comfortable to his employees, when used. This is indicative. For better clarification refer PPE procedure-TPSMS/GSP/PPE/023. as per safety terms and condition Appendix 3 CFM 3 in detail. R7

PPE Requirement

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/Gas cutters	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 / Linemen	Rubber hand gloves <i>with correct voltage rating and expiry date normally one year from Manufacturing date-(R7)</i> & Electrical resistant shoes, Safety helmet with induction strip to alert about presence of voltage for those linemen who climb the poles or work on electrical equipment
6	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, Work positioning attachment


PPE Type and Testing Frequency

Sl. No.	Name of PPE	IS / EN Standard	Testing Frequency	Remarks
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.	

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02	HDPE Safety helmet with chin strap and ratchet type for adjustment for non-Electrical work	IS:2925-1984	Monthly and visual check every day for any crack in shell.	
03	Full body harness (Safety belt)	EN 361	Monthly and visual check every day of the bends and the harness.	
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.
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.
06	Fireproof jacket for chest protection		Monthly and visual check every day.	
07	Safety helmet with induction Strip for linemen and working for electrical work-Class E	EN 397/2012	Monthly and visual check everyday	Induction Strip alerts presence of voltage
08	Shorting clamps, crocodile clamps, Discharge Rod and Neon tester		Monthly and visual check everyday	For discharging the residual voltage and test before touch

Pictorial View of PPEs 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 for Nonelectrical work and electrical work	IS:2925-1984/ EN 397/2012	
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	Fireproof jacket for chest protection		
08	Reflective jacket to each workman	As per Tata Power standard	

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These pictures are indicative. Actual product may vary.

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 company.
3. Safety Representative of the BA must 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. Company 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.

Appendix 9: CSM F9 - 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		
Scope of work: -		
Drawing References: -		
Detail of Sub contractors involved: -		
Method Statement Prepared By: - Designation: - (e.g., Site Manager)	<u>Signature</u>	<u>Date</u>

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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 roles and responsibilities of all personnel involved in activity i.e., Site management staff including subcontractors' staff, Project Manager/Site Manager of principal contractor, Sub Contractor Site Manager, Project Engineer, Safety officer, Competent Supervisory Staff etc.)*

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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).*

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S. 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)*.

Fall Protection Measures: (Where Work at height cannot be avoided)	
Control Measures for Electrical Hazards	
Others Hazard if any (please provide details)	

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Hazardous Substances to be used in job:
(Attach MSDS if required)

						
Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N

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, firefighting, 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*

<i>Safety Helmet / Hard Hats</i>		<i>Safety Shoe / Safety Boots</i>	
<i>Gum Boot</i>		<i>Double Lanyard Safety Harness with work positioning attachment</i>	
<i>Electrical Hand gloves</i>		<i>Other hand gloves</i>	
<i>Eye protection</i>		<i>Respiratory protection</i>	
<i>Ear Protection</i>		<i>Electrical Arc flash suit</i>	
<i>Chemical resistant suit</i>		<i>Reflective Jackets</i>	
<i>Any Other</i>		<i>Any Other</i>	

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:

- Please give a brief writeup / methodology of your organization's plan to avoid impact of the COVID-19 pandemic at Tata Power working site.
 - 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 12: CSM F12 - Safety Violation Penalty Criteria

Major Violations and Escalation matrix--(R7)

Consequence of safety violation observed not related to incidents or accidents		Violations				
Sl. No.	Safety Violation	1st	2nd	3rd	4th	Subsequent violation
1	Working without required PPE such as Helmet/gloves/safety shoes/Safety harness etc.	A	B	C	D	Will Attract the same penalty as 4th violation
2	Working without proper tools and tackles	A	B	C	D	
3	Poor or bad condition of Crane/Hydra/Vehicle and/or Incompetent driver and/or helper).	B	C	D	E	Termination of Contract and blacklisting after repetition of violations (3 to 4 times as the case may be)
4	Improper Working at Height	B	C	D	E	
5	Untrained /unauthorized workman engaged in high-risk jobs	B	C	D	E	
6	Violation of SOP or WI or LOTO	C	D	E		
7	Working without PTW or LC / Without authorization / Without creating Safe Zone	C	D	E		

Legend	Action to be Taken	Responsibility	Penalty (INR)	Repeat Violations
A	Levy of Penalty	Order manager / EIC	5000	The no. of repeat violations shall be calculated cumulative during the contract period, not on a monthly basis
B	Memo to BA and Levy of Penalty	Order manager / EIC	10000	
C	Memo to BA and Levy of Penalty	Order manager / EIC	25000	
D	Memo to BA and Levy of Penalty	Order Manager / EIC	50000	
E	Memo to BA, Levy of Penalty, Termination of Contract, Blacklist	Order Manager / EIC	100000	

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Other Violations and Penalty

Penalty shall be imposed on the contractors under the following circumstances for breaching the contractual agreements. The list is not exhaustive, but indicative.

Sl. No	Description of Violation	Severity	Penalty (INR)
1.	Unhygienic/Bad condition of PPE	2	500
2.	Unsafe Act/Condition of Severity 4	4	4000
3.	Unsafe Act/Condition of Severity 5	5	5000
4.	No Earthing of Electrical equipment	5	5000
5.	Working without efficient supervision	4	4000
6.	Non-reporting of incidents	3	3000
7.	Starting the job without Toolbox Talk	4	4000
8.	Electric cable tied with metal wire / Use of damaged electrical cable / Use of two core cable	3	3000
9.	Rubber mat not available in front of electrical panels.	3	3000
10.	Inserting naked wire into the socket instead of a plug	5	5000
11	Inflammable materials stored inside PSS/FCC/Distribution Room	5	5000
12	Water accumulation found near electrical panels / equipment	5	5000
13	Grinding wheel/ Coupling/ Piling winch/other rotating parts without guard	4	4000
14	Inadequate illumination of working area	3	3000
15	Bringing inside PSS/FCC or any other work area any chemicals without approval.	5	5000
16	Loose materials in work area which can fall down or fly during a storm	5	5000
17	Misusing emergency facilities like fire hydrant line/ hose box/ spray system/ eye wash etc.	3	3000
18	Entering restricted areas like switch yard, hazardous material storage room etc. without authorization	3	3000
19	Not using 24 V lamp inside confined spaces	3	3000
20	Bypassing/overriding safety interlocks	5	5000
21	Working besides road without proper barricading and monitoring of traffic	5	5000

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22	Smoking in prohibited area (Closed Go-downs, Storage of flammable material, Storage of Gas cylinders, PSS , Offices etc.)	3	3000
23	Improper stacking of materials in Storage Yard	4	4000
24	Sleeping at workplace	3	3000
25	First aid box not available / in locked condition	2	2000
26	Appointment of subcontractor without his Safety Bid Evaluation and/or without the permission of engineer in charge or Order manager.	5	5% of order value
27	Bad Housekeeping with respect to TPSMS/GSP/GHK/022 <ul style="list-style-type: none"> • 1st Instant • 2nd instant • 3rd instant • 4th instant • Subsequent instants 	2	<ul style="list-style-type: none"> • 1000 • 2000 • 5000 • 10000 • 10000
28	Violations related to vehicles with respect to TPSMS/CSP/RSP/015. <ul style="list-style-type: none"> • Parking without wheel choke • Parking in undesignated area • Heavy vehicle without helper or co-driver • Seat belt not available / not used • Driver without license • Heavy vehicles without reverse horn • Using mobile phone while driving • Lights/mirrors not working /broken 	3	1000 per each violation
28	Violation in Gas cutting and Gas cylinder handling <ul style="list-style-type: none"> • Cylinder valve without guard • No flashback arrester • Leaky DA/Oxygen hose • Cylinders not kept in secured manner • Cylinder trolley not available • Cylinders are transported by manual rolling 	5	2000 per each violation
29	Violations in Lifting Operations w.r.t. to TPSMS/CSP/HEMS/005 <ul style="list-style-type: none"> • Hook latch missing • Load raised or swung over people or occupied areas of building • Persons standing within the swing area of the crane • No barricading of crane working area • Use of damaged lifting tools and tackles 	5	2000 per each violation

	<ul style="list-style-type: none"> Lifting tools and tackles not tested / Test certificate expired Crane operator without proper license Angular loading Lifting / shifting heavy material without guide rope Using mobile phone during loading and unloading jobs 		
30	Violation in Scaffolding work w.r.t. to TPSMS/CSP/SCAF/007 <ul style="list-style-type: none"> Unstable scaffolding/nonstandard Scaffolding in use Handrails/mid rails/toe guards missing Safety harness not anchored on fixed structure Opening found in working platform 	5	2000 per violation
31	Violation in Excavation Work w.r.t. to TPSMS/CSP/EXS/002 <ul style="list-style-type: none"> Loose material falling into excavated pit Water logging in excavated pits / trenches Inadequate or no barricading Undercut / cave in found on sides of excavated pits 	4	2000 per violation
32	Caution boards, danger signs (luminescent /red) along with emergency contact number are not found displayed.	3	3000
34	Spillage of hazardous material/chemicals during transportation	4	4000

Penalty for Incidents / Accidents-(R7)

Consequence of incident / Accident		Incident / Accident				Action Required
Sr.No.	Type of Injury	1st	2nd	3rd	4th	
1	Major Injury (Bone injury or burn or hospitalization >48 hrs.) Non-fatal	F	F	G	G	Action Required
2	Major Injury (Bone injury or burn or hospitalization >48 hrs.) Non-Fatal (Two or more non-Fatal in one event)	G	G	H		Intolerable
3	Single fatality	G	H			
4	Multiple fatalities (Two or more fatalities in one event). Anywhere in Tata power.	H				

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Legend	Action to be taken	Responsibility	Penalty (INR)	The no. of violations shall be calculated cumulative during the contract period for all contracts in SBU, not on a monthly basis
F	Memo to BA and Levy of Penalty	Order Manager/Engineer in charge	200000	
G	Memo to BA and Levy of Penalty	Order Manager/Engineer in charge	500000	
H	Memo to BA, Levy of Penalty, Termination of Contract and Blacklisting the BA	Order Manager/Engineer in charge	1000000	

Appendix -13: CHECKLIST TO BE USED DURING SITE VISIT

Checklist to be used: 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?		
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		
	Total Score		
	Site Visit Score		

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

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Appendix 14: Indicative List of High-Risk Jobs

Indicative high-risk jobs are given below. This is not an exhaustive list. This is only indicative.

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	Maintenance / Testing and Replacement of High Voltage (33 KV etc.) Switchyard equipment
6	Installation of Lifts
7	Installation of EOT Cranes
8	Tower Dismantling
9	Working on H Frame /Pole mounted Transformers
10	Excavation in operational Area having power cables in receiving station
11	Identification and spiking of cable / disconnection of cables from poles
12	Working on Electrical Panels
13	Working on live electrical switch yard, Material handling and equipment repair/installation.
14	All activities that require climbing on a pole/structures/Towers/Transformers
15	Cable laying and termination jobs
16	Excavation beyond 5 feet near existing building and structures
17	Working in confined Spaces
18	Stringing of new conductors over poles

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



(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018



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: 15th June, 2018





**TATA CODE OF CONDUCT
2015**



LEADERSHIP THAT INSPIRES

For over 100 years, the Tata group has been led by visionaries who have stayed true to the vision of the founder, Jamsetji Tata.

A vision that placed the greater good of society at par with business growth.

A vision that put into practice pioneering social initiatives that changed the way responsible business was run.

And a vision that brought into the group a strong social conscience.



We do not claim to be more unselfish, more generous or more philanthropic than other people. But we think we started on sound and straightforward business principles, considering the interests of the shareholders our own, and the health and welfare of the employees, the sure foundation of our success.

Jamsetji Tata
Founder of the Tata group
Chairman (1868 – 1904)

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FOREWORD

Tata companies have consistently adhered to the values and ideals articulated by the Founder for over 150 years. The Tata Code of Conduct was first formalized by Mr Ratan Tata. It articulates the Group's values and ideals that guide and govern the conduct of our companies as well as our colleagues in all matters relating to business. Today, the Code is a bedrock on which we base our individual, as well as leadership commitments to core Tata values.

The Tata Code of Conduct outlines our commitment to each of our stakeholders, including the communities in which we operate, and is our guiding light when we are sometimes faced with business dilemmas that leave us at ethical crossroads. The Code is also dynamic in that it has been periodically refreshed in order to remain contemporary and contextual to the changes in law and regulations. However it remains unaltered at its core.

Our stellar reputation and success as a business entity has been defined by the powerful commitment and adherence to the core values and principles expressed in this Code, by all our employees, directors and partners. I trust every Tata colleague and Tata company will continue to not only comply with the laws and regulations that govern our business interests around the world, but will continue to set new standards of ethical conduct that will generate deep respect and inspire emulation by others.

N. Chandrasekaran

21st February, 2017



A. OUR VALUES

TATA has always been values-driven. The five core values that underpin the way we conduct our business activities are:



INTEGRITY

We will be fair, honest, transparent and ethical in our conduct; everything we do must stand the test of public scrutiny.

UNITY

We will invest in our people and partners, enable continuous learning, and build caring and collaborative relationships based on trust and mutual respect.

RESPONSIBILITY

We will integrate environmental and social principles in our businesses, ensuring that what comes from the people goes back to the people many times over.

PIONEERING

We will be bold and agile, courageously taking on challenges, using deep customer insight to develop innovative solutions.

EXCELLENCE

We will be passionate about achieving the highest standards of quality, always promoting meritocracy.

These universal values serve as the foundation for the Tata Code of Conduct. They find expression within the value system of every Tata company.

B. SCOPE AND PURPOSE OF THIS CODE

1. This Code sets out how we behave with:
 - our employees, or those who work with us;
 - our customers;
 - the communities and the environment in which we operate;
 - our value-chain partners, including suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents;
 - our joint-venture partners or other business associates;
 - our financial stakeholders;
 - the governments of the countries in which we operate; and
 - our group companies.
2. In this Code, “we or us” means our company, our executive directors, officers, employees and those who work with us, as the context may require.
3. The term “our group companies” in this Code typically means companies Tata Sons intends for this Code to apply to, and / or to whom Tata Sons has issued this Code.
4. This Code sets out our expectations of all those who work with us. We also expect those who deal with us to be aware that this Code underpins everything we do, and in order to work with us they need to act in a manner consistent with it.

REMEMBER...

It is our commitment to protect our reputation and our brand equity by adhering to the values and principles set out in this Code. By doing so, we strengthen our unique culture and identity.

OUR CORE PRINCIPLES



The Tata philosophy of management has always been, and is today more than ever, that corporate enterprises must be managed not merely in the interests of their owners, but equally in those of their employees, of the consumers of their products, of the local community and finally of the country as a whole.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

C. OUR CORE PRINCIPLES

1. We are committed to operating our businesses conforming to the highest moral and ethical standards. We do not tolerate bribery or corruption in any form. This commitment underpins everything that we do.
2. We are committed to good corporate citizenship. We treat social development activities which benefit the communities in which we operate as an integral part of our business plan.
3. We seek to contribute to the economic development of the communities of the countries and regions we operate in, while respecting their culture, norms and heritage. We seek to avoid any project or activity that is detrimental to the wider interests of the communities in which we operate.
4. We shall not compromise safety in the pursuit of commercial advantage. We shall strive to provide a safe, healthy and clean working environment for our employees and all those who work with us.
5. When representing our company, we shall act with professionalism, honesty and integrity, and conform to the highest moral and ethical standards. In the countries we operate in, we shall exhibit culturally appropriate behaviour. Our conduct shall be fair and transparent and be perceived as fair and transparent by third parties.
6. We shall respect the human rights and dignity of all our stakeholders.
7. We shall strive to balance the interests of our stakeholders, treating each of them fairly and avoiding unfair discrimination of any kind.
8. The statements that we make to our stakeholders shall be truthful and made in good faith.
9. We shall not engage in any restrictive or unfair trade practices.
10. We shall provide avenues for our stakeholders to raise concerns or queries in good faith, or report instances of actual or perceived violations of our Code.
11. We shall strive to create an environment free from fear of retribution to deal with concerns that are raised or cases reported in good faith. No one shall be punished or made to suffer for raising concerns or making disclosures in good faith or in the public interest.
12. We expect the leaders of our businesses to demonstrate their commitment to the ethical standards set out in this Code through their own behaviour and by establishing appropriate processes within their companies.
13. We shall comply with the laws of the countries in which we operate and any other laws which apply to us. With regard to those provisions of the Code that are explicitly dealt with under an applicable law or employment terms, the law and those terms shall take precedence. In the event that the standards prescribed under any applicable law are lower than that of the Code, we shall conduct ourselves as per the provisions of the Code.

REMEMBER...

"Good faith" means having a reasonable belief that the information you have provided is truthful. It does not mean having 'all the evidence' about the potential violation or case reported.

OUR EMPLOYEES



Once you got the best people, the people who shared our values and ideals, we left them free to act on their own. We do not fetter them. We encourage them and give them opportunities for leadership.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

D. OUR EMPLOYEES

Equal opportunity employer

1. We provide equal opportunities to all our employees and to all eligible applicants for employment in our company. We do not unfairly discriminate on any ground, including race, caste, religion, colour, ancestry, marital status, gender, sexual orientation, age, nationality, ethnic origin, disability or any other category protected by applicable law.
2. When recruiting, developing and promoting our employees, our decisions will be based solely on performance, merit, competence and potential.
3. We shall have fair, transparent and clear employee policies which promote diversity and equality, in accordance with applicable law and other provisions of this Code. These policies shall provide for clear terms of employment, training, development and performance management.

Q & A

A job requirement entails extensive travel. One of the candidates has excellent relevant experience and qualifications. However, this candidate is a single parent. As a result, I feel such a situation would significantly hinder this candidate's ability to cope with the job requirement. What should I do?

In accordance with the Code, the decision to recruit an employee should be based upon merit. We cannot make a presumption that the candidate would not be able to meet the travel requirements of the job. All eligible candidates should be provided with equal opportunity to demonstrate or justify that they can cope with the travel requirements of the job. Being a single parent cannot be a ground to be discriminated against at any stage of recruitment or ongoing employment in our company.

REMEMBER...

We do not tolerate harassment in any form and therefore we expect every employee to discourage such misdemeanours in the workplace.

Dignity and respect

4. Our leaders shall be responsible for creating a conducive work environment built on tolerance, understanding, mutual cooperation and respect for individual privacy.
5. Everyone in our work environment must be treated with dignity and respect. We do not tolerate any form of harassment, whether sexual, physical, verbal or psychological.
6. We have clear and fair disciplinary procedures, which necessarily include an employee's right to be heard.
7. We respect our employees' right to privacy. We have no concern with their conduct outside our work environment, unless such conduct impairs their work performance, creates conflicts of interest or adversely affects our reputation or business interests.

Human rights

8. We do not employ children at our workplaces.
9. We do not use forced labour in any form. We do not confiscate personal documents of our employees, or force them to make any payment to us or to anyone else in order to secure employment with us, or to work with us.

Bribery and corruption

10. Our employees and those representing us, including agents and intermediaries, shall not, directly or indirectly, offer or receive any illegal or improper payments or comparable benefits that are intended or perceived to obtain undue favours for the conduct of our business.

REMEMBER...

Violation by even a single employee of any law relating to anti-bribery, anti-corruption, anti-competition, data privacy, etc. could result in severe financial penalties and cause irreparable reputational damage to the company.

Gifts and hospitality

11. Business gifts and hospitality are sometimes used in the normal course of business activity. However, if offers of gifts or hospitality (including entertainment or travel) are frequent or of substantial value, they may create the perception of, or an actual conflict of interest or an 'illicit payment'. Therefore, gifts and hospitality given or received should be modest in value and appropriate, and in compliance with our company's gifts and hospitality policy.

Freedom of association

12. We recognise that employees may be interested in joining associations or involving themselves in civic or public affairs in their personal capacities, provided such activities do not create an actual or potential conflict with the interests of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

REMEMBER...

As a general rule, we may accept gifts or hospitality from a business associate, only if such a gift:

- has modest value and does not create a perception (or an implied obligation) that the giver is entitled to preferential treatment of any kind;
- would not influence, or appear to influence, our ability to act in the best interest of our company;
- would not embarrass our company or the giver if disclosed publicly.

The following gifts are never appropriate and should never be given or accepted:

- gifts of cash or gold or other precious metals, gems or stones;
- gifts that are prohibited under applicable law;
- gifts in the nature of a bribe, payoff, kickback or facilitation payment*;
- gifts that are prohibited by the gift giver's or recipient's organisation; and
- gifts in the form of services or other non-cash benefits (e.g. a promise of employment).

(*'Facilitation' payment is a payment made to secure or speed up routine legal government actions, such as issuing permits or releasing goods held in customs.)

Working outside employment with us

13. Taking employment, accepting a position of responsibility or running a business outside employment with our company, in your own time, with or without remuneration, could interfere with your ability to work effectively at our company or create conflicts of interest. Any such activity must not be with any customer, supplier, distributor or competitor of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

Integrity of information and assets

14. Our employees shall not make any wilful omissions or material misrepresentation that would compromise the integrity of our records, internal or external communications and reports, including the financial statements.
15. Our employees and directors shall seek proper authorisation prior to disclosing company or business-related information, and such disclosures shall be made in

accordance with our company's media and communication policy. This includes disclosures through any forum or media, including through social media.

16. Our employees shall ensure the integrity of personal data or information provided by them to our company. We shall safeguard the privacy of all such data or information given to us in accordance with applicable company policies or law.
17. Our employees shall respect and protect all confidential information and intellectual property of our company.
18. Our employees shall safeguard the confidentiality of all third party intellectual property and data. Our employees shall not misuse such intellectual property and data that comes into their possession and shall not share it with anyone, except in accordance with applicable company policies or law.
19. Our employees shall promptly report the loss, theft or destruction of any confidential information or intellectual property and data of our company or that of any third party.

Q&A

I am an accountant in the finance department of my company. Due to my artistic skills, I received an offer to pen cartoons for a children's publication for which I would receive compensation. I plan to undertake this activity during week-ends. What should I do before accepting this offer?

Before accepting the offer, you should ascertain whether the company policies and rules require you to make a disclosure to your supervisor so that the company may determine whether your undertaking this activity adversely affects our company's interests. On confirmation from the company that it does not do so, you would be free to take up the activity. It is also your duty to bring to the attention of the company whenever there is any change in the situation you have disclosed.

20. Our employees shall use all company assets, tangible and intangible, including computer and communication equipment, for the purpose for which they are provided and in order to conduct our business. Such assets shall not be misused. We shall establish processes to minimise the risk of fraud, and misappropriation or misuse of our assets.
21. We shall comply with all applicable anti-money laundering, anti-fraud and anti-corruption laws and we shall establish processes to check for and prevent any breaches of such laws.

Insider trading

22. Our employees must not indulge in any form of insider trading nor assist others, including immediate family, friends or business associates, to derive any benefit from access to and possession of price sensitive information that is not in the public domain. Such information would include information about our company, our group companies, our clients and our suppliers.

Q & A

Our company has recently announced the launch of a new business initiative. In connection with this, your friend who is a journalist with a leading business newspaper has asked you to provide some information that he could cover in his forthcoming article. He has promised not to quote you, or reveal your identity. Should you be giving him this information?

No. You should not be sharing information of this nature with the media, even if it is assured that the source would remain anonymous. Only authorised personnel in the company are permitted to speak to the media and provide information of this nature.

Our company has a “Use of Social Media” policy that lays down the “dos and don’ts” for use of social media even if you may access such media on your own time. Why is there such a policy?

External communication is a serious matter. It must be carefully managed because information put out with reference to our company or its businesses needs to be clear, truthful and not violate any undertakings we have given to other parties. In each business there are managers nominated to authorise and make different types of statements to the outside world. These managers should be consulted about any request for information you may receive or information you think we should give out.

In using social media, in particular blogs or social networking sites, you should exercise great caution while talking about our company or the business we do. It may feel like you are chatting with friends or expressing a personal opinion but even while doing so you cannot share any confidential information of our company.

REMEMBER...

We must respect the property rights of others by never misusing their assets, intellectual property or trade secrets, including the copying or downloading of unauthorised software, trademarks, copyrighted material or logos. We should never make unauthorised copies of computer software programs or use unlicensed personal software on company computers.

Prohibited drugs and substances

23. Use of prohibited drugs and substances creates genuine safety and other risks at our workplaces. We do not tolerate prohibited drugs and substances from being possessed, consumed or distributed at our workplaces, or in the course of company duties.

Conflicts of interest

24. Our employees and executive directors shall always act in the interest of our company and ensure that any business or personal association *including close personal relationships* which they may have, does not create a conflict of interest with their roles and duties in our company or the operations of our company. Further, our employees and executive directors shall not engage in any business, relationship or activity, which might conflict with the interest of our company or our group companies.

25. Should any actual or potential conflicts of interest arise, the concerned person must immediately report such conflicts and seek approvals as required by applicable law and company policy. The competent authority shall revert to the employee within a reasonable time as defined in our company's policy, so as to enable the concerned employee to take necessary action as advised to resolve or avoid the conflict in an expeditious manner.

26. In the case of all employees other than executive directors, the Chief Executive Officer / Managing Director shall be the competent authority, who in turn shall report such cases to the Board of Directors on a quarterly basis. In case of the Chief Executive Officer / Managing Director and executive directors, the Board of Directors of our company shall be the competent authority.

Q&A

You are responsible for maintaining our company's customer database. One of your friends is starting a business venture and requests you to share a few particulars from this database for marketing purposes of his business. He assures you that he would keep the data as well as his source confidential. Should you do so?

No. You should respect the confidentiality of customer information and not share any part of the database with any person without due authorisation.

You have access to revenue numbers of different business units of our company. While having a conversation with you over evening drinks, your friend enquires about the financial performance of our company. You do not share detailed information with your friend, but share approximate revenue figures. Is this conduct of yours correct?

No, it is not. You are not permitted to share financial information of our company with others who do not need to know this information. Financial information should always be safeguarded and disclosed only on a need-to-know basis after obtaining requisite approvals. Sharing of any price sensitive information that is not generally available with the public could also lead to violation of applicable insider trading laws.

27. Notwithstanding such or any other instance of conflict of interest that exists due to historical reasons, adequate and full disclosure by interested employees shall be made to our company's management. At the time of appointment in our company, our employees and executive directors shall make full disclosure to the competent authority, of any interest leading to an

actual or potential conflict that such persons or their immediate family (including parents, siblings, spouse, partner, children) or persons with whom they enjoy close personal relationships, may have in a family business or a company or firm that is a competitor, supplier, customer or distributor of, or has other business dealings with, our company.

REMEMBER...

A conflict of interest could be any known activity, transaction, relationship or service engaged in by an employee, his/her immediate family (including parents, siblings, spouse, partner, and children), relatives or a close personal relationship, which may cause concern (based upon an objective determination) that the employee could not or might not be able to fairly perform his/her duties to our company.

Examples of Potential Conflicts of Interest

A conflict of interest, actual or potential, arises where, directly or indirectly, an employee or executive director:

- (a) engages in a business, activity or relationship with anyone who is party to a transaction with our company;
- (b) is in a position to derive an improper benefit, personally or for any family member or for any person in a close personal relationship, by making or influencing decisions relating to any transaction;
- (c) conducts business on behalf of our company or is in a position to influence a decision with regard to our company's business with a supplier or customer where a relative of, or a person in close personal relationship with, an employee or executive director is a principal officer or representative, resulting in a personal benefit or a benefit to the relative;
- (d) is in a position to influence decisions with regard to award of benefits such as increase in salary or other remuneration, posting, promotion or recruitment of a relative or a person in close personal relationship employed in our company or any of our group companies;
- (e) undertakes an activity by which the interest of our company or our group companies can be compromised or defeated; or
- (f) does anything by which an independent judgement of our company's or our group companies' best interest cannot be exercised.

28. If there is a failure to make the required disclosure and our management becomes aware of an instance of conflict of interest that ought to have been disclosed by an employee or executive director, our management shall take a serious view of the matter and consider suitable disciplinary action as per the terms of employment. In all such matters, we shall follow clear and fair disciplinary procedures, respecting the employee's right to be heard.

Examples of activities normally approved (post-disclosure) as per applicable company policy

Acceptance of a position of responsibility (whether for remuneration or otherwise) in the following cases would typically be permitted, provided the time commitments these demand do not disturb or distract from the employee's primary duties and responsibilities in our company, and are promptly disclosed to the relevant competent authority:

- (a) Directorships on the Boards of any of our group companies, joint ventures or associate companies.
- (b) Memberships/positions of responsibility in educational/professional bodies, where such association will promote the interests of our company.
- (c) Memberships or participation in government committees/bodies or organisations.

Q&A

You are in a relationship with a colleague who has been recently moved into your team and would now be reporting to you. What should you do?

Romantic or close personal relationships with another employee where a reporting relationship exists and one is responsible for evaluating the other's performance, is likely to create a conflict of interest. In such a situation, you would need to report the potential conflict to your supervisor.

Your company is submitting a proposal to a company in which you were previously employed. You have confidential information pertaining to your previous employer, which you believe will help your present employer in winning the contract. Should you share this information?

No. You should not share this information with your company since it relates to confidential information of a third party. Your company respects its employees' duty to protect confidential information that they may have relating to their previous employers.

You are the purchasing manager in the procurement department of your company. You receive an invitation from a supplier to attend a premier sporting event as her guest. This particular supplier is one of the vendors who has submitted a proposal for an open tender issued by your company. Should you accept the invitation?

No. You should not accept the invitation in this instance. Since you are in a key decision-making role for the tender, any unusual benefit that you receive could be perceived as an inducement that could compromise your objectivity.

OUR CUSTOMERS



We have continued to enjoy prosperity, even with adverse times to fight against. Our relations with all concerned are the most friendly. We have maintained the same character for straight-forward dealing with our constituents and customers. Our productions have continued to be of the same high quality, and therefore command the best reputation and realise the highest prices. ... I mention these facts only to point out that with honest and straight-forward business principles, close and careful attention to details, and the ability to take advantage of favourable opportunities and circumstances, there is a scope for success.

Jamsetji Tata
Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

E. OUR CUSTOMERS

Products and services

1. We are committed to supplying products and services of world-class quality that meet all applicable standards.
2. The products and services we offer shall comply with applicable laws, including product packaging, labelling and after-sales service obligations.
3. We shall market our products and services on their own merits and not make unfair or misleading statements about the products and services of our competitors.

Export controls and trade sanctions

4. We shall comply with all relevant export controls or trade sanctions in the course of our business.

Fair competition

5. We support the development and operation of competitive open markets and the liberalisation of trade and investment in each country and market in which we operate.
6. We shall not enter into any activity constituting anti-competitive behaviour such as abuse of market dominance, collusion, participation in cartels or inappropriate exchange of information with competitors.
7. We collect competitive information only in the normal course of business and obtain the same through legally permitted sources and means.

Dealings with customers

8. Our dealings with our customers shall be professional, fair and transparent.
9. We respect our customers' right to privacy in relation to their personal data. We shall safeguard our customers' personal data, in accordance with applicable law.

Q&A

You are the Regional Sales Manager of our company. You have become a member of an “informal group”, on an instant messaging service, whose members are the regional sales heads of our company’s competitors. The administrator of the group has requested an in-person meeting to informally discuss market conditions and brainstorm on “pricing strategy” from an industry perspective. What should you do?

Any meeting with competitors, especially to discuss “pricing strategy”, could be an attempt to promote an anti-competitive practice or manipulate prices. You should respond by declining this invitation and exiting the “informal group”. You should also report this incident to your supervisor and your Legal department.

You are attending a customer meeting with a colleague, and your colleague makes an untruthful statement about the company’s services. What should you do?

You should assist your colleague in correcting the inaccuracy during the meeting if possible. If this is not possible, raise the issue with your colleague after the meeting to enable him/her or the company to correct any misrepresentation made to the customer.

While working on a customer project, you receive a call from your colleague. He used to manage that customer account before you took over his role. He recalls that he had worked with the customer on developing a new ordering system which he thinks would be beneficial for another customer and requests you to send him the project details. What should you do?

You must not share this information without specific approval of the customer; you are not permitted to use a customer’s assets, including software, for another customer or for any personal use.

REMEMBER...

Striving for excellence in the standards of our work and in the quality of our goods and services is a core Tata value. It is the unwavering practice of this value that builds and sustains customer trust in our brand.

OUR COMMUNITIES AND THE ENVIRONMENT



In a free enterprise, the community is not just another shareholder in business but is in fact the very purpose of its existence.

Jamsetji Tata

Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

F. OUR COMMUNITIES AND THE ENVIRONMENT

Communities

1. We are committed to good corporate citizenship, and shall actively assist in the improvement of the quality of life of the people in the communities in which we operate.
2. We engage with the community and other stakeholders to minimise any adverse impact that our business operations may have on the local community and the environment.
3. We encourage our workforce to volunteer on projects that benefit the communities in which we operate, provided the principles of this Code, where applicable, and in particular the 'Conflicts of Interest' clause are followed.

The environment

4. In the production and sale of our products and services, we strive for environmental sustainability and comply with all applicable laws and regulations.
5. We seek to prevent the wasteful use of natural resources and are committed to improving the environment, particularly with regard to the emission of greenhouse gases, consumption of water and energy, and the management of waste and hazardous materials. We shall endeavour to offset the effect of climate change in our activities.

OUR VALUE-CHAIN PARTNERS



If we had done some of the things that some other groups have done, we would have been twice as big as we are today. But we didn't, and I would not have it any other way.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

(on the pace of expansion of the Tata group in the 1960s and 70s)

G. OUR VALUE-CHAIN PARTNERS

1. We shall select our suppliers and service providers fairly and transparently.
2. 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.
3. Our suppliers and service providers shall represent our company only with duly authorised 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.
4. 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.
5. We respect our obligations on the use of third party intellectual property and data.

Q & A

You head the procurement function in our company. You have tight budgetary constraints for a project that you are working on. In order to complete the project within the targeted costs, you intend to request your supplier to provide you an exceptional discount on this project order on the understanding that you would “make it up to him” in future orders. Would you be violating the Code?

Yes, you would. Inducement in any form, including future benefits to the supplier, could compromise your ability to act objectively and in the best interests of the company and therefore must be avoided.

REMEMBER...

Our value-chain partners would include our suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents; joint-venture partners and other business associates.

OUR FINANCIAL STAKEHOLDERS



Ethical behaviour in business – in every sphere and with all constituents – has been the bedrock on which the Tata group has built, and operates, its enterprises. This has been an article of faith for the group ever since its inception, a fundamental element of our cherished heritage and the essence of our way of life.

Ratan Tata

Chairman, Tata Sons (1991 – 2012)

H. OUR FINANCIAL STAKEHOLDERS

1. We are committed to enhancing shareholder value and complying with laws and regulations that govern shareholder rights.
 2. We shall inform our financial stakeholders about relevant aspects of our business in a fair, accurate and timely manner and shall disclose such information in accordance with applicable law and agreements.
 3. We shall keep accurate records of our activities and shall adhere to disclosure standards in accordance with applicable law and industry standards.
-

GOVERNMENTS



Business, as I have seen it, places one great demand on you; it needs you to impose a framework of ethics, values, fairness and objectivity on yourself at all times. It is not easy to do this; you cannot impose it on yourself forcibly because it has to become an integral part of you.

Ratan Tata

Chairman, Tata Sons (1991 – 2012)

I. GOVERNMENTS

Political non-alignment

1. We shall act in accordance with the constitution and governance systems of the countries in which we operate. We do not seek to influence the outcome of public elections, nor to undermine or alter any system of government. We do not support any specific political party or candidate for political office. Our conduct must preclude any activity that could be interpreted as mutual dependence/favour with any political body or person, and we do not offer or give any company funds or property or other resources as donations to any specific political party, candidate or campaign.

Any financial contributions considered by our Board of Directors in order to strengthen democratic forces through a clean electoral process shall be extended only through the Progressive Electoral Trust in India, or by a similar transparent, duly-authorized, non-discriminatory and non-discretionary vehicle outside India.

Government engagement

2. We engage with the government and regulators in a constructive manner in order to promote good governance. We conduct our interactions with them in a manner consistent with our Code.
3. We do not impede, obstruct or improperly influence the conclusions of, or affect the integrity or availability of data or documents for any government review or investigation.

OUR GROUP COMPANIES



I do not think anyone was on par with Jamsetji as an industrial visionary. But that is not the sole reason why I have been an admirer of Jamsetji.

The major reason was his sense of values, sterling values, which he imparted to this group. If someone were to ask me, what holds the Tata companies together, more than anything else, I would say it is our shared ideals and values which we have inherited from Jamsetji Tata.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

J. OUR GROUP COMPANIES

1. We seek to cooperate with our group companies, including joint ventures, by sharing knowledge, physical resources, human and management resources and adopting leading governance policies and practices in accordance with applicable law including adherence to competition law, where relevant.
2. We shall strive to achieve amicable resolution of any dispute between us and any of our group companies, through an appropriate dispute resolution mechanism so that it does not adversely affect our business interests and stakeholder value.
3. We shall have processes in place to ensure that no third party or joint venture uses the TATA name/brand to further its interests without proper authorisation.
4. Our Board of Directors shall consider for adoption policies and guidelines periodically formulated by Tata Sons and circulated to group companies.

Q & A

You are in the process of selecting potential vendors for an IT project in our company. In the final shortlist of two companies, one is a new start-up with limited references and a lower price-quotation, while the other is a Tata company with thirty years of implementation experience and good references, but a marginally higher quote for the same job. With all other parameters of choice being nearly equal, which company should you select for the job?

While price is undoubtedly an important criterion for decision making, it is clearly not the only one to be evaluated. You may also need to consider good customer references, proven track record and shared value systems in order to decide on your IT partner.

You are in the process of selecting potential vendors for a project. One of the three finalists is a group company. In reviewing the final proposals, you rank the group company second out of the three proposals based on pricing and total cost of ownership, and select the first-ranked vendor. Is this the right decision?

Yes. You should select the vendor that, on its own merits, is the vendor that is most appropriate for your company's requirements. You should not select a group company only because of its affiliation.

RAISING CONCERNS

We encourage our employees, customers, suppliers and other stakeholders to raise concerns or make disclosures when they become aware of any actual or potential violation of our Code, policies or law. We also encourage reporting of any event (actual or potential) of misconduct that is not reflective of our values and principles.

Avenues available for raising concerns or queries or reporting cases could include:

- immediate line manager or the Human Resources department of our company
- designated ethics officials of our company
- the 'confidential reporting' third party ethics helpline (if available)
- any other reporting channel set out in our company's 'Whistleblower' policy.

We do not tolerate any form of retaliation against anyone reporting legitimate concerns. Anyone involved in targeting such a person will be subject to disciplinary action.

If you suspect that you or someone you know has been subjected to retaliation for raising a concern or for reporting a case, we encourage you to promptly contact your line manager, the company's Ethics Counsellor, the Human Resources department, the MD/CEO or the office of the group's Chief Ethics Officer.

Q & A

My supervisor has asked me to do something which I believe may be illegal. I am afraid if I do not do what I am told, I could lose my job. Should I do it?

No. Breaking the law is never an option. Discuss the situation with your supervisor to be certain that you both understand the facts. If your concerns are not resolved, contact a higher level supervisor, the Ethics Counsellor, the Legal department or report them via the company's confidential reporting system, if available.

I feel that my supervisor is treating me unfairly for reporting a concern to the Ethics Counsellor. What should I do?

Retaliation against anyone who raises a concern is a violation of the Code. You should therefore promptly report this action of your supervisor to the Ethics Counsellor or the MD/CEO of your company or via the company's confidential reporting system, if available.

ACCOUNTABILITY

This Code is more than a set of prescriptive guidelines issued solely for the purpose of formal compliance. It represents our collective commitment to our value system and to our core principles.

Every person employed by us, directly or indirectly, should expect to be held accountable for his/her behaviour. Should such behaviour violate this Code,

they may be subject to action according to their employment terms and relevant company policies.

When followed in letter and in spirit, this Code is *'lived'* by our employees as well as those who work with us. It represents our shared responsibility to all our stakeholders, and our mutual commitment to each other.

SPEAK UP...

If you are unsure whether a particular action you are about to take is consistent with the principles set forth in the Code, ask yourself:

- Could it directly or indirectly endanger someone or cause them injury?
- Is it illegal/unlawful or out of line with our policies and procedures?
- Does my conscience reject it? Does it conflict with my personal values?
- Would I feel uncomfortable if the story appeared in the media? Would it shame my company, spouse, partner, parent or child?
- Does it 'feel' wrong?

If the answer to any of these questions is "Yes", please stop and consult your reporting manager, the Ethics Counsellor, the Human Resource department, the Legal department or any member of the senior management team, to assist you in making the decision.

When faced with a dilemma: Stop, Think, Act Responsibly

NOTE

The Code does not provide a comprehensive and complete explanation of all expectations from a company standpoint or obligations from a stakeholder standpoint.

Our employees have a continuing obligation to familiarise themselves with all applicable law, group-level advisories and policies, company-level policies, procedures and work rules as relevant. For any guidance on interpretation of the Code, we may seek support from our company's Ethics Counsellor or from the group's Chief Ethics Officer, as appropriate.

All joint ventures are encouraged to adopt the Tata Code of Conduct (TCOC) or a code of conduct that incorporates all elements of the TCOC.

This version of the Tata Code of Conduct supersedes all earlier versions and associated documents and stands effective from 29th July, 2015.

For any query or clarification on the Code, please contact the office of the group's Chief Ethics Officer via email at: ethicsoffice@tata.com.

TATA CODE OF CONDUCT – 2015

I acknowledge that I have received the Tata Code of Conduct.

I have read the Tata Code of Conduct and I acknowledge that as a Tata employee, I am required to comply with the guidelines described therein and failure to do so may subject me to action as per my employment terms and relevant company policies.

If I have a concern about a violation, or a potential violation of the Tata Code of Conduct, I understand that there are channels available to me in my company to report such concerns. By making use of these channels when necessary, I will play my part in maintaining the high ethical standards to which we hold ourselves.

Signature: _____

Date: _____

Name: _____

Department: _____

Address: _____

(Please submit this declaration to your Ethics Counsellor or the Human Resource department of your company.)







For further information on the Code please contact:
 The Ethics Office,
 Tata Sons Ltd.,
 Bombay House,
 24, Homi Mody Street,
 Mumbai - 400001, India.
 Email: ethicsoffice@tata.com

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

Tender Reference: CC25NP019

Document Date: 27th June 2024

CONFIDENTIAL

Section F.1: EMD Format

FORMAT F.1

Format of BID BG / EMD

Whereas (Name of the Contractor), a Company incorporated under the Indian Companies Act 1956, having its Registered office at _____, (hereinafter called the "BIDDER") has in response to your Invitation to Bid against Enquiry No. _____ dated _____, for (name of work), offered to supply and/or execute the works as contained in Employers letter dated _____.

AND WHEREAS BIDDER is required to furnish to you a Bank Guarantee for the sum of Rs. _____/-(Rupees ____ only) as Earnest Money against Bidder's offer as aforesaid.

AND WHEREAS we, (name of the bank) having our Registered Office at _____ and Branch office at _____, have at the request of Bidder, agreed to give you this Guarantee as hereinafter contained.

NOW THEREFORE, in lieu of earnest money deposit, we, the undersigned, hereby covenant that the aforesaid Bid of the BIDDER shall remain open for acceptance by you during the period of validity as mentioned in the Bid Document or any extension thereof as requested by you and if Bidder shall for any reason back out, whether expressly or impliedly, from this said Bid during the period of its validity or any extension thereof as aforesaid, we hereby guarantee to you the payment of the sum of Rs. _____/-(Rupees ____ only) on demand and without demur and notwithstanding the existence of any dispute between you and the BIDDER in this regard and we hereby further agree as follows:

- (a) You shall have the right to file/make a claim on us under the Guarantee for a further period of six months from the said date of expiry.
- (b) That this guarantee shall not be revoked during its currency without your written express consent.
- (c) That you may without affecting this guarantee grant time or other indulgence to or negotiate further with BIDDER in regard to the conditions contained in the said Bid

document and thereby modify these conditions or add thereto any further conditions as may be mutually agreed upon between you and BIDDER.

- (d) That the guarantee hereinbefore contained shall not be affected by any change in the constitution of our Bank or in the constitution of BIDDER.
- (e) That any account settled between you and BIDDER shall be conclusive evidence against us of the amount due hereunder and shall not be questioned by us.
- (f) That this guarantee commences from the date hereof and shall remain in force till BIDDER, if his Bid is accepted by you, furnishes the Contract Performance Guarantee as required under the said specifications and executes formal Contract Agreement as therein provided or till ____Days (__days) from the date of submission of the Bid by the BIDDER i.e. (expiry date), whichever is earlier.
- (g) That the expression, BIDDER and Bank, and OWNER herein used shall, unless such an interpretation is repugnant to the subject or context, include their respective successors and assignees.
- (h) 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 and shall be extended from time to time for such period or periods as may be desired by you. Unless a demand or claim under this Guarantee is received by us in writing within six months from (expiry date), i.e. on or before (claim period date), we shall be discharged from all liabilities under this guarantee thereafter.
- (i) Any claim/extension under the guarantee can be lodgeable at issuing outstation bank or at Mumbai branch and claim will also be payable at Mumbai Branch. **(To be confirmed by Mumbai Branch by a letter to that effect)**

Notwithstanding anything contained herein above:

- a) Our liability under this Bank Guarantee shall not exceed Rs._____/-(Rupees _____ only).
- b) This Bank Guarantee shall be valid upto ----- 200.
- c) Our Liability to make payment shall arise and we are liable to pay the guaranteed amount or any part there of under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before ----- 200.