BSES RAJDHANI POWER LIMITED

Tender for

Supply, Installation, Testing & commissioning of RTU system at 04 DTC grid sub stations in BRPL, New Delhi (INDIA)

NIT NO. CMC/BR/23-24/RB/PR/RJ/1127

Tender Date: 08.06.2023

Due Date for Submission: 28.06.2023, 1500 HRS

BSES RAJDHANI POWER LTD (BRPL)
Corporate Identification Number: **U74899DL2001PLC111527**
Telephone Number: +91 11 3009 9999
Fax Number: +91 11 2641 9833
Website: **www.bsesdelhi.com**

BSES RAJDHANI POWER LIMITED

Section – I

REQUEST FOR QUOTATION

Tender Notification: CMC/BR/23-24/RB/PR/RJ/1127

Supply, Installation, Testing & commissioning of RTU system at 04 DTC grid sub stations in BRPL, New Delhi (INDIA)

BSES RAJDHANI POWER LIMITED

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SECTION – I: REQUEST FOR QUOTATION

1.00 **Event Information**

BRPL invites sealed tenders in 2 envelopes for following scope of work

Sl. No.	Description	Estimated Cost (Rs.)	Qty.	Delivery & Installation at
1	Supply, Installation, Testing & commissioning of RTU system at 04 DTC grid sub stations in BRPL, New Delhi (INDIA)	1.50 Crores	As per BOQ (Bidder is requested to verify the same before bidding by visiting the site)	Delhi Sites

The bidder must qualify the requirements as specified in clause 2.0 stated below.

1.01 The schedule of specifications with detail terms & conditions can be obtained from address given below against submission of non-refundable demand draft of **Rs.1180/-** drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi. The tender documents & detail terms and conditions can also be downloaded from the website **"www.bsesdelhi.com --> Tenders --> BSES Rajdhani Power Ltd --> Open Tenders"**. In case tender papers are downloaded from the above website, then the bidder has to enclose a demand draft covering the cost of bid documents.

1.02 Bids will be received upto 28.06.2023, 1500 HRS at the address given at 3.01 below. Part A of the Bid shall be opened on 28.06.2023, 1530 HRS.

Part B of the Bid will be opened in case of Techno-Commercially qualified Bidders and the date of opening of same shall be intimated in due course. It is the sole responsibility of the bidder to ensure that the bid documents reach this office on or before the last date.

1.02.1 BSES Rajdhani Power Ltd reserves the right to accept/reject any or all Tenders without assigning any reason thereof in the event of following

(i) **Earnest Money Deposit (EMD)** of value Rs 3,00,000/- and is not deposited in shape of Bank Fixed deposit (lien marked in favor of BSES RAJDHANI POWER LTD.)/ Bank Guarantee valid for One Hundred Fifty (120) days after due date of submission or amended due date of submission drawn in favor of BSES Rajdhani Power Ltd, 1ST FLOOR, C - BLOCK,BSES BHAWAN,NEHRU PLACE, NEW DELHI – 110019 by any Indian bank/ foreign bank having service branch in India.

(ii) The offer does not contain prices indicating break-up towards all taxes & duties in prescribed format

(iii) Complete Technical details are not enclosed.

(iv) Tender is received after due date and time**.**

(v) Technical offer contains any prices

(vi) Prices are **not FIRM** and subject to Price Variation

2.0 QUALIFICATION CRITERIA:-

The prospective bidder must qualify all of the following requirements to participate in the bidding process who meet following requirements will be considered as successful bidder and management has a right to disqualify those bidders who do not meet these requirements.

Sr. Nos.	Criteria	Documents Required
	Technical & Financial	
1	The bidder should have own manufacturing facility in India for RTUs/FRTU in last 3 years.	Factory incorporation certificate / Undertaking. Details of manufacturing units, locations and works from where supply against this tender shall be proposed to be furnished.
2	The bidder should have servicing , repairing, testing & refurbishment facility in INDIA with necessary spares and testing equipment for providing prompt after sales service for RTU/FRTU.	Relevant Details/certificates/Undertaking (Details of the set-up available shall be brought out in the offer.The bidder shall also submit undertaking along with the bid confirming the infrastructure details submitted)
3	The bidder should have successfully designed & supplied and executed minimum 50 Nos of RTU/FRTU to any utilities/SEB's/PSU's/reputed firm (for which end user shall be Utility/SEB's/PSU's for developing distribution Network) in last 5 years.	a. Work Order copies b. Work completion certificates c. List of projects executed including customer name, PO number (with date), date of completion and rating (Capacity/Voltage etc) shall be provided.
4	Performance certificate for minimum 2 year satisfactory performance for similar rating or higher rating supplied in last 7 years from at least two utilities/ SEB/ PSUs / reputed firm wherin the end user shall be Utility/SEB's/PSU's In case of bidder has a previous association with BRPL/BYPL for similar product and service,the performance feedeback for that bidder by BRPL/BYPL shall only be considered irrespective of performance certificate issued by any third organization.	Performance certificate

5	The bidder should have average annual turnover of minimum of Rs. 200 Crores in last three financial years.	Balance Sheet and Duly certified CA certificate to be submitted. Bidders shall submit the certified Annual financial statement for the last completed three financial years and duly certified CA Certificate with UDIN No. and reporting of Annual Turnover.
6	The Bidder shall submit an undertaking that "No Litigation" is pending with BRPL or its Group/Associates Companies.	Self Undertaking
7	The bidder must possess valid latest ISO 9001:2015 or equivalent certification	Valid ISO 9001:2015 certificate
8	An undertaking (self-certificate) that the bidder has not been blacklisted/debarred by any central/state government institution including electricity boards	Self Undertaking
9	The bidder must have valid PAN No., GST registration in addition to other statuary compliances. The bidder must submit the copy of registrations and submit an undertaking that the bidder shall comply all the statutory compliances as per the applicable laws/rules etc. before the start of the work.	Copies of certificates/Documents

ALL OTHER TERMS AND CONDITIONS OF THE NIT, INCLUDING BALANCE QUALIFYING CONDITIONS , SHALL REMAIN THE SAME.

Notwithstanding anything stated above, BRPL reserves the right to assess bidder's capability to perform the contract, assess the capability and installed capacity of the Bidder for carrying out the supplies, should the circumstances warrant such assessment in the overall interest of the purchaser. In this regard the decision of the purchaser is final.

3.00 BIDDING AND AWARD PROCESS

Bidders are requested to submit their offer strictly in line with this tender document. **NO DEVIATION IS ACCEPTABLE**. BRPL shall response to the clarifications raised by various bidders and the will be distributed to all participating bidders through website.

3.01 BID SUBMISSION

The bidders are required to submit the bids in 2(two) parts to the following address

Head of Department
Contracts & Material Deptt.
BSES Rajdhani Power Ltd
1st Floor, C Block

BSES Bhawan, Nehru Place
New Delhi 110019

PART A: TECHNICAL **BID** comprising of following (1 original + 1 copy)

- EMD in prescribed format
- Non-refundable demand draft for Rs 1180/- in case the forms are downloaded from website
- Documentary evidence in support of qualifying criteria
- Technical Details / Filled in GTP/Type test report etc
- Qualified Manpower available & Organization Chart
- Testing Facilities
- Copies of Orders, Execution /Performance Certificate & Other Documents to support the QC as per clause 2.0
- Original Tender documents duly stamped & signed on each page as token of acceptance
- Acceptance to Commercial Terms and Conditions viz Delivery schedule/period, Payment terms, PBG etc

PART B: FINANCIAL **BID** comprising of (1 original only)

- Price strictly in the Format enclosed indicating Break up of basic price, taxes & duties, transportation etc

3.02 **TIME SCHEDULE**

The bidders should complete the following within the dates specified as under:

S. No.	Steps	Date
1	Date of sale of bid documents	08.06.2023, 1500Hrs
2	Last date of Queries, if any	23.06.2023, 1500Hrs.
3	Last date of receipt of bid documents	28.06.2023, 1500Hrs
4	Date & time of opening of tender – Part A	28.06.2023, 1530Hrs

This is a two part bid process. Bidders are to submit the bids in 2(two) parts

Both these parts should be furnished in separate sealed covers super scribing NIT no. DUE DATE OF SUBMISSION, with particulars as **PART-A TECHNICAL BID & COMMERCIAL TERMS & CONDITIONS** and **Part-B FINANCIAL BID** and these sealed envelopes should again be placed in another sealed cover which shall be submitted before the due date & time specified.

Part – A: Technical Bid should not contain any cost information whatsoever and shall be submitted within the due date.

PART B: This envelope will be opened after techno-commercial evaluation and only of the qualified bidders.

REVERSE AUCTION: Purchaser reserves the right to use **REVERSE AUCTION** through SAP-SRM as an optional tool as an integral part of the entire tendering process. All techno-commercially qualified bidders shall participate in this event

Notwithstanding anything stated above, the Purchaser reserves the right to assess bidder's capability to perform the contract, should the circumstances warrant such assessment in the overall interest of the purchaser. In this regard the decision of the purchaser is final.

BIDS RECEIVED AFTER DUE DATE AND TIME MAY BE LIABLE TO REJECTION

4.00 AWARD DECISION

4.01 Purchaser intends to award the business on a lowest bid basis, so suppliers are encouraged to submit the bid competitively. The decision to place purchase order/LOI solely depends on purchaser on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that Purchaser may deem relevant.

4.02 In the event of your bid being selected by purchaser (and / or its affiliates) and you subsequent DEFAULT on your bid; you will be required to pay purchaser (and / or its affiliates) an amount equal to the difference in your bid and the next lowest bid on the quantity declared in NIT/RFQ.

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

4.04 Qty Variation: The purchaser reserves the rights to vary the quantity by (+/-) 30% of the tender quantity.

5.00 MARKET INTEGRITY

We have a fair and competitive marketplace. The rules for bidders are outlined in the Terms & Conditions. Bidders must agree to these rules prior to participating. In addition to other remedies available, we 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 Terms & Condition. A bidder who violates the marketplace rules or engages in behavior that disrupts the fair execution of the marketplace restricts a bidder to 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 the terms of the published in Request for Quotation/NIT.

6.00 SUPPLIER CONFIDENTIALITY

All information contained in this RFQ is confidential and shall not be disclosed, published or advertised in any manner without written authorization from BRPL. This includes all bidding information submitted.

All RFQ documents remain the property of BRPL and all suppliers are required to return these documents to BRPL upon request.

Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

7.00 CONTACT INFORMATION

Technical clarification, if any, as regards this RFQ shall be sought in writing and sent by post/courier to following address. The same shall not be communicated through email/phone

	Technical	Commercial
Contact Person	Mr. Gopal Nariya	Mr. Pankaj Goya Ms. Rachna Jain
Address	BSES Rajdhani Power Ltd , 4th Floor, Building no. 20, Nehru Place, New Delhi 110019	BSES Rajdhani Power Ltd , 1st Floor, C Block, BSES Bhawan, Nehru Place, New Delhi 110019
Email	**Gopal.Nariya@relianceada.com**	**pankaj.goyal@relianceada.com** **Rachna.jain@relianceada.com**

SECTION – II INSTRUCTION TO BIDDERS

8.0 BID FORM

8.01 The Bidder shall submit one"Original'and one"Copy'of the Un-priced Bid Form, Price Schedules & Technical Data Sheets duly filled in as per attached specification/BOM etc enclosed.

9.0 EMD

The bidder shall furnish, as part of its bid, an EMD amounting Rs. 3,00,000/- as specified in the RFQ. The EMD is required to protect the Purchaser against the risk of Bidder's conduct which would warrant forfeiture.

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

(a) Banker's Cheque / Demand Draft/Pay Order drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi.

(b) Bank Guarantee valid for One hundred Twenty (120) days after due date of submission or amended due date of submission drawn in favour of BSES Rajdhani Power Ltd, BSES Bhawan, Nehru Place, New Delhi 110019

The EMD may be forfeited in case of:

(a) The Bidder withdraws its bid during the period of specified bid validity

OR

(b) The case of a successful Bidder, if the Bidder does not

(i) Accept the Purchase Order, or

(ii) Furnish the required performance security BG.

10.0 BID PRICES

10.01 Bidders shall quote for the entire Scope of Supply/Work with a break-up of prices for individual items and Taxes & Duties. The total Bid Price shall also cover all the Supplier's obligations mentioned in or reasonably to be inferred from the Bidding Documents in respect of Design, Supply, Transportation to site, all in accordance with the requirement of Bidding Documents The Bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total Price with taxes, duties & freight upto destination.

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

10.03 Prices quoted by the Bidder shall be **"Firm"** and not subject to any price adjustment

during the performance of the Contract. **A Bid submitted with an adjustable price/ Price Variation Clause will be treated as non -responsive and rejected.**

10.04 The qty break-up shown else-where in Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any item not indicated but is required to complete the job, shall be deemed to be included in the prices quoted.

11.0 BID CURRENCIES

Prices shall be quoted in Indian Rupees Only.

12.0 PERIOD OF VALIDITY OF BIDS

12.01 Bids shall remain valid for 120 days from the due date of submission of the Bid & subsequent corrigendum/amendment/extension of due date of submission.

12.02 Notwithstanding Clause 12.01 above, the Purchaser may solicit the Bidder‘s consent to an extension of the Period of Bid Validity. The request and the responses thereto shall be made in writing and sent by post/courier.

13.0 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.

14.0 FORMAT AND SIGNING OF BID

14.01 The original Bid Form and accompanying documents, clearly marked "Original Bid" and “copy” must be received by the Purchaser at the date, time and place specified pursuant to Clauses 15.0 and 16.0. In the event of any discrepancy between the original and the copy, the original shall govern.

14.02 The original and copies of the Bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the Bidder. **Such authorization shall be indicated by written Power-of-Attorney accompanying the Bid.**

14.03 The Bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

15.0 SEALING AND MARKING OF BIDS

15.01 Bid submission: One original, Copy-1, (hard copies) of all the Bid Documents shall be sealed and submitted to the Purchaser before the closing time for submission of the bid.

15.02 The Technical Documents and the EMD shall be enclosed in a sealed envelope and the said envelope shall be super scribed with —“Technical & EMD“. The price bid shall be

inside another sealed envelope with super scribed "Financial Bid ". Both these envelopes shall be sealed inside another big envelope. All the envelopes should bear the Name and Address of the Bidder and marking for the Original, Copy-1, and the envelopes should be super scribed with —"Tender Notice No. & Due date of opening".

15.03 The Bidder has the option of sending the Bids in person. Bids submitted by Email/Telex/Telegram /Fax will be rejected. No request from any Bidder to the Purchaser to collect the proposals from Courier/Airlines/Cargo Agents etc shall be entertained by the Purchaser.

16.0 DEADLINE FOR SUBMISSION OF BIDS

16.01 The original Bid, together with the required copies, must be received by the Purchaser at the address specified earlier.

16.02 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will there after be subject to the deadline as extended.

17.0 ONE BID PER BIDDER

Each Bidder shall submit only one Bid by itself. **No Joint Venture is acceptable**. A Bidder who submits or participates in more than one Bid will cause all those Bids to be rejected.

18.0 LATE BIDS

Any Bid received by the Purchaser after the deadline for submission of Bids prescribed by the Purchaser, pursuant to Clause 16.0, will be declared "Late" and may be rejected and returned unopened to the Bidder.

19.0 MODIFICATIONS AND WITHDRAWAL OF BIDS

19.1 The Bidder is not allowed to modify or withdraw its Bid after the Bid's submission.

20.0 THE PURCHASER 'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR A LL BIDS

The Purchaser reserves the right to accept or reject any Bid and to annul the Bidding process and reject all Bids at anytime prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Purchaser's action.

21.0 AWARD OF CONTRACT/ ORDERS

21.01 The Purchaser will award the Contract to the successful Bidder whose Bid has been Determined to be the lowest-evaluated responsive Bid, provided further that the Bidder has been determined to be qualified to satisfactorily perform the Contract. Purchaser reserves the right to award order to other bidders in the tender, provided it is required for timely execution of project & provided he agrees to come to the lowest rate.

21.02 Though the contract is for Turnkey in nature, the Purchaser intends to issue 2 (two) separate Purchase/Work Orders viz
a) Purchase Order for Supply Portion
b) Work Order for Installation, Testing & Commissioning

Purchaser intends to award the business on a lowest bid basis, so suppliers are encouraged to submit the bid competitively. The decision to place purchase order/LOI solely depends on purchaser on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that Purchaser may deem relevant.

In the event of your bid being selected by purchaser (and / or its affiliates) and you subsequent DEFAULT on your bid; you will be required to pay purchaser (and / or its affiliates) an amount equal to the difference in your bid and the next lowest bid on the quantity declared in NIT/RFQ.

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

Splitting of quantity: The purchaser 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 any reason..

Splitting of tender quantity amongst more than one bidder shall be governed by below mentioned guidelines:

- If the quantity is to be split among 2 bidders, it will be done in the ratio of 70:30 on L1 price.
- If the quantity is to be split among 3 bidders, it will be done in the ratio of 60:25:15 on L1 price.
- In case quantity needs to be distributed and order splitting is required, distribution of quantity shall be maximum among three (3) bidders.

Qty Variation: The purchaser reserves the rights to vary the quantity by (+/-) 30% of the tender quantity.

Repeat Order: BRPL reserves the right to place repeat order at the same rates & terms and conditions as per this tender against additional requirement subject to mutual agreement between BRPL & supplier..

22.0 LETTER OF INTENT/ NOTIFICATION OF AWARD

The letter of intent/ Notification of Award shall be issued to the successful Bidder whose bids have been considered responsive, techno-commercially acceptable and evaluated to be the lowest (L1). The successful Bidder shall be required to furnish a letter of acceptance with in 7 days of issue of the letter of intent /Notification of Award by Purchaser. The date of LOI/LOA shall be treated as Start date of work.

23.0 CONTRACT PERFORMANCE BANK GAURANTEE

Within 15 days of the receipt of Notification of Award/ Letter of Intent/PO from the Purchaser, the successful Bidder shall furnish the Performance Bank Guarantee towards faithful performance

of Contract for an amount of 10% (Ten percent) of the Contract Price. The Performance Bond shall be valid upto completion period/handing over, whichever is earlier plus 3 months claim period. Upon submission of the performance security, the EMD shall be released.

"Notwithstanding anything stated in this agreement, It is agreed by the Seller that in case of default by the seller in furnishing the Performance Bank Guarantee, the purchaser/BRPL, without prejudice to the rights available with the purchaser, shall be entitled to retain a total sum not exceeding 120% of the amount of required performance bank guarantee for the tenure and upon the terms as specified in this agreement. It is agreed that the purchaser shall not be paying any interest for the said sum retained by the purchaser in lieu of default by the seller in furnishing the performance bank guarantee and no claim of any nature shall be maintainable from the side of seller, disputing the above said retention. Whereas, in case, after the deduction of above sum by the purchaser, if the seller at any point of time, submits the PBG of the required value and tenure and requests for the refund of the amount retained on this ground, the purchaser shall be releasing the money retained in lieu of PBG without any interest/cost."

24. COMISSIONING PERIOD

Supply, erection, testing & commissioning of entire system and integration with existing SCADA System within 10 weeks from the date of LOI/PO.

Successful bidder shall submit detailed project plan mentioning all project activities schedule to BRPL.

Section II-1: SPECIAL TERMS AND CONDITIONS OF CONTRACT

1.1. Bidders are requested to visit the site to understand the scope of work, site conditions and requirements prior to Bidding. Hence, no price/time escalation shall be admissible on these accounts.

1.2. The scope of this tender includes supply , survey , design , engineering , manufacturer , shop testing ,inspection , packing , dispatch , loading , unloading and storage at site, storage and construction insurance , assembly , erection ,structural , complete pre-commissioning checks , testing and commissioning at site.

1.3. Prices for all the activities shall be FIRM till the actual completion of the job. Statutory variation will be allowed for direct supplies only wherever breakup of Taxes & Duties are available in Price Bid. In case bidder has not submitted any price breakup, no variation on account of statuary variation shall be paid extra by BRPL.

1.4. Bidder has to submit the technical parameters with details of Spares with catalogue, reference codes etc.

1.5. Wherever BRPL specifications are not available relevant IS/IEC to be followed. All Drawings mentioned in the Tender Specification and other required for the completeness of the tender shall be submitted. Drawing submission process shall not be deemed complete of all the requirements are not complied during the submission of the same.

1.6. Bidder has to submit the Grid wise price bifurcation in bid. Unprice copy must be attached with the Part A. Reverse Auction will be carried out on Lump sum Basis/Total Landed Cost.

1.7. Any other material not specifically mentioned above but required for successful commissioning and operation is in the scope of bidder.

1.8. Successful bidder has to compliance the statutory compliance.

1.9. Successful Bidder has to depute the safety officer and quality officer separately at site for whole duration and they have to submit the safety report and quality report to BRPL E-I-C on weekly basis.

1.10. Successful bidder has to send the weekly progress report to BRPL EIC.

1.11. In case of any major deviation, deletion or addition which bidder may feel is relevant to this project & for its safe operation and completion of works; Bidder may clearly highlight and communicate the same to the purchaser with his bid.

1.12. Problem Troubleshooting & Restoration In Warranty Period For A Particular Material/Equipment:

Service Engineer Availability to Attend, Identify & Restore Defects (Minor) of materials/Equipment's under Guarantee Period within 48 Working Hours (Exclusion of Material Support Cases)

Spare Material Delivery for Restoration Of circuit (Major Defect) Under Guarantee Period within Two Weeks. Seller must keep Requisite Inventory of Critical Spares & Other Equipment's Covered in Guarantee Period to Restore Equipment within Two Weeks.

In Case Of Complete Replacement of material, complete material to Be Replaced within a Period of 2 Weeks.

1.13. PROJECT INFORMATION & COMPLETION

The contractor shall be fully responsible to complete the project in time. It is desired that the project should complete as per the schedule from the date of LOI or purchase order whichever is earlier. The detail completion schedule shall be prepared by vendor and shall be submitted at the time of detailed engineering for approval. Vendor has to submit the progress report fortnightly in the format attached with this tender/as asked by the Purchaser.

1.14. PROJECT IMPLEMETATION & EXECUTION CONTROL

The bidders are requested to submit the following along with the bid, about the project implementation & execution methodology.

a) Write up/overview of project Plan
b) Implementation Methodology
c) Project Organization Chart for Representatives, Project Office & site office teams along with the functions.
d) Bar Chart for various activities to achieve scheduled completion.

SECTION III: GENERAL TERMS AND CONDITIONS - SUPPLY

1.01 All the Bids shall be prepared and submitted in accordance with these instructions.

1.02 Bidder shall bear all costs associated with the preparation and delivery of its Bid, and the Purchaser will in no case shall be responsible or liable for these costs.

1.03 The Bid should be submitted by the Bidder in whose name the bid document has been issued and under no circumstances it shall be transferred /sold to the other party.

1.04 The Purchaser reserves the right to request for any additional information and also reserves the right to reject the proposal of any Bidder, if in the opinion of the Purchaser, the data in support of RFQ requirement is incomplete.

1.05 The Bidder is expected to examine all instructions, forms, terms & conditions and specifications in the Bid Documents. Failure to furnish all information required in the Bid Documents or submission of a Bid not substantially responsive to the Bid Documents in every respect may result in rejection of the Bid. However, the Purchaser's decision in regard to the responsiveness and rejection of bids shall be final and binding without any obligation, financial or otherwise, on the Purchaser.

2.0 DEFINITION OF TERMS

2.01 "Purchaser" shall mean BSES Rajdhani Power Limited, on whose behalf this bid enquiry is issued by its authorized representative / officers.

2.02 "Bidder" shall mean the firm who quotes against this bid enquiry issued by the Purchaser. "Supplier" or "Supplier" shall mean the successful Bidder and/or Bidders whose bid has been accepted by the Purchaser and on whom the "Letter of Acceptance" is placed by the Purchaser and shall include his heirs, legal representatives, successors and permitted assigns wherever the context so admits.

2.03 "Supply" shall mean the Scope of Contract as described.

2.04 "Specification" shall mean collectively all the terms and stipulations contained in those portions of this bid document known as RFQ, Commercial Terms & Condition, Instructions to Bidders, Technical Specifications and the Amendments, Revisions, Deletions or Additions, as may be made by the Purchaser from time to time.

2.05 "Letter of Acceptance" shall mean the official notice issued by the Purchaser notifying the Supplier that his proposal has been accepted and it shall include amendments thereto, if any, issued by the Purchaser. The "Letter of Acceptance" issued by the Purchaser shall be binding on the "Supplier" The date of Letter of Acceptance shall be taken as the effective date of the commencement of contract.

2.06 "Month" shall mean the calendar month and "Day" shall mean the calendar day.

2.07 "Codes and Standards" shall mean all the applicable codes and standards as indicated in the Specification.

2.08 "Offer Sheet" shall mean Bidder's firm offer submitted to BRPL in accordance with the specification.

2.09 "Contract" shall mean the "Letter of Acceptance/Purchase Order" issued by the Purchaser.

2.10 "Contract Price" shall mean the price referred to in the "Letter of Acceptance/Purchase Order".

2.11 "Contract Period" shall mean the period during which the "Contract" shall be executed as agreed between the Supplier and the Purchaser in the Contract inclusive of extended contract period for reason beyond the control of the Supplier and/or Purchaser due to force majeure.

2.12 "Acceptance" shall mean and deemed to include one or more of the following as will be stipulated in the specification:

a) The written acceptance of material by the inspector at suppliers works to ship the materials.
b) Acceptance of material at Purchaser site stores after its receipt and due inspection/ testing and release of material acceptance voucher.
c) Where the scope of the contract includes supplying, acceptance shall mean issue of necessary equipment / material takeover receipt after installation & commissioning and final acceptance.

3.0 CONTRACT DOCUMENTS & PRIORITY

3.01 Contract Documents: The terms and conditions of the contract shall consist solely of these RFQ conditions and the offer sheet.

4.0 SCOPE OF SUPPLY -GENERAL

4.01 The "Scope of Supply" shall be on the basis of Bidder's responsibility, completely covering the obligations, responsibility and supplies provided in this Bid enquiry whether implicit or explicit.

4.02 Bidder shall have to quote for the Bill of quantities as listed elsewhere.

4.03 All relevant drawings, data and instruction manuals.

5.0 QUALITY ASSURANCE AND INSPECTION

5.01 Immediately on award of contract, the bidder shall prepare detailed quality assurance plan/test procedure identifying the various stages of manufacture, quality checks performed at each stage, raw material inspection and the Customer hold points. The document shall also furnish details of method of checking, inspection and acceptance standards / values and get the approval of Purchaser before proceeding with manufacturing. However, Purchaser shall have right to review the inspection reports, quality checks and results of suppliers in house inspection department which are not Customer hold points and the supplier shall comply with the remarks made by purchaser or his representative on such reviews with regards to further testing, rectification or rejection, etc. In case of standard items, BRPL shall forward the standard QAP which is to be followed by vendor during manufacturing.

5.02 Witness and Hold points are critical steps in manufacturing, inspection and testing where the supplier is obliged to notify the Purchaser in advance so that it may be witnessed by the Purchaser. Final inspection is a mandatory hold point. The supplier to proceed with the work past a hold point only after clearance by purchaser or a witness waiver letter from BRPL.

5.03 The performance of waiver of QA activity by Purchaser at any stage of manufacturing does not relieve the supplier of any obligation to perform in accordance with and meet all the requirements of the procurement documents and also all the codes & reference documents mentioned in the procurement document nor shall it preclude subsequent rejection by the purchaser.

5.04 On completion of manufacturing the items can only be dispatched after receipt of dispatch instructions issued by the Purchaser.

5.05 All in-house testing and inspection shall be done with out any extra cost. The in-house inspection shall be carried out in presence of BSES/BSES authorized third party inspection agency. Cost of Futile/abortive visit(s) shall be debited from the invoices

5.06 Purchaser reserves the right to send any material being supplied to any recognized laboratory for testing, wherever necessary and the cost of testing shall be borne by the Bidder. In case the material is found not in order with the technical requirement / specification, the charges along with any other penalty which may be levied is to be borne by the bidder. To avoid any complaint the supplier is advised to send his representative to the stores to see that the material sent for testing is being sealed in the presence of bidder's representative.

6.0 PACKING, PACKING LIST & MARKING

6.01 **Packing:** Supplier shall pack or shall cause to be packed all Commodities in crates/boxes/drums/containers/cartons and otherwise in such a manner as shall be reasonably suitable for shipment by road or rail to BRPL, Delhi/New Delhi stores/site without undue risk of damage in transit.

6.02 **Packing List:** The contents of each package shall be itemized on a detailed list showing the exact weight, extreme outside dimensions (length, width & weight) of each container/box/drum/carton, Item SAP Code, PO No & date. One copy of the packing list shall be enclosed in each package delivered.

7.01 PRICE BASIS FOR SUPPLY OF MATERIALS

a) Bidder to quote their prices on Landed Cost Basis and separate price for each Grid Packages.
FIRM prices for supply to BRPL Delhi/New Delhi stores inclusive of packing, forwarding, loading at manufacturer's premises, payment of GST.

b) The above supply prices shall also include unloading at BRPL Delhi/New Delhi stores/site.

c) Transit insurance will be arranged by Purchaser; however bidder to furnish required details in advance for arranging the same by Purchaser

8.0 TERMS OF PAYMENT AND BILLING – SUPPLY & INSTALLTION

Supply Part

a) 70% prorata of supply value shall be payable against supply of equipment and materials within 30 days against receipt of material at site and submission of following documents duly certified by BRPL Project-in-charge:

i. Consignee copy of LR
ii. Detailed invoice showing commodity description, qty, unit & total price,
iii. Original certificate issued by BRPL confirming receipt of material at site & acceptance
iv. Dispatch clearance & inspection report issued by the inspection authority
v. Packing List, Test Reports
vi. Guarantee Certificate.

b) 30% prorata after Installation, testing, Commissioning & Integration with SCADA duly certified by BRPL Project-in-charge and Handing Over of the entire Installation and submission of BG of 10% of contract value valid up to Defect Liability period plus 3 months towards Claim period.

OR

In case, commissioning is delayed or not started due to reason not attributable to Vendor, than balance 30% payment against supply part shall be released after 45 days from the receipt of complete material of respective site/Grid and submission of BG of 10% of contract value valid up to Defect Liability period plus 3 months towards Claim period.

Erection, Testing, Installation and Commissioning:

a) 100 % after Installation, testing, Commissioning & Integration with SCADA duly certified by BRPL Project-in-charge.

9.0 PRICE VALIDITY

9.01 All bids submitted shall remain valid, firm and subject to unconditional acceptance by BRPL Delhi for 120 days from the due date of submission & subsequent corrigendum/amendment/extension of due date of submission. For awarded suppliers/contractors, the prices shall remain valid and firm till contract completion.

10.0 PERFORMANCE GUARANTEE

10.01 Bank guarantee shall be drawn in favour of "BSES Rajdhani Power Ltd" as applicable. The performance Bank guarantee shall be in the format as specified by BRPL.

10.02 Contract performance bank guarantee of total 10% of the contract price shall be submitted within 15 days of award of contract with the validity till completion of the contract period.

10.03 Contractor shall submit the performance bank guarantee equivalent to the Ten (10%) percent of the total contract price and shall be valid for a period of 30 months from the last date of dispatch or 24 months from the date of commissioning, whichever is earlier, plus 3 months towards claim period .

"Notwithstanding anything stated in this agreement, It is agreed by the Seller that in case of default by the seller in furnishing the Performance Bank Guarantee, the purchaser/BRPL, without prejudice to the rights available with the purchaser, shall be entitled to retain a total sum not exceeding 120% of the amount of required performance bank guarantee for the tenure and upon the terms as specified in this agreement. It is agreed that the purchaser shall not be paying any interest for the said sum retained by the purchaser in lieu of default by the seller in furnishing the performance bank guarantee and no claim of any nature shall be maintainable from the side of seller, disputing the above said retention. Whereas, in case, after the deduction of above sum by the purchaser, if the seller at any point of time, submits the PBG of the required value and tenure and requests for the refund of the amount retained on this ground, the purchaser shall be releasing the money retained in lieu of PBG without any interest/cost."

11.0 FORFEITURE

11.01 Each Performance Bond established under Clause 10.0 shall contain a statement that it shall be automatically and unconditionally forfeited without recourse and payable against the presentation by BRPL of this Performance Bond, to the relevant bank referred to above, together with a simple statement that supplier has failed to comply with any term or condition set forth in the Contract.

11.02 Each Performance BG established under will be automatically and unconditionally forfeited without recourse if BRPL in its sole discretion determines that supplier has failed to comply with any term or condition set forth in the contract.

12.0 RELEASE

All Performance Bonds will be released without interest within seven (7) days from the last date up to which the Performance Bond has to be kept valid (as defined in Clause 10.0) except for the case set forth in Clause 21.0.

13.0 WARRANTY/DEFECTS LIABILITY PERIOD

13.01 The bidder to guarantee the materials / items supplied against any defect of failure, which arise due to faulty materials, workmanship or design for the entire defects liability period. The Defect liability period shall be 60 months after commissioning or 66 months from the last date of supply, whichever is earlier.

If during the defects liability period any materials / items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within 30 days from the date of receipt of intimation.

The bidder shall able to depute their service personnel within 48 hours in case of emergency and shall ensure the availability of manpower/spares for the same during warranty period.

14.0 RETURN, REPLACEMENT OR SUBSTITUTION.

BRPL shall give Supplier notice of any defective Commodity promptly after becoming aware thereof. BRPL may in its discretion elect to return defective Commodities to Supplier for replacement, free of charge to BRPL, or may reject such Commodities and purchase the same or similar Commodities from any third party. In the latter case BRPL shall furnish proof to Supplier of the cost of such substitute purchase. In either case, all costs of any replacement, substitution, shipping, labour and other related expenses incurred in connection with the return and replacement or for the substitute purchase of a Commodity hereunder should be for the account of Supplier. BRPL may set off such costs against any amounts payable by BRPL to Supplier. Supplier shall reimburse BRPL for the amount, if any, by which the price of a substitute Commodity exceeds the price for such Commodity as quoted in the Bid.

15.0 EFFECTIVE DATE OF COMMENCEMENT OF CONTRACT:

15.01 The date of the issuance of the Letter of Acceptance/Purchase Order shall be treated as the effective date of the commencement of Contract.

16.0 TIME – THE ESSENCE OF CONTRACT

16.01 The time and the date of completion of the "Supply"" as stipulated in the Letter Of Acceptance / Purchase order issued to the Supplier shall be deemed to be the essence of the "Contract". The Supply has to be completed not later than the aforesaid Schedule and date of completion of supply.

17.0 THE LAWS AND JURISDICTION OF CONTRACT:

17.01 The laws applicable to this Contract shall be the Laws in force in India.

17.02 All disputes arising in connection with the present Contract shall be settled amicably by mutual consultation failing which shall be finally settled as per the rules of Arbitration and Conciliation Act, 1996 at the discretion of Purchaser. The venue of arbitration shall be at Delhi in India.

18.0 EVENTS OF DEFAULT

18.01 Events of Default. Each of the following events or occurrences shall constitute an event of default ("Event of Default") under the Contract:

(a) Supplier fails or refuses to pay any amounts due under the Contract;

(b) Supplier fails or refuses to deliver Commodities conforming to this RFQ/ specifications, or fails to deliver Commodities within the period specified in P.O. or any extension thereof

(c) Supplier becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or the Supplier's creditors file any petition relating to bankruptcy of Supplier;

(d) Supplier otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Supplier of notice of such failure from BRPL.

19.0 CONSEQUENCES OF DEFAULT.

(a) If an Event of Default shall occur and be continuing, BRPL may forthwith terminate the Contract by written notice.

(b) In the event of an Event of Default, BRPL may, without prejudice to any other right granted to it by law, or the Contract, take any or all of the following actions;

(i) present for ` to the relevant bank the Performance Bond;

(ii) Purchase the same or similar Commodities from any third party; and/or

(iii) Recover any losses and/or additional expenses BRPL may incur as a result of Supplier's default

20.0 LIQUIDATED DAMAGES

20.01 If supply of items / equipment is delayed beyond the supply schedule as stipulated in LOI/PO, then the Supplier shall be liable to pay the Purchaser for delay a sum of 1 % (one percent) of the basic (ex-works) price for every week of delay or part thereof for individual mile stone deliveries.

20.02 The total amount for delay under the contract will be subject to a maximum of ten (10%) percent of the total contract value.

20.03 The Purchaser may, without prejudice to any method of recovery, deduct the amount for such damages from any amount due or which may become due to the Supplier or from the Performance Bond or file a claim against the supplier.

21 VARIATION IN TAXES, DUTIES & LEVIES:

21.01 The total order value shall be adjusted on account of any variations in Statutory Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period only. However, incase of reduction in taxes, duties and levies, the the benefits of the same shall be passed on to BUYER.

21.02 No other Taxes, Duties & Levies other than those specified above will be payable by BUYERexcept in case of new Levies, Taxes & Duties imposed by the Competent

Authorities by way of fresh notification(s) subsequent to the issue of PURCHASE ORDER but within the stipulated delivery period.

21.03 Notwithstanding what is stated above, changes in Taxes, Duties & Levies shall apply only tothat portion of PURCHASE ORDER not executed on the date of notification by CompetentAuthority. Further, changes in Taxes, Duties & Levies after due date of Delivery shall notaffect PURCHASE ORDER Terms and Value.

21.04 PURCHASE ORDER value shall not be subject to any variation on account of variation in Exchange rate(s).

22 A TAXES & DUTIES ON RAW MATERIALS & BOUGHT OUT COMPONENTS:

21A.01 Taxes & Duties on raw materials & bought out components are included in Order Value andare not subject to any escalation or variation for any reason whatsoever. 21A.02 Taxes & Duties on raw materials & bought out components procured indigenously are included in Order Value and are not subject to any escalation or variation for any reason whatsoever.

The total order value shall remain **FIRM** within stipulated delivery period and shall not be adjusted on account of any price increase/variations in commodities & raw materials. However Statutory Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period shall be borne by BRPL on submission of necessary documents claiming such variation. The variation will be applicable only on such value wherever price breakup of same is submitted by vendor/available in PO/WO

The company reserves the right to review/change the terms & conditions of the Purchase Order/Work Order prospectively w.e.f. the date of implementation of GST to give effect/take care the impact of GST, if required.

23.0 FORCE MAJEURE

23.01 General

An ”Event of Force Majeure" shall mean any event or circumstance not within the reasonable control directly or indirectly, of the Party affected, but only if and to the extent that:

(i) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected party's ability to perform its obligations under this Contract and to mitigate the consequences thereof.

(ii) For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.

(iii) Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract.
(iv) Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken in order to comply with above clause.

23.02 Specific Events of Force Majeure subject to the provisions of above clause, Events of Force Majeure shall include only the following to the extent that they or their consequences satisfy the above requirements:
(i) The following events and circumstances:
a) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters.
b) Explosions or fires
(ii) War declared by the Government of India, provided that the ports at Mumbai are declared as a war zone.
(iii) Dangers of navigation, perils of the sea.

23.03 Notice of Events of Force Majeure If a force majeure event prevents a party from performing any obligations under the Contract in part or in full that party shall:
i) Immediately notify the other party in writing of the force majeure events within 7(seven) working days of the occurrence of the force majeure event
ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event.
iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable
iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis.
v) Provide prompt notice of the resumption of full performance or obligation to the other party.

23.04 Mitigation of Events of Force Majeure Each Party shall:

(i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure including recourse to alternate methods of satisfying its obligations under the Contract;
(ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and
(iii) Keep the other Party informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.

23.05 Burden of Proof In the event that the Parties are unable in good faith to agree that a Force Majeure event has occurred to an affected party, the parties shall resolve their dispute in accordance with the provisions of this Agreement. The burden of proof as to whether or not a force Majeure event has occurred shall be upon the party claiming that the force majeure event has occurred and that it is the affected party.

23.06 Termination for Certain Events of Force Majeure. If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure

event for a continuous period of more than 3 months, the Parties shall promptly discuss in good faith how to proceed with a view to reaching a solution on mutually agreed basis. If a solution on mutually agreed basis cannot be arrived at within a period of 30 days after the expiry of the period of three months, the Contract shall be terminated after the said period of 30 days and neither Party shall be liable to the other for any consequences arising on account of such termination.

23.07 The Purchaser may terminate the contract after giving 7(seven) days notice if any of following occurs:

a) Contractor fails to complete execution of works within the approved schedule of works, terms and conditions
b) In case the contractor commits any Act of Insolvency, or adjudged insolvent
c) Has abandoned the contract
d) Has failed to commence work or has suspended the progress of works
e) Has failed to proceed the works with due diligence and failed to make such due progress

23.08 Limitation of Force Majeure event. The Supplier shall not be relieved of any obligation under the Contract solely because cost of performance is increased, whether as a consequence of adverse economic consequences or otherwise.

23.09 Extension of Contract Period due to Force Majeure event The Contract period may be extended by mutual agreement of Parties by way of an adjustment on account of any period during which an obligation of either Party is suspended due to a Force Majeure event.

23.10 Effect of Events of Force Majeure. Except as otherwise provided herein or may further be agreed between the Parties, either Party shall be excused from performance and neither Party shall be construed to be in default in respect of any obligations hereunder, for so long as failure to perform such obligations shall be due to and event of Force Majeure."

24.0 TRANSFER AND SUB-LETTING

24.01 The Supplier shall not sublet, transfer, assign or otherwise part with the Contract or any part thereof, either directly or indirectly, without prior written permission of the Purchaser.

25.0 RECOVERIES

25.01 When ever under this contract any money is recoverable from and payable by the bidder, the purchaser shall be entitled to recover such sum by appropriating in part or in whole by detecting any sum due to which any time thereafter may become due from the supplier in this or any other contract. Should the sum be not sufficient to cover the full amount recoverable the bidder shall pay to the purchaser on demand the remaining balance.

26.0 WAIVER

26.01 Failure to enforce any condition herein contained shall not operate as a waiver of the condition itself or any subsequent breach thereof.

27.0 INDEMNIFICATION

Notwithstanding contrary to anything contained in this RFQ, Supplier shall at his costs and risks make good any loss or damage to the property of the Purchaser and/or the other Supplier engaged by the Purchaser and/or the employees of the Purchaser and/or employees of the other Supplier engaged by the Purchaser whatsoever arising out of the negligence of the Supplier while performing the obligations under this contract.

28.0 DOCUMENTATION:

The Bidder's shall procure all equipment from BRPL approved sources as per attached specifications. The Bidder's shall submit 5 copies of Material/Type Test Certificates, O&M Manuals, and Approved & As-built drawings. The Bidder's shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by BRPL Engineer in-charge.

29.0 COMMISSIONING SPARES

29.01 Commissioning Spares shall be deemed to be included in the quoted

BSES RAJDHANI POWER LIMITED

SECTION IV
PRICE FORMAT – SUPPLY & INSTALLATION

Format for Price Quotation (As per BoQ mentioned in Tender Document)

S. No.	Name of Substation/Location	RTU Hardware Supply (A)		RTU Hardware Installation Testing & Commissioning(B)		Supply of Adaptation Material (C)		Services for Adaptation Material (D)		Total Amount (Landed Price Including GST & Freight)
		Quantity	Amount (Landed Price Including GST & Freight)	Quantity	Amount(Landed Price Including GST)	Quantity	Amount(Landed Price Including GST & Freight)	Quantity	Amount(Landed Price Including GST & Freight)	A+B+C+D
1	DTC Ambedkar Nagar	1 Lot		1 Lot		1 Lot		1 Lot		
2	DTC Srinivaspuri	1 Lot		1 Lot		1 Lot		1 Lot		
3	DTC Nangloi	1 Lot		1 Lot		1 Lot		1 Lot		
4	DTC Peeragarhi	1 Lot		1 Lot		1 Lot		1 Lot		
	Total									

NOTE:

1 Training to BRPL Engineers & Factory Inspections shall be in Vendor's scope as per specification.

2 Dismantlling of Old RTU and Cable shall be vendor's Scope as per specification.

3 Transportation of Scrap Material from Site to Scrap Stores (Within Delhi) shall be vendor's Scope as per specification.

4 The discount received after the RA and final negotiation, w.r.t the initial financial bid shall be applied on all line Packages on a pro-rata basis.

*BOQ Scada for DTC Ambedkar Nagar - Technical Specification Page No – 01 – 02
*BOQ Scada for DTC Srinivaspuri - Technical Specification Page No – 06 - 07
*BOQ Scada for DTC Nangloi - Technical Specification Page No – 60 - 63
*BOQ Scada for DTC Peeragarhi - Technical Specification Page No – 60 - 63

SECTION V

GENERAL TERMS & CONDITIONS - ERECTION, TESTING & COMMISSIONING

1. DEFINITIONS and INTERPRETATION

The following terms shall have the following meanings:

1.1 "Company": means BSES Rajdhani Power Ltd, a company incorporated under the Companies Act 1956 and having its office at BSES Bhawan, Nehru Place, New Delhi 110 019, which expression shall include its authorized representatives, agents, successors and assigns.
1.2 "Contractor": shall mean the successful Tenderer / vendor to whom the contract has been awarded
1.3 "Rate": The unit rates for the work to be carried out at site shall be as per finalized unit rates through tender. The finalized rates shall be firm for the entire duration of work to be carried out by the Contractor under the work order and are not subject to escalation for any reason whatsoever.
1.4. CONTRACT SPECIFICATION: The terms "CONTRACT Specification" shall mean the Technical specification of the work as agreed by you and description of work as detailed in Annexure-I enclosed herewith and all such particulars mentioned directly/referred to or implied as such in the contract.
1.5 SITE: The terms "Site" shall mean the working location in BRPL area. Under this tender, working location shall be as mentioned elsewhere.
1.6 ENGINEER IN CHARGE: "Engineer In-charge" means the Company's authorized representative for the purpose of carrying out the work.

2. EXAMINATION OF SITE AND LOCAL CONDITIONS:

The contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work. The company shall not accept any claim whatsoever arising out of the difficult site/terrain/local conditions, if any.

3. LANGUAGE AND MEASUREMENT:

The CONTRACT issued to the contractor by the company and all correspondence and documents relating to the CONTRACT placed on the Contractor shall be written in English language.

Metric System shall be followed for all dimension, units etc.

5. RATES:

The rates finalized for this order shall be firm for the entire duration of work carried out by the Contractor under the order and are not subject to any variation and escalation for any reason whatsoever.

The cost of insurance during loading/unloading of materials/ equipments during its storage and handling/erection at site for installation is included in the contractor's scope and value is included in the unit rates finalized.

The unit rates finalized are also inclusive of barricading and watch & ward during execution and no separate charges shall be paid for the same.

The cost of training of BRPL Official shall be included in the prices quoted by vendor.

6. TAXES AND DUTIES:

Prices are inclusive of all taxes and duties and GST. However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS).The order involves only services and labour hence WCT/VAT not applicable to the order.

The total order value shall remain **FIRM** within stipulated delivery period and shall not be adjusted on account of any price increase/variations in labour. However Statutory Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period shall be borne by BRPL on submission of necessary documents claiming such variation. The variation will be applicable only on such value wherever price breakup of same is submitted by vendor/available in PO/WO.

8. DEFECT LIABILITY PERIOD:

Work executed shall be guaranteed against any defect or failure which may arise due to faulty materials, design or workmanship for a period of 60 Months from commissioning or 66 months from supply,whichever is earlier.

If during the Defect Liability Period any materials/ items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within 30 days from the date of receipt of intimation.

9. PERFORMANCE GUARANTEE

9 .01 Bank guarantee shall be drawn in favour of "BSES Rajdhani Power Ltd" as applicable. The Performance Bank guarantee shall be in the format as specified by BRPL.

9.02 Contract performance bank guarantee of total 10% of the contract price shall be submitted within 15 days of award of contract with the validity till completion of the contract period.

9.03 Contractor shall submit the performance bank guarantee equivalent to the 10% of the contract value at the time of claiming the last payment as per clause no. of **TERMS OF PAYMENT (Erection, Testing &** Commissioning)), with the validity of the bank guarantee 30 months from the last date of dispatch or 24 months from the date of commissioning, whichever is earlier, plus 3 months towards claim period.

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"Notwithstanding anything stated in this agreement, It is agreed by the Seller that in case of default by the seller in furnishing the Performance Bank Guarantee, the purchaser/BRPL, without prejudice to the rights available with the purchaser, shall be entitled to retain a total sum not exceeding 120% of the amount of required performance bank guarantee for the tenure and upon the terms as specified in this agreement. It is agreed that the purchaser shall not be paying any interest for the said sum retained by the purchaser in lieu of default by the seller in furnishing the performance bank guarantee and no claim of any nature shall be maintainable from the side of seller, disputing the above said retention. Whereas, in case, after the deduction of above sum by the purchaser, if the seller at any point of time, submits the PBG of the required value and tenure and requests for the refund of the amount retained on this ground, the purchaser shall be releasing the money retained in lieu of PBG without any interest/cost."

10. COMPLETION PERIOD

You are required to mobilize your manpower and Tools & Tackles and furnish a list of equipments to be used for erection and commence the execution activity as per instructions of Engineer In-charge. The entire erection work should be completed **within 10 weeks** from the date of issue of LOI. The detailed schedule and milestone completion dates would be as per the contract schedules given from time to time by Engineer In-charge at site. You shall submit a weekly progress report to Engineer In charge.

11. CLEANLINESS

All debris shall be removed and disposed of at assigned areas on daily basis. Surplus excavated earth shall be disposed of in an approved manner. In short, you shall be fully responsible for keeping the work site clean at all times. In case of non- compliance, company shall get the same done at Contractor's risk and costs.

12. COMMISSIONING & ACCEPTANCE TEST:

After completion of the work, the Contractor shall conduct trial run/ operation in the presence of Engineer In charge. During such trial run the system shall be operated under the supervision of the Contractor. If any rectification/modification required during this period the Contractor shall do all necessary measures.
On satisfactory completion of above, the system shall be deemed to have energized and placed in commercial operation. The Engineer In Charge will issue an acceptance certificate.

13. WORK COMPLETION CERTIFICATION, HANDING OVER.

The work carried out by the Contractor under this order has to be certified by Engineer In-charge for satisfactory completion of work allotted to the contractor with respect to specifications / Field Quality Procedures as per applicable standards. In case of modification/correction to be carried out, contractor shall carry out the said modifications/correction without additional cost. The Contractor shall remain in close contact with Engineer In-Charge at site to report the general findings of the fieldwork during the initial as well as later stage of the work at site.

The contractor shall be solely responsible for any shortage or damage of materials issued to them handling of and / or in storage and erection at site and cost of the same will be recovered from the

contractor as certified by Engineer In-Charge. Contractor must submit a periodical material reconciliation statement in the approval format with every Running Bill raise by him or end of every month whichever is earlier. The contractor shall maintain an accurate and exhaustive record detailing out the list of all items received by him for the purpose of erection and keep such record open for the inspection of the company.

14. LIQUIDATED DAMAGES

14.1 Liquidated Damages: In the event of any delay in completion of the work beyond the stipulated time given by in order due to reasons solely attributable to the Contractor, the Contractor shall pay to the Company liquidated damages.

If the Contractor failed perform the services within the time period specified in the order, the Company shall, without prejudice to its other remedies under the contract, deduct liquidated damages a sum equivalent to 1 % of the order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of total order value or remaining value. Once the maximum is reached to Company may consider termination of contract without any liabilities to Company.

Engineer In charge should specifically mention the amount of LD levied on the bill of contractor.

15. SAFETY CODE:

The Contractor shall ensure adequate safety precautions at site as required under the law of the land and shall be entirely responsible for the complete safety of their workman as well as other workers at site and premises. The contractor shall not deploy any worker below the age of 18 years.

The contractor shall observe the safety requirements as laid down in the contract and in case of sub-contract (only after written approval of company); it shall be the responsibility of main contractor that all safety requirements are followed by the employees and staff of the sub-contractor.

The contractor employing two hundred employees or more, including contract workers, shall have a safety coordinator in order to ensure the implementation of safety requirements of the contract and a contractor with lesser number of employees, including contract workers, shall nominate one of his employees to act as safety coordinator who shall liaise with the safety officer on matters relating to safety and his name shall be displayed on the notice board at a prominent place at the work site.

The contractor shall be responsible for non-compliance of the safety measures, implications, injuries, fatalities and compensation arising out of such situations or incidents.

In case of any accident, the contractor shall immediately submit a statement of the same to the owner and the safety officer, containing the details of the accident, any injury or causalities, extent of properly damage and remedial action taken to prevent recurrence and in addition, the contractor shall submit a monthly statement of the accidents to the owner at the end of each month.

PENALTY:

15.1 Penalty: 1% of basic price for every week delay subject to maximum of 10% of total PO/WO value of undelivered units/ Service work.

16. STATUTORY OBLIGATIONS:

The Contractor shall take all steps as may be necessary to comply with the various applicable laws/rules including the provisions of contract labour (Regulation & Abolition Act) 1970 as amended, minimum wages Act, 1984, Workman Compensation Act, ESI Act, PF Act, Bonus Act and all other applicable laws and rules framed there under including any statutory approval required from the Central/State Govt. Ministry of Labour. Broadly, the compliance shall be as detailed below, but not limited to:

a) Labour License under Contract Labour Act (R & A) Act 1970
b) PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.
c) All employees to have a temporary or permanent ESI Card as per ESI Act.
d) ESI Registration No.
e) GST registration number, if applicable.
f) PAN No.
g) Work Contract Tax Registration Number/ VAT Registration.

(Engineer-in-charge responsible for execution of the job should obtain a copy of Labour License before start of the work by the contractor.)

The Contractor must follow:

a) Third party Insurance Policy before start of work.
b) To follow Minimum Wages A ct prevailing in the state.
c) Salary / Wages to be distributed in presence of representative of Company's representative not later than 7th of each month.
d) To maintain Wage- cum - Attendance Register.
e) To maintain First Aid Box at Site.
f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.
g) Workman Compensation Policy. {If applicable}
h) Labour license before start of work. {If applicable}

17. WORKMAN COMPENSATION:

The Contactor shall take insurance policy under the Workman Compensation Act to cover such workers who are not covered under ESI and PF by the Contractor however engaged to undertake the jobs covered under this order and a copy of this insurance policy will be given to Company for reference and records. This insurance policy shall be kept valid at all times. In case there are no worker involve other than those who are covered under ESI and PF by the Contractor, the Contractor shall certify for the same,

The contractor shall keep the company indemnified at all times, against all claims of compensation under the provision of Workmen Compensation Act 1923 and as amended from

time to time or any compensation payable under any other law for the time being workman engaged by the contractor/sub-contractor/sub-agent in carrying out the job involved under this work order and against costs and expenses, if any, incurred by the company in connection therewith and without prejudice to make any recovery.

The company shall be entitled to deduct from any money due to or to become due to the Contractor, moneys paid or payable by way of compensation as aforesaid or cost or expenses in connection with any claims thereto and the Contractor shall abide by the decision of the Company as to the sum payable by the Contractor under the provisions of this clause.

ACCIDENTAL INSURANCE POLICY FOR LIFE COVER:
Before commencing the execution of the work the CONTRACTOR shall take Accidental insurance policy for the staff engaged by him for this work to insure against any loss of life which may occur during the contract for the work of the COMPANY. The policy shall have coverage of Rs. 10 Lacs (Table C- Death + Permanent Total Disability + Partial permanent Disability due to external accidents). The Contractor shall be responsible for on the spot same day claim settlement with the victim's legal heirs without waiting for settlement by insurance claim without any liability on BRPL. The premium amount for such life cover policy shall be bourne by the contractor. The contractor shall furnish copy of policy when demanded by BRPL.

18. STAFF AND WORKMAN

It shall be responsibility of contractor

(a) To obtain Contract Labour License from the concerned authorities and maintain proper liaison with them. Necessary Forms for obtaining Labour License would be issued by the company. However you will bear all expenses for obtaining Labour license and registration in PF Department for your scope of work. You will deposit PF of your staff/laborer each month and all related documents should be furnished to us.

b) To obtain workman insurance cover against deployment of workers etc.

(II) To maintain, proper records relating to workmen employed, in the form of various Registers, namely,

a) Register of workmen.
b) Register of muster roll.
c) Register of overtime.
d) Register of wages.
e) Any other register as per latest amendment Labour Act.

The records shall be in the prescribed formats only.

(III) To disburse monthly wages to your workers/ supervisors in time and in the presence of Company representatives or as directed by the Labour authorities.

(IV) To maintain proper liaison with the Project authorities, local police and all other government and local bodies.

(V) To pay your workmen at least not less than the minimum prescribed wages as per state/Central Labour laws as may be, applicable. The contractor shall, be responsible for compliance of all the provisions of minimum Wages Act, PF, ESIC Act workmen Compensation Act and Contract Labour Regulation & Abolition Act the rules made there under. In case of non-compliance of the statutory requirements. The company would take necessary action at the risk and cost of the Contractor.

(VI) To employ required number of skilled/semi-skilled and unskilled workmen as per site requirement to complete the entire project as per schedule. To provide safety shoes, safety helmets, safety belts, gloves etc. to your worker/staff as per requirement during erection work.

(VII) To employ necessary engineering and supervisory staff for completion of the Project in time. While day-to-day management of the site and supervision of the works shall be the responsibility of your Engineer - In charge, he will report to the Engineer in charge to assist him to discharge the overall responsibility of the execution of the project.

19. THIRD PARTY INSURANCE

Before commencing the execution of the work the contractor shall take third party insurance policy to insure against any damage or loss or injury which may occur to any property / public property or to any person or any employee or representative of any outside Agency/ the company engaged or not engaged for the work of the company, by or arising out of the execution of the work or temporary work or in carrying out of this Agreement. For third party insurance policies, the contractor shall be responsible for settlement of claims with the underwriters without any liability on the purchaser / owner and will arrange replacements / rectification expeditiously without a waiting settlement by insurance claim at contractors own cost.

20. SECURITY

Adequate number of trained Security Guards shall be deployed both at the storage yard and stores as well as places of work to prevent theft and pilferage of material and accessories and various other materials. All security rules and safety rules enforced at site by company shall be strictly observed.

21. ENVIRONMENTAL, HEALTH & SAFETY PLAN:

Contractor will make ensure that the Environment, Health & Safety (EHS) requirements are clearly understood and faithfully implemented at all levels at site as per instruction of Company. Contractors must comply with these requirements:

a) Comply with all of the elements of the EHS Plan and any regulations applicable to the work

b) Comply with the procedures provided in the interests of Environment, Health and Safety

c) Ensure that all of their employees designated to work are properly trained and competent

d) Ensure that all plant and equipment they bring on to site has been inspected and serviced in accordance with legal requirement and manufacturer's or suppliers' instructions

e) Make arrangements to ensure that all employees designated to work on or visit the site present themselves for site induction prior to commencement of work

f) Provide details of any hazardous substances to be brought onsite

g) Ensure that a responsible person accompanies any of their visitors to site

All contractors staff is accountable for the following:

1. Use the correct tools and equipment for the job and use safety equipment and protective clothing supplied, e.g. helmets, goggles, ear protection, etc. as instructed
2. Keep tools in good condition
3. Report to the Supervisor any unsafe or unhealthy condition or any defects in plant or equipment
4. Develop a concern for safety for themselves and for others
5. Prohibit horseplay
6. Not to operate any item of plant unless they have been specifically trained and are authorized to do so.

22. TEST CERTIFICATE & QUALITY ASSURANCE:

The Contractor shall procure all equipment from genuine sources as approved by the Company and as per Company specifications. The Contractor shall submit all the test certificates and joint inspection reports related to major equipment wherever applicable. The contractor shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by company / Engineer in-charge.

23. SUB-CONTRACTING / SUBLETTING:

CONTRACTOR shall not assign or transfer the whole or any part of this Work Order or any other benefits accruing there from nor shall it subcontract / sublet the whole or any part of the Works without the prior written consent of COMPANY.

In the event the contractor assigns this work order, contractor's assignees shall be bound by the terms and conditions of this work order and shall , if deemed necessary by COMPANY at the time of such assignment, undertake in writing to be so bound by this Work Order.

Notwithstanding the subletting / subcontracting of any portion of the works, contractor shall remain wholly responsible for the carrying out, completion and satisfactory execution of Works in all respects in accordance with this Work Order, specification, approved drawings and data sheets.

24. INDEMNITY:

Contractor shall indemnify and save harmless COMPANY against and from any and all liabilities, claims, damages, losses or expenses arising due to or resulting from:

a) any breach non-observance or non-performance by contractor or its employees or agents of any of the provisions of this Work Order.

b) any act or omission of contractor or its employees or agents.

c) any negligence or breach of duty on the part of contractor, its employees or agents including any wrongful use by it or them of any property or goods belonging to or by COMPANY.

Contractor shall at all times indemnify COMPANY against all liabilities to other persons, including he employees or agents of COMPANY or contractor for bodily injury, damage to property or other loss which may arise out of or in consequence of the execution or completion of Works and against all costs charges and expenses that may be occasioned to COMPANY by the claims of such person.

25. EVENTS OF DEFAULTS:

COMPANY may, without prejudice to any of its other rights or remedies under the Work Order or in law, terminate the whole or any part of this Work Order by giving written notice to the Contractor, if in the opinion of COMPANY, contractor has neglected to proceed with the works with due diligence or commits a breach of any of the provisions of this work order including but not limited to any of the following cases:

a) Failing to complete execution of work within the terms specified in this work order.
b) Failing to complete works in accordance with the approved schedule of works.
c) Failing to meet requirements of specifications, drawings, and designs as approved by COMPANY.
d) Failing to comply with any reasonable instructions or orders issued by COMPANY in connection with the works.
e) Failing to comply with any of the terms or conditions of this work order.

In the event COMPANY terminates this work order, in whole or in part, on the occurrence of any event of default, COMPANY reserves the right to engage any other subcontractor or agency to

complete the work or any part thereof, and in addition to any other right COMPANY may have under this work order or in law including without limitation the right to penalize for delay under clause 15.0 of this work order, the contractor shall be liable to COMPANY for any additional costs that may be incurred by COMPANY for the execution of the Work.

26 RISK & COST:

If the Contractor of fails to execute the work as per specification / as per the direction of Engineer's In-change within the scheduled period and even after the extended period, the contract shall got cancel and company reserves the right to get the work executed from any other source at the Risk & Cost of the Contractor. The Extra Expenditure so incurred shall be debited to the Contractor.

27. ARBITRATION:

Any dispute or difference arising out of this Purchase Order shall be discussed by the Purchaser and Supplier. Both shall endeavor to reach an amicable settlement within a period of Thirty (30) days. If an agreement could not be reached within this period then the dispute shall be referred to arbitration under the Indian Arbitration and Conciliation Act-1996, as may be amended from time to time. The venue of arbitration shall be Delhi.

The award shall be a reasoned award and shall be final and binding on both the parties and shall not be subjected to appeal. Subject to arbitration the Courts at Delhi shall have exclusive jurisdiction over all matters arising under this Purchase Order. During pendency of arbitration the parties shall continue to perform respective obligations under this Purchase Order.

28. FORCE MAJEURE:

28.1 General:

An "Event of Force Majeure" shall mean any event or circumstance not within the reasonable control, of the Party affected, but only if and to the extent that:

(i) Such event or circumstance, despite the exercise of reasonable diligence, could not have been prevented, avoided or reasonably foreseen by such Party;

(ii) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected parties ability to perform its obligations under this Contract and to mitigate the consequences thereof. For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.

(iii) Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract; and

(iv) Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken in order to comply with above clause

28.2 Specific Events of Force Majeure:

Subject to the provisions of above clause, Events of Force Majeure shall include only the following to the extent that they or their consequences satisfy the above requirements:
The following events and circumstances:

(i) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters, and

(ii) Explosions or fires

(iii) Declaration of the Site as war zone.

Any order, regulation, directive, requirement from any Governmental, legislative, executive or judicial authority.

28.3 Notice of Events of Force Majeure

If a force majeure event prevents a party from performing any obligations under the Contract in part or in full, that party shall :

(i) Immediately notify the other party in writing of the force majeure events within 2 working days of the occurrence of the force majeure event

(ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event

(iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable

(iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis

(v) Provide prompt notice of the resumption of full performance or obligation to the other party.

28.4 Mitigation of events of force majeure:

The Contractor shall:

(i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure, including applying other ways in which to perform the Contract;

(ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and Keep the Company informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.

28.5 Burden of proof:

In the event that the Parties are unable in good faith to agree that a Force Majeure event has occurred to an affected party, the parties shall resolve their dispute in accordance with the provisions of this Contract. The burden of proof as to whether or not a force majeure event has occurred shall be upon the party claiming that the force majeure event has occurred and that it is the affected party.

28.6 Terminations for certain events of force majeure:

If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 1 (one) month during the Term of the Contract the Contract shall be terminated at the discretion of the Company and

neither Party shall be liable to the other for any consequences arising on account of such termination.

29. SECRECY CLAUSE:

The technical information, drawing and other related documents forming part of work order and the information obtained during the course of investigation under this work order shall be the Company's executive property and shall not be used for any other purpose except for the execution of the work order. The technical information drawing, records and other document shall not be copied, transferred, or divulged and/ or disclosed to third party in full/part, not misused in any form whatsoever except to the extent for the execution of this work order.

These technical information, drawing and other related documents shall be returned to the Company with all approved copies and duplicates including drawing/plans as are prepared by the Contractor during the executions of this work order, if any, immediately after they have been used for agreed purpose.
In the event of any breach of this provision, the contractor shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

30. TERMINATION:

The Supplier hereby undertakes to fully comply and conform to the terms and conditions of this Order. In the event of failure to do so, Purchaser shall have the right to terminate the assignment and claim damages. The upper limit for the damages will be the value of equivalent material / services, which are available from Third parties.

In case of unfinished/incomplete supplies, due to reasons not attributable to the Purchaser, the Purchaser reserves the right to complete the supply at the Supplier's risk & cost, by engaging any third party.

Should unforeseen conditions arise and the Purchaser deems it necessary, to suspend indefinitely or abandon the supplies, the purchase order may be terminated by Purchaser after having given 10 days notice in writing. In the event of such termination, the Supplier shall be entitled to be paid the amount due for the supplies rendered and/or expenses incurred up to the date of such termination. Any such compensation being claimed shall be substantiated by the Supplier. The upper limit for the compensation being claimed shall be the value of the Purchase order.

31. QUALITY:

Contractor shall ensure that strict quality is maintained and execution of works under this Work Order and Works are executed in conformity with the Specification.

All tools, tackles, instruments and other equipments used in the execution of the Works shall be duly calibrated as required and Contractor shall maintain proper records of such tools, tackles, instruments and / or equipment.

32. ACCEPTANCE

Acceptance of this work order implies and includes acceptance of all terms and conditions enumerated in this work order in the technical specification and drawings made available to you consisting of general conditions, detailed scope of work, detailed technical specification & detailed equipment, drawing. Complete scope of work and the Contractor's and Company's contractual obligation are strictly limited to the terms set out in the work order. No amendments to the concluded work order shall be binding unless agreed to in writing for such amendment by both the parties.

However, during the course of the execution of the work order, if at any time the Company's representative observe and form an opinion that the work under the work order is not being performed in accordance with the terms of this work order, the company reserves its right to cancel this work order forthwith without assigning any reason and the Company will recover all damages including losses occurred due to loss of time from the Contractor.

We request you to please sign the duplicate copy of this work order as a token of your acceptance and return to us.

SECTION VI
VENDOR CODE OF CONDUCT

Purchaser is committed to conducting its business in an ethical, legal and socially responsible manner. To encourage compliance with all legal requirements and ethical business practices, Purchaser has established this Vendor Code of Conduct (the "Code") for Purchaser's Vendors. For the purposes of this document, "Vendor" means any company, corporation or other entity that sells, or seeks to sell goods or services, to Purchaser, including the Vendor's employees, agents and other representatives. Fundamental to adopting the Code is the understanding that a business, in all of its activities, must operate in full compliance with the laws, rules and regulations of the countries in which it operates. This Code encourages Vendors to go beyond legal compliance, drawing upon internationally recognized standards, in order to advance social and environmental responsibility.

I. Labour and Human Rights

Vendors must uphold the human rights of workers, and treat them with dignity and respect as understood by the international community.

- Fair Treatment - Vendors must be committed to a workplace free of harassment. Vendors shall not threaten workers with or subject them to harsh or inhumane treatment, including sexual harassment, sexual abuse, corporal punishment, mental coercion, physical coercion, verbal abuse or unreasonable restrictions on entering or exiting company provided facilities.
- Antidiscrimination - Vendors shall not discriminate against any worker based on race, colour, age, gender, sexual orientation, ethnicity, disability, religion, political affiliation, union membership, national origin, or marital status in hiring and employment practices such as applications for employment, promotions, rewards, access to training, job assignments, wages, benefits, discipline, and termination. Vendors shall not require a pregnancy test or discriminate against pregnant workers except where required by applicable laws or regulations or prudent for workplace safety. In addition, Vendors shall not require workers or potential workers to undergo medical tests that could be used in a discriminatory way except where required by applicable law or regulation or prudent for workplace safety.
- Freely Chosen Employment - Forced, bonded or indentured labour or involuntary prison labour is not to be used. All work will be voluntary, and workers should be free to leave upon reasonable notice. Workers shall not be

required to hand over government-issued identification, passports or work permits as a condition of employment.

- Prevention of Under Age Labour - Child labour is strictly prohibited. Vendors shall not employ children. The minimum age for employment or work shall be 15 years of age, the minimum age for employment in that country, or the age for completing compulsory education in that country, whichever is higher. This Code does not prohibit participation in legitimate workplace apprenticeship programs that are consistent with Article 6 of ILO Minimum Age Convention No. 138 or light work consistent with Article 7 of ILO Minimum Age Convention No. 138.
- Juvenile Labour - Vendors may employ juveniles who are older than the applicable legal minimum age for employment but are younger than 18 years of age, provided they do not perform work likely to jeopardize their heath, safety, or morals, consistent with ILO Minimum Age Convention No. 138.
- Minimum Wages - Compensation paid to workers shall comply with all applicable wage laws, including those relating to minimum wages, overtime hours and legally mandated benefits. Any disciplinary wage deductions are to conform to local law. The basis on which workers are being paid is to be clearly conveyed to them in a timely manner.
- Working Hours - Studies of good manufacturing practices clearly link worker strain to reduced productivity, increased turnover and increased injury and illness. Work weeks are not to exceed the maximum set by local law. Further, a work week should not be more than 60 hours per week, including overtime, except in emergency or unusual situations. Workers should be allowed at least one day off per seven-day week.
- Freedom of Association - Open communication and direct engagement between workers and management are the most effective ways to resolve workplace and compensation issues. Vendors are to respect the rights of workers to associate freely and to communicate openly with management regarding working conditions without fear of reprisal, intimidation or harassment. Workers' rights to join labour unions, seek representation and or join worker's councils in accordance with local laws should be acknowledged.

II. Health and Safety Vendors must recognize that in addition to minimizing the incidence of work-related injury and illness, a safe and healthy work environment enhances the

quality of products and services, consistency of production and worker retention and morale. Vendors must also recognize that ongoing worker input and education is essential to identifying and solving health and safety issues in the workplace.

The health and safety standards are:

- Occupational Injury and Illness - Procedures and systems are to be in place to prevent, manage, track and report occupational injury and illness, including provisions to: a) encourage worker reporting; b) classify and record injury and illness cases; c) provide necessary medical treatment; d) investigate cases and implement corrective actions to eliminate their causes; and e) facilitate return of workers to work.
- Emergency Preparedness - Emergency situations and events are to be identified and assessed, and• their impact minimized by implementing emergency plans and response procedures, including: emergency reporting, employee notification and evacuation procedures, worker training and drills, appropriate fire detection and suppression equipment, adequate exit facilities and recovery plans.
- Occupational Safety - Worker exposure to potential safety hazards (e.g., electrical and other energy sources, fire, vehicles, and fall hazards) are to be controlled through proper design, engineering and administrative controls, preventative maintenance and safe work procedures (including lockout/tagout), and ongoing safety training. Where hazards cannot be adequately controlled by these means, workers are to be provided with appropriate, well-maintained, personal protective equipment. Workers shall not be disciplined for raising safety concerns.
- Machine Safeguarding - Production and other machinery is to be evaluated for safety hazards. Physical guards, interlocks and barriers are to be provided and properly maintained where machinery presents an injury hazard to workers.
- Industrial Hygiene - Worker exposure to chemical, biological and physical agents is to be identified, evaluated, and controlled. Engineering or administrative controls must be used to control overexposures. When hazards cannot be adequately controlled by such means, worker health is to be protected by appropriate personal protective equipment programs.

- Sanitation, Food, and Housing - Workers are to be provided with ready access to clean toilet facilities, potable water and sanitary food preparation, storage, and eating facilities. Worker dormitories provided by the Participant or a labour agent are to be maintained clean and safe, and provided with appropriate emergency egress, hot water for bathing and showering, and adequate heat and ventilation and reasonable personal space along with reasonable entry and exit privileges.
- Physically Demanding Work - Worker exposure to the hazards of physically demanding tasks,• including manual material handling and heavy or repetitive lifting, prolonged standing and highly repetitive or forceful assembly tasks is to be identified, evaluated and controlled.

III. Environmental

Vendors should recognize that environmental responsibility is integral to producing world class products. In manufacturing operations, adverse effects on the environment and natural resources are to be minimized while safeguarding the health and safety of the public.

The environmental standards are:

- Product Content Restrictions - Vendors are to adhere to applicable laws and regulations regarding prohibition or restriction of specific substances including labeling laws and regulations for recycling and disposal. In addition, Vendors are to adhere to all environmental requirements specified by Purchaser.
- Chemical and Hazardous Materials -Chemical and other materials posing a hazard if released to the environment are to be identified and managed to ensure their safe handling, movement, storage, recycling or reuse and disposal.
- Air Emissions - Air emissions of volatile organic chemicals, aerosols, corrosives, particulates, ozone depleting chemicals and combustion by-products generated from operations are to be characterized, monitored, controlled and treated as required prior to discharge.
- Pollution Prevention and Resource Reduction -Waste of all types, including water and energy, are to be reduced or eliminated at the source or by practices such as modifying production, maintenance and facility processes, materials substitution, conservation, recycling and re-using materials.

- Wastewater and Solid Waste - Wastewater and solid waste generated from operations, industrial processes and sanitation facilities are to be monitored, controlled and treated as required prior to discharge or disposal.
- Environmental Permits and Reporting - All required environmental permits (e.g. discharge• monitoring) and registrations are to be obtained, maintained and kept current and their operational and reporting requirements are to be followed.

IV. Ethics

Vendors must be committed to the highest standards of ethical conduct when dealing with workers, Vendors, and customers.

- Corruption, Extortion, or Embezzlement - Corruption, extortion, and embezzlement, in any form, are strictly prohibited. Vendors shall not engage in corruption, extortion or embezzlement in any form and violations of this prohibition may result in immediate termination as an Vendor and in legal action.
- Disclosure of Information - Vendors must disclose information regarding its business activities, structure, financial situation, and performance in accordance with applicable laws and regulations and prevailing industry practices.
- No Improper Advantage - Vendors shall not offer or accept bribes or other means of obtaining undue or improper advantage.
- Fair Business, Advertising, and Competition - Vendors must uphold fair business standards in• advertising, sales, and competition.
- Business Integrity - The highest standards of integrity are to be expected in all business interactions. Participants shall prohibit any and all forms of corruption, extortion and embezzlement. Monitoring and enforcement procedures shall be implemented to ensure conformance.
- Community Engagement - Vendors are encouraged to engage the community to help foster social and economic development and to contribute to the sustainability of the communities in which they operate.
- Protection of Intellectual Property - Vendors must respect intellectual property rights; safeguard customer information; and transfer of technology and know-how must be done in a manner that protects intellectual property rights.

V. Management System

Vendors shall adopt or establish a management system whose scope is related to the content of this Code. The management system shall be designed to ensure (a) compliance with applicable laws, regulations and customer requirements related to the Vendors' operations and products; (b) conformance with this Code; and (c) identification and mitigation of operational risks related to this Code. It should also facilitate continual improvement.

The management system should contain the following elements:

- Company Commitment - Corporate social and environmental responsibility statements affirming Vendor's commitment to compliance and continual improvement.
- Management Accountability and Responsibility - Clearly identified company representative[s] responsible for ensuring implementation and periodic review of the status of the management systems.
- Legal and Customer Requirements - Identification, monitoring and understanding of applicable laws, regulations and customer requirements.
- Risk Assessment and Risk Management - Process to identify the environmental, health and safety and labour practice risks associated with Vendor's operations. Determination of the relative significance for each risk and implementation of appropriate procedural and physical controls to ensure regulatory compliance to control the identified risks.
- Performance Objectives with Implementation Plan and Measures - Areas to be included in a risk assessment for health and safety are warehouse and storage facilities, plant/facilities support equipment, laboratories and test areas, sanitation facilities (bathrooms), kitchen/cafeteria and worker housing /dormitories. Written standards, performance objectives, targets and implementation plans including a periodic assessment of Vendor's performance against those objectives.
- Training - Programs for training managers and workers to implement Vendor's policies, procedures and improvement objectives.
- Communication - Process for communicating clear and accurate information about Vendor's performance, practices and expectations to workers, Vendors and customers.

- Worker Feedback and Participation - Ongoing processes to assess employees' understanding of• and obtain feedback on practices and conditions covered by this Code and to foster continuous improvement.
- Audits and Assessments - Periodic self-evaluations to ensure conformity to legal and regulatory• requirements, the content of the Code and customer contractual requirements related to social and environmental responsibility.
- Corrective Action Process - Process for timely correction of deficiencies identified by internal or• external assessments, inspections, investigations and reviews.
- Documentation and Records - Creation of documents and records to ensure regulatory compliance• and conformity to company requirements along with appropriate confidentiality to protect privacy.

The Code is modelled on and contains language from the Recognized standards such as International Labour Organization Standards (ILO), Universal Declaration of Human Rights (UDHR), United Nations Convention against Corruption, and the Ethical Trading Initiative (ETI) were used as references in preparing this Code and may be useful sources of additional information.

Annexure - I

The Contractor must submit the following to Engineer-In-Charge before commencement of work:

a) GST Nos.
b) PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.
c) All employees to have a temporary or permanent ESI Card as per ESI Act.
d) ESI Registration No.
e) PAN No.
f) Work Contract Tax/VAT Registration Number.
g) Labor License under Contract Labor Act (R & A) Act 1970(All Engineer-in-charge responsible for execution of the job should obtain a copy of Labor License as per guidelines of HR department before start of the work by the contractor.)

The Contractor must follow:

a) Third party Insurance Policy before start of work.

b) To follow Minimum Wages Act prevailing in the state.

c) Salary/ Wages to be distributed in presence of Company's representative not later than 7th of each month.

d) To maintain Wage- cum - Attendance Register.

e) To maintain First Aid Box at Site.

f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.

g) Workman Compensation Policy. (If applicable)

h) Labor license before start of work. (If applicable)

Appendix- I
COMMERCIAL TERMS AND CONDITIONS – SUPPLY

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	a) **Firm**, FOR Delhi store basis. Prices shall be inclusive of GST, freight up to Delhi stores. b) Unloading at stores - in vendor's scope c) Transit insurance in BRPL scope	
3	Payment terms	**Supply Part** A) 70% prorata of supply value shall be payable against supply of equipment and materials within 30 days against receipt of material at site and submission of following documents duly certified by BRPL Project-in-charge: i. Consignee copy of LR ii. Detailed invoice showing commodity description, qty, unit & total price, iii. Original certificate issued by BRPL confirming receipt of material at site & acceptance. iv. Dispatch clearance & inspection report issued by the inspection authority. v. Packing List, Test Reports vi. Guarantee Certificate. B) 30% prorata after Installation, testing, Commissioning & Integration with SCADA duly certified by BRPL Project-in-charge and Handing Over of the entire Installation and submission of BG of 10% of contract value valid up to Defect Liability period plus 3 months towards Claim period. In case, commissioning is delayed or not started due to reason not attributable to Vendor, than balance 30% payment against supply part shall be released after 45 days from the receipt of complete material of respective site/Grid and submission of BG of 10% of contract value valid up to Defect Liability period plus 3 months towards Claim period. Erection, Testing, Installation and Commisioning:	

		C) **Erection, Testing, Installation and Commisioning:** 100% after Installation, testing, Commissioning & Integration with SCADA of equipment of installation duly certified by BRPL Project-in-charge.	
4	Completion time	Commissioning of Testing & Commissioning of materials: 10 weeks from date of LOI/ PO	
5	Defect Liability period	60 months after commissioning or 66 months from the last date of supply, whichever is earlier.	
6	Liquidated damages	1% of basic price for every week delay subject to maximum of 10% of total PO/WO value of undelivered units/ Service work.	
7	Contract Performance Bank Guarantee	Contract performance bank guarantee of total 10% of the contract price shall be submitted within 15 days of award of contract with the validity till completion of the contract period.	
8	Performance Bank Guarantee	10% of total PO value for 24 months after commissioning or 30 months from date of supply, whichever is earlier plus 3 months towards claim period	

BSES RAJDHANI POWER LIMITED

APPENDIX II

BID FORM

To

Head of Department
Contracts & Material Deptt.
BSES Rajdhani Power Ltd
New Delhi 110019

Sir,

1 We understand that BRPL is desirous of execution of ……(Name of work)

2 Having examined the Bidding Documents for the above named works, we the undersigned, offer to deliver the goods in full conformity with the Terms and Conditions and technical specifications for the sum indicated in Price Bid or such other sums as may be determined in accordance with the terms and conditions of the contract .The above amounts are in accordance with the Price Schedules attached herewith and are made part of this bid.

3 If our Bid is accepted, we under take to deliver the entire goods as) as per delivery schedule mentioned in Section IV from the date of award of purchase order/letter of intent.

4 If our Bid is accepted, we will furnish a performance bank guarantee for an amount of 10% (Ten)percent of the total contract value for due performance of the Contract in accordance with the Terms and Conditions.

5 We agree to abide by this Bid for a period of 120 days from the due date of bid submission & subsequent corrigendum/amendment/extension of due date of submission. It shall remain binding upon us and may be accepted at any time before the expiration of that period.

6 We declare that we have studied the provision of Indian Laws for supply of equipments/materials and the prices have been quoted accordingly.

7 Unless and until Letter of Intent is issued, this Bid, together with your written acceptance there of, shall constitute a binding contract between us.

8 We understand that you are not bound to accept the lowest, or any bid you may receive.

9 There is provision for Resolution of Disputes under this Contract, in accordance with the Laws and Jurisdiction of Contract.

Dated this..... day of..... 20…..

Signature..... In the capacity of

…….....duly authorized to sign for

and on behalf of

(IN BLOCK CAPITALS).....

BSES RAJDHANI POWER LIMITED

Appendix III

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed & stamped by the bidder along-with bid)

BSES Rajdhani Power Ltd (BRPL) intends to use reverse auction through SAP-SRM tool as an integral part of entire tendering process. All techno-commercially qualified bidders shall participate in the reverse auction.

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

1. In case of bidding through Internet medium, bidders are advised to ensure availability of all associated infrastructure as required to participate in the reverse auction event. Inability to bid due to telephone glitch, internet response issues, software & hardware hangs/failures, power failures or any other reason shall not be the responsibility of BRPL.
2. In case bidder fails to participate in the reverse auction event due to any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid submitted by them as a part of tender shall be considered as bidder's Final No Regret offer. Any off-line price bids received from a bidder in lieu of non-participation in the reverse auction event shall be rejected by BRPL.
3. The bidder is advised to understand the auto bid process t safeguard themselves against any possibility of non-participation in the reverse auction event.
4. The bidder shall be prepared with competitive price quotes during the day of reverse auction event.
5. The prices quoted by bidder in reverse auction event shall be on FOR Landed cost BRPL Store/site basis inclusive of all relevant taxes, duties, levies, transportation charges etc.
6. The prices submitted by the bidder during reverse auction event shall be binding on the Bidder.

7. The bidder agrees to non-disclosure of trade information regarding bid details e.g. purchase, Identity, bid process/technology, bid documentation etc.

8. BRPL will make every effort to make the bid process transparent. However award decision of BRPL will be final and binding on the bidder.

9. The prices submitted during reverse auction event shall be binding on the bidder.

10. No request for Time extension of the reverse auction event shall be considered by BRPL.

11. BRPL shall provide the user id and password to the authorized representative of the bidder. Authorization letter in lieu of the same shall be submitted along with the signed and stamped acceptance form.

12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all inclusive prices offered during conclusion of the reverse auction event for arriving at contract amount

APPENDIX IV

FORMAT FOR EMD BANK GUARANTEE

(To be issued in a Non Judicial Stamp Paper of Rs.50/-purchased in the name of the bank)

Whereas [*name of the Bidder*] (herein after called the "Bidder") has submitted its bid dated [*date of submission of bid*] for the supply of [*name and/or description of the goods*] (here after called the "Bid").

KNOW ALL PEOPLE by these presents that WE [name of bank] at [*Branch Name and address*],having our registered office at[*address of the registered office of the bank*](herein after called the "Bank"),are bound unto BSES Rajdhani Power Ltd., with it's Corporate Office at BSES Bhawan Nehru Place, New Delhi -110019 ,(herein after called —the "Purchaser")in the sum of Rs. ……/- (Rupees …….. only) for which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these presents.

Sealed with the Common Seal of the said Bank this_____ day of_____ 20____.

TH E CONDITIONS of this obligation are:

1 If the Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Bid Form ; or

2. If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity:

(a) Fails or refuses to execute the Contract Form, if required; or

(b) Fails or refuses to furnish the performance security, In accordance with the Instructions to Bidders/ Terms and Conditions;

We undertake to pay to the Purchaser up to the above amount upon receipt of its first written demand, without the Purchaser having to substantiate its demand, provided that is its demand the purchaser will note that amount claimed by it is due to it, owing to the occurrence of one or both of the two condition(s), specifying the occurred condition or condition(s).

This guarantee will remain in force up to and including One Hundred Twenty(120) days after the due date of submission bid, and any demand in respect thereof should reach the Bank not later than the above date.

(Stamp & signature of the bank)

Signature of the witness

APPENDIX - V

LITIGATION HISTORY

Year	Name of client	Details of contract & date	Cause of Litigation/ arbitration and dispute	Disputed amount

APPENDIX - VI
CURRENT CONTRACT COMMITMENTS/ WORK IN PROGRESS

Year	Name of client	Details of contract & date	Value of outstanding work	Estimated completion date

APPENDIX - VII

FINANCIAL DATA
(Duly Certified by Chartered Accountant)

	FY 20-21	FY 21-22	FY 22-23
Total assets			
Current assets			
Total Liability			
Current Liability			
Profit before taxes			
Profit after taxes			
Sales Turnover			

APPENDIX VIII

CHECK LIST

Sl No	Description	Compliance
1	INDEX	YES/NO
2	COVERING LETTER	YES/NO
3	BID FORM (UNPRICED) DULY SIGNED	YES/NO
4	BILL OF MATERIAL (UNPRICED)	YES/NO
5	DOCUMENTS IN SUPPORT OF QUALIFICATION CRITERIA	YES/NO
6	TECHNICAL BID	YES/NO
7	ACCEPTANCE TO COMMERCIAL TERMS AND CONDITIONS	YES/NO
8	FINANCIAL BID (IN SEALED ENVELOPE)	YES/NO
9	EMD IN PRESCRIBED FORMAT	YES/NO
10	DEMAND DRAFT OF RS 1000/- DRAWN IN FAVOUR OF BSES RAJDHANI POWER LTD	YES/NO
11	POWER OF ATTORNEY/AUTHORISATION LETTER FOR SIGNING THE BID	YES/NO
12	FINANCIAL DATA IN TABULAR FORMAT	YES/NO
13	LIST OF CURRENT COMMITMENTS/ WORK IN PROGRESS	YES/NO
14	BANK SOLVENCY CERTIFICATE	YES/NO
15	NO LITIGATION CERTIFICATE	YES/NO

BSES RAJDHANI POWER LIMITED

2APPENDIX-I
FORMAT FOR PERFORMANCE BANK GUARANTEE-ETC

(TO BE ISSUED ON RS 1OO/- STAMP PAPER)

Bank Guarantee No.

Place:

Date:

To
BSES Rajdhani Power Limited

Whereas BSES RAJDHANI POWER LTD (hereinafter referred to as the "Purchaser", which expression shall unless repugnant to the context or meaning thereof include its successors, administrators and assigns) has awarded to M/s.. with its Registered/ Head Office at

(hereinafter referred to as the "Supplier" which expression shall unless repugnant to the context or meaning thereof, include its successors administrators, executors and assigns), a contract no. dated (the Contract);

And whereas the value of the Contract is Rs. (The Contract Value).

And whereas it is a condition of the Contract that the Supplier shall provide a Performance Bank Guarantee for the due and faithful performance of the entire Contract for a sum equivalent to - % of the Contract Value to the Purchaser on or before

And whereas the Bank under instructions from the Supplier has agreed to guarantee dIe due performance of the Contract.
Now it is agreed as follows:

1. we (Name of the Bank) having its Head Office at
(hereinafter referred to as the Bank, which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) 5hall indemnify and keep indemnified the Purchaser for, and guarantee and undertake to pay to the Purchaser immediately on written demand, a sum equivalent to % of the Contract Value
as aforesaid at any time upto (day/month/year) without any demur, reservation,
contest, recourse or protest and/or without any reference to the Supplier, against all losses, damages, costs and expenses that may be caused to or suffered by the Purchaser by reason of any default on the pall of the Supplier in performing and observing any and allthe terms and conditions of the Contract or breach on the part if the Supplier of terms or conditions of the Contract.

2. The demand shall consist only of an original letter issued by Purchaser stating that the Supplier has failed to fulfill its obligations under the Contract. Such demand made by the Purchaser on the Bank shall be conclusive and binding notwithstanding any difference or dispute

between the Purchaser and the Supplier or any difference or dispute pending before any Court, Tribunal, Arbitrator or any other authority.

3. The Bank undertakes not to revoke this guarantee during its currency without previous written consent of the Purchaser and further agrees that the guarantee herein contained shall continue to be enforceable during the period that would be taken for satisfactory performance and fulfillment in all respects of the Contract or in the event of any dispute between the Purchaser and Supplier until the dispute is settled (provided that d1e claim! demand under this guarantee is lodged /referred during the currency of this guarantee) or till the Purchaser discharges this guarantee whichever is earlier.

4. The Purchaser shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee from time to time to extend the time for performance of the Contract by tbe Supplier. The Purchaser shall have the fullest liberty, without affecting the liability of the Bank under this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Supplier, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract. or any other course or remedy or security available to the Purchaser. The Bank shall not be released of its obligations under these presents by any exercise by the Purchaser of its liberty with reference: to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Purchaser or any other indulgence shown by the Purchaser of by any other matter or thing whatsoever which under law would, but for this provision, have the effect of relieving the Bank.

5. The Bank agrees that the Purchaser and its option shall be entitled to enforce this guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Supplier and notwithstanding any security or other guarantee that the Purchaser may hive in relation to the Supplier's liabilities.

6. Notwithstanding anything contained hereinabove the liability of the Bank under this guarantee is restricted to a sum equivalent to % of the Contract Value ie. Rs.(Rupees) and it shall remain in force upto and including .Unless a demand to enforce a claim under this guarantee is made against the Bank within 3 months from the the above date of expiry i.e. up to all the rights of the Purchaser under the said guarantee shall be forfeited and the Bank shall be released and discharged from all liabilities thereafter.

7. This Performance Bank Guarantee shall be governed by the laws of India.

Dated this Witness

day of 20……. at

1. For Bank

2. Signature
Name Power of Attorney No:

Banker's Seal

ANNEXURE –I-ETC

The Contractor must submit the following to Engineer-In-Charge before commencement of work:

a) Labor License under Contract Labor Act (R & A) Act 1970(All Engineer-in-charge responsible for execution of the job should obtain a copy of Labor License as per guidelines of HR department before start of the work by the contractor.)
b) PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.
c) All employees to have a temporary or permanent ESI Card as per ESI Act.
d) ESI Registration No.
e) PAN No.
f) Work Contract Tax/VAT Registration Number.

The Contractor must follow:

a) Third party Insurance Policy before start of work.

b) To follow Minimum Wages Act prevailing in the state.

c) Salary/ Wages to be distributed in presence of Company's representative not later than 7th of each month.

d) To maintain Wage- cum - Attendance Register.

e) To maintain First Aid Box at Site.

f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.

g) Workman Compensation Policy. (If applicable)

h) Labor license before start of work. (If applicable)

TECHNICAL SPECIFICATION
(Page 1- 65 as below)

BOQ Scada for DTC Ambedkar Nagar

S.No.	Items Required	Brief Specifications	Make	Qty	Units
1	RTU	RTU panel (Ref. BRPL Specs) , CPU -4 ETH and 4 serial ports(with master CPU redundancy) Supporting Protocols, IEC 104 master & slave, IEC 61850 client & server,IEC 103 slave , modbus RTU & Modbus TCP/IP,PSU(24-60V DC) with redundancy ,Diode -o-ring Unit- 2 No's, DI module-64 channels,DO module 48 channels,AI module-12 channels,Surge Protectors to be considered for AI channels,Ethernet Surge Arrestors-4 nos,Serial Surge Arrestors-4 nos.GPS receiver system for time Synchronisation.Warranty 5 Years for All Electronic modules.	ABB,Siemens,Schneider	1	No
2	Ethernet Switch	Managed , 16TX FE, 2 FX (LC type)GBE, LC type Managed, Aux Supply 48V DC ± Tolerance ,redundant power supply,Managed ports,19 inch flush mounting,should support 802.1d STP,802.1w RSTP,RADIUS/TACACS,Port mirroring, SNMP version 1,2,3 SNTP,SSH,SSL,HTTPS,DoS,ARP,spoofing prevention , VLan ,IEC 61850-3 compliant.Warranty 5 years	Hirschmann,Ruggedcom	1	No
3	Ethernet Switch Panel	Wall mounted,600(H)x570(W)x400(D)mm,2mm thickness,CRCA sheet ,shell type,standard color RAL7035 powder coating,Gland Plate as mentioned in drg.,Acrylic type front door,Fan & Filter at top mounting of Ethernet Switch shall be on slide-able and draw-able type heavy duty arrangement. Mounting arrangement shall be as shown in the drawing,Panel lock should be Chrome plated double –bit 3mm lock with 90 degree movement stainless steel lock,Panel Protection class shall be IP54. (for ref. Panel Drawing attached).		1	No.
4	Ethernet Switch	SW,ENET,6TX Fast Ethernet 2FX Gigabit ethernet, LC Type multimode ;8PORT;48VDC,managed,din rail ,dual redundant power supply,should support 802.1d STP,802.1w RSTP, RADIUS,TACACS,Port mirroring, SNMP Version 1,2,3 SNTP,SSH,SSL,HTTPS,DoS,ARP spoofing prevention,VLAN,IEC 61850-3.	Hirschmann,Ruggedcom	1	No
5	LIU 4 ports LC type	multimode	Preston	2	No
6	FO armored 8 fiber	multimode		50	M
7	Cable tray	TRAY,CBL,300MM;75MM;2.5MM;GI		50	M
8	CAT6 cable	CBL,ENET,CAT-6;4PAIR Armoured ,Shielded Twisted Pair	Beldon,DLINK	330	M
9	DI cable	CBL,CNTRL,ARM FRLS;1.1KV;1.5MM2;CU;8C		500	M
10	Cable Armored 2 core	CBL,PWR,2.5MM2;2CORE;MULTI STRAND CU		60	No
11	Gland ,CBL,1 inch,SGL CU CMPRSN	GLND,CBL,1IN;SS,SGL CMPRSN	comex	20	No
12	Gland ,CBL,1/2 inch,SGL CU CMPRSN	GLND,CBL,1/2 IN;SS,SGL CMPRSN	comex	30	No
13	RS485 cable armored	RS-485, 2 Pair 24AWG (7x32) Tinned Copper, PE Insulation, Overall Beldfoil®+Tinned Copper Braid(90%) Shield, PVC Outer Jacket, CM	Beldon 9842 or equivalent specifications	60	M
14	RS485 cable non armored	RS-485, 2 Pair 24AWG (7x32) Tinned Copper, PE Insulation, Overall Beldfoil®+Tinned Copper Braid(90%) Shield, PVC Outer Jacket, CM	Beldon 9842 or equivalent specifications	50	M
15	Cable 16 SQmm for Earthing	Copper, stranded, FRLS, green color,16 SQMM		20	M

Note: ***1*** ***For detailed material technical Specs,refer BRPL SAS Material specification documet***

2 **RTU Spares BOQ shall be as per BRPL Tender Technical Specs.**

BOQ Scada for DTC Ambedkar Nagar

S.No.	Work description	Qty	UOM
1	Installation of Ethernet Switch Panel on Wall.wall fasteners in vendors scope	1	No.
2	Installation of RTU.Floor mount using fasteners.Supply of Fasteners etc in Vendors scope.	1	Lot
3	Cable tray laying with joint plates, MS angle support and nut bolts (size 300*50*2mm thick) Note - Purchase of required MS Angle Supports with Joint Plates & Nut Bolts for Cable trays(1 Set equivalent to 2 numbers of Joint Plates + 8 No's Nut & Bolts + 16 Washers)comes under vendor Scope.	50	mtrs
4	Cable laying,glanding tagging , ferruling ,termination & Proper Dressing (16 core, 1.5 mm2).Supply of Thimbles,Tags & ferrule ,cable tie in vendors scope	500	mtrs
5	Cable laying, glanding,tagging & ferruling and termination& Proper Dressing (2 core, 2.5 mm2) Supply of Thimbles,Tags & ferrule ,cable tie in vendors scope	60	mtrs
6	Cable Laying ,glanding,Tagging & ferruling ,termination & Proper Dressing of RS485 cable (to connect MFM's)Supply of Thimbles,Tags & ferrule ,cable tie in vendors scope	110	mtrs
7	Cable Laying,glanding,tagging ,Crimping CAT-6 cable with proper tagging ,Glanding and dressing upto RTU/Switch panel). Supply of RJ45 Jacks with boot cover in vendors scope.	330	mtrs
8	Cable Laying,glanding,tagging ,crimping LC connectors panel and terminations till LIU's . Supply of LC connectors and other ancilliary material in bidders scope .	50	mtrs
9	Material Transportation	3	lots
10	OEM Services for configuration, testing and commissioning of RTU for communication with SCADA Control centre.	1	LOT
11	Earthing of RTU & Switch Panel	2	No's

Note : BRPL SAS Adaptation Specification document to be referred for details about standard and quality of services

DTC Ambedkar nagar Signal LIST				
		Signal Name	**Signal type**	**Integration source**
33KV INCOMING CIRCUITS	Status	CB STATUS	Double point input status	IED
		SPRING CHARGED	Single point input status	IED
		BREAKER IN SERVICE	Single point input status	IED
		TRIP CIRCUIT SUPERVISION	Single point input status	IED
		MASTER TRIP RELAY OPRTD	Single point input status	IED
		SCADA ENABLED	Single point input status	IED
		MAIN DC FAIL	Single point input status	RTU-HARDWIRED
		OCEF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		DIFF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		OVER CURRENT STAGE 1	Single point input status	IED
		OVER CURRENT STAGE 2	Single point input status	IED
		EARTH FAULT STAGE 1	Single point input status	IED
		EARTH FAULT STAGE 2	Single point input status	IED
		DIFFERENTIAL PROT OPRTD	Single point input status	IED
	FAULT DATA	R_PH FAULT CURRENT	Measured float	IED
		Y_PH FAULT CURRENT	Measured float	IED
		B_PH FAULT CURRENT	Measured float	IED
		N_PH FAULT CURRENT	Measured float	IED
	MEASURANDS	R_PH CURRENT	Measured float	MFM
		Y_PH CURRENT	Measured float	MFM
		B_PH CURRENT	Measured float	MFM
		R_Y PH VOLT	Measured float	MFM
		Y_B PH VOLT	Measured float	MFM
		B_R PH VOLT	Measured float	MFM
		ACTIVE POWER	Measured float	MFM
		REACTIVE POWER	Measured float	MFM
		POWER FACTOR	Measured float	MFM
		MAXIMUM DEMAND	Measured float	MFM
		NEUTRAL CURRENT	Measured float	MFM
		%THD VOLTAGE	Measured float	MFM
		%THD CURRENT	Measured float	MFM
	COMMAND	CB OPEN/CLOSE	DOUBLE POINT CONTRO	IED
		MASTER RESET	SINGLE POINT CONTRO	IED
33KV OUTGOING FEEDERS	Status	CB STATUS	Double point input status	IED
		SPRING CHARGED	Single point input status	IED
		BREAKER IN SERVICE	Single point input status	IED
		TRIP CIRCUIT SUPERVISION	Single point input status	IED
		MASTER TRIP RELAY OPRTD	Single point input status	IED
		SCADA ENABLED	Single point input status	IED
		MAIN DC FAIL	Single point input status	RTU-HARDWIRED
		OCEF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		DIFF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		OVER CURRENT STAGE 1	Single point input status	IED
		OVER CURRENT STAGE 2	Single point input status	IED
		EARTH FAULT STAGE 1	Single point input status	IED
		EARTH FAULT STAGE 2	Single point input status	IED
		DIFFERENTIAL PROT OPRTD	Single point input status	IED
	FAULT DATA	R_PH FAULT CURRENT	Measured float	IED
		Y_PH FAULT CURRENT	Measured float	IED
		B_PH FAULT CURRENT	Measured float	IED
		N_PH FAULT CURRENT	Measured float	IED
		R_PH CURRENT	Measured float	MFM
		Y_PH CURRENT	Measured float	MFM
		B_PH CURRENT	Measured float	MFM
		R_Y PH VOLT	Measured float	MFM

	MEASURANDS	Y_B PH VOLT	Measured float	MFM
		B_R PH VOLT	Measured float	MFM
		ACTIVE POWER	Measured float	MFM
		REACTIVE POWER	Measured float	MFM
		POWER FACTOR	Measured float	MFM
		MAXIMUM DEMAND	Measured float	MFM
		NEUTRAL CURRENT	Measured float	MFM
		%THD VOLTAGE	Measured float	MFM
		%THD CURRENT	Measured float	MFM
	COMMAND	CB OPEN/CLOSE	DOUBLE POINT CONTRO	IED
		MASTER RESET	SINGLE POINT CONTROI	IED
33KV BUS COUPLER	Status	CB STATUS	Double point input status	IED
		SPRING CHARGED	Single point input status	IED
		BREAKER IN SERVICE	Single point input status	IED
		TRIP CIRCUIT SUPERVISION	Single point input status	IED
		MASTER TRIP RELAY OPRTD	Single point input status	IED
		SCADA ENABLED	Single point input status	IED
		MAIN DC FAIL	Single point input status	RTU-HARDWIRED
		OCEF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		OVER CURRENT STAGE 1	Single point input status	IED
		OVER CURRENT STAGE 2	Single point input status	IED
		EARTH FAULT STAGE 1	Single point input status	IED
		EARTH FAULT STAGE 2	Single point input status	IED
	FAULT DATA	R_PH FAULT CURRENT	Measured float	IED
		Y_PH FAULT CURRENT	Measured float	IED
		B_PH FAULT CURRENT	Measured float	IED
		N_PH FAULT CURRENT	Measured float	IED
	MEASURANDS	R_PH CURRENT	Measured float	MFM 1
		Y_PH CURRENT	Measured float	MFM 1
		B_PH CURRENT	Measured float	MFM 1
		R_Y PH VOLT BUS1	Measured float	MFM 1
		Y_B PH VOLT BUS 1	Measured float	MFM 1
		B_R PH VOLT BUS 1	Measured float	MFM 1
		R_Y PH VOLT BUS 2	Measured float	MFM 2
		Y_B PH VOLT BUS 2	Measured float	MFM 2
		B_R PH VOLT BUS 2	Measured float	MFM 2
		ACTIVE POWER	Measured float	MFM 1
		REACTIVE POWER	Measured float	MFM 1
		POWER FACTOR	Measured float	MFM 1
		MAXIMUM DEMAND	Measured float	MFM 1
		NEUTRAL CURRENT	Measured float	MFM 1
		%THD VOLTAGE	Measured float	MFM 1
		%THD CURRENT	Measured float	MFM 1
	COMMAND	CB OPEN/CLOSE	Double Point Control	IED
		MASTER RESET	Single Point Control	IED
BATTERY CHARGER	STATUS	CHARGER A AC MCCB TRIP	Single point Status	Battery Charger Data Acquisition Unit through Modbus
		CHARGER A DC MCCB TRIP	Single point Status	
		CHARGER B AC MCCB TRIP	Single point Status	
		CHARGER B DC MCCB TRIP	Single point Status	
		BATTERY MCCB TRIP	Single point Status	
		INSULATION FAILURE (DC LEAKAGE)	Single point Status	
		CHARGER A RECT/CAP FUSE BLOWN	Single point Status	
		CHARGER B RECT/CAP FUSE BLOWN	Single point Status	
		CHARGER A DC VOLTAGE	Analog measured Input	
		CHARGER A DC CURRENT	Analog measured Input	
		CHARGER B DC VOLTAGE	Analog measured Input	
		CHARGER B DC VOLTAGE	Analog measured Input	
		BATTERY VOLTAGE	Analog measured Input	

	MEASURANDS	BATTERY CURRENT	Analog measured Input	
LI-ION BATTERY MODULE	LI-IONBATTERY STATUS	BATTERY BANK 1 STATE OF HEALTH	Single point Status	BATTERY MODULE THROUGH MODBUS
		BATTERY BANK 1 STATE OF CHARGE	Single point Status	
		BATTERY BANK 1 TEMPERATURE	Single point Status	
		BATTERY BANK 1 TERMINATE CHARGE ALARM	Single point Status	
		BATTERY BANK 1 TERMINATE DISCHARGE ALARM	Single point Status	
		BATTERY BANK 1 OVER CURRENT ON CHARGE	Single point Status	
		TOTAL VOLTAGE OV ALARM	Single point Status	
		TOTAL VOLTAGE UV ALARM	Single point Status	
		TOTAL VOLTAGE OV PROTECTION	Single point Status	
		TOTAL VOLTAGE UV PROTECTION	Single point Status	
		BATTERY BANK 1 OVER CURRENT ON DISCHAHRGE	Single point Status	
	LI- ION BATTERY MEASURANDS	TOTAL VOLTAGE	UNSIGNED INT	
		PACK VOLTAGE	UNSIGNED INT	
		CHARGING CURRENT	UNSIGNED INT	
		DISCARGE CURRENT	UNSIGNED INT	
		RATED CAPACITY	UNSIGNED INT	
		REMAINING CAPACITY	UNSIGNED INT	
Fire Suppression system	Status	suppression system cylinder 1 pressure valve oprtd	Single point Status	RTU-Hardwired
		suppression system cylinder 2 pressure valve oprtd	Single point Status	RTU-Hardwired
		suppression system cylinder 3 pressure valve oprtd	Single point Status	RTU-Hardwired
		suppression system cylinder 4 pressure valve oprtd	Single point Status	RTU-Hardwired
		Supression system common dc supply fail	Single point Status	RTU-Hardwired

BOQ Scada for DTC Srinivaspuri

S.No.	Items Required	Brief Specifications	Make	Qty	Units
1	RTU	RTU panel (Ref. BRPL Specs) , CPU -4 ETH and 4 serial ports(with master CPU redundancy) supporting Protocols, IEC 104 master & slave, IEC 61850 client & server,IEC 103 slave , modbus RTU & Modbus TCP/IP,PSU(24-60V DC) with redundancy ,Diode -o-ring Unit- 2 No's, DI module-64 channels,DO module 48 channels,AI module-12 channels,Surge Protectors to be considered for AI channels,Ethernet Surge Arrestors-4 nos,Serial Surge Arrestors-4 nos.GPS receiver system for time Synchronisation.Warranty 5 Years for All Electronic modules.	ABB,Siemens,Schneider	1	No
2	Ethernet Switch	Managed , 16TX FE, 2 FX (LC type)GBE, LC type Managed, Aux Supply 48V DC ± Tolerance ,redundant power supply,Managed ports,19 inch flush mounting,should support 802.1d STP,802.1w RSTP,RADIUS/TACACS,Port mirroring, SNMP version 1,2,3 SNTP,SSH,SSL,HTTPS,DoS,ARP,spoofing prevention , VLan ,IEC 61850-3 compliant.Warranty 5 years	Hirschmann,Ruggedcom	1	No
3	Ethernet Switch Panel	Wall mounted,600(H)x570(W)x400(D)mm,2mm thickness,CRCA sheet ,shell type,standard color RAL7035 powder coating,Gland Plate as mentioned in drg.,Acrylic type front door,Fan & Filter at top mounting of Ethernet Switch shall be on slide-able and draw-able type heavy duty arrangement. Mounting arrangement shall be as shown in the drawing,Panel lock should be Chrome plated double –bit 3mm lock with 90 degree movement stainless steel lock,Panel Protection class shall be IP54. (for ref. Panel Drawing attached).		1	No.
4	Ethernet Switch	SW,ENET,6TX Fast Ethernet 2FX Gigabit ethernet, LC Type multimode ;8PORT;48VDC,managed,din rail ,dual redundant power supply,should support 802.1d STP,802.1w RSTP, RADIUS,TACACS,Port mirroring, SNMP Version 1,2,3 SNTP,SSH,SSL,HTTPS,DoS,ARP spoofing prevention,VLAN,IEC 61850-3.	Hirschmann,Ruggedcom	1	No
5	LIU 4 ports LC type	multimode	Preston	2	No
6	FO armored 8 fiber	multimode		50	M
7	Cable tray	TRAY,CBL,300MM;75MM;2.5MM;GI		50	M
8	CAT6 cable	CBL,ENET,CAT-6;4PAIR Armoured ,Shielded Twisted Pair	Beldon,DLINK	330	M
9	DI cable	CBL,CNTRL,ARM FRLS;1.1KV;1.5MM2;CU;8C		500	M
10	Cable Armored 2 core	CBL,PWR,2.5MM2;2CORE;MULTI STRAND CU		60	No
11	Gland ,CBL,1 inch,SGL CU CMPRSN	GLND,CBL,1IN;SS,SGL CMPRSN	comex	20	No
12	Gland ,CBL,1/2 inch,SGL CU CMPRSN	GLND,CBL,1/2 IN;SS,SGL CMPRSN	comex	30	No
13	RS485 cable armored	RS-485, 2 Pair 24AWG (7x32) Tinned Copper, PE Insulation, Overall Beldfoil®+Tinned Copper Braid(90%) Shield, PVC Outer Jacket, CM	Beldon 9842 or equivalent specifications	60	M
14	RS485 cable non armored	RS-485, 2 Pair 24AWG (7x32) Tinned Copper, PE Insulation, Overall Beldfoil®+Tinned Copper Braid(90%) Shield, PVC Outer Jacket, CM	Beldon 9842 or equivalent specifications	50	M
15	Cable 16 SQmm for Earthing	Copper, stranded, FRLS, green color,16 SQMM		20	M

Note: ***1*** ***For detailed material technical Specs,refer BRPL SAS Material specification documet***

2 **RTU Spares BOQ shall be as per BRPL Tender Technical Specs.**

BOQ Scada for DTC Srinivaspuri

S.No.	Work description	Qty	UOM
1	Installation of Ethernet Switch Panel on Wall.wall fasteners in vendors scope	1	No.
2	Installation of RTU.Floor mount using fasteners.Supply of Fasteners etc in Vendors scope.	1	Lot
3	Cable tray laying with joint plates, MS angle support and nut bolts (size 300*50*2mm thick) Note - Purchase of required MS Angle Supports with Joint Plates & Nut Bolts for Cable trays(1 Set equivalent to 2 numbers of Joint Plates + 8 No's Nut & Bolts + 16 Washers)comes under vendor Scope.	50	mtrs
4	Cable laying,glanding tagging , ferruling ,termination & Proper Dressing (16 core, 1.5 mm2).Supply of Thimbles,Tags & ferrule ,cable tie in vendors scope	500	mtrs
5	Cable laying, glanding,tagging & ferruling and termination& Proper Dressing (2 core, 2.5 mm2) Supply of Thimbles,Tags & ferrule ,cable tie in vendors scope	60	mtrs
6	Cable Laying ,glanding,Tagging & ferruling ,termination & Proper Dressing of RS485 cable (to connect MFM's)Supply of Thimbles,Tags & ferrule ,cable tie in vendors scope	110	mtrs
7	Cable Laying,glanding,tagging ,Crimping CAT-6 cable with proper tagging ,Glanding and dressing upto RTU/Switch panel). Supply of RJ45 Jacks with boot cover in vendors scope.	330	mtrs
8	Cable Laying,glanding,tagging ,crimping LC connectors panel and terminations till LIU's . Supply of LC connectors and other ancilliary material in bidders scope .	50	mtrs
9	Material Transportation	3	lots
10	OEM Services for configuration, testing and commissioning of RTU for communication with SCADA Control centre.	1	LOT
11	Earthing of RTU & Switch Panel	2	No's

Note : BRPL SAS Adaptation Specification document to be referred for details about standard and quality of services

Signal List DTC Srinivaspuri				
		Signal Name	**Signal type**	**Integration source**
33KV INCOMING CIRCUITS	Status	CB STATUS	Double point input status	IED
		SPRING CHARGED	Single point input status	IED
		BREAKER IN SERVICE	Single point input status	IED
		TRIP CIRCUIT SUPERVISION	Single point input status	IED
		MASTER TRIP RELAY OPRTD	Single point input status	IED
		SCADA ENABLED	Single point input status	IED
		MAIN DC FAIL	Single point input status	RTU-HARDWIRED
		OCEF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		DIFF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		OVER CURRENT STAGE 1	Single point input status	IED
		OVER CURRENT STAGE 2	Single point input status	IED
		EARTH FAULT STAGE 1	Single point input status	IED
		EARTH FAULT STAGE 2	Single point input status	IED
		DIFFERENTIAL PROT OPRTD	Single point input status	IED
	FAULT DATA	R_PH FAULT CURRENT	Measured float	IED
		Y_PH FAULT CURRENT	Measured float	IED
		B_PH FAULT CURRENT	Measured float	IED
		N_PH FAULT CURRENT	Measured float	IED
	MEASURANDS	R_PH CURRENT	Measured float	MFM
		Y_PH CURRENT	Measured float	MFM
		B_PH CURRENT	Measured float	MFM
		R_Y PH VOLT	Measured float	MFM
		Y_B PH VOLT	Measured float	MFM
		B_R PH VOLT	Measured float	MFM
		ACTIVE POWER	Measured float	MFM
		REACTIVE POWER	Measured float	MFM
		POWER FACTOR	Measured float	MFM
		MAXIMUM DEMAND	Measured float	MFM
		NEUTRAL CURRENT	Measured float	MFM
		%THD VOLTAGE	Measured float	MFM
		%THD CURRENT	Measured float	MFM
	COMMAND	CB OPEN/CLOSE	DOUBLE POINT CONTRO	IED
		MASTER RESET	SINGLE POINT CONTRO	IED
33KV OUTGOING FEEDERS	Status	CB STATUS	Double point input status	IED
		SPRING CHARGED	Single point input status	IED
		BREAKER IN SERVICE	Single point input status	IED
		TRIP CIRCUIT SUPERVISION	Single point input status	IED
		MASTER TRIP RELAY OPRTD	Single point input status	IED
		SCADA ENABLED	Single point input status	IED
		MAIN DC FAIL	Single point input status	RTU-HARDWIRED
		OCEF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		DIFF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		OVER CURRENT STAGE 1	Single point input status	IED
		OVER CURRENT STAGE 2	Single point input status	IED
		EARTH FAULT STAGE 1	Single point input status	IED
		EARTH FAULT STAGE 2	Single point input status	IED
		DIFFERENTIAL PROT OPRTD	Single point input status	IED
	FAULT DATA	R_PH FAULT CURRENT	Measured float	IED
		Y_PH FAULT CURRENT	Measured float	IED
		B_PH FAULT CURRENT	Measured float	IED
		N_PH FAULT CURRENT	Measured float	IED
		R_PH CURRENT	Measured float	MFM
		Y_PH CURRENT	Measured float	MFM
		B_PH CURRENT	Measured float	MFM
		R_Y PH VOLT	Measured float	MFM

	MEASURANDS	Y_B PH VOLT	Measured float	MFM
		B_R PH VOLT	Measured float	MFM
		ACTIVE POWER	Measured float	MFM
		REACTIVE POWER	Measured float	MFM
		POWER FACTOR	Measured float	MFM
		MAXIMUM DEMAND	Measured float	MFM
		NEUTRAL CURRENT	Measured float	MFM
		%THD VOLTAGE	Measured float	MFM
		%THD CURRENT	Measured float	MFM
	COMMAND	CB OPEN/CLOSE	DOUBLE POINT CONTRO	IED
		MASTER RESET	SINGLE POINT CONTROI	IED
33KV BUS COUPLER	Status	CB STATUS	Double point input status	IED
		SPRING CHARGED	Single point input status	IED
		BREAKER IN SERVICE	Single point input status	IED
		TRIP CIRCUIT SUPERVISION	Single point input status	IED
		MASTER TRIP RELAY OPRTD	Single point input status	IED
		SCADA ENABLED	Single point input status	IED
		MAIN DC FAIL	Single point input status	RTU-HARDWIRED
		OCEF RELAY INTERNAL RELAY FAIL	Single point input status	RTU-HARDWIRED
		OVER CURRENT STAGE 1	Single point input status	IED
		OVER CURRENT STAGE 2	Single point input status	IED
		EARTH FAULT STAGE 1	Single point input status	IED
		EARTH FAULT STAGE 2	Single point input status	IED
	FAULT DATA	R_PH FAULT CURRENT	Measured float	IED
		Y_PH FAULT CURRENT	Measured float	IED
		B_PH FAULT CURRENT	Measured float	IED
		N_PH FAULT CURRENT	Measured float	IED
	MEASURANDS	R_PH CURRENT	Measured float	MFM 1
		Y_PH CURRENT	Measured float	MFM 1
		B_PH CURRENT	Measured float	MFM 1
		R_Y PH VOLT BUS1	Measured float	MFM 1
		Y_B PH VOLT BUS 1	Measured float	MFM 1
		B_R PH VOLT BUS 1	Measured float	MFM 1
		R_Y PH VOLT BUS 2	Measured float	MFM 2
		Y_B PH VOLT BUS 2	Measured float	MFM 2
		B_R PH VOLT BUS 2	Measured float	MFM 2
		ACTIVE POWER	Measured float	MFM 1
		REACTIVE POWER	Measured float	MFM 1
		POWER FACTOR	Measured float	MFM 1
		MAXIMUM DEMAND	Measured float	MFM 1
		NEUTRAL CURRENT	Measured float	MFM 1
		%THD VOLTAGE	Measured float	MFM 1
		%THD CURRENT	Measured float	MFM 1
	COMMAND	CB OPEN/CLOSE	Double Point Control	IED
		MASTER RESET	Single Point Control	IED
BATTERY CHARGER	STATUS	CHARGER A AC MCCB TRIP	Single point Status	Battery Charger Data Acquisition Unit through Modbus
		CHARGER A DC MCCB TRIP	Single point Status	
		CHARGER B AC MCCB TRIP	Single point Status	
		CHARGER B DC MCCB TRIP	Single point Status	
		BATTERY MCCB TRIP	Single point Status	
		INSULATION FAILURE (DC LEAKAGE)	Single point Status	
		CHARGER A RECT/CAP FUSE BLOWN	Single point Status	
		CHARGER B RECT/CAP FUSE BLOWN	Single point Status	
		CHARGER A DC VOLTAGE	Analog measured Input	
		CHARGER A DC CURRENT	Analog measured Input	
		CHARGER B DC VOLTAGE	Analog measured Input	
		CHARGER B DC VOLTAGE	Analog measured Input	
		BATTERY VOLTAGE	Analog measured Input	

	MEASURANDS	BATTERY CURRENT	Analog measured Input	
LI-ION BATTERY MODULE	LI-IONBATTERY STATUS	BATTERY BANK 1 STATE OF HEALTH	Single point Status	BATTERY MODULE THROUGH MODBUS
		BATTERY BANK 1 STATE OF CHARGE	Single point Status	
		BATTERY BANK 1 TEMPERATURE	Single point Status	
		BATTERY BANK 1 TERMINATE CHARGE ALARM	Single point Status	
		BATTERY BANK 1 TERMINATE DISCHARGE ALARM	Single point Status	
		BATTERY BANK 1 OVER CURRENT ON CHARGE	Single point Status	
		TOTAL VOLTAGE OV ALARM	Single point Status	
		TOTAL VOLTAGE UV ALARM	Single point Status	
		TOTAL VOLTAGE OV PROTECTION	Single point Status	
		TOTAL VOLTAGE UV PROTECTION	Single point Status	
		BATTERY BANK 1 OVER CURRENT ON DISCHAHRGE	Single point Status	
	LI- ION BATTERY MEASURANDS	TOTAL VOLTAGE	UNSIGNED INT	
		PACK VOLTAGE	UNSIGNED INT	
		CHARGING CURRENT	UNSIGNED INT	
		DISCARGE CURRENT	UNSIGNED INT	
		RATED CAPACITY	UNSIGNED INT	
		REMAINING CAPACITY	UNSIGNED INT	
Fire Suppression system	Status	suppression system cylinder 1 pressure valve oprtd	Single point Status	RTU-Hardwired
		suppression system cylinder 2 pressure valve oprtd	Single point Status	RTU-Hardwired
		suppression system cylinder 3 pressure valve oprtd	Single point Status	RTU-Hardwired
		suppression system cylinder 4 pressure valve oprtd	Single point Status	RTU-Hardwired
		Supression system common dc supply fail	Single point Status	RTU-Hardwired

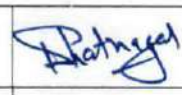
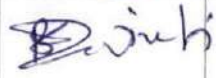
BSES Rajdhani Power Limited
BSES Bhawan, Nehru Place, New Delhi- 19

BRPL

TECHNICALSPECIFICATION

FOR

SCADA SUBSTATION AUTOMATION SYSTEM

Prepared by	Sanjay Bhatnagar		Rev: 0
Reviewed & Approved by	BHUWANESH DWIVEDI		Date: 07-10-22

1.0 INTENT OF SPECIFICATION:

This specification is intended to cover the supply and execute work related to interface of all electrical equipment with RTU panel complete with all materials and accessories for efficient and trouble free operation. In the event of any discrepancy with the listed documents, the stipulation of this specification shall govern.

2.0 SCOPE OF WORK

For substation, it is proposed to lay and terminate panel wirings / control cables if any between the equipment such as CT, PT, Circuit Breaker, Isolators, 11 KV Switchgear, 66,33,11 KV Control & Relay Panels, Power Transformer & its sensors – OTI, WTI, TPI, AVR, etc, REGDA relay, Capacitor Bank, NIFPS, Smoke Detectors and Battery Charger.

The scope of work under this category would include:

- Supply of SCADA materials – BCPU & RTU with Processors (Basic License - IEC 870-5,101,103,104, Modbus, IEC 61850-8-1, IEC -104 Master, IEC 104 Slave + PLC License) along with IO Modules. Other accessories such as Communication Rack, Power Supply Modules, MFM, GPS, Converters for DC to DC & Other FO Converters, Cables - FO, CAT-6, RS485, Control Cables and Connectors if any shall be in SCADA vendor's scope of supply.
- Installation, Testing & Commissioning of SCADA equipment with Control Center via IEC-104 Protocol.
- Integration, Database development & Testing of SCADA Front end equipment (Sub Station level equipment integration over Modbus TCP IP,Serial/IEC-103/IEC-61850 Protocols.
- Extraction of ICD / SCD files from IED and further integration with RTU over IEC-61850 / IEC103 Protocols at site with Supplied Hardware.
- Supply of Necessary RTU Till Tool with Licenses & Softwares if any (Ex: IET600) required forICD/SCD file configuration in RTU.
- Laying and Termination of armored Communication cables (Ethernet, Fiber Optic Patch Cards/Cable, RS 485 cables) between grid devices (Numerical Relays / BCPU, Transformer Monitoring Modules, Smoke detector, NIFPS panel, MFM, Battery Charger) to RTU/DCU/Gateway with proper tagging, and dressing up to RTU panel. Supply of SuitableGlands, White Sleeve PVC ferrule, tagging, lugs shall be scope of vendor's supply.
- Laying and termination of control cables between grid equipment (control and relay panel, NIFPS, Battery Units) to RTU for hardwired signals.
- Installation of cable trays with accessories or trench as required for the cabling work.
- Integration of PQA over Modbus TCP IP/IEC-61850 with dedicated network.
- Integration Li-Ion Battery Charger over Modbus TCP IP/Serial with RTU.

- Preparation of cable schedule, wiring diagrams, Training documents with Step by Step . Procedures and Interconnection as built drawings.
- Separate earthing bus bars to be provided for RTU panel and it will be directly connected to grid earthing . Earth BAR material should be Copper.
- Separate earth riser with connections for Electronic cards, gateway, Switches, DCU etc.
- All internal wiring between BCU and C&R Panel terminals, All Numerical relays, MFM (Multifunctional meters) and other grid equipment integration should be under SCADA vendor's scope.
- Hardware & software integration of RTU, Bay Control Units along with other equipment viz. Battery Chargers, Multi-Function Meters, Fire Fighting System Signals, Transformer relays (for OTI, WTI, TPI, AVR, etc.), Smoke Detector Panels, Numerical Relays,
- 11&33&66KV Control and Relay panel signals etc. shall be in Vendor's scope.
- FAT and Training arrangements at factory/Work shop for BSES SCADA team (6 Persons for5 days) – Travel, Boarding, accommodation and local conveyance etc. Shall be under SCADA Vendor's Scope.

2.1 Cables

The following types of cables / wirings will be required for extending signals and commands. Tagging is mandatory for all types of cables. Heat shrinking ferrule sleeves with printed ferrules to be used for identifying cables & Signals.

- 2.5 mm2, multi-stranded flexible copper wire, FRLS 1.1KV HRPVC for AC & DC Supply & 1.5 mm2 multi strand cables for other internal wiring for RTU.
- Red (P)and Black(N) color cable core to be used for AC and DC wiring.
- Fiber Optic Cables (GLASS&PLASTIC Types) with suitable connectors & Ethernet cables (CAT6) with conduit pipe for internal connections and GI Armored Cables for external connections.
- 2 C X 2.5 MM2 multi strained copper cable, ARM FRLS 1.1KV HRPVC for external AC / DCPower Supply.
- 10C/16/6 C x 1.5 mm2, multi strained copper cable, ARM FRLS 1.1KV HRPVC, application for digital signal feedback / command (DI/DO).
- 6 C x 1.5 mm2, multi strained screened copper cable, ARM FRLS 1.1KV HRPVC, Application:digital signal feedback (AI).
- 3P X 1.5 mm2 for DO (Digital output)
- Suitable Insulated lugs – Ring, U Type to be used for SCADA terminations.
- 2P X 0.5 mm2 Screened GI Armored RS485, Twisted pair (2 Pair), 22gauge Belden, 9842 8761 or equivalent for external (RTU to BCUs /MFM/BATT.CHG/Transformer Monitoring Devices) RS 485 connections.

The supplied cable shall be as per latest IS, also refer control cable specification & Armored cables should be supplied for trench applications.

❖ **Cable Gland**

Double Compression cable glands (Materials - Brass and Stainless Steel & Suitable for Industrial Grade) of different sizes for cable entry into the RTU, DCU, CRP & Other Panels

❖ **Cable Trays and NS cable Support**

➢ Perforated / ladder type (galvanized Iron) with cover for laying all type of the cables.

2.2 Multifunction Meters (Accuracy – 0.2)

To extend the current / voltage / active and reactive power, power factor, etc. to RTU, MFMs, to be installed in C & R Panel individually for each feeder/ breakers and should be integrated with RTU. The outputs of these meters (in groups of 5) connections should be made using twisted pair screened cable (Typically 22gauge Belden 8761 or equivalent) & two wires (A and B) connections are daisy chained together and integrated with RTUs. All hardware's or protocol converters for having Modbus Protocol output, CT & PT wirings to MFMs and its Configuration should be in Vendor's scope.

For the protection of MFMs and RTU cards against Surges and electrical leakages, it is necessary to install Surge Protection Devices in b/w RTU & MFM serial loops. The typical diagram for this connection is mentioned in the System Architecture diagram. MFM should be powered through Grid Battery Voltage (220 Volt-or 50 Volts DC as per site requirement).

The following parameters of MFM must be available for communication with RTU.

- Phase Voltages (L1-N, L2-N, L3-N)
- Line Voltages (L1-L2, L2-L3, L1-L3)
- Line Currents (IL1 , IL2, IL3)
- Active Power & Reactive Power
- Maximum Demand (KW) & Frequency
- Power factor
- Active Energy and reactive Energy
- THD mean current & THD mean Voltage
- Neutral Current.
- Phase Angles

Approved Makes – RISH 3440 and Conzerv EM 6400NG+

2.3 Numerical Relays or Bay Control Protection Units for all feeders (11, 33, 66 KV)

Numerical IEDs / Relays shall be integrated with Remote Terminal Units. All hardware's and protocol converters if required for compatibility with SCADA shall be in Vendor's scope.
The respective BCPU(IED) must have **dual redundancy communication ports** (Ethernet/Copper/FO Ports) with **RSTP & PRP** protocols for SCADA connections & It will be connected to RTU via IEC 61850 protocol. (Dual Ports required to form a **RSTP & PRP** Networks b/w relay to relay connections).
Data Base File must be downloadable and Up-loadable from BCU.
The following signals are to be taken from Numerical Relays to the BCUs through internal hard wiring. This list is indicative only and number of signals should not be limited to this. Additional signals should be taken during review of actual drawings. – **Refer Para 2.8 for detail signals list with data format (DPI, DCO, SPI, SCO, Measured Values) types.**

- Online Currents / Voltage & 86 Relay trip signal
- All breaker, Isolators, Control & Relay Panel indications and commands
- Fault current all phase and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/FRelay).
- Fault Differential and Bias current in Line and Transformer Differential Relay
- Fault voltage and phase indication of faulty phase viz. R, Y, B (Voltage Protection Relay).
- Post fault currents (R, Y, B phase separately) measured value & Relay Internal Fault
- Fault distance (in case of distance relays - R, Y, B Phase separately)
- Unbalance Current (in case of neutral displacement relay of capacitor feeders).

2.4 Transformer Signal – Transformer Monitoring Unit (TMU):

OTI, WTI, TPI, AVR, OLTC counts and Transformer auxiliary protection signals should be integrated with RTU via IEC 61850 / IEC103 / Modbus Protocol. TMU must have dual communication ports & have the option of RSTP and PRP Protocols for SCADA Connections. All field installations of these sensors and its wiring/cabling and configuration along with hardware's or protocol converters, if any, should be in Contractor's scope. - **Refer Para 2.8 for detail signal's list with data types.**

2.5 Battery Charger and Lithium Battery Integrations:

Battery Chargers and Lithium Ion Battery bank should support MODBUS RTU Protocol and integrated with RTU through serial communication (RS 485) cables.
Laying communication cables through conduit pipe and battery charger signals (Soft & Hard Signals) integration with an RTU shall be in Vendor's Scope. - **Refer Para 2.8 for detail Battery Charger signal's list with data types.**

2.6 Data Concentrator Unit / Gateway & Remote Terminal Units

For extending the signals from the grid to the Master Control Centre & Backup Control Centre, BCPUs and RTUs are to be installed. BCPUs needs to be initially physically integrated with Numerical relays of respective breakers to enable soft signals and commands for breakers to be configured there and respective BCPU integrated with Remote TerminalUnits through IEC – 61850 protocol. However the options for IEC-60870-103 protocol along with the MODBUS protocol option is required for other devices integrations. BCPUs can be of **ABB, Siemens, Schneider Electric, GE**, etc. make is depending on the type / make of switch gears. **Remote Terminal Units need to be installed for interface between the BCPUs and Control Centers (Main and Backup) through IEC – 60870 – 104 Protocol.** The size of RTU will depend on the size of the substation, no. of the feeders / number of signals and command outputs along with sufficient spares (20%) for future requirement.
All associated equipment and Supply of accessories including software & Operating tool / multiple user licenses for RTU & BCPU, MCBs for DC and AC Supply, DC to DC Converter (in case station battery voltage level is 220 volts DC), etc. should be in Vendor's scope.
Hardware & software integration of RTUs, BCPU along with other equipment viz. Battery Chargers, Multi-Function Meters, Fire Fighting Systems, Signals, Transformer relays (for OTI, WTI, TPI, AVR, etc.), Numerical Relays, etc. should be in Vendor's scope.

Hot redundancy is required for Main Processor Modules, rack board, PSU and Gateway for MCC & BCC Communications. Each main processor must have two Ethernet ports dedicated for communication with SCADA servers over IEC 60870-104 protocol. While First Module will be live, redundant should be hot standby and vice versa. Communication switchover between either modules in case of failure. Main Processor module along with Rack for MCC communication should be separate from the IO cards.
All modules (IO/Processors/PSU) must have **conformal Coating** to protect against moisture, dust, chemicals and harsh environments.
Data Base File must be downloadable and Up-loadable from RTU, CPU and Gateway. **Approved RTU makes – ABB-RTU560, Schneider-SAITEL DP, Siemens A8000. Bidders who are OEM of RTU and Numerical Relays are acceptable if approved after evaluation of performance during trial. (Observation Period – 90 Days with Minimum 90 IED Capacity) with successful test results are main criteria for induction of any new models in BRPL.**

Note : System shall be approved if they agree to fulfill the following terms & Conditions. It is applicable for all OEM products.

- AMC period of 3 years shall be given along with this proposal.
- AMC period shall be started after handing over the system to BRPL.
- During AMC period all the issues pertaining to RTU/Gateway/BCU shall be handled by OEM at site irrespective of number of site visits.
- 5 Year replacement warranty is applicable to OEM's Electronic RTU Modules, Gateway Units Network devices etc .If any hardware (or) Software fails during this period shall be rectified by OEM on site within 48 hours.

- Antivirus/Cyber Security solution for Gateway/RTU unit with 5 years validity need to be considered. Patches update if any, required with in this period shall be under OEM's scope.
- 5 years warranty is mandatory for all SCADA/RTU products (Electronic modules/cards, GPS, Ethernet Switches, HMI etc.). If any cards fails/burns due to surges from CT, PT via RS485/serial, Surges through cables etc. then replacement shall be under OEM's scope till warranty period. Suitably designed SPD's shall be incorporated in the circuits as per the site requirements to avoid such failures.

RTU/ Data Concentrator Unit Features & Performance capabilities

2.6.1 RTU, DCU Size and Expandability

20% Spare for RTU, DCU - Provision for 20 % (Basic IO Count +20% Spare) of the total DI / DO signals (hard/soft) as a spare shall be made available for future requirement.

Spare Communication Port – In RTU there shall be the provision of 3 to 4 spare ports to accommodate IEC 103/Mod Bus Protocol Connections and spare port 1 each, for IEC 104 and IEC 61850 communication.

20% Spare for BCPU - Each Control and Relay panel BCU must have 20% (Basic + 20% Spare)of the particular bay DI/DO signals as a spare.

Panel Size & Hardware Capacity - The RTU system shall have the capacity of accommodating additional 50% of the basic I/O counts by addition of hardware such as modules, racks, panels, Terminal Blocks of basic I/O counts.

Software license Capacity - The RTU software license shall have the minimum capacity to configure 5000 data points and to configure minimum 150 IED's.

2.6.2 Remote database, downloading of RTU from master station / SCADA control center.

2.6.3 RTU shall have the capability of automatic start-up and initialization following restoration of power after an outage without the need for manual intervention. All restarts shall be reported to the connected master stations.

2.6.4 Act as a data concentrator on IEC60870-5-101/104/MODBUS/IEC 61850 protocols and Support for IEC 60870-5-103, IEC 60870-5-101, IEC 61850,MODBUS TCP IP and RS485 Modbus RTU protocols & ability to act as a gateway for Numerical relays.

2.6.5 Cyber Security

As the SCADA system will use public domain, such LAN/VSAT/GPRS/CDMA etc. therefore it is mandatory to guard the data/ equipment. from intrusion/damage/breach of security & shall have SSL/VPN based security.

2.6.6 Internal battery backup to hold data in SOE buffer memory & also maintaining the time & date.

2.6.7 RTU must have the capability of time synchronization with a GPS receiver and the GPS atthe control room will be used for this synchronization purpose. In case of failure of the GPS receiver, the RTUs time synchronization should be through the Master's SCADA clock.

2.6.8 **GPS for Time Synchronization** - The RTU must have inbuilt or external GPS with antenna & internal real time clock to synchronize the IEDs connected to it over their respective protocol. **GPS must have dual redundant LAN port for time synchronization.**

Approved Makes – MASSIBUS & SANDS

2.6.9 **Main Processor(CPU in RTU & Gateway) HOT Redundancy for MCC & BCC communication**

Main processor (DCU) /RTU should have adequate capacity for data handling / processing and main processor/CPU must have required number of communication ports for simultaneous communication with Master Stations (MCC & BCC), /MFTs and RTU configuration & maintenance tool. RTU main processor/Gateway must have HOT redundancy features for control center communications.

RTU Processor must have the capacity of integration of minimum 120 IED's over IEC -61850 Protocol.

2.6.10 **Hot Standby/Dual Power Supply Unit & Redundancy in power source for RTU and BCU/BCPU** - Possibility to increase the RTU,BCU main rack availability by having a second power supply card in case the first one fails , if any one Power supply card fails the other one should keep the system continuous live.

2.6.11 **CPU/RTU Soft Configuration Future (Communicate to multiple master stations simultaneously on IEC60870-5-104.)**

RTU/DAU must have multiple location (minimum 5 Locations) data transmission facility viz Master Control Centre, Backup Control Centre etc.

2.6.12 **Protection Devices for RTU, BCPU** – All modules (all **Digital, Analog Input modules)** and ports **(Serial and Ethernet ports)** must have in-built or external surge protection devicesand optical isolation

2.6.13 **RTU Self Diagnostic /Data logger function with licence--**

RTU shall be provided with self diagnostic feature/function that continuously monitors the operation of the RTU and report RTU hardware errors to the connected master stations. The function shall check for memory, processor, and input/output ports errors and failures of other functional areas defined in the specification of the RTU. If any system tries to connect to RTU for download/ Unload files, it should be stored as a log in RTU.

2.6.14 **RTU Panels**

At least 50% of the space inside each enclosure shall be unused (spare) space that shall be reserved for future use. The OEM shall provide required panels conforming to IEC 529

for housing the RTU modules/racks, relays, Ethernet switches etc. and other requiredhardware. The panels shall meet the following requirements:

- Shall be free standing, floor mounted and height shall not exceed 2200 mm.
- RTU Panel should have air cooling with FAN with Filters/ louvers mounted on rear side of RTU panel with temperature/humidity control facility.
- Separate room / Cabinet with AC Provision to be considered for RTU and IT Equipment.
- All doors and removable panels shall be fitted with long life rubber gaskets for sealing.
- All non-load bearing panels/doors ,top and bottom portion, rear cover shall be fabricated from minimum 2.0 mm thickness steel sheet and all load bearing panels, frames, top & bottom panels shall be fabricated from minimum 3.0 mm thickness steel sheet.
- Shall have maintenance access to the hardware and wiring through lockable full height doors.
- Shall have the provisions for bottom cable entry.
- All panels shall be supplied with 230V AC, 50 Hz, single-phase, 5 A switch & duplex socket arrangement for maintenance.
- All panels shall be provided with white LED lights of 9W rating at front and rear for illumination. Limit switches should be provided on the doors to control the switching.
- All panels should be provided with heater & thermostat for controlling moisture and should be installed on safe location inside the panel.
- All panels shall meet IP54 class ofIngress protection.
- There shall be no sharp corners or edges. All edges shall be rounded to prevent injury.
- Document Holder shall be provided inside the cabinet to keep test report, drawing, maintenance register etc.
- All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trims shall be made of flame retardant material and shall not produce toxic gases under fire conditions.

2.6.15 RTU Grounding

The safety ground shall be isolated from the signal ground and shall be connected to the ground network. Safety ground shall be a copper bus bar. The contractor shall connect the panel's safety ground to the grid grounding network. Separate grounding (2Pits) is created for communication equipment and Signal ground shall be connected to the communication equipment signal ground. The grid station should be at equipotential.

2.7 Ethernet /Fiber Switch

The Ethernet/Fiber optic switches should be a managed switch and are intended to be installed in the control room and shall be compliant to IEC-61850-3 electrical substation networks and IEEE 1613 standards. Provisions for additional feeders on the Ring Configuration should be provided on the same switch.

- Laying of Ethernet/Fiber cables for relay/BCU port to the RTU via switch through conduit pipe / metal galvanized tray and integration with an RTU shall be in Vendor's Scope.

Ethernet/FO Switch Standard Features

- Switch design should withstand for power substation automation applications that operate in extremely harsh environment (High and niedium voltage Substation environment) and it also withstands vibration, electrical surges, fast transients, electrostatic discharge, and extreme temperatures and humidity. Industrial managed Fast Ethernet Switch shall be supplied according to IEEE 802.3.
- Switch features and configuration should be easy to user interface and it must directly integrate with any other IEC-61850 devices. Shall be managed type, Layer-2 Switches and have KEMA certifications for IEC 61850.
- The FO switch shall support Multimode fiber and single mode fiber in 100Mbps ports on an SFP (simple form factor pluggable), for ease of functionality and maintenance.100Mbps ports for substation level communications & 2 or 4 Gigabit Ports for uplink communications as per site requirement.
- Ethernet Switch PCB / PSU must have conformal Coating to protect against moisture, dust,chemicals and extreme temperatures etc.
- Ambient conditions: Operating Temperature -40+70 °C, Storage temperature -40 +85 °C, Relative Humidity 5-95%
- Redundancy Ring: Dual Ring to be consider between Ethernet switches for maintaining redundancy network.
- Hot Standby/Dual PSU & Redundancy in power supply - Possibility to increase the switch availability by having a second power source in case the first one fails. Each PSU should be connected with a different power source, if anypower source or Power supply card fails then other one should keep the switch continuous operation with auto changeover.
- 20% Spare ports – 20% ports should be available as spare for future enhancements.
- Link Failure /Watchdog contact alarm –Programmable Link failure/watch dog contact to be provided as solid state relay hardwired contact.
- Logs and alarms with Time Stamp - Statistics about link status alarms are to be stored with the accurate timestamps duly tracing all events.
- Security features - The switch shall support different user access levels with different passwords, including the facility to work with different VLANs, following the 802.1Q standard, port security based on MAC addresses, possibility to disable unused ports, authentication protocols shall be provided. The switch shall have advanced cyber security features to be implemented to avoid unauthorized access to the system such as RADIUS/TACACS+ & VPN gateway support with IP Sec & SSH.
- High Speed Implementation of RSTP protocol - The switch shall support STP and RSTP protocols and shall facilitate for recovery and the fault recovery times shall be within 5 -10msec per switch, always fulfilling the RST protocol.
- Time Synchronization to RTU/Server and Connected IED/BCU – The switch shall have an internal clock and shall be synchronized from a network SNTP/NTP server, so all time stamped events shall be with a reliable time reference. Also Switch must have the feature of acting as SNTP Server.

- Tools with License - Diagnostics tool, other necessary tools with a multi user license to be provided along with the switch.
- Mounting Options - Switch should be DIN Rail/Flush mountable as per the site requirements with tool kit for mounting to be included.
- Local USB /console port for emergency boot/configuration is Mandatory.
- Network based distributed security by having a firewall on each port of the switch for all the standard Industrial protocol like IEC-61850 should be available.
- The switch shall have the facility of Port mirroring and the user shall configure one port to replicate traffic flows of different ports, so the system administrator can monitor the incoming, outgoing or all kinds of traffic that is going through the ports under study.
- ITU-T G.8032 support for Ethernet Ring redundancy, ensuring fast failure detection is preferred.
- They switches shall sustain the stringent levels in temperature range and electromagnetic immunity defined in the 61850-3, but also the advanced functional requirements defined for operation with other IEC-61850 devices. The Switch should becertified on IEC-61850, functional & Environmental specifications by KEMA.
- ETH Switch Panel :
    - ETH Switches & LIU should be fixed in dedicated wall / Floor mountable cabinet in11kV and 33/66KV CRP Room.
    - Panel must have Sliding tray's for installation of switches.
    - Panel have suitable AC and DC MCB of appropriate rating and relevant accessories for supply.
    - All doors and removable panels shall be fitted with long life rubber gasket for sealing.
    - All non-load bearing panels/doors ,top and bottom portion, rear cover shall be fabricated from minimum 2.0 mm thickness steel sheet and all load bearing panels, frames, top & bottom panels shall be fabricated from minimum 2.0 mm thickness steel sheet.
    - Shall have maintenance access to the hardware and wiring through lockable doors.
    - Shall have the provisions for bottom cable entry.
    - All panels shall be supplied with 230V AC, 50 Hz, 5A switch & socket arrangement with a lamp inside the panel.
    - All panels shall be indoor and IP54 class of Ingress protection.
    - Front Toughened glass door with turning angle around 180 deg.
    - There shall be no sharp corners or edges. All edges shall be rounded to prevent injury.
    - All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trims shall be made of flame retardant material and shall not produce toxic gases under fire conditions.
- Approved Makes of Switches – **RUGGEDCOM, CISCO & HIRSCHMANN.**

2.8 SIGNAL LIST (11/33/66KV)

List of Abbreviations
AI - Analog Input/Analog Values
MV - Measured Value
MFM - Multi Function Meter
DCO - Double Command Output
DPI - Double Point Indication
SCO - Single Command Output
SPI - Single Point Indication
RTU - Remote Terminal Units
BCU - Bay Control Units

Signals - 11KV Out Going Feeders	Digital Input/AI soft through N.Relay/BCPU	Digital Out Put soft through N.Relay/BCPU	Digital Input Hard Wire to RTU	Additional Signals Hard wire to RTU for backup	Signal Type	N.Relay Protocol
Breaker ON	√			√		IEC-61850 with Dual Communication Ports
Breaker OFF				√	DPI	
Trip Ckt Healthy -1	√				SPI	
Trip Ckt Healthy - 2	√				SPI	
Spring Charge	√				SPI	
Breaker in service	√				SPI	
Breaker in Test	√				SPI	
Auto Trip(86) Operated	√				SPI	
Panel DC Fail				√	SPI	
L/R Switch in Local	√		√		SPI	
L/R Switch in SCADA					SPI	
Relay Int Fault.				√	SPI	
Over Current Operated	√		√		SPI	
Earth Fault Operated	√				SPI	
BKR Close COMMAND					SPI	
BKR Open COMMAND		√		√	DCO	
AutoTrip(86) relay reset from Remote		√			SCO	
3Phase R,Y,B - Current & Voltage,Active Power,Reactive Power,Power Factor,Max.Demand,Neu.Current	√				AI/MV	
Fault current and phase indication of faulty phase viz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).Disturbance Records,Fault Graphs for Remote diagnosis purpose	√				AI	
Total Signals - BCPU & RTU	10 DI +IGEN DI + Analog , Measurand Values	3 DO	2DI	5DI + 2 DO		

Chapter 6b. Technical Specification for SCADA interface work & Automation

Essential Inbuilt Spare in BCPU	3 DI	2 DO				

Signals 33 KV Incomers	Digital Input/AI soft through N-Relay/BCPU	Digital Out Put soft through N-Relay/BCPU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	N-Relay Protocol
Breaker ON	√			√	DPI	IEC-61850 with dual Communication Ports
Breaker OFF				√		
Trip Ckt Healthy - 1	√				SPI	
Trip Ckt Healthy - 2	√				SPI	
Spring Charge	√				SPI	
Breaker in service	√				SPI	
Breaker in Test					SPI	
Auto Trip(86) Operated	√			√	SPI	
VT fuse Blown - Metering.	√				SPI	
VT fuse Blown – Protection	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local	√				SPI	
L/R Switch in SCADA				√	SPI	
Relay Int Fault.			√		SPI	
Over Current Operated(All stages)	√				SPI	
Earth Fault Operated (All stages)	√				SPI	
Under Voltage Prot.Operated	√				SPI	
Over Voltage Prot.Operated	√				SPI	
REF Operated	√				SPI	
BKR Close COMMAND		√		√	DCO	
BKR Open COMMAND				√		
AutoTrip(86) relay reset from Remote		√			SCO	
3Phase R,Y,B - Current & Voltage,Active Power,Reactive Power,Power Factor,Max.Demand,Neu.Current	√				AI/MV	
Fault current and phase indication of faulty phase viz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).Fault voltage and phase indication of faulty phaseviz. R,Y,B (Voltage Protection Relay). Disturbance Records, Fault Graphs for Remote diagnosis purpose	√				AI	
Total Signals - BCPU & RTU	12 DI + IGEN Digital+Analog , Measurand Values	3 DO	2DI	5DI + 2 DO		
Essential inbuilt Spare in BCPU	3 DI	2 DO				

Technical Specifications for SCADA Interface work & Automation

Signals - 11KV Bus Coupler	Digital Input/AI softthrough N:Relay/BCU	Digital OutPut soft through N:Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire toRTU for backup	Signa l Type	N:Relay Protocol
Breaker ON	√			√	DP I	IEC-61850 with Dual Communication Ports
Breaker OFF				√		
Trip Ckt Healthy -1	√				SPI	
Trip Ckt Healthy -2	√				SPI	
Spring Charge	√				SPI	
Breaker in service	√				SPI	
Breaker in Test					SPI	
Auto Trip(86) Operated	√			√	SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local	√				SPI	
L/R Switch in SCADA				√	SPI	
Relay Int Fault.			√		SPI	
PT MCB - Metering operated	√				SPI	
PT MCB - Protection operated	√				SPI	
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
BKR Close COMMAND		√		√	DCO	
BKR Open COMMAND						
Fault current and phase indication of faulty phase viz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).Disturbance Records,Fault Graphs for Remote diagnosis purpose	√				AI	
Total Signals - BCPU & RTU	10 DI +IGEN DI + Analog, Measurand Values	3 DO	2DI	5DI + 2 DO		
Essential inbuilt Spare in BCPU,BCU	3 DI	2 DO				

Signals - 11KV Capacitors	Digital Input/AI softthrough N:Relay/BCPU	Digital OutPut soft through N:Relay/BCPU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire toRTU for backup	Signa l Type	N:Relay Protocol
Breaker ON	√			√	DPI	IEC-61850 with Dual Communication Ports
Breaker OFF				√		
Bank ISO ON	√				DPI	
Bank ISO OFF						
Trip Ckt Healthy -1	√				SPI	
Trip Ckt Healthy -2	√				SPI	
Spring Charge	√				SPI	
Breaker in service	√				SPI	
Breaker in Test					SPI	
Master Trip(86) Operated	√			√	SPI	

Bus PT fuse Blown - Metering.	√				SPI
Bus PT fuse Blown - Protection	√				SPI
Panel DC Fail			√		SPI
L/R Switch in Local	√				SPI
L/R Switch in SCADA	√			√	SPI
Over Current Operated	√				SPI
Earth Fault Operated	√				SPI
Under Voltage Prot.Operated	√				SPI
Over Voltage Prot.Operated	√				SPI
Neg.Phase.sequence Operated	√				SPI
Timer Relay operated/Normal	√				DPI
Relay Int Fault.			√		SPI
BKR Close COMMAND		√		√	DCO
BKR Open COMMAND					
BANK ISO OPN		√			DCO
BANK ISO CLS					
Master trip (86)reset from remote		√			SCO
3Phase R,Y,B - Current&Voltage,Reactive Power,Neu.Current	√				AI/MV
Fault current and phase indication of faulty phase viz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).Fault voltage and phase indication of faulty phaseviz. R,Y,B (Voltage Protection Relay). Disturbance Records, Fault Graphs for Remote diagnosis purpose	√				AI
Total Signals - BCPU & RTU	12 DI + IGEN DI+Analog , Measurand Values	5 DO	6DI	5DI + 2 DO	
Essential inbuilt Spare in BCPU	3 DI	2 DO			

Signals -33 & 66KV Incomers/Out Going	Digital Input/AI soft through N:Relay/BCPU	Digital Out Put soft through N:Relay/BCPU	Digital Input/Output Hard Wire to RTU	Additional Spare signals (Hard wire to RTU for backup)	Signal Type	Protocol
Breaker ON	√			√	DPI	IEC-61850 with Dual Communication Ports.
Breaker OFF						
Front Bus (89A) ISO ON(In-Case of O/D)	√			√	DPI	
Front Bus (89A) ISO OFF (In-Case of O/D)						
Rear Bus (89B) ISO ON (In-Case of O/D)	√			√	DPI	
Rear Bus (89B) ISO OFF (In-Case of O/D)						
LINE ISO (89L) ON (In-Case of O/D)	√			√	DPI	
LINE ISO (89L) OFF (In-Case of O/D)						
Earth Switch (89LE) -1 ON (In-Case of O/D)	√				DPI	
Earth Switch (89LE) -1 OFF (In-Case of O/D)						
Earth Switch (89LE) - 2 ON (In-Case of O/D)	√				DPI	
Earth Switch (89LE) - 2 OFF (In-Case of O/D)						
Breaker in service (In-case of I/D BKR)	√				SPI	
Breaker in Test (In-case of I/D BKR)	√				SPI	

Trip coil Ckt Healthy - 1	√				SPI	
Trip coil Ckt Healthy - 2	√				SPI	
Spring Charge	√				SPI	
Master trip(86) Operated	√			√	SPI	
SF6 Pressure Low	√				SPI	
SF6 Lock Out	√				SPI	
VT fuse Fail	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local	√				DPI	
L/R Switch in Remote	√			√		
LBB Operated	√				SPI	
Relay Int Fault.			√		SPI	
Over Current Operated (All stages)	√				SPI	
Earth Fault Operated (All stages)	√				SPI	
DIFF.Prot Operated	√				SPI	
DIST.Plot Operated	√				SPI	
BKR CLS COMMAND		√		√	DCO	
BKR OPN COMMAND				√		
Front Bus (89A) ISO OPNCOMMAND (In-Case of O/D)		√			DCO	
Front Bus (89A) ISO CLS COMMAND (In-Case of O/D)						
Rear Bus (89B) ISO CLS COMMAND (In-Case of O/D)		√			DCO	
Rear Bus (89B) ISO OPN COMMAND (In-Case of O/D)						
LINE ISO (89L) OPN COMMAND (In-Case of O/D)		√			DCO	
LINE ISO (89L) CLS COMMAND (In-Case of O/D)						
Master Trip(86) relay reset from Remote		√			SCO	
3Phase R,Y,B - Current&Voltage,Active&Reactive Power,PowerFactor,Max.Demand,Neu.Current etc	√				AI/MV	
Fault current and phase indication of faulty phaseviz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Relay). Fault Differential and Bias current in Line and Transformer Differential Relay ,Fault distance (in Distance Relay) ,Disturbance Records, Fault Graphs for Remote diagnosis purpose	√				AI	
Total Signals - BCPU & RTU	29 DI + IGEN DI+Analog Measurand Values	9 DO	3DI	8DI + 8 DO		
Essential inbuilt Spare in BCPU	6 DI	3 DO				

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Signals - 33 & 66KV Transformer	Digital Input/AI soft through N/Relay/BCPU	Digital Out Put soft through N/Relay/BCPU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	Protocol
Breaker ON	√			√	DPI	IEC-61850 with dual Communication Ports
Breaker OFF						
Front Bus (89A) ISO ON(In-Case of O/D)	√			√	DPI	
Front Bus (89A) ISO OFF (In-Case of O/D)						
Rear Bus (89B) ISO ON (In-Case of O/D)	√			√	DPI	
Rear Bus (89B) ISO OFF (In-Case of O/D)						
TRF ISO (89T) ON (In-Case of O/D)	√			√	DPI	
TRF ISO (89T) OFF (In-Case of O/D)						
Earth Switch (89LE) -1 ON (In-Case of O/D)	√				DPI	
Earth Switch (89LE) -1 OFF (In-Case of O/D)						
Earth Switch (89LE) - 2 ON (In-Case of O/D)	√				DPI	
Earth Switch (89LE) - 2 OFF (In-Case of O/D)						
Breaker in service (In-case of I/D BKR)	√				DPI	
Breaker in Test (In-case of I/D BKR)						
Trip coil Ckt Healthy - 1 & 2	√				SPI	
Spring Charge	√				SPI	
Auto Trip(86) Operated	√			√	SPI	
Differential Operated	√				SPI	
LBB Operated	√				SPI	
REF/SEF Prot Operated	√				SPI	
SF6 Pressure Low & SF6 Lock Out	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local	√				DPI	
L/R Switch in Remote	√			√		
Relay Int Fault.			√		SPI	
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
BKR CLS COMMAND		√		√	DCO	
BKR OPN COMMAND				√		
Front Bus (89A) ISO OPNCOMMAND (In-Case of O/D)		√			DCO	
Front Bus (89A) ISO CLS COMMAND (In-Case of O/D)						
Rear Bus (89B) ISO CLS COMMAND (In-Case of O/D)		√			DCO	
Rear Bus (89B) ISO OPN COMMAND (In-Case of O/D)						
Trf ISO (89T) OPN COMMAND (In-Case of O/D)		√			DCO	
Trf ISO (89T) CLS COMMAND (In-Case of O/D)						
Mastertrip (86) relay reset from Remote		√			SCO	
3Phase R,Y,B -Current&Voltage,Active&Reactive Power,PowerFactor,Max.Demand,Neu.Current	√				AI/MV	

Fault current and phase indication of faulty phaseviz. R,Y,B, Earth, Unbalance(O/C & E/F Relay),Fault voltage and phase indication of faultyphase viz. R,Y,B (Voltage Protection Relay). Fault Differential and Bias current in Line and Transformer Differential Relay ,Fault distance (in Distance Relay) ,Disturbance Records, Fault Graphs for Remote diagnosis purpose	√				AI	
Total Signals - BCPU & RTU	28 DI + IGEN DI+Analog, Measurand Values	9 DO	4DI	8DI + 8 DO		
Essential inbuilt Spare in BCPU	6 DI	3 DO				

Transformer - RTCC/A-Eberle Signals	Digital Input/AI soft through TMM	Digital Out Put soft through TMM	Digital Input/Output Hard Wire to RTU	Analog Input soft through TMM	Signal Type	Protocol
A-Eberle Unit Faulty/DC Fail			√		SPI	IEC-61850 with Dual Communication Ports
Oil Temp Alarm	√				SPI	
Oil Temp trip	√				SPI	
Winding Temp Alarm	√				SPI	
Winding Temp Trip	√				SPI	
Buchholz Alarm	√				SPI	
Buchholz Trip	√				SPI	
PRV TRIP	√				SPI	
OLTC OSR	√				SPI	
MOG/LOW Oil level Alarm	√				SPI	
SPR Trip	√				SPI	
OSR Main Tank	√				SPI	
L/R Switch In Local	√				DP I	
L/R Switch in Remote	√					
Auto Mode	√				DP I	
Manual Mode	√					
Fan Fail	√				SPI	
Tap Changer Fail	√				SPI	
OLTC Out of Step/Stuck Up/Motor trip	√				SPI	
Tap Rise/Tap Low Command		√			DCO/RCO	
Tap Rise/Tap Low Command		√				
Oil Temp				√	AI	
Winding Temp				√	AI	
Tap Position				√	AI	
Total Signals - BCPU & RTU	19 DI	2 Command	1 DI	3 Analog, Measurand Values		
Essential inbuilt Spare in BCPU	2 DI	1 DO				

Technical Specification for SCADA interface work & Automation

Signals - 33 & 66KV Bus Coupler	Digital-Input/AI soft through N.Relay/BCPU	Digital Out Put soft through N.Relay/BCPU	Digital-Input/Output Hard-Wire to RTU	Additional signals Hard wire to RTU for backup	Signal-Type	Protocol
Breaker ON	√			√	DPI	IEC-61850 with Dual Communication Ports
Breaker OFF						
Front Bus (89A) ISO ON(In-Case of O/D)	√			√	DPI	
Front Bus (89A) ISO OFF (In-Case of O/D)						
Rear Bus (89B) ISO ON (In-Case of O/D)	√			√	DPI	
Rear Bus (89B) ISO OFF (In-Case of O/D)						
Earth Switch (89AE-1) - ON (In-Case of O/D)	√				DPI	
Earth Switch (89AE-1) - OFF (In-Case of O/D)						
Earth Switch (89AE-2) - ON (In-Case of O/D)					DPI	
Earth Switch (89AE-2) - OFF (In-Case of O/D)						
Earth Switch(89BE-3) - ON (In-Case of O/D)	√				DPI	
Earth Switch(89BE-3) - OFF (In-Case of O/D)						
Earth Switch(89BE-4) - ON (In-Case of O/D)					DPI	
Earth Switch(89BE-4) - OFF (In-Case of O/D)						
Breaker In service (In-case of I/D BKR)	√				DPI	
Breaker in Test (In-case of I/D BKR)						
Trip coil Ckt Healthy - 1 & 2	√				SPI	
Spring Charge	√				SPI	
Auto Trip(86) Operated	√			√	SPI	
SF6 Pressure Low	√				SPI	
SF6 Lock Out	√				SPI	
VT fuse-1 Blown	√				SPI	
VT fuse-2 Blown	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local	√				DPI	
L/R Switch in Remote	√			√		
LBB Operated	√				SPI	
Relay Int Fault.			√		SPI	
Over Current Operated (All stages)	√				SPI	
Earth Fault Operated(All stages)	√				SPI	
BKR CLS COMMAND		√		√	DCO	
BKR OPN COMMAND				√		
Front Bus (89A) ISO OPNCOMMAND (In-Case of O/D)		√			DCO	
Front Bus (89A) ISO CLS COMMAND (In-Case of O/D)						
Rear Bus (89B) ISO CLS COMMAND (In-Case of O/D)		√			DCO	
Rear Bus (89B) ISO OPN COMMAND (In-Case of O/D)						
AutoTrip(86) relay reset from Remote		√			SCO	
3Phase R,Y,B - Current ,BUS PT-01 & BUS PT023Phase votages.	√				AI/MV	

Fault current and phase indication of faulty phaseviz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).Fault voltage and phase indication of faultyphase viz. R,Y,B (Voltage Protection Relay). Fault Differential and Bias current in Line and Transformer Differential Relay ,Fault distance (in Distance Relay) ,Disturbance Records, Fault Graphs for Remote diagnosis purpose	√				AI	
Total Signals - BCPU & RTU	31 DI + IGEN DI + Analog ,Measurand Values	9 DO	2DI	6DI + 6 DO		
Essential inbuilt Spare in BCPU	6 DI	3 DO				

Signals - 33 & 66KV CAP Bank	Digital Input/AI soft through N.Relay/BCPU	Digital Out Put soft through N.Relay/BCPU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	Protocol
Breaker ON	√			√	DPI	IEC-61850 With Dual Communication Ports
Breaker OFF						
Front Bus (89A) ISO ON(In-Case of O/D)	√			√	DPI	
Front Bus (89A) ISO OFF (In-Case of O/D)						
Rear Bus (89B) ISO ON (In-Case of O/D)	√			√	DPI	
Rear Bus (89B) ISO OFF (In-Case of O/D)						
CAP Bank ISO ON (In-Case of O/D)	√			√	DPI	
CAP Bank ISO OFF (In-Case of O/D)						
Earth Switch ON (In-Case of O/D)	√				DPI	
Earth Switch OFF (In-Case of O/D)						
Trip coil Ckt Healthy - 1 & 2	√				SPI	
Spring Charge	√				SPI	
Auto Trip(86) Operated	√			√	SPI	
SF6 Pressure Low & SF6 Lock Out of all chambers	√				SPI	
VT fuse Blown	√				SPI	
Cap Discharge Time	√				SPI	
Netural Displacement	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local/Remote	√			√	DPI	
LBB Operated	√				SPI	
Relay Int Fault.			√		SPI	
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
Under Voltage Prot.Operated	√				SPI	
Over Voltage Prot.Operated	√				SPI	
BKR CLS COMMAND		√		√	DCO	
BKR OPN COMMAND				√		
Front Bus (89A) ISO OPNCOMMAND (In-Case of O/D)		√			DCO	
Front Bus (89A) ISO CLS COMMAND (In-Case of O/D)						
Rear Bus (89B) ISO CLS COMMAND (In-Case of O/D)		√			DCO	

Rear Bus (89B) ISO OPN COMMAND (In-Case of O/D)						
CAP Bank ISO OPN COMMAND (In-case of O/D)		√			DCO	
CAP Bank ISO CLS COMMAND (In-case of O/D)						
3Phase R,Y,B - Current& Voltage,Reactive Power,Neu.Current	√				AI/MV	
Fault current and phase indication of faulty phaseviz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).Fault voltage and phase indication of faultyphase viz. R,Y,B (Voltage Protection Relay). Fault Differential and Bias current in Line and Transformer Differential Relay ,Fault distance (In Distance Relay) ,Disturbance Records, Fault Graphs for Remote diagnosis purpose	√				AI	
Total Signals - BCPU & RTU	26 DI + Analog Measurand Values	9 DO	2DI	10DI + 10 DO		
Essential inbuilt Spare in BCPU,BCU	6 DI	3 DO				

Signals - BUS PT-1&2	Digital Input/AI soft through N:Relay/BCU	Digital OutPut soft through N:Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire toRTU for backup	Signal Type	Protocol
BUS A (89A) ON	√			√	DPI	IEC-61850 with Dual Communication Ports
BUS A (89A) OFF						
BUS B (89B) ON	√			√	DPI	
BUS B (89B) OFF						
Earth Switch (89LE) - 1 ON	√				DPI	
Earth Switch (89LE) - 1 OFF						
Earth Switch (89LE) - 2 ON	√				DPI	
Earth Switch (89LE) - 2 OFF						
BUS-A ISO OPN COMMAND		√		√	DCO	
BUS-A ISO CLS COMMAND						
BUS-B ISO OPN COMMAND		√		√	DCO	
BUS-B ISO CLS COMMAND						
Total Signals - BCPU & RTU	8 DI	4 DO		4DI+4DO		
Essential Spare in BCPU	2 DI	1 DO				

Signals - Smoke Detector - ALL Sensors,Manual Call Points Integration with RTU over MODBUS TCP/IP Protocol.	Soft Signals	Signal Type	Protocol
All Sensors Alarm operated Signals(10 to 20 Sensors)	√	SPI	MODBUS Serial (or)TCP/IPProtocol with Dual Communication Ports
All Manual Call Points - MCP-1,MCP-2,etc...	√	SPI	

Signals - Battery Charger	Digital Input/AI soft through RTU	AI from Transducer(4 to 20MA) /AI Hard wire signal to RTU	Signal Type	Protocol
CHG A AC M/F CUM AC U/V	√		SPI	Modbus Serial Rs485 RTU Protocol with Dual ports
CHG A AC OVER VOLTAGE	√		SPI	
CHG A RECTIFIER FUSE BLOWN	√		SPI	
CHG A FILTER FUSE BLOWN	√		SPI	
CHG A DC MCB TRIP/OFF	√		SPI	
CHG A DC UNDER VOLTAGE	√		SPI	
CHG A DC OVER VOLTAGE	√		SPI	
CHG A FLOAT	√		SPI	
CHG A BOOST	√		SPI	
CHG A DC FAIL	√		SPI	
CHG B AC M/F CUM AC U/V	√		SPI	
CHG B AC OVER VOLTAGE	√		SPI	
CHG B RECTIFIER FUSE BLOWN	√		SPI	
CHG B FILTER FUSE BLOWN	√		SPI	
CHG B DC MCB TRIP/OFF	√		SPI	
CHG B DC UNDER VOLTAGE	√		SPI	
CHG B DC OVER VOLTAGE	√		SPI	
CHG B FLOAT	√		SPI	
CHG B BOOST	√		SPI	
CHG B DC FAIL	√		SPI	
BATTERY MCCB TRIP/OFF	√		SPI	
DC system Earth	√		SPI	
Insulation fault	√		SPI	
Charger A AC INPUT CURRENT	√		AI	
Charger A AC INPUT VOLTAGE	√		AI	
Charger A DC OUTPUT CURRENT	√		AI	
Charger A DC OUTPUT VOLTAGE	√		AI	
Charger B AC INPUT CURRENT	√		AI	
Charger B AC INPUT VOLTAGE	√		AI	
Charger B DC OUTPUT CURRENT	√		AI	
Charger B DC OUTPUT VOLTAGE	√		AI	
Battery Current	√		AI	
Battery Load Voltage	√		AI	
Battery Voltage from Transducer		√	AI	4 to 20 MA O/P
Battery Current from Transducer		√	AI	

Signals - LT Board	Digital Input Hard Wire to RTU	MFM data through Modbus protocol	Signal Type & Meter OP ⇨ Modbus with Dual Ports.
LT AC Fail	√		SPI

R,Y,B Phase Current		√	AI

Signals - Fire Fighting(All Transformers)	Digital Input Hard Wire toRTU	Signal Type
SYSTEM OPERATED	√	SPI
SYSTEM OUT OF SERVICE	√	SPI
TCIV CLOSED	√	SPI
FIRE DETECTOR TRIP	√	SPI
N2 CYLINDER PRESSURE LOW	√	SPI
FIRE SYSTEM ALARM	√	SPI
DC SUPPLY FAIL	√	SPI

MFM - BUS PT-1 & 2 Signals (Front & Rear BUS)	Data Type	Protocol
R-Phase Current	MV/MFI	Modbus Serial Rs485 RTU
Y-Phase Current	MV/MFI	
B-Phase Current	MV/MFI	
Neutral Current	MV/MFI	
R-Y Phase Voltage	MV/MFI	
Y-B Phase Voltage	MV/MFI	
B-R Phase Voltage	MV/MFI	

MFM - Signals - All Feeders (Including Bus Section/Coupler OF 11/33/66 KV)	Data Type	Protocol
R-Phase Current	MV/MFI	Modbus Serial Rs485 RTU
Y-Phase Current	MV/MFI	
B-Phase Current	MV/MFI	
Neutral Current	MV/MFI	
R-Y Phase Voltage	MV/MFI	
Y-B Phase Voltage	MV/MFI	
B-R Phase Voltage	MV/MFI	
Active Power	MV/MFI	
Active Energy	MV/MFI	
Reactive Power	MV/MFI	
Power Factor	MV/MFI	
Maximum Demand	MV/MFI	
Phase angle 1	MV/MFI	
Phase angle 2	MV/MFI	
Phase angle 3	MV/MFI	
THD Mean Current	MV/MFI	
THD Mean Voltage	MV/MFI	

Note1 : Suitable Heavy Duty Relay /Contactor's with free Wheeling Diode to be placed in between RTU- DO card & Trip/Close Coil circuits of respective breakers for all breaker /Isolator open & Close circuits..It should be placed either at RTU (or) Breaker panel end.Its Potential free contact will be connected in the Closing/Tripping Coil Circuits.

Note 2: Incase of Indoor GIS Panel then all SF6 Low/Lockout of all chamber signals(Approximately 10 to 15 signals per chamber) to be wired up to RTU.
Note 3: PQA (Protocol – Modbus TCP IP/IEC-61850 with dedicated switch to be offered for communication with RTU as well as Router) & Lithium Ion Signal will be finalized at the time of drawing review.
Note4: All Panels - IRF, DC FAIL SIGNALS can be preferred to terminate with adjacent relays to avoid hard wiring.

2.8.1. **Comments -**

Analog signals (Fault Current levels, Disturbance records, Fault graphs for remote diagnosis, etc.)from Numerical relays needs to be confirmed by vendor before finalize the tender documents.

All the above mentioned signals (Refer Signal List -2.8) including Notifier / Smoke Detector Signalare compulsory and additional signal (10%) will be considered during detailed engineering.

Following indications data format should be configured as a DPS (Double point Status) in Relay (BCPU).

- All Feeders Circuit Breaker ON & Circuit Breaker OFF
- All Feeders BUS Isolators (89A, 89B, 89L, 89T) - ON & OFF
- All Earth Switches ON & OFF

Following command data format should be configured as a DPC (Double point control) inRelay (BCPU).

- All Feeders Circuit Breaker - Open & Close
- All Feeders BUS Isolators (89A, 89B, 89L, 89T) - Open & Close
- All Earth Switches – Open & Close.

3.0 Key Points -

1 All SCADA equipment viz. DAU / DCU, MFM, Battery Charger, A-eberle relays, etc. Should be powered through auxiliary supply of 48 V (or) 220 Volt DC.

2 Power Supply for Routers/ Gateway (IT Equipment) through an existing battery bank via DC to DC Converters (Input: 48 VDC/220 VDC, Output: 12 Volt DC) or as per the requirements of Routers.

Converter 01 Specifications: Input 220 Volt DC & Output 12 to 48 Volt DC

Converter 02 Specifications: Input 220 Volt DC (or) 48 Volt DC & Output 12 Volt DC

3 Any other wiring / cabling if required due to non availability of serial communication /MODBUS/IEC 61850 protocols (with justified reason) should be hardwired and that is in Contractor's scope.

4 All Fire Suppression signals to be consider as a hard wire and terminated up to RTU.

5 Suitable transducers with an output of 4-20 mA have to be installed in the RTCC /Battery charger if required and the outputs of these transducers should be extended to terminal for further extension to the RTU.

6 STATION BUS : Topology
- IED to Switch : PRP Network/Protocol with CU (or) FO Ports.
- Redundant Ring with Ethernet /Copper Cable – Switch to Switch & LIU.
- Redundant Ring with Fiber Optic Cable – From Switch/LIU to RTU/Gateway.
- Note: Ring Network topology will be decided during the detail engineering stage.

7 The C & R ,RTCC, Battery Charger Panel should have additional spare contacts (potential free)for all SCADA signals,– **Refer Signal List 2.8**

8 **Data Base File must be down-loadable and Up-loadable from RTU, CPU, BCPU, BCU and Gateway.**

9 **Separate Room/Cabinet with AC for RTU and IT Equipment.**

10 ***Warranty (5 Years) for SCADA products - All Supplied SCADA material should cover warranty for the duration of 5 years & Warranty period will start after successful commissioning of the SCADA equipment at site. If any SCADA materials found faulty during warranty period should be replaced within two weeks.***

11 **Training at Lab/Factory** should be provided on configuration, installation, commissioning aspects of RTU,DCU,BCPU and Numerical Relay at your training/work center to the BSES SCADA team (4 to 5 persons) at factory/training center(5 days) comes under Vendor's scope.

Training documents to be submitted for approval & Documents should contain all the necessary installations,connections and Data Base development procedure & further trouble shooting procedure,etc..shall also be provided in the manual.

Training at Site: Vendor shall provide One trainer at site for training after commissioning of SCADA RTU at site.

12 **Spares:** loose Spare Materials for following items with below mentioned quantity to besupplied for emergency back up/maintenance purpose.
- CPU (Main Processor) with Ethernet Interface Card/Memory in RTU – 1 No
- CPU(Main Processor Module in BCPU) – 1 No
- Gateway – 1 No
- RTU Rack – 1 No
- BCPU with Rack – 1 No
- Communication Module for IEC-103 & Modbus Communications with Serial InterfaceCard/Memory in RTU – 1 No
- DO Contactots – 10% of supplied qty.
- DI/DO/AI/ Cards in RTU – 10% of the total IO signals
- DI/DO/AI/ Cards in BCPU – 10% of the total IO signals
- PSU Cards in RTU – 1 No

- Ethernet Switches (AS PER SA) – 2 No's
- LIU Unit – 1 No
- Fiber Optic Patch Cards with Connectors - 20% of total installed cables.
- MFM – 5% of Supplied Qty.
- FO Armored Cable with connectors – 100 Mtrs
- DC to DC converters if any for RTU Supply – 1 No.

13 **Protection devices for all SCADA Equipmentes –**

- Surge Protection devices installation between RTU & MFM Serial loops.
- SPD for Main DC Source.
- HDR/Inter Posing Relay for all Digital Output Signal's.
- All modules (All Digital, Analog Input modules in BCPU and RTU) and ports (Serial andEthernet ports) must have in-built or external surge protection devices and optical isolation.

14 System Architecture : System Architecture should be submitted at the time of tenderingprocess.

15 Following tools to be supplied

- laptop 1 No to be supplied with following specification
  15G8# 4U8T5PA Processor:- Intel i7 11800H, 11th Gen, RAM:-16 GB DDR4, SSD:- 1 TB , Ethernet: Giga bit network connection, Bluetooth 4.1, Camera:720p HD, Diplay :- 15.6" FHD, Graphics :- Intel UHD Graphics, Audio :- Stereo with Dolby, Integrated dual digital aray microphone, Mouse : Wired Optical, Battery life :- Up to 8.7 Hours, with OS WIN10 Pro with license & MS office with license , Laptop carry bag, 64 Bit along With 5 years On-site warranty.

16 Drawings/GTP shall be submitted to BRPL-3 Sets hardcopy for approval in the event of awardof work.

17 As Built Drawings 3 Sets Hard copy and 2 set in Pen drive shall be submitted at the time of Handover of project for Final billing.

18 DB back up along with Software in Pen drive shall be handover at the time of Handover of project for Final billing.

19 **All the above features are indicative only and detailed engineering and deviation shall be analyzed just before actual procurement and with discussion through a supplier/ vendor.**

4.0 System Architecture Diagram

The Tentative System Architecture diagram is enclosed for reference. It will be revised during the approval stage of drawings..

5.0 PACKING AND SHIPMENT

Shall be packed such that protected against corrosion, dampness, heavy rains, breakage and vibration in GPS Enabled Vehicle and shipment status through GPS Device shall be sent to BRPL Project incharge Via SMS/Email.

6.0 QUALITY ASSURANCE

Factory Acceptance Test : BRPL executives shall be visiting the vendors factory for inspection of Supply material. Travel Ticket (return flight), local travel, boarding and lodging shall be in vendor's scope.

Field Quality Plan : Vendor shall submit a field quality paln for approval of buyer before taking up the execution work at site.

7.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless the owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.No deviations will be acceptable post order.

BSES
BSES Rajdhani Power Limited

WALL MOUNTED ETHERNET SWITCH PANEL TECHNICAL DESIGN SPECIFICATIONS

INDEX

Prepared By.

ADITYA UNIYAL
Emp. ID-41008200
DGM-SCADA Autom. Dept.
BSES Rajdhani Power Limited
(A Joint Venture with Govt. of NCT Delhi)

Reviewed By.

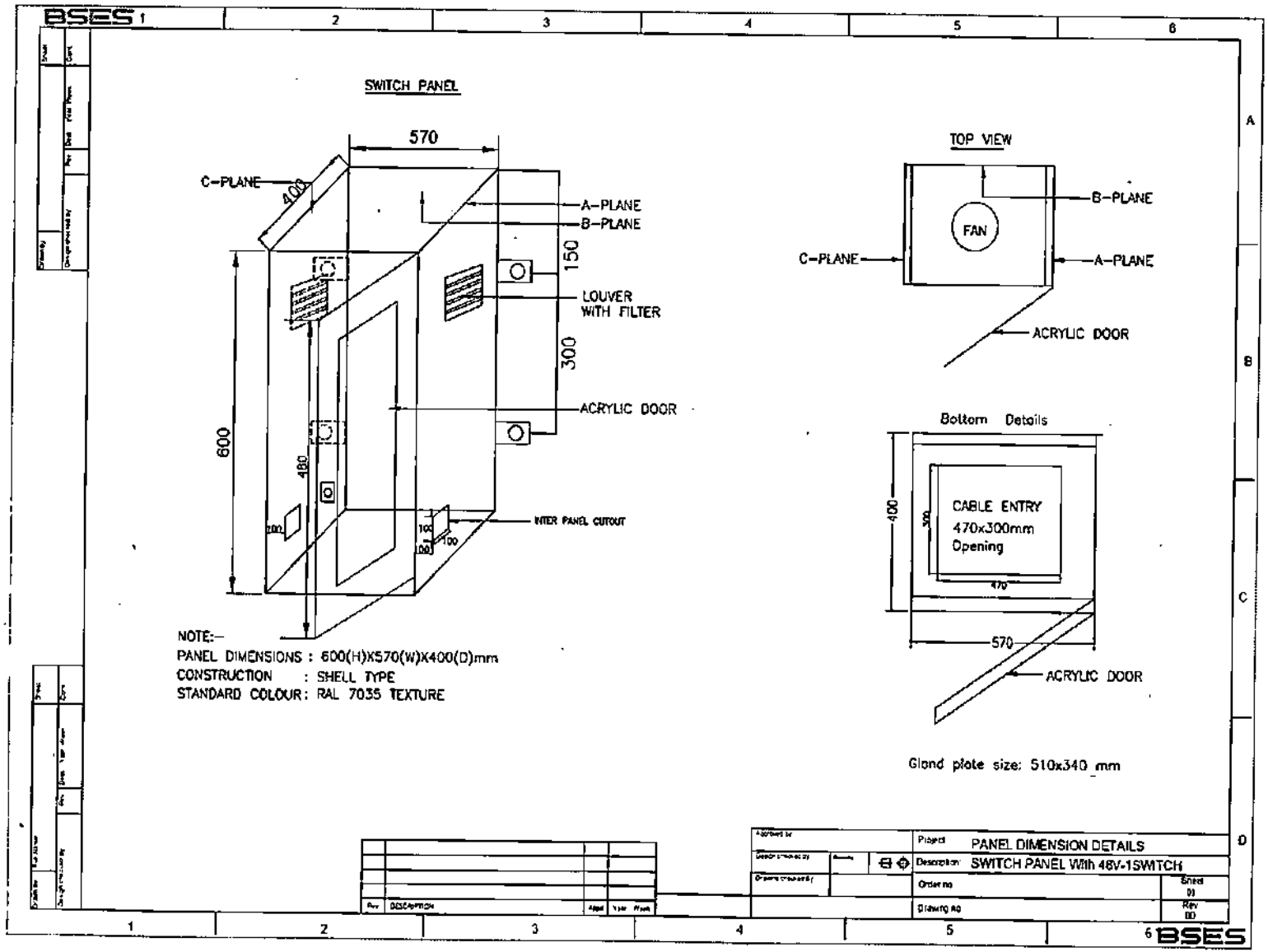
Sanjay Bhatnagar
Emp. No. 40131362
Sr. Deputy General Manager
Head SCADA Maintenance
BSES Rajdhani Power Limited
A Joint Venture with Govt. of NCT Delhi

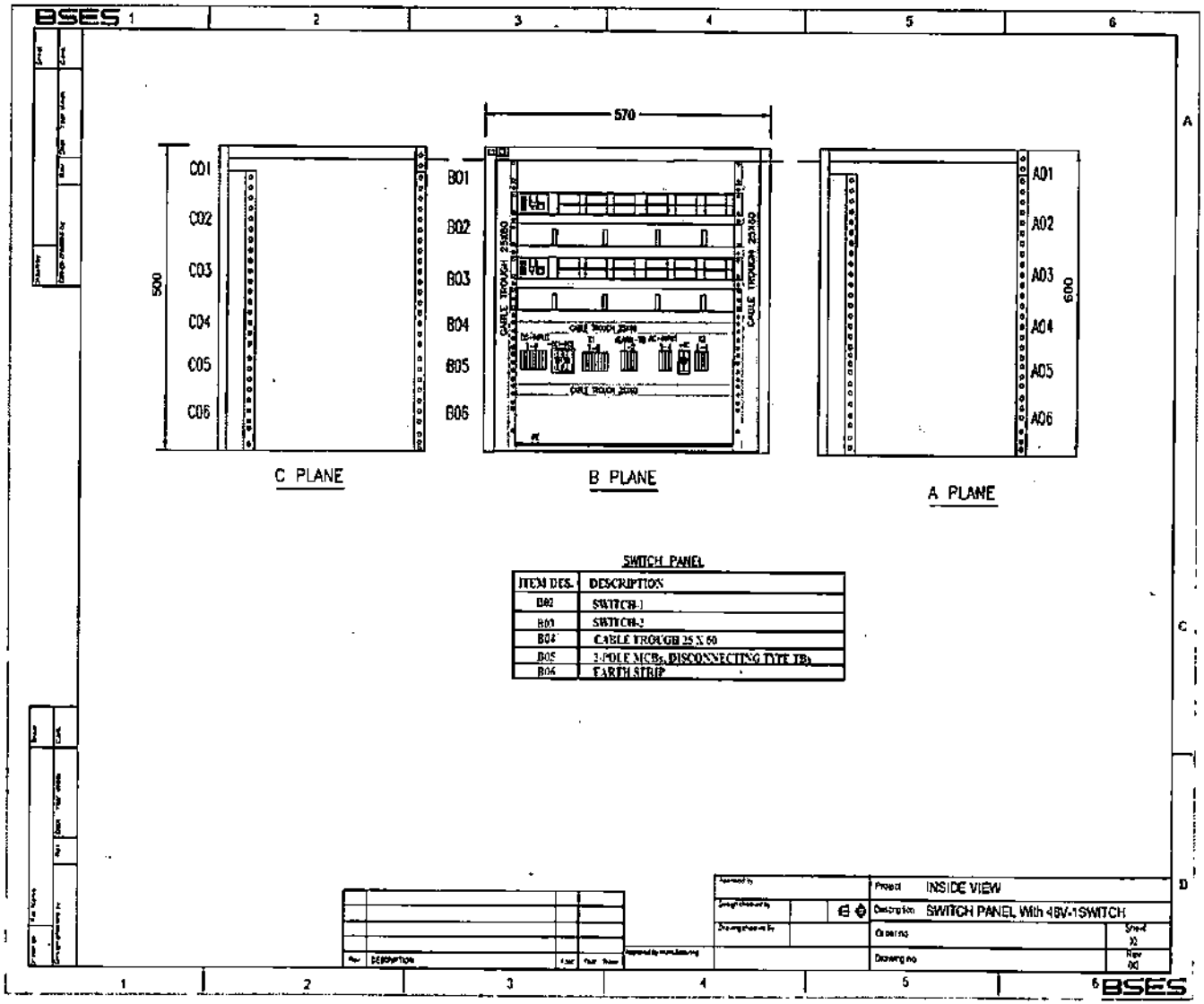
Approved By.

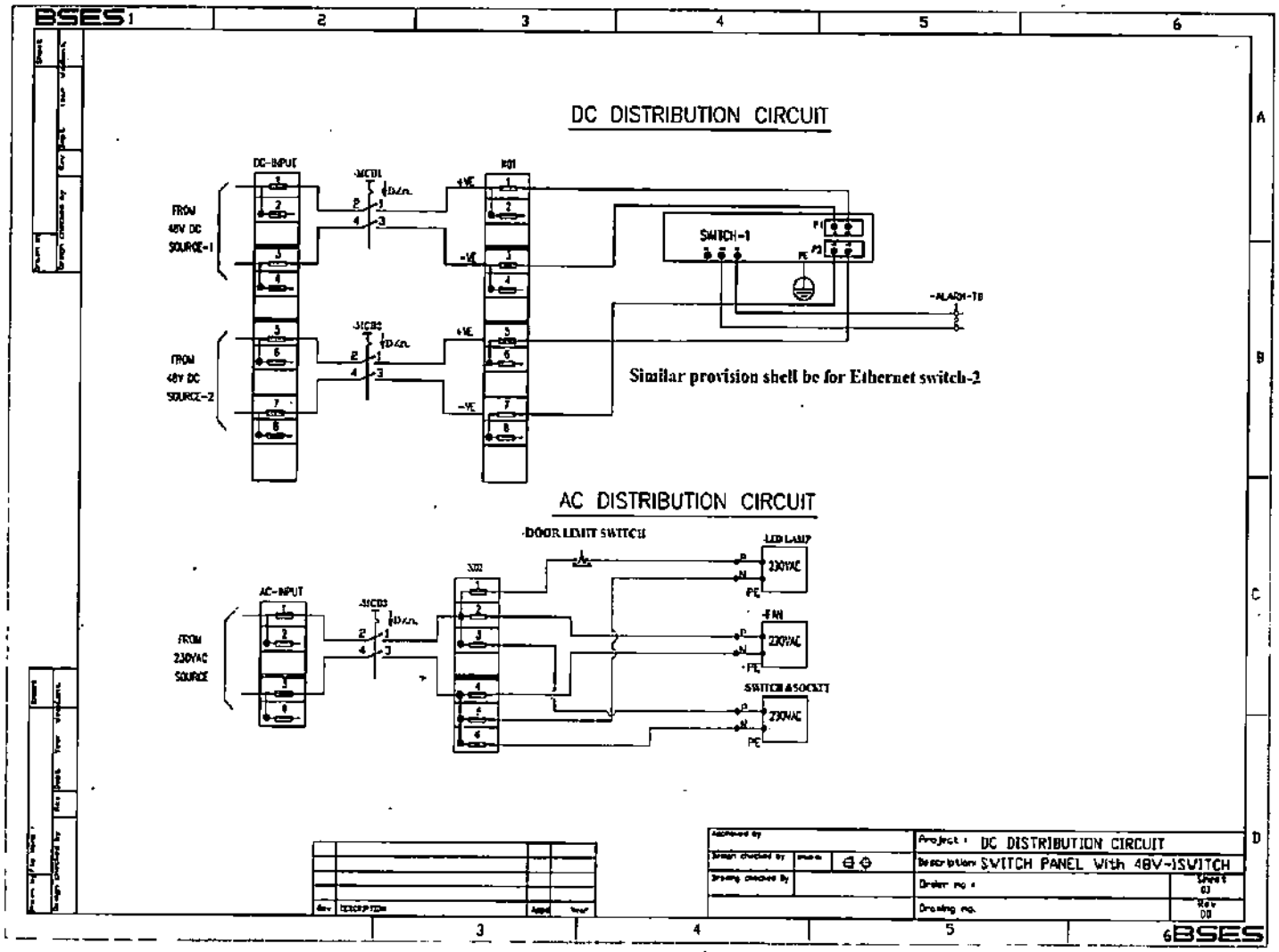
Bhuwanesh Kumar Dwivedi
Addl.Vice President-Automation
Emp. No. 41019190
BSES Rajdhani Power Limited
A Joint Venture with Govt. of NCT Delhi

BSES Rajdhani Power Limited

Bill of Materials				
S.No.	Item Name	Item Description	Make	Qty (Nos)
1.	Panel for Ethernet Switch	Wall mounted,600(H)x570(W)x400(D)mm,2mm thickness, CRCA sheet, Shell type,standard colour RAL7035 powder coating,Gland Plate as mentioned in drwg., Acrylic type front door, Fan & Filter at top mounting of Ethernet Switch shall be on slide-able and draw-able type heavy duty arrangement. Mounting arrangement shall be as shown in the drawing. Panel Protection class shall be IP54. *(for ref. Panel Drawing attached).*		1
2.	Door lock	Chrome plated 3mm lock with 90 degree movement stainless steel lock		2
3.	Switch &Socket (AC)	230V AC ±20% ,5A		1 each
4.	MCB(AC)	230V AC ±20%,6A,dual pole	Havells,Schneider,ABB	1
5.	MCB (DC)	50V DC ±10% ,4 A dual pole	Havells,Schneider,ABB	2
6.	Terminal Blocks(AC)	Disconnecting Fuse type ,fuse fast blow glass type,6amps,10 ways,	Connectwell,Wago	10
7.	Terminal blocks (DC)	Disconnecting Fuse type, fuse fast blow glass type,4 amp,16 ways	Connectwell,Wago	16
8.	Terminal Blocks (Alarm)	Non-disconnecting type 4 ways	Connectwell,Wago	4
9.	FAN with Filters	Operating voltage ,230V ±20%AC,Heavy Duty,130CFM,	Reputed Make	1 each
10.	Earthing Strip	500mmx25mmx4mm copper suitable to connect four earth connections of multi stranded copper earth lead of size 4 Sq.mm.		1
11.	Internal Wiring(AC/DC)	2.5 sqmm, FR,multi stranded copper wire,colour coded	KEI,polycab,Havells	LS
12.	Panel illumination with limit switch control	LED 5/6Watts,230V AC		1
13.	Cable manager Duct	Suitable size.		2
14.	Telescopic ball bearing channels to make switch draw-able	Stainless steel appropriate size and specifications	Hettich, Reputed Make	2 sets.


SWITCH PANEL
570
C-PLANE
400
A-PLANE
B-PLANE
150
LOUVER
WITH FILTER
300
ACRYLIC DOOR
600
480
100
100
100
INTER PANEL CUTOUT
NOTE:-
PANEL DIMENSIONS : 600(H)X570(W)X400(D)mm
CONSTRUCTION : SHELL TYPE
STANDARD COLOUR: RAL 7035 TEXTURE
TOP VIEW
FAN
B-PLANE
C-PLANE
A-PLANE
ACRYLIC DOOR
Bottom Details
400
300
CABLE ENTRY
470x300mm
Opening
470
570
ACRYLIC DOOR
Gland plate size: 510x340 mm
Project PANEL DIMENSION DETAILS
Description SWITCH PANEL With 48V-1SWITCH
Order no
Drawing No
Sheet 01
Rev 00
BSES


BSES
570
C01
C02
C03
C04
C05
C06
500
B01
B02
B03
B04
B05
B06
A01
A02
A03
A04
A05
A06
600
C PLANE
B PLANE
A PLANE
SWITCH PANEL
ITEM DES.
DESCRIPTION
B02
SWITCH-1
B03
SWITCH-2
B04
CABLE TROUGH 25 X 60
B05
3-POLE MCBs, DISCONNECTING TYPE TB's
B06
EARTH STRIP
Project
INSIDE VIEW
Description
SWITCH PANEL With 4BV-1SWITCH
Drawing no.
BSES


BSES
DC DISTRIBUTION CIRCUIT
DC-INPUT
MCB1
MCB2
MCB3
MCB4
FROM 48V DC SOURCE-1
FROM 48V DC SOURCE-2
FROM 230VAC SOURCE
SWITCH-1
-ALARM-TB
Similar provision shell be for Ethernet switch-2
AC DISTRIBUTION CIRCUIT
AC-INPUT
DOOR LIMIT SWITCH
LED LAMP
230VAC
-FAN
SWITCH&SOCKET
Project : DC DISTRIBUTION CIRCUIT
Description: SWITCH PANEL With 48V-1SWITCH
Drawing no.
Rev
00
BSES

BSES Rajdhani Power Limited
BSES Bhawan, Nehru Place, New Delhi- 19

TECHNICAL SPECIFICATION & BOQ

FOR

SUPPLY OF RTU AND OTHER ACCESSORIES FOR WEST DTC PROJECTS(2 NO'S).

K.A Sastri Kumar

Chapter 6b. Technical Specification for SCADA Interface work & Automation

1.0 INTENT OF SPECIFICATION:

This specification is intended to cover the supply and execute work related to interface of all electrical equipments with RTU panel complete with all materials and accessories for efficient and trouble free operation. In the event of any discrepancy with the listed documents, the stipulation of this specification shall govern.

2.0 SCOPE OF WORK

Scope of Suply : RTU/FRTU – 2 No's with Other Interface accessories as per BOM (Refer Para 3.0- 3.1.1 to 3.1.3 and Refer 4.0 for SCADA Spares & Tools.)

The scope of work under this category would include:

- Supply of SCADA materials – FRTU & RTU with Processors (Basic License - IEC 870-5,101,103,104, Modbus, IEC 61850-8-1, IEC -104 Master, IEC 104 Slave + PLC License) along with IO Modules. Other accessories such as Communication Rack, Power Supply Modules, MFM,GPS, Converters for DC to DC & Other FO Converters, Cables Cables - FO, CAT-6, RS485, Control Cables, Connectors if any shall be in SCADA vendor's scope of supply.
- Installation, Testing & Commissioning of SCADA equipments with Control Center via IEC-104 Protocol.
- Integration, Database development & Testing of SCADA Front end equipments (Sub Station level equipments integration over Modbus TCP IP,Serial/IEC-103/IEC-61850 Protocols.
- Extraction of ICD/SCD files from IED and further integration with RTU over IEC-61850/IEC103 Protocols at site with Supplied Hardware.
- Supply of Necessary RTU Till Tool with Licenses & Softwares if any (Ex:IET600) required for ICD/SCD file configuartion in RTU.
- Laying and Termination of armored Communication cables (Ethernet, Fiber Optic Patch Cards/Cable,RS 485 cables) between grid devices (Numerical Relays/BCP, Smoke detector, , MFM, Battery Charger) to RTU/DCU/Gateway with proper tagging,and dressing upto RTU panel. Supply of Suitable Glands, White Sleeve PVC ferrule, tagging, lugs shall be scope of vendor's supply.
- Laying and termination of control cables between grid equipments (control and relay panel, Battery Units) to RTU for hardwired signals.
- Installation of cable trays with accessories or trench as required for the cabling work.
- Integration of PQA over Modbus TCP IP/IEC-61850 with dedicated network.
- Integration Li-Ion Battery Charger Over Modbus TCP IP/Serial with RTU.

Chapter 6b. Technical Specification for SCADA interface work & Automation

- Preparation of cable schedule, Wiring diagrams,Training documents with Step by Step Procedures and Interconnection as built drawings.
- Separate earthing bus bars to be provided for RTU panel and it will be directly connected to grid earthing.Earth BAR material should be Copper.
- All internal wiring between BCU and C&R Panel terminals, All Numerical relays,MFM (Multifunctional meters) and other grid equipment integration should be under SCADA vendor's scope.
- Hardware & software integration of RTU, Bay Control Units along with other equipments viz. Battery Chargers, Multi Function Meters, Fire Fighting System Signals, Smoke Detector Panels, Numerical Relays, 11&33&66KV Control and Relay panel signals etc. shall be in Vendor's scope.
- FAT Visit at factory for BSES SCADA team (2 Persons for 3 days) – Travel ,Boarding, accommodation and local conveyance etc..shall be under SCADA Vendor's Scope.
- Training arrangements at factory/Work shop for BSES SCADA team (5 to 6 Persons for 5 days) – Travel ,Boarding, accommodation and local conveyance etc..shall be under SCADA Vendor's Scope.

2.1 Cables

The following types of cables / wirings will be required for extending signals and commands. Tagging is mandatory for all types of cables. Heat shrinking ferrule sleeves with printed ferrules to be used for identifying cables & Signals.

- 2.5 mm2, multi-stranded flexible copper wire, FRLS 1.1KV HRPVC for AC & DC Supply & 1.5 mm2 multi strand cables for other internal wiring for RTU.
- Red(P)and Black(N) color cable core to be used for AC and DC wiring.
- Fiber Optic Cables (GLASS&PLASTIC Types) with suitable connectors & Ethernet cables (CAT6) with conduit pipe for internal connections and GI Armored Cables for external connections.
    - CAT6 : Approved Make - D-LINK ,Belden and Equivalent.
    - Twisted Pair Armored Cable
    - Meets TIA /EIA-568-C.2 requirements and comply with CAT-6
    - specifications. - Compliant for 10/100/1000 Mbps bandwidth
    - Performance specification up to 250 MHz
    - UV resistance outer sheath
    - Inner Sheath Flame Retardant (IEC60332-1)
    - Suitable for Outdoor application
    - Rugged Double sheath construction
    - RoHS Complaint
    - ECCS Tape armoring provides Excellent Mechanical protection,
    - Discriptions: Copper cable, 4 pairs category 6 UTP,23 AWG solid copper conductor for superior conductivity,HD-PE insulation material,Fire resistant PVC jacket

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- Operating Temp : '-20°C to +60°C

- 10C/16/6 C x 1.5 mm2,multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application: digital signal feed back(DI/DO).
- 6 C x 1.5 mm2,multi strained screened copper cable, ARM FRLS 1.1KV HRPVC ,Application: digital signal feed back(AI).
- 3P X 1.5 mm2 for DO (Digital output)
- Suitable Insulated lugs – Ring, U Type to be used for SCADA terminations.
- 2P X 0.5 mm2 Screened GI Armored RS485,Twisted pair(2 Pair), 22gauge Belden 8761 or equivalent for external (RTU to BCUs /MFM/BATT.CHG) RS 485 connections.
  - Material : Annealed Tin Copper.
  - No of Diameter of strand in conductor : 7 No's/0.30 mm,
  - Dia of Wire : 0.30 mm,
  - Resistance at 20 deg : 70.3 Ohms/KM
  - Material : High density Polyethylene.
  - Thickness of Insulation : 0.6 mm/0.5 mm for Un Armored
  - Elongation at Break : 150%(min)
  - Pairing : Each Pair has different colors.
  - HV Test at Room Temp : 2.0KV for 1 Minute.
  - Material of Screen : Aluminium Mylar Type.
  - Thickness of Tape : 30x40 Microns/30x50 Microns for Un Armored
  - Copper Breading : 90% ATC / 90% for Un Armored.
  - Armouring : Gslvanised steel Wire.
  - Outer Sheath : FRLS PVC
  - Thickness of Sheath : 1.24 mm./1 mm for Un Armored.

    - Approved Make for RS485 : Belden or Equivalent.
    - Approved Makes for ARM Control Cables : KEI,POLYCAB or Equivalent.
    - Approved Make for Cat6 : D-LINK , Belden or Equivalent.

The supplied cable shall be as a latest IS, also refer control cable specification & Armored cables should be supplied for trench applications.

❖ **Cable Gland**

Single Compression cable glands (Materials - Brass and Stainless Steel & Suitable for Industrial Grade) of different sizes for cable entry into the RTU,DCU,CRP & Other Panels.

- Approved Make: COMEX or Equivalent.

❖ **Cable Trays and NS cable Support**

Perforated / ladder type (galvanized Iron) with cover for laying all type of the cables.
Separate tray in trench is required for SCADA Communication Cables.

- Length :2.5 Mtrs,Thickness-3mm,Depth :100MM,Width :300MM

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2.2 Multifunction Meters (Accuracy = 0.2)

MFM Supply is not in your scope but Integrtion with Supply of SPD for serial protection is in your scope.

To extend the current / voltage / active and reactive power, power factor, etc. to RTU, MFMs, to be installed in C & R Panel individually for each feeder/ breakers and should be integrated with RTU.The outputs of these meters **(in groups of 5)** connections should be made using twisted pair screened cable (Typically 22gauge Belden 8761 or equivalent) & two wires (A and B) connections are daisy chained together and integrated with RTUs. All hardware's or protocol converters for having Modbus Protocol output, CT & PT wirings to MFMs and its Configuration should be in Vendor's scope.

For the protection of MFMs and RTU cards against Surges and electrical leakages, it is necessary to install Surge Protection Devices in b/w RTU & MFM serial loops.

The following parameters of MFM must be available for communication with RTU.

- Phase Voltages (L1-N, L2-N, L3-N)
- Line Voltages (L1-L2, L2-L3, L1-L3)
- Line Currents (IL1 , IL2, IL3)
- Active Power & Reactive Power
- Maximum Demand (KW) & Frequency
- Power factor
- Active Energy
- THD mean current & THD mean Voltage
- Neutral Current.
- Phase Angles

Approved Makes – RISH 3440 and Conzerv EM 6400NG

2.3 Numerical Relays or Bay Control Protection Units for all feeders

Supply of BCPU/IED is not in your scope but Integrtaion with RTU and Supply of SPD for ETH/FO Port protection is in your scope. protection is in your scope.

Numerical Relays(BCPU) shall be integrated with Remote Terminal Units. All hardware's and protocol converters if required for compatibility with SCADA shall be in Vendor's scope.

The respective BCPU(IED) must have **dual redundancy communication ports** (Ethernet/Copper/FO Ports) with **PRP** protocols for SCADA connections & It will be connected to RTU via IEC 61850 protocol. (Dual Ports required to form a **PRP** Networks b/w relay to relay connections).

Data Base File must be downloadable and Uploadable from BCU.

The following signals are to be taken from Numerical Relays to the BCUs through internal hard wiring. This list is indicative and signals should not be limited to this. Additional signals

can be taken during review of actual drawings. – **Refer Para 2.8 for detail signals list with data format (DPI,DCO,SPI,SCO,Measured Values) types.**

- Online Currents / Voltage & Relay General trip signal
- All breaker,Isolators,Control & Relay Panel indications and commands
- Fault current and phase indication of faulty phase viz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).
- Fault Differential and Bias current in Line and Transformer Differential Relay
- Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Relay).
- Post fault currents (R, Y, B phase separately) measured value & Relay Internal Fault
- Fault distance (in case of distance relays - R, Y, B Phase separately)
- Unbalance Current (in case of neutral displacement relay of capacitor feeders).

2.4 **Battery Charger and Lithium Battery Integrations:**

All signals of Battery Chargers/Lithium Ion should have MODBUS Protocol output and integrated with an RTU through serial communication (RS 485) cables.
Laying communication cables through conduit pipe and battery charger signals (Soft & Hard Signals) integration with an RTU shall be in Vendor's Scope. - **Refer Para 2.8 for detail Battery Charger signal's list with data types.**

2.5 **Remote Terminal Units**

For extending the signals from the grid to the Master Control Centre & Backup Control Centre, BCPUs and RTUs are to be installed. BCPUs needs to be initially physically integrated with Numerical relays of respective breakers to enable soft signals and commands for breakers to be configured there and respectice BCPU integrated with Remote Terminal Units through IEC – 61850 protocol. However the options for IEC-60870-103 protocol along with the MODBUS protocol option is required for other devices integrations. BCPUs can be of **ABB, Siemens,Schneider Electric,GE, etc .,** make is depending on the type/ make of switch gears.**Remote Terminal Units need to be installed for interface between the BCPUs and Control Centers (Main and Backup) through IEC – 60870 – 104 Protocol.** The size of RTU will depend on the size of the substation, no. of the feeders/ number of signals and command outputs along with sufficient spares (20%) for future requirement.
All associated equipments and Supply of accessories including software &Operating tool / multiple user licenses for RTU & BCPU, MCBs for DC and AC Supply, DC to DC Converter (in case station battery voltage level is 220 volts DC), etc. should be in Vendor's scope.
Hardware & software integration of RTUs, BCPU along with other equipments viz. Battery Chargers, Multi Function Meters, Fire Fighting Systems, Signals, Transformer relays (for OTI, WTI, TPI, AVR, etc.), Numerical Relays, etc. should be in Vendor's scope.
In case of more than one BCPU,RTU,DATA Concentrator than these units must be able to communicate with other units on internal local IPs (Ex – 192.168.0.1) other than LAN IP(Ex-10.125.107.1) series.

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Hot redundancy is required for Main Processor cards, rack board,PSU and Gateway for MCC & BCC Communications.Each main processor must have two Ethernet ports dedicated for communication with SCADA servers over IEC 60870-104 protocol. First card will be live and 2nd card will be hot standby. Communication switchover between either cards in case of failure.Main Processor cards along with Rack for MCC communication should be separate from the IO cards.

All cards (IO/Processors/PSU) must have conformal Coating to protect against moisture,dust,chemicals and extreme temperatures,etc..

Data Base File must be downloadable and Uploadable from RTU,CPU and Gateway.

Approved RTU makes –

- ABB-RTU560 with CMR02/01 Processors.
- Schneider-SAITEL DP,
- Siemens A8000

Bidders who are OEM of RTU and Numerical Relays are only acceptable for supply of RTU/FRTU to BRPL through this tendering process.Pilot test will be done for any new system(other than above mentioned approved list) with minimum Observation Period of 90 Days with successful test results are main criteria for induction of any new models in BRPL.

Note : System shall be approved if they are agree to fulfill the following terms & Conditions, It is applicable for all OEM products.

- AMC period should be given 3 years (1 Visit/Quarter)along with this proposal.
- AMC period should be started after handovering the system to BSES.
- 5 years replacement warranty is mandatory for all SCADA/RTU products(Electronic cards,GPS,Switches,HMI,etc...).If any cards fails/burnt due to surges from CT,PT via RS485/serial,Surges through cables then replacement will be in your scope up to 5 years. So, suitable SPD to be incorporate in the system according to site requirements for avoid card failures. If any hardware (or) Software fails during this period will be rectified by OEM. ... Antivirus/Cyber Security solution for Gateway/RTU unit with 5 years validity need to be considered. Patches updatation if any required with in this period is comes under vender scope

2.6. RTU,Data Concentrator Unit Features & Performance capabilities

2.6.1 RTU,DCU Size and Expandability

20% Spare for RTU,DCU - Provision for 20 % (Basic IO Count +20% Spare) of the total DI / DO signals (hard/soft) as a spare should be made available for future requirement.

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20% Spare for BCPU - Each Control and Relay panel BCU must have 20% (Basic + 20% Spare) of the particular bay DI/DO signals as a spare should be available.

Panel Size & Hardware Capacity - The RTU panel sizing should be capable of accommodating additional 50% of the basic I/O counts by way of addition of hardware such as modules, racks, panels, Terminal Blocks of basic I/O counts.

Software Capacity - The RTU software and database generation should be sized to accommodate for additional 50% of the basic I/O count & No of IEDwithout requiring software or database regeneration or License.

2.6.2 Remote database, downloading of RTU from master station/SCADA control center.

2.6.3 RTU shall have the capability of automatic start-up and initialization following restoration of power after an outage without the need for manual intervention. All restarts shall be reported to the connected master stations.

2.6.4 Act as a data concentrator on IEC60870-5-101/104/MODBUS/IEC 61850 protocols and Support for IEC 60870-5-103, IEC 60870-5-101, IEC 61850,MODBUS TCP IP and RS485 Modbus RTU protocols & ability to act as a gateway for Numerical relays.

2.6.5 **Cyber Security**

As the SCADA system will use public domain, such LAN/VSAT/GPRS/CDMA etc. therefore it is mandatory to guard the data/ equipment from intrusion/damage/breach of security & shall have SSL/VPN based security.

2.6.6 Internal battery backup to hold data in SOE buffer memory & also maintaining the time & date.

2.6.7 RTU must have the capability of time synchronization with a GPS receiver and the GPS at the control room will be used for this synchronization purpose. In case of failure of the GPS receiver, the RTUs time synchronization should be through the Master's SCADA clock.

2.6.8 **GPS for Time Synchronization -** The RTU must have inbuilt and external GPS with antenna & internal real time clock to synchronize the IEDs connected to it over their respective protocol. **GPS must have dual redundant LAN port for time synchronizations.**

Approved Makes – MASSIBUS & SANDS

2.6.9 **Main Processor(CPU in RTU & Gateway) HOT Retundancy for MCC & BCC communication**

Main processor (DCU) /RTU should have adequate capacity for data handling / processing and main processor/CPU must have required number of communication ports for simultaneous communication with Master Stations (MCC & BCC), /MFTs and RTU configuration & maintenance tool.**RTU main processor and Gateway must have HOT redundancy features for control center communications.**

RTU Processor must have the capacity of integration of minimum 120 IED's over IEC -61850 Protocol.

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2.6.10 **Hot Standby/Dual Power Supply Unit & Redundancy in power source for RTU and BCU/BCPU** - Possibility to increase the RTU,BCU main rack availability by having a second power supply card in case the first one fails , **if any one Power supply card fails the other one should keep the system continuous live.**

2.6.11 **CPU/RTU Soft Configuration Future (Communicate to multiple master stations simultaneously on IEC60870-5-104.)**

RTU/DAU must have multiple location (minimum 5 Locations) data transmission facility VAZ Master Control Centre, Backup Control Centre, etc.

2.6.12 **Protection Devices for RTU,BCPU** – All modules (all Digital, Analog Input modules) and ports (Serial and Ethernet ports) must have in-built or external surge protection devices and optical isolation

2.6.13 **Diagnostic Software & Multi user tool/License for RTU/(Numerical Relay) BCU** -

Diagnostic Software tool with licensed version shall be provided to continuously monitor the operation of the RTU and report RTU hardware errors to the connected master stations. The software shall check for memory, processor, and input/output ports errors and failures of other functional areas defined in the specification of the RTU. **If any system tries to connect to RTU for download/ Upload files,itshould be stored as a log in RTU.**

2.6.14 **RTU Panels**

At least 50% of the space inside each enclosure shall be unused (spare) space that shall be reserved for future use. The Contractor shall provide required panels conforming to IEC 529 for housing the RTU modules/racks, relays,Ethernet switches etc. and other required hardware. The panels shall meet the following requirements:

- Shall be free standing, floor mounted and height shall not exceed 2200 mm.
- RTU Panel should have air conditioner and should be mounted on side wall of RTU panel with temperature/humidity control facility. FAN with Filters shall be considered for for back up cooling.
- All doors and removable panels shall be fitted with long life rubber beading.
- All non load bearing panels/doors ,top and bottom portion, rear cover shall be fabricated from minimum 2.0 mm thickness steel sheet and all load bearing panels, frames, top & bottom panels shall be fabricated from minimum 3.0 mm thickness steel sheet.
- Shall have maintenance access to the hardware and wiring through lockable full height doors.
- Shall have the provisions for bottom cable entry.
- All panels shall be supplied with 230V AC, 50 Hz, single-phase switch and 15/5A duplex socket arrangement for the maintenance.
- All panels shall be provided with an internal maintenance lamp, space heaters and gaskets.

- All panels shall be indoor, dust-proof with rodent protection, and meet IP54 class of Ingress protection.
- There shall be no sharp corners or edges. All edges shall be rounded to prevent injury.
- Document Holder shall be provided inside the cabinet to keep test report, drawing, maintenance register etc.
- All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trims shall be made of flame retardant material and shall not produce toxic gases under fire conditions.

2.6.15 **RTU Grounding**

The safety ground shall be isolated from the signal ground and shall be connected to the ground network. Safety ground shall be a copper bus bar. The contractor shall connect the panel's safety ground to the grid grounding network. Separate grounding(2Pits) is created for communication equipments and Signal ground shall be connected to the communication equipment signal ground.

2.7 Ethernet /Fiber Switch

The Ethernet/Fiber optic switches Should be a managed switch and are intended to be installed in the control room and shall be complaint to IEC-61850 electrical substation networks and IEEE 1613 standards. Provisions for additional feeders on the Ring Configuration should be provided on the same switch.

- Laying of Ethernet/Fiber cables for relay/BCU port to the RTU via switch through conduit pipe and integration with an RTU shall be in Vendor's Scope.
- Switch, Standard Features
- Switch design should withstand for power substation automation applications that operate in extremely harsh environments (High and medium voltage S/Stn environments) and it also withstands vibration, electrical surges, fast transients, electrostatic discharge, and extreme temperatures and humidity. Industrial managed Fast Ethernet Switch shall be supplied according to IEEE 802.3.
- Switch features and configuration should be easy to user interface and it must directly integrate with any other IEC-61850 devices. Shall be managed type,Layer-2 Switches and have KEMA certifications for IEC 61850.
- The FO switch shall support Multimode fiber and single mode fiber in 100Mbps ports on an SFP (simple form factor pluggable), for ease of functionality and maintenance.100Mbps ports for sub station level communications & 2 or 4 Gigabit Port for uplink communications.
- ETH Switch PCB/PSU must have **conformal Coating** to protect against moisture, dust, chemicals and extreme temperatures,etc..
- Retundancy Ring : Dual Ring to be consider between Ethernet switches for maintaining redundancy network.

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- Hot Standby/Dual PSU & Redundancy in power source - Possibility to increase the switch availability by having a second power source in case the first one fails & should be available with 48VDC.Each PSU should be connected with a different power source, if any one power source or Power supply card fails then other one should keep the switch continuous operation.
- 20% Spare ports - Each switch must have 20% spare ports for future/back up requirements.
- Link Failure contact alarm - Failure contact alarm shall be achieved by hardware contact that is activated when a link problem occurs.
- Logs and alarms with Time Stamp - Statistics about link status alarms are to be stored with the accurate timestamp duly tracing all events.
- Security features - The FO switches shall support different user levels with different passwords, including the facility to work with different VLANs, following the 802.1Q standard, port security based on MAC addresses, possibility to disable unused ports, authentication protocols shall be provided. The FO switches shall have advanced security features to be implemented to avoid unauthorized access to the system Such as RADIUS/TACACS & VPN gateway support with IP Sec & SSH.
- High Speed Implementation of RSTP protocol - The FO switches shall support STP and RSTP protocols, and shall facilitate for recovery and the fault recovery times shall be within 5 -10msec per switch, always fulfilling the RST protocol.
- Time Synchronization to RTU/Server and Connected IED/BCU - The FO switch shall have an internal clock and shall be synchronized from a network SNTP/NTP server, so all time stamped events shall be with a reliable time reference.
- Tools with License - Diagnostics tool, other necessary tools with a multi user license to be provided along with the switch.
- Mounting Options - Switch should be DIN Rail Mountable & also need to quote for Optional Wall/Rack Mountable kit.
- Local USB port for emergency boot is Mandatory.
- Network based distributed security by having a firewall on each port of the switch for all the standard Industrial protocol like IEC-61850 should be available.
- The FO switch shall have the facility of Port mirroring and the user shall configure one port to replicate traffic flows of different ports, so the system administrator can monitor the incoming, outgoing, or all kinds of traffic that is going through the ports under study.
- ITU-T G.8032 support for Ethernet Ring redundancy, ensuring fast failure detection is preferred.
- They FO switches shall sustain the stringent levels in temperature range and electromagnetic immunity defined in the 61850-3, but also the advanced functional requirements defined for operation with other IEC-61850 devices. The Switch should be certified on IEC-61850, functional & Environmental specifications by KEMA.
- ETH Switch Panel :

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- ETH Switches & LIU should be fixed in dedicated wall / Floor mountable cabinet in 11kV and 33/66KV CRP Room.
- Panel must have Sliding tray's for installation of switches.
- Panel have suitable AC/DC MCB and relevant accessories for supply.
- All doors and removable panels shall be fitted with long life rubber beading.
- All non load bearing panels/doors ,top and bottom portion, rear cover shall be fabricated from minimum 2.0 mm thickness steel sheet and all load bearing panels, frames, top & bottom panels shall be fabricated from minimum 2.0 mm thickness steel sheet.
- Shall have maintenance access to the hardware and wiring through lockabledoors.
- Shall have the provisions for bottom cable entry.
- All panels shall be supplied with 230V AC, 50 Hz, single-phase switch and 15/5A duplex socket arrangement with an internal maintenance lamp for the maintenance.
- All panels shall be indoor, dust-proof with rodent protection, and meet IP54 class of Ingress protection.
- There shall be no sharp corners or edges. All edges shall be rounded to prevent injury.
- All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trims shall be made of flame retardant material and shall not produce toxic gases under fire conditions.

➢ Approved Makes of Switches – **RUGGEDCOM & HIRSCHMANN.**

2.8 SIGNAL LIST (11/33/66KV)

List of Abbreviations
AI - Analog Input/Analog Values
MV - Measured Value
MFM - Multi Function Meter
DCO - Double Command Output
DPI - Double Point Indication
SCO - Single Command Output
SPI - Single Point Indication
RTU - Remote Terminal Units
BCU - Bay Control Units

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Signals - 33 & 66KV Incomers/Out Going	BCPU(IED) to RTU (BI-Soft)	BCPU(IED) to RTU (BO-Soft)	BI/BO Hard Wire to RTU	Signal Type	Protocol
Breaker ON / Breaker OFF	√		√	DPI	IEC-61850 with Dual Communication Ports
Breaker in service (In-case of I/D BKR)	√			SPI	
Breaker in Test (In-case of I/D BKR)	√			SPI	
Trip coil Ckt Healthy - 1 & 2	√			SPI	
Spring Charge	√			SPI	
Master trip(86) Operated-1&2	√		√	SPI	
SF6 Pressure Low	√			SPI	
SF6 Lock Out	√			SPI	
VT fuse Fail	√			SPI	
Panel DC Fail			√	SPI	
L/R Switch in Local	√			SPI	
L/R Switch in Remote	√			SPI	
LBB Operated	√			SPI	
Relay Int Fault.-1&2			√	SPI	
Over Current Operated+Trip (All stages) from IED	√			SPI	
Earth Fault Operated+Trip (All stages) from IED	√			SPI	
OC+EFRelayCommunicationStatus	√			SPI	
DIFF.Prot Operated	√			SPI	
DIST.Ptot Operated	√			SPI	
BKR CLS COMMAND			√		
BKR OPN COMMAND		√	√	DCO	
Master Trip(86) relay-1 reset from Remote		√		SCO	
Master Trip(86) relay-2 reset from Remote		√		SCO	
Analog Values from IED : 3Phase R,Y,B -Current&Voltage,Active& Reactive Power,PowerFactor,Max.Demand,Neu.Current etc	√			AI/MV	
Fault current and phase indication of faulty phase viz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Relay). Fault Differential and Bias current in Line and Transformer Differential Relay ,Fault distance in Distance Relay).	√			AI/MV	
Total Signals - From BCPU	20 DI + IGEN DI+Analog , Measurand Values	4 DO			
Total Signals H.W to RTU		2 DO	7 DI		

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Signals - 33 & 66KV BUS Coupler	BCPU(IED) to RTU (BI-Soft)	IED to RTU (BO-Soft)	BI/BO Hard Wire to RTU	Signal Type	Protocol
Breaker ON					IEC-61850 with Dual Communication Ports
Breaker OFF	√		√	DPI	
Breaker in service (In-case of I/D BKR)	√			SPI	
Breaker in Test (In-case of I/D BKR)	√			SPI	
Trip coil Ckt Healthy - 1 & 2	√			SPI	
Spring Charge	√			SPI	
Master trip(86) Operated	√		√	SPI	
SF6 Pressure Low /Lockout	√			SPI	
VT fuse Fail-1 & 2	√			SPI	
Panel DC Fail			√	SPI	
L/R Switch in Remote	√			SPI	
LBB Operated	√			SPI	
Relay Int Fault.-1			√	SPI	
Over Current Operated+Trip (All stages) from IED	√			SPI	
Earth Fault Operated+Trip (All stages) from IED	√			SPI	
OC+EFRelayCommunicationStatus	√			SPI	
BKR CLS COMMAND			√		
BKR OPN COMMAND		√	√	DCO	
Master Trip(86) relay reset from Remote		√		SCO	
Analog Values from IED : 3Phase R,Y,B -Current&Voltage,Active& Reactive Power,PowerFactor,Max.Demand,Neu.Current etc	√			AI/MV	
Fault current and phase indication of faulty phase viz. R,Y,B, Earth, Unbalance(O/C & E/F Relay).Fault voltage and phase Indication of faulty phase viz. R,Y,B (Voltage Protection Relay). Fault Differential and Bias current in Line ,Fault distance (in Distance Relay) ,Disturbance Records,	√			AI/MV	
Total Signals - From BCPU	16 DI + IGEN DI+Analog , Measurand Values	3 DO			
Total Signals H.W to RTU		2 DO	5 DI		

Signals - Smoke Detector - ALL Sensors,Manual Call Points Integration with RTU over MODBUS TCPIP Protocol.	Soft Signals	Signal Type	Protocol
All Sensors Alarm operated Signals (10 to 20 Sensors)	√	SPI	MODBUS Serial (or)TCP/IP Protocol with Dual

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All Manual Call Points - MCP-1,MCP-2.etc...	√	SPI	Communication Ports

Signals - Battery Charger	Digital Input/AI soft through RTU	AI from Transducer(4 to 20MA) /AI Hard wire signal to RTU	Signal Type	Protocol
CHG A AC M/F CUM AC U/V	√		SPI	Modbus Serial Rs485 RTU Protocol with Dual ports
CHG A AC OVER VOLTAGE	√		SPI	
CHG A RECTIFIER FUSE BLOWN	√		SPI	
CHG A FILTER FUSE BLOWN	√		SPI	
CHG A DC MCB TRIP/OFF	√		SPI	
CHG A DC UNDER VOLTAGE	√		SPI	
CHG A DC OVER VOLTAGE	√		SPI	
CHG A FLOAT	√		SPI	
CHG A BOOST	√		SPI	
CHG A DC FAIL	√		SPI	
CHG B AC M/F CUM AC U/V	√		SPI	
CHG B AC OVER VOLTAGE	√		SPI	
CHG B RECTIFIER FUSE BLOWN	√		SPI	
CHG B FILTER FUSE BLOWN	√		SPI	
CHG B DC MCB TRIP/OFF	√		SPI	
CHG B DC UNDER VOLTAGE	√		SPI	
CHG B DC OVER VOLTAGE	√		SPI	
CHG B FLOAT	√		SPI	
CHG B BOOST	√		SPI	
CHG B DC FAIL	√		SPI	
BATTERY MCCB TRIP/OFF	√		SPI	
DC system Earth	√		SPI	
Insulation fault	√		SPI	
Charger A AC INPUT CURRENT	√		AI	
Charger A AC INPUT VOLTAGE	√		AI	
Charger A DC OUTPUT CURRENT	√		AI	
Charger A DC OUTPUT VOLTAGE	√		AI	
Charger B AC INPUT CURRENT	√		AI	
Charger B AC INPUT VOLTAGE	√		AI	
Charger B DC OUTPUT CURRENT	√		AI	
Charger B DC OUTPUT VOLTAGE	√		AI	
Battery Current	√		AI	
Battery Load Voltage	√		AI	
Battery Voltage from Transducer		√	AI	4 to 20 MA O/P
Battery Current from Transducer		√	AI	

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Signals - LT Board	Digital Input Hard Wire to RTU	MFM data through Modbus protocol	Signal Type & Meter OP – Modbus RTU Serial
LT AC Fail	√		SPI
R,Y,B Phase Current		√	AI

Lithium Ion Battery	Digital	Measured Values	Signal Type	Protocol
BATTERY BANK 1 STATE OF HEALTH	√		SPI	Modbus Serial Rs485 RTU Protocol with Dual ports
BATTERY BANK 1 STATE OF CHARGE	√		SPI	
BATTERY BANK 1 TEMPERATURE	√		SPI	
BATTERY BANK 1 TERMINATE CHARGE ALARM	√		SPI	
BATTERY BANK 1 TERMINATE DISCHARGE ALARM	√		SPI	
BATTERY BANK 1 OVER CURRENT ON CHARGE	√		SPI	
TOTAL VOLTAGE OV ALARM	√		SPI	
TOTAL VOLTAGE UV ALARM	√		SPI	
TOTAL VOLTAGE OV PROTECTION	√		SPI	
TOTAL VOLTAGE UV PROTECTION	√		SPI	
BATTERY BANK 1 OVER CURRENT ON DISCHAHRGE	√		SPI	
TOTAL VOLTAGE		√	UNSIGNED INT	
PACK VOLTAGE		√	UNSIGNED INT	
CHARGING CURRENT		√	UNSIGNED INT	
DISCARGE CURRENT		√	UNSIGNED INT	
RATED CAPACITY		√	UNSIGNED INT	
REMAINING CAPACITY		√	UNSIGNED INT	

FIRE Suppression System	H.W Signal to RTU	Signal Type	Protocol
suppression system cylinder 1 pressure valve oprtd	√	SPI	H.W
suppression system cylinder 2 pressure valve oprtd	√	SPI	
suppression system cylinder 3 pressure valve oprtd	√	SPI	
suppression system cylinder 4 pressure valve oprtd	√	SPI	
Supression system common dc supply fail	√	SPI	

MFM - BUS PT -1 ,2 Signals (Front & Rear BUS)	Data Type	Protocol
R-Phase Current	MV/MFI	Modbus Serial Rs485 RTU
Y-Phase Current	MV/MFI	
B-Phase Current	MV/MFI	
Neutral Current	MV/MFI	

R-Y Phase Voltage	MV/MFI	
Y-B Phase Voltage	MV/MFI	
B-R Phase Voltage	MV/MFI	

MFM - Signals - All Feeders (Including Bus Section/Coupler OF 11/33/66 KV)	Data Type	Protocol
R-Phase Current	MV/MFI	Modbus Serial Rs485 RTU
Y-Phase Current	MV/MFI	
B-Phase Current	MV/MFI	
Neutral Current	MV/MFI	
R-Y Phase Voltage	MV/MFI	
Y-B Phase Voltage	MV/MFI	
B-R Phase Voltage	MV/MFI	
Active Power	MV/MFI	
Active Energy	MV/MFI	
Reactive Power	MV/MFI	
Power Factor	MV/MFI	
Maximum Demand	MV/MFI	
Phase angle 1	MV/MFI	
Phase angle 2	MV/MFI	
Phase angle 3	MV/MFI	
THD Mean Current	MV/MFI	
THD Mean Voltage	MV/MFI	

Note1 : Suitable Heavy Duty Relay /Contactor's with free Wheeling Diode to be placed in between RTU- DO card & Trip/Close Coil circuits of respective breakers for all breaker /Isolator open & Close circuits..It should be placed either at RTU (or) Breaker panel end.Its Potential free contact will be connected in the Closing/Tripping Coil Circuits.

Note 2: Incase of Indoor GIS Panel then all SF6 Low/Lockout of all chamber signals(Approximately 10 to 15 signals per chamber) to be wired up to RTU.

Note 3: PQA (Protocol – Modbus TCP IP/IEC-61850 with dedicated switch to be offered for communication with RTU as well as Router)& Lithium Ion Signal will be finalized at the time of drawing review.

Note4: All Panels - IRF,DC FAIL SIGNALS can be preferred to terminate with adjacent relays to avoid hard wiring.

2.8.1.Comments -

Analog signals (Fault Current levels,Disturbance records, Fault graphs for remote diagnosis, etc,) from Numerical relays needs to be confirmed by vendor before finalize the tender documents.

All the above mentioned signals(Refer Signal List -2.8) including Notifier /Smoke Detector Signal are compulsory and additional signal (10%) will be considered during detailed engineering.

Following indications data format should be configured as a DPS (Double point Status) in Relay(BCPU).

- All Feeders Circuit Breaker ON & Circuit Breaker OFF

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- All Feeders BUS Isolators (89A,89B,89L,89T) - ON & OFF
- All Earth Switches ON & OFF

3.0 Detail BOM :

3.1.1.RTU Hard Ware with Services :

DTC Peeragarhi and DTC Nangloi			
S.no	BOQ - RTU Hardware	UNIT	QTY
1	1. IO Modules - 76 DI CH (SPI),28 DO CH (SCO),8 AI CH 2. Serial Ports Mod Bus, Battery Charger, FAP & IEC - 103 Protocols – 4 Numbers with External SPD's 3. Ethernet Ports for Numerical Relay communication on IEC - 61850 Protocol - 2 No's External SPD's 4. Ethernet Ports for Main Link on IEC-104 Protocol to Control Center (MCC/BCC) - 2 No's with External SPD's 5. Ethernet Ports for Mod bus TCP IP - 1 No 5.220/48 Volt DC Hot Stand By Power Supply + Diode O Ring Unit for RTU. 7. Rack to Rack Cables, Rack to Rack Communication Card if any to be considered.. 8. Supply, laying and termination of 19 Core Flexible/Armored Control cables (0.75/1Sqmm). **9.IED Integration Capacity over IEC-61850 Protocols - 40 No's** 10.No OF RTU Panels - 1 No's 11.GPS Module for Time Synchronization. Surge Protectors (Inbuilt with cards or External devices) for Isolation of Cards (Analog Input & Digital Input Modules) and communication Serial Ports and Ethernet Ports. Interposing Relays (4 NO Contacts) with Reverse Polarity Diode with 4 NO Contacts for each DO modules, Hot Standby Power Supply Unit for All Racks Modules, Ethernet Card (CPU-Main Processor) with HOT Standby for external communication with Control Center, .Protocols Supported for CPU – IEC 870-5-101/103/104 Master and Slave, Mod bus TCP IP & Mod bus Serial, IEC 61850-8-1 Master/Slave. Warranty - All Supplied SCADA material should cover warranty for the duration of 60 months from the date of commissioning.	LOT	2
2	RTU Software with PLC Logic License for Data Base Developemnt Work.	No's	2
3	Ethernet Switch 12 Port (8 CU + 2 FO port) with Supply of Switch Panel. Mounting Type : DIN Rail Mounted.	No's	6
3	Ethernet Switch Panels Panel Dimension :600(H)x570(W)x400(D)mm Construction - Shell Type with sliding type channel for Placing Switches. Standard Colour - RAL 7035 texture Gland Plate - 510x340 mm,Acrylic type Front Door, FAN With Filter at Top. 2Pole MCB for AC and DC Connections with TB. approx weight of box --------58Kgs Thickness of box -------------2mm thickness Type of Box Material---------CRCA sheet material	No's	2
4	LIU with LC Type - 8 Ports MAKE - PRESTON	No's	6
5	GPS WITH TIME DISPLAY UNIT MOUNTING : 1U,19 INCH RACK MOUNT DUAL RJ45 PORTS POWER SUPPLY : UNIVERSAL & 18 TO 72 VOLTS 2COM PORTS FOR HMI AND DISPLAY UNIT MAKE - MASSIBUS & SANDS	No's	2

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Chapter 6b. Technical Specification for SCADA interface work & Automation

	RTU Services		
1	Preparation of cable schedule from CRP & Other equipments to RTU Connections, Wiring diagrams,System Architecture and Interconnection as built drawings.	LOT	2
2	Supply,laying and termination of all type of control & Communications cables(Refer Adaptation BOM) between CRP,other auxiliraies to RTU Modules with ferruling,tagging for SCADA Hardwired/Soft Signals	LOT	2
3	Extraction of ICD/SCD files from IED and further integration with RTU over IEC-61850/IEC103 Protocols at site with Supplied Hardware.	LOT	2
4	ETC of New supplied RTU with grid equipments thr IEC 61850/Modbus/IEC-103 and H.W.Signals & Further integration with existing data center(MCC) over IEC-104 protocol.	LOT	2
5	RTU Training (4 Persons /Batch for 5 Days) at Factory/Work Shop with Training Documents Training arrangements at factory/Work shop for BSES SCADA team (4 Persons for 5 days) – Travel ,Boarding, accommodation and local conveyance etc..shall be under SCADA Vendor's Scope.	SET	2

3.1.2.Adaptation Hard Ware :

ADAPTATION MATERIAL FOR 2 Grids			
B	BOQ	Unit	Qty
1	16 core, 1.5 mm2,multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application: digital signal feed back.	Mtrs	1200
2	3P X 1.5 mm2 for DO (Digital output)	Mtrs	500
3	2 core, 2.5 mm2, multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application:Auxilary Supply	Mtrs	300
3	Armored RS485,Twisted pair, 2 pair,22gauge Belden 8761 or equivalent.	Mtrs	300
4	Un Armored RS485,Twisted pair, 2 Pair, 22gauge Belden 8761 or equivalent.	Mtrs	100
5	Armored CAT-6 Cable	Mtrs	610
6	Un Armored CAT-6 Cable	Mtrs	300
7	ARM FO Cable with LC-LC Connectors (or) LC-ST Connectors	Mtrs	200
8	Perforated GI Cable Trays CABLE TRAY – Length :2.5 Mtrs,Thickness-3mm,Depth :100MM,Width :300MM	Mtrs	50
9	Single Core - 10 Sqmm Cable for Panel Earthing	Mtrs	200
10	2.5Sqmm Cu Cable - Red,Gray,Blue,yellow,Black - as per site requirements	LOT	2
11	Lugs - 2.5Sqmm -PIN,RING,U,Types - as per site requirements	LOT	2
12	Suitable Single compression SS Metal Glands 1&3/4&1/2 inch for all type of cables Make : COMEX Approximate Minimum Quantity : 1 Inch - 60 No's,1/2 Inch - 60 No's, Glands to be supplied as per Site Requirements and Size of the cables but Pre Approvals are mandatory.	LOT	2
13	Lugs - 10 Sqmm - Ring Type, For Earthing Connections.	LOT	2

14	For all Cables : Tie,Tags , White Sleeve Ferrules printed with Black letters	LOT	2
15	Patch Cables LC-LC/LC-ST - according to SA.	LOT	2

3.1.3. Services :

ADA SERVICES			
B	SCOPE OF SERVICES	Unit	QTY
1	Installation of RTU/FRTU in Floor (or) Wall with Fastners Note : Supply of Fastners and other Materials supply for Floor/Wall Fixing comes under vender scope.	No's	2
2	Installation of Switch Panel's	Panel's	2
3	Cable laying and tagging (ARM 16 core,3 Pair 1.5 mm2) & Termination with Petty Materials Such as connectors,Lugs,Jacks,White Sleeves,Ferrules,etc...	Mtrs	1700
4	Cable laying and tagging (2 core, 2.5 mm2) with Petty Materials Such as connectors,Lugs,Jacks,White Sleeves,Ferrules,etc...	Mtrs	300
5	Connection of MFMs,Battery Charger,Battery,FAP and Other Modbus Devices (Laying and termination of RS485 cable thru metal conduit/GI pipe with proper tagging,Glanding and dressing upto RTU panel)	Mtrs	400
6	Connection of **IED relay** (Laying and termination of CAT-5 /FO Cables thru metal conduit/GI pipe with proper tagging ,Glanding and dressing upto RTU/Switch panel)	Mtrs	910
7	ARM FO Cable laying with termination at LIU/Switch End with Splicing of Cables and Connectors(LC-LC/LC-ST). Note : Splicing and Connectors comes under vebder Scope.	Mtrs	200
8	Cable tray laying with joint plates, MS angle support and nut bolts (size 400*50*2mm thick) Note - Purchase of required MS Angle Supports with Joint Plates & Nut Bolts for Cable trays(1 Set equivalent to 2 numbers of Joint Plates + 8 No's Nut & Bolts + 16 Washers)comes under vendor Scope.	Mtrs	50
9	Panels Earthing up to earth Pit.	Mtrs	200
10	Cable glanding and termination with Lugs and Ferrules in CRP,Charger panel,charger,DCDB,ACDB & RTU Panels Note - Purchase of necessary Lugs & White Sleeve Ferrules Comes Under Vendor Scope for all cable terminations.	Nos	2
11	Material transportation from Multiple Sites	Nos	4
12	Cable Crimping Work for all CAT-6 Cables +Supply of Jack	LOT	2

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13	Ferruling Work for all type of cables with White Sleeve printed in Black Letters.	LOT	2
14	Miscellaneous Work	LOT	2

Note : Need acceptances from all participents against the above BOM(3.1.1 to 3.1.3) & It should be submitted by all OEM during submission of their Bids to C&M for evaluations.

4.0 Key Points -

1 All SCADA equipment : RTU/FRTU,Switches Should be powered through auxiliary supply of 48 Volt DC.

2 Any other wiring / cabling if required due to non availability of serial communication /MODBUS/IEC 61850 protocols (with justified reason) should be hardwired and that is in Contractor's scope.

3 STATION BUS : Topology
- Ehernet/Copper Cable - From IED/BCU to Switch
- Redundant Ring through Fiber Optic Cable - From Switch to Switch.
- Redundant Ring through Fiber Optic Cable - Switch to RTU/Gateway.
  - Note : Ring Network topology will be decided during the detail engineering stage.

4 **Data Base File must be downloadable and Uploadable from RTU,FRTU and Gateway.**

5 Warranty (5 Years) for SCADA products - All Supplied SCADA material should cover warranty for the duration of 5 years & Warranty period will start after successful commissioning of the SCADA equipments at site. If any SCADA materials found faulty during warranty period should be replaced within two weeks.

6 Training at Lab/Factory should be provided on configuration, installation, commissioning aspects of RTU and Numerical Relay at your training/work center to the BSES SCADA team (4 to 5 persons) at factory/training center(5 days) comes under Vendor's scope.

Training documents to be submitted for approval & Documents should contain all the necessary installations,connections and Data Base development procedure & further trouble shooting procedure,etc..shall also be provided in the manual.

Training at Site:Vendor shall provide One trainer at site for training after commissioning of SCADA RTU at site.

7 **Spares for DTC Nagloi :** loose Spare Materials for following items with below mentioned quantity to be supplied for emergency back up/maintenance purpose.

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- CPU (Main Processor) with Ethernet Interface Card/Memory in RTU – 1 NO
- Gateway – 1 No along with Protocol simulation license/Tool.
- RTU Rack – 1 No (Basic as well as extension rack – 1 qty).
- Communication Module for IEC-103 & Modbus Communications with Serial Interface Card/Memory in RTU – 1 No
- DO Contactots – 10% of supplied qty.
- DI/DO/AI/ Cards in RTU – 10% of the total IO signals
- DI/DO/AI/ Cards in BCPU – 10% of the total IO signals
- PSU Cards in RTU – 1 No
- Ethernet Switches (AS PER SA) – 1
- LIU Unit – 1 No
- Fiber Optic Patch Cards with Connectors - 20% of total installed cables.
- MFM – 1 No
- DC to DC converters if any for RTU Supply – 1 No.
- SPD – 1 No for each type (DI – 1 No,Serial – 1 No,ETH – 1 No)

8 **Spares for DTC Peeragarhi :** loose Spare Materials for following items with below mentioned quantity to be supplied for emergency back up/maintenance purpose.

- CPU (Main Processor) with Ethernet Interface Card/Memory in RTU – 1 NO
- Gateway – 1 No along with Protocol simulation license/Tool.
- RTU Rack – 1 No
- Communication Module for IEC-103 & Modbus Communications with Serial Interface Card/Memory in RTU – 1 No
- DO Contactots – 10% of supplied qty.
- DI/DO/AI/ Cards in RTU – 10% of the total IO signals
- DI/DO/AI/ Cards in BCPU – 10% of the total IO signals
- PSU Cards in RTU – 1 No
- Ethernet Switches (AS PER SA) – 1
- Fiber Optic Patch Cards with Connectors - 20% of total installed cables.
- MFM – 1 No
- DC to DC converters if any for RTU Supply – 1 No.
- SPD – 1 No for each type (DI – 1 No,Serial – 1 No,ETH – 1 No)

9 **Protection devices for all SCADA Equipmentes –**

- Surge Protection devices installation between RTU & MFM Serial loops.
- SPD for Main DC Source.
- HDR/Inter Posing Relay for all Digital Output Signal's.
- All modules (All Digital, Analog Input modules in BCPU and RTU) and ports (Serial and Ethernet ports) must have in-built or external surge protection devices and optical isolation.

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Chapter 6b. Technical Specification for SCADA Interface work & Automation

10 Syatem Architecture : Tentative System Architecture should be submitted at the time of tendering process.

11 Following tools to be supplied

- laptop 1 No to be supplied with following specification
  Make : Lenova & Model : Think Pad L Series
  10th Generation Intel Core TM i5-10210UProcessor(4Cores/8Threads, 1.60-GHZ up to 2.10 GHZ with Turbo Boost, 6MB Casche),Windows 10 Pro 64,
  35.56cms(14.0)FHD (1366x768)TN220nts Anti-glare, 8GB RAM DDR4
  5Years Onsite Warranty,Stereo,Dolby@AudioTM
  65W Adaptor,Carry Bag & Wired Mouse,Integrated Intel@UHD Graphics
  HDMI Port,2xUSB 3.2Gen1, 1xUSB 32 Type-C Gen 1.1xUSB3.2 Type-C Gen2.
  Laptop Battery 3 Cell,45Wh,CAM 720p HD
  Intel Wi-FI & Blue tooth 5.1

12 Drawings/GTP shall be submitted to BRPL-3 Sets hardcopy for approval in the event of award of work.

13 As Built Drawings 3 Sets Hard copy and 2 Set in Pen drive shall be submitted at the time of Handover of project for Final billing.

14 DB back up along with Software in Pen drive shall be handover at the time of Handover of project for Final billing.

15 All the above features are indicative only and detailed engineering and deviation will be analyzed just before actual procurement and with discussion through a supplier/ vendor.

5.0 PACKING AND SHIPMENT

Shall be packed such that protected against corrosion, dampness, heavy rains, breakage and vibration in GPS Enabled Vehicle and shipment status through GPS Device shall be sent to BRPL Project incharge Via SMS/Email.

6.0 QUALITY ASSURANCE

Factory Acceptance Test : BRPL executives shall be visiting the vendors factory for inspection of Supply material. Travel Ticket (return flight), local travel, boarding and lodging shall be in vendor's scope.

Field Quality Plan : Vendor shall submit a field quality paln for approval of buyer before taking up the execution work at site.

7.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless the owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.No deviations will be acceptable post order.

K.A. Sastikumar.