Tender Notification for

Survey, Design, Supply, Installation, Testing & Commissioning of 33 kV GIS Switching Substation on Single point responsibility basis at Okhla, New Delhi

CMC/BR/22-23/RB/PR/KG/1053 DT 06.08.2022

Due Date for Submission: 29.08.2022 1530HRS

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**

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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	Survey, Design, Supply, Installation, Testing & Commissioning of 33 kV GIS Switching Substation on Single point responsibility basis at Okhla, New Delhi	10.30 Crores	As per BOQ Attached	Delhi, Sites

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

All envelopes shall be duly super scribed "Survey, Design, Supply, Installation, Testing & Commissioning of 33 kV GIS Switching Substation on Single point responsibility basis at Okhla, New Delhi NIT NO CMC/BR/22-23/RB/PR/KG/1053"

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 up to 29/08/2022 1530 HRS at the address given at 3.01 below. Part A of the Bid shall be opened on 29/08/2022 1600 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.

1.03 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 10,30,000/-** is not deposited in shape of Demand Draft/Pay Order/Banker's Cheque /Bank Guarantee drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi.
(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.
(iv) Technical offer contains any prices
(v) Prices are **not FIRM** and subject to Price Variation

2.0 **Qualification Criteria:-**

Technical

The prospective bidder shall either be the Original Equipment Manufacturers (OEMs) of "GIS Panels "of 33 kV or Higher Voltage rating, with manufacturing base in India OR Bidder shall be the "Established EPC contractors", with the relevant experience of execution of GIS sub-station and must qualify all of the following requirements to participate in the bidding process and bidder who meets following requirements will be considered as successful bidder and BRPL has a right to disqualify those bidders who do not meet these requirements.

1. Bidder shall be the Manufacturer (OEM) of "GIS Panels "of 33 kV or Higher Voltage rating, with manufacturing base in India. Offered GIS equipment shall be supplied from Indian manufacturing unit only.
   OR
   Bidders shall be "EPC contractor" with the relevant experience in the field of installation and commissioning of 33 KV or Higher Voltage rating GIS Substation, along with the complete Supply, Installation, Including all associated Civil Works.
   Erection of GIS panels shall be executed by "OEM" Only.
   For GIS Panel- EPC Contractor shall supply from the GIS – OEMs who adhere to the Qualification Criteria as specified in Points 1-4 of QR.
   EPC Contractor shall furnish the name of GIS – OEM, along with the Bid Submitted.

2. The bidder shall have servicing , repairing, testing & refurbishment facility in India with necessary spares and testing equipment for providing prompt after sales service for GIS and other major items.
   OR
   Incase Bidder is the EPC contractor, shall have necessary tie-up with OEMs for servicing, repairing, testing & refurbishment facility in INDIA with necessary spares and testing equipment for providing prompt after sales service for GIS and other Major equipments.

3. The bidder must have designed, supplied, installed & commissioned at least 2 Nos. of GIS Grid Sub-stations of 33 kV or higher voltage Rating including civil work on turnkey basis in last Five (5) years from date of Bid opening in any utilities/SEB's/PSU's/reputed firm wherein the end user shall be Utility/SEB's/PSU's. The list of orders/LOI for such installations shall be furnished.
   OR
   Bidders shall be "EPC contractor" with the relevant experience in the field of installation and commissioning of 33 KV or Higher Voltage rating GIS Substation, along with the complete Supply, Installation, Including all associated Civil Works in last Five (5) years from date of Bid opening in any utilities/SEB's/PSU's/reputed firm wherein the end user shall be Utility/SEB's/PSU's. The list of orders/LOI for such installations shall be furnished.

4. Bidder shall submit Two (2) performance certificates for the satisfactory performance from reputed Electricity Board(s)/ reputed company(ies) in India /Abroad , transmission and distribution utilities for the 33 KV or Higher Voltage Rating of GIS Grid Substation work, completed in past on turnkey basis.
   In case bidder has a previous association with BRPL/BYPL for similar product and service, the performance feedback for that bidder by BRPL/BYPL shall only be considered irrespective of performance certificate issued by any third organization.
   OR
   EPC Contractor shall submit two (2) performance certificates for the satisfactory performance from reputed Electricity Board(s)/ reputed company(ies) in India /Abroad, transmission and distribution utilitiy(ies) for the 33 KV or Higher Voltage Rating Grid Substation work completed in past, including associated Civil work on turnkey basis .
   In case of bidder has a previous association with BRPL/BYPL for similar product and service, the performance feedback for that bidder by BRPL/BYPL shall only be considered irrespective of performance certificate issued by any third organization.

Financial:

5. Bidder should have Average Annual Sales Turnover of Rs 200 Crores or more in last three (3) Financial Years (i.e. FY 2019-20, 2020-21 & 2021-22).

6. The Bidder shall submit an undertaking that "No Litigation" is pending with the BRPL or its Group/Associates Companies.

7. The bidder should possess valid Electrical Contractor License issued by competent statutory agency to undertake work in NCT Delhi. In case bidder is not having this license, Bidder to give the undertaking that it will be obtained by them before the start of the work at site or suitable sub-contractor having the valid license shall be engaged for works at site where copy of valid license shall be submitted to BRPL before the start of the work.

8. The bidder must possess valid ISO 9001:2015 certification

9. An undertaking (self-certificate) that the bidder has not been blacklisted/debarred by any central/state government institution/Electricity utilities

10. The bidder must have valid PAN No., GST Registration Number, in addition to other statutory compliances. The bidder must submit the copy of registrations and submit an undertaking that the bidder shall comply all the statuary compliances as per the laws/rules etc. before the start of the supply/work.

Note: A Bidder shall submit only one bid in the same tendering process, either individually as Bidder or GIS manufacturer or EPC contractor. A Bidder who submits or participates in more than one bid will cause all of the proposals in which the bidder has participated to be disqualified. All reference dates shall be taken as the date of technical bid opening

For either of the PQR conditions listed below as 1, 2 & 3, incase bidder is 100% owned subsidiary of their parent organization then the credentials of the parent organization shall be considered as compliance to the QR requirement as listed below. The QR parameters against which the bidder can submit the credential of their parent company are as below:

1. Bidder shall submit the Two (2) performance certificates for the satisfactory performance from Two (2) reputed Electricity Board/ reputed company in India /Abroad , transmission and distribution utilities for the 33 KV or Higher Voltage Rating of GIS Grid Substation work, completed in past including associated civil work on turnkey basis.

2. The bidder must have designed, supplied, installed & commissioned at least 2 Nos. of GIS Grid Sub-stations of 33 kV or higher voltage Rating including civil work on turnkey basis in last Five (5) years from date of Bid opening in any utilities/SEB's/PSU's/reputed firm wherein the end user shall be Utility/SEB's/PSU's.

3. Bidder must have average annual turnover of minimum Rs 200 Crores during last Three (3) financial years.

For either of the above PQR conditions listed as 1, 2 & 3 , incase bidder is 100% owned subsidiary of their parent organization, credential of the parent organization shall be considered as a compliance to the QR requirement , subjected to the fulfillment of the following conditions :

a) The submission of Additional 5% contract performance bank Guarantee (CPBG) from the parent company (whose credential has been submitted against the QR requirement). This bank Guarantee shall be over and above the 10% CPBG as per NIT conditions.

• Parent organization shall submit the additional BG from Indian Bank only.

• Additional BG shall be given by Parent company on behalf of the 100% Indian subsidiary company to M/s. BRPL against the said tender, against which Parent company credential have been submitted to BRPL for the purpose of vendor qualification of 100% Indian subsidiary Company.

• In case of any default in the performance of the contract in terms of supplies/timely execution/ performance of the equipment /contract, BRPL shall raise the invocation notice to Indian subsidiary company only for both BGs i.e one submitted by the bidder (Indian Subsidiary) and the other submitted by the parent company and parent company shall have "NO Objection" in this regard.

b) Extended warranty of two (2) years from the bidding Company for the installed GIS grid.

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

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 Department
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	11.08.2022
2	Pre-Bid meeting	17.08.2022 1430 HRS
3	Pre-Bid meeting ink	https://bsesbrpl.webex.com/meet/rakesh.bansal
4	Last date of Queries, if any	20.08.2022
5	Last date of receipt of bid documents	29.08.2022 1530HRS
6	Date & time of opening of tender – Part A	29.08.2022 1600HRS

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.

In case RA is not concluded/conducted for any reasons, a "final no regret" financial bid in a sealed envelope will be called for from all qualified bidders

BIDS RECEIVED AFTER DUE DATE AND TIME SHALL 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 shall be restricted from bidding for a length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

- Failure to honor prices submitted to the marketplace.
- Breach of the terms of the published in Request for Quotation/NIT.

6.00 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 bidders are required to return these documents to BRPL upon request.

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

7.00 Contact Information

Technical or Commercial clarifications, if any, as regards this RFQ shall be sought in writing and sent by mail to following address. The same shall not be communicated through phone.

	Technical	**Commercial**
Contact Person	Mr. Abhinav Srivastava	Mr. Pankaj Goyal
Address	BSES Rajdhani Power Ltd , 1st Floor, BSES Bhawan, Nehru Place, New Delhi 110019	BSES Rajdhani Power Ltd , 1st Floor, D Block, BSES Bhawan, Nehru Place, New Delhi 110019
Email	abhinav.r.srivastava@relianceada.com	pankaj.goyal@relianceada.com kumar.ga.gaurav@relianceada.com

SECTION – II: INSTRUCTION TO BIDDERS

1.00 GENERAL

BSES Rajdhani Power Ltd, hereinafter referred to as "The Company " are desirous of awarding work for "Survey, Design, Supply, Installation, Testing & Commissioning of 33 kV GIS Switching Substation on Single point responsibility basis at Okhla, New Delhi".

2.00 SCOPE OF WORK

The scope of the work is as per BOQ in the tender.

3.00 DISCLAIMER

This Document includes statements, which reflect various assumptions, which may or may not be correct. Each Bidder shall conduct its own estimation and analysis and should check the accuracy, reliability and completeness of the information in this Document and obtain independent advice from appropriate sources in their own interest.

Neither Purchaser nor its employees will have any liability whatsoever to any Bidder or any other person under the law or contract, the principles of restitution or unjust enrichment or otherwise for any loss, expense or damage whatsoever which may arise from or be incurred or suffered in connection with anything contained in this Document, any matter deemed to form part of this Document, provision of Services and any other information supplied by or on behalf of Purchaser or its employees, or otherwise a rising in any way from the selection process for the Supply.

Though adequate care has been taken while issuing the Bid document, the Bidder should satisfy itself that Documents are complete in all respects. Intimation of any discrepancy shall be given to this office immediately.

This Document and the information contained herein are Strictly Confidential and are for the use of only the person(s) to whom it is issued. It may not be copied or distributed by the recipient to third parties (other than in confidence to the recipient's professional advisors).

4.00 COST OF BIDDING

The Bidder shall bear all cost associated with the preparation and submission of its Bid and the company will be in no case be responsible or liable for those costs.

5.00 BIDDING DOCUMENTS

The Scope of Work, Bidding Procedures and Contract Terms are described in the Bidding Documents. In addition to the covering letter accompanying Bidding Documents, the Bidding Documents include:

Request for Quotation (RFQ) - Section - I
Instructions to Bidders (ITB) - Section - II
Special Terms & Conditions of Contract (SCC) - Section –III
General Terms and Condition Supply (GCC-Supply) - Section –IV
Price Format Supply- Section V
General Terms and Condition Erection, Testing & Commissioning (GCC-ETC) - Section –VI
Price Format Erection, Testing & Commissioning - Section VII
General Terms and Condition –Civil - Section VIII
Price format- Civil – Section IX

Grand Summary of the Quoted Price – Section X
Vendor Code of Conduct - Section XI
Technical Specifications - Annexure I

The Bidder is expected to examine the Bidding Documents, including all Instructions, Forms, Terms and Specifications. Failure to furnish all information required by the Bidding Documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will may result in the rejection of the Bid.

6.00 AMENDMENT OF BIDDING DOCUMENTS

At any time prior to the deadline for submission of Bids, the Company may for any reasons, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by amendment.

The Amendment shall be part of the Bidding Documents, pursuant to Clause 5.00, and it will be notified in web site **www.bsesdelhi.com**, and will be binding on them.

In order to afford prospective Bidders reasonable time in which to take the Amendment into account in preparing their Bids, the Company may, at its discretion, extend the deadline for the submission of Bids. The same shall be published as a corrigendum in website **www.bsesdelhi.com.**

Purchaser shall reserve the rights to following

- extend due date of submission
- modify tender document in part/whole
- cancel the entire tender

Bidders are requested to visit website regularly for any modification/clarification/ corrigendum/ addendum of the bid documents.

7.00 LANGUAGE OF BID

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

8.00 DOCUMENTS COMPRISING THE BID

The Bid prepared and submitted by the Bidder shall comprise the following components:

- Bid Form, Price & other Schedules (STRICTLY AS PER FORMAT) and Technical Data Sheets completed in accordance with Technical Specification
- All the Bids must be accompanied with the required EMD as mentioned in the Section-I against each tender.
- Tender documents duly stamped and signed on each page by authorized signatory

9.00 BID FORM

9.01 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.

9.02 **EMD**

The bidder shall furnish, as part of its bid, an EMD amounting 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) In the case of a successful Bidder, if the Bidder does not

(i) Accept the Purchase Order/ Work Order, or

(ii) Furnish the required performance security BG.

10.00 **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, Erection, testing & commissioning 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. The Bidder is required, at his expense, to obtain all the information he may require to enable him to submit his tender including necessary visits to the site to ascertain the local conditions, procurement of necessary materials, labour, etc., requirements of the local/government/public authorities in such matters.

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.**

11.00 **BID CURRENCIES**

Prices shall be quoted in Indian Rupees Only.

12.00 **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.

13.00 **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.

14.00 **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.

15.00 **SEALING AND MARKING OF BIDS**

15.01 Bid submission: One original & one Copy (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 and Copy. 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.

16.00 **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 thereafter be subject to the deadline as extended.

17.00 **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.

18.00 **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 shall be rejected and returned unopened to the Bidder.

19.00 **MODIFICATIONS AND WITHDRAWAL OF BIDS**

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

20.00 **PROCESS TO BE CONFIDENTIAL**

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

21.00 **CLARIFICATION OF BIDS**

To assist in the examination, evaluation and comparison of Bids, the Purchaser may, at its discretion, ask the Bidder for a clarification of its Bid. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted.

22.0 **PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS**

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

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

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

22.04 Bid determined as not substantially responsive will be rejected by the purchaser and/or the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non - conformity.

23.00 **EVALUATION AND COMPARISON OF BIDS**

The evaluation of Bids shall be done based on the delivered cost competitiveness basis.

23.01 The evaluation of the Bids shall be a stage-wise procedure. The following stages are identified for evaluation purposes: In the first stage, the Bids would be subjected to a responsiveness check. The Technical Proposals and the Conditional ties of the Bidders would be evaluated.

23.02 Subsequently, the Financial Proposals along with Supplementary Financial Proposals, if any, of Bidders with Techno-commercially Acceptable Bids shall be considered for final evaluation.

23.03 The Purchaser's evaluation of a Bid will take into account, in addition to the Bid price, the following factors, in the manner and to the extent indicated in this Clause:

- Delivery Schedule
- Conformance to Qualifying Criteria
- Deviations from Bidding Documents

Bidders shall base their Bid price on the terms and conditions specified in the Bidding Documents.

The cost of all quantifiable deviations and omissions from the specification, terms and conditions specified in Bidding Documents shall be evaluated. The Purchaser will make its own assessment of the cost of any deviation for the purpose of ensuring fair comparison of Bids.

23.04 Any adjustments in price, which result from the above procedures, shall be added for the purposes of comparative evaluation only to arrive at an "Evaluated Bid Price". Bid Prices quoted by Bidders shall remain unaltered.

24.00 CONTACTING THE PURCHASER

24.01 If any Bidder wishes to contact the Purchaser on any matter related to the Bid, from the time of Bid opening to the time of contract award, the same shall be done in writing only.

24.02 Any effort by a Bidder to influence the Purchaser and/or in the Purchaser‘s decisions in respect of Bid evaluation, Bid comparison or Contract Award, will result in the rejection of the Bidder‘s Bid.

25.00 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 any time 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.

26.00 AWARD OF CONTRACT

26.01 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.

26.02 The Purchaser intends to issue separate Purchase/Work Orders viz
a) Purchase Order for Supply
b) Work Order for Installation, Testing & Commissioning

27.00 THE PURCHASER ’S RIGHT TO VARY QUANTITIES

The Purchaser reserves the right to vary the quantity i.e. increase or decrease the numbers/quantities without any change in terms and conditions during the execution of the Order.

28.00 **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 within 7 days of issue of the letter of intent /Notification of Award by Purchaser. The date of LOI/PO shall be treated as Start date of work.

29.00 **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 up to completion period/handing over, whichever is earlier plus 3 months claim period. Upon submission of the performance security, the EMD shall be released. 2 (two) nos. separate CPBG's shall be submitted against Supply, ETC.

30.00 **CORRUPT OR FRADULENT PRACTICES**

30.01 The Company requires that the Bidders observe the highest standard of ethics during the procurement and execution of the Project. In pursuance of this policy, the Company:

(a) Defines, for the purposes of this provision, the terms set forth below as follows:

"Corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving, or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and

"Fraudulent practice" means a misrepresentation of facts in order to influence a award process or the execution of a contract to the detriment of the Company, and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at artificial non -competitive levels and to deprive the Company of the benefits of free and open competition.

(b) Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

(c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a contract.

30.02 Furthermore, Bidders shall be aware of the provision stated in the Terms and Conditions of Contract.

31.00 **COMPLETION PERIOD**

10 Months from the date of PO

2 months: Engineering - Drawing submission & approval and release of civil drawings to site for construction

5 months: Civil Construction at Site (by Consumer) and Electrical equipment Manufacturing

3 months: Erection, Testing and Commissioning of electrical equipment and related accessories and handing over

Section III

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, obtaining statutory clearance & certification from state electrical inspector and handing over of Grid to owner on single point responsibility basis.

1.3. The scope includes supply of all barricading, free issued materials (including installation, transportation, loading & unloading), dewatering, watch and ward and transportation of scrap (generated at Site), balance free-issued material, dismantled material from site to BRPL store including loading & unloading and no additional charges shall be paid against these activities. Used barricading material will be taken back by bidder soon after job is handed over or as directed by BRPL Engineer-In-Charge (E-I-C). No additional cost for these items will be paid to the Bidder. Any leakage, pilferage and damage of the material shall be in vendor's scope.

1.4. Joints & Terminations installation shall only be done by OEM. No additional cost for this item will be paid to the Bidder. Contractor to provide all support to the Jointers for doing Joints & Terminations of Joint Kits.

1.5. 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.

1.6. There will be no price escalation given to bidder even if there is delay in the project due to ROW permission.

1.7. Permission from road owning agencies & statutory clearance for road cutting shall be taken by Bidder. The Bidder shall follow-up with local authorities and other connected persons that may require carrying out the job under this work order.

1.8. Electrical Inspector Clearance fees shall be in Bidder's scope. The related fees, payments and pursuance work shall be in scope of Bidder only.

1.9. Bidder has to submit the technical parameters with details of Spares for each rating with catalogue, reference codes etc.

1.10. 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 if all the requirements are not complied during the submission of the same.

1.11. The bidder should have own testing equipment's/they have to provide like IR Tester, Hi Pot Test Kit, Earth Tester, etc with Calibration Certificates for testing.

1.12. The Bidder should have own Safety equipment like Neon Tester, Portable Earth, Earthing discharge rod etc. along with Calibration Certificates of all the equipment.

1.13. The Bidder should have all major tools and tackles required for installation, testing & commissioning works.

1.14. Bidder has to submit the item wise price bifurcation in bid. Un-priced copy must be attached with the Part A. Reverse Auction will be carried out on Lump sum Basis/Total Landed Cost i.e. Supply + ETC+ Civil.

1.15. Any other material not specifically mentioned above but required for successful commissioning and operation is in the scope of bidder. Prior approval shall be taken from central engineering department before execution. Commercial approval shall be taken from C&M Department before execution.

1.16. Successful bidder has to adhere to the statutory compliance.

1.17. 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.

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

1.19. 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.

1.20. Necessary Statutory Clearances from CEI of Delhi & any other authority for energizing shall be in the scope of this tender.

1.21. After commissioning of the complete system and final approval of Electrical Inspector & Compliance to punch points observed to the satisfaction of Projects as per statutory requirements, system shall be handed over to BRPL.

1.22. **Guarantee period/Defect Liability period:**

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical specifications are not part of contract documents or guarantee period is not specified in the Technical specifications, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in Technical specifications, Defect liability period will be 24 Months from the Date of Commissioning or 30 months from the date of delivery of final lot of supplies made, whichever is later.

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

1.23. **Failure during Guarantee Period:**

If the equipment and material supplied/service or work rendered under the contract fails to perform its due, rated & intended quality performance, during the Guarantee period, the bidder is liable to undertake repair/rectify/replace the equipment and material supplied/service or work rendered under the contract within time frame as specified below at bidder's cost to make the equipment and material supplied/service or work rendered under the contract of performing its due, rated and intended quality performance. If bidder fails to repair/rectify/replace the equipment or material supplied/service or work rendered under the contract, failed in Guarantee Period, purchaser will be at liberty to get the same done at bidder's risks and costs and recover all

such expenses plus the purchaser own charges (@ 15% of expenses incurred), from the bidder or from the "Performance Bank Guarantee" as the case may be.

If during the Warranty/ Guarantee period some parts of the supplies are replaced owing to the defects/ damages under the Warranty, the Warranty period for such replaced parts shall be until the expiry of twelve months from the date of such replacement or renewal or until the end of original Guarantee period, whichever is later.

a) 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)

b) Spare Material Delivery for rectification of defect (Major) Under Guarantee Period within Two Weeks. Bidder must keep Requisite Inventory of Critical Spares & Other Equipments Covered in Guarantee Period to Restore Equipment within Two Weeks.

c) In Case Of Complete Replacement of material, within a Period of 4 Weeks.

Note: BRPL is in the business of Power distribution and is committed to providing reliable and continuous power supply to its customers. In case of any fault in the system, BRPL's top most priority is to rectify the fault and restore the system as soon as possible and maintain the supply.

If during the defect liability period any fault occurs in the system due to faulty materials, design or workmanship, BRPL shall intimate the vendor of such occurrence for taking immediate corrective action.

However, if the situation, in BRPL's sole discretion warrants an emergency restoration, it reserves the right to take immediate action for identifying the fault and restoring the system with available resources & materials or with help from any other third party agency under intimation to the Vendor. All costs of replacement, substitution, shipping, labour and other related expenses including taxes and levies incurred in connection with the restoration of fault plus 15% of expenses incurred as administrative overheads shall be for the account of Vendor. BRPL will charge the vendor for the costs incurred for fault restoration or may set off such costs against any amounts payable by BRPL to the Vendor or deduct from the PBG submitted by the Vendor. Vendor shall pay BRPL the amount within 30 days.

Root cause analysis of the fault shall be done jointly by BRPL's CES & O&M teams and Vendor. In case the fault is due to any reason other than faulty materials, design or workmanship, Vendor shall be exempted from any further action or Cost.

1.24. All the bay equipment (i.e- LA, CT, PT, Disc Insulator, String, Suspension Insulator, Bushing etc.) shall be Polymeric type in the place of porcelain with creepage 31mm/kV. Rest of the parameter to be followed as per tech spec.

1.25. **PROJECT INFORMATION & COMPLETION**

The contractor shall be fully responsible to complete the project in time. It is desired that the project should be completed as per the schedule from the date of LOI or purchase order whichever is earlier. The detailed 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 with this tender/as asked by the Purchaser.

1.26. **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 & Network Diagram (with critical path) for various activities to achieve scheduled completion.

SECTION IV
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

Contract Documents: The terms and conditions of the contract shall consist solely of these RFQ conditions and the offer sheet. The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the same shall be explained and adjusted by the Purchaser, who shall thereupon issue to the Contractor, instructions thereon. In such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

1. Any amendments to Contract
2. Commercial Terms & Conditions of the Contract
3. Clarifications/addendum/corrigendum to Tender
4. Terms & Conditions of the Tender

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 can 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 without any extra cost. The in-house inspection shall be carried out in presence of BRPL/BRPL 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

Bidder has to quote their prices on Landed Cost Basis and quote separate price for each item.

FIRM prices for supply to BRPL Delhi/New Delhi stores inclusive of packing, forwarding, loading at manufacturer's premises, payment of all taxes, GST, Freight, any other local charges etc.

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

Transit insurance will be arranged by bidder.

8.0 Terms of payment and billing – SUPPLY

a) 10% advance against submission of BG of equivalent amount valid up to completion period/handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably.

b) 75% pro-rata of supply value shall be payable against R/A bills for 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.

c) 10% pro-rata after installation/erection of equipment duly certified by BRPL Project-in-charge

d) 5% pro-rata after completion of successful acceptance testing, commissioning and Handing Over of the entire Installation and duly certified by BRPL Project-in-charge and submission of PBG of 10% of contract value valid up to Defect Liability period i.e. 24 months from the date of Handing over of entire Installation Plus 3 months towards Claim period.

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 10% of the contract value at the time of claiming the last payment as per clause no. 8.0(C) (Terms of payment and billing – SUPPLY), with the validity of the bank guarantee till Defect Liability Period plus 3 months towards Claim period.

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 at 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 Guarantee of Performance

The bidder shall stand guarantee that the equipment and material supplied/service or work rendered under the contract is free from design, manufacturing, material, construction, erection & installation and workmanship & quality defects and is capable of its due, rated and intended quality performance, as an integrated product delivered under the contract for a specific period termed as Guarantee Period. The bidder should also guarantee that the equipment/material is new and unused except for the usage required for the tests and checks required as part of quality assurance.

14.0 Guarantee Period/Defects Liability Period

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical specifications are not part of contract documents or guarantee period is not specified in the Technical specifications, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in Technical specifications, Defect liability period will be 24 Months from the Date of Commissioning or 30 months from the date of delivery of final lot of supplies made, whichever is later.

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.

Cost of repairs on failure in Guarantee Period:

The cost of repairs/rectification /replacement, apart from the actual cost of repairs/rectification/replacement is also inclusive of all bidder costs of required transportation, site inspection /mobilization/dismantling and re-installation costs as applicable, to be borne by the bidder. The bidder has to ensure that the interruption in the usage of intended purpose of the equipment is minimized to the maximum extent In lieu of the time taken for repairs/rectification/replacement.

15.0 Latent Defect:

Hidden defects in manufacturing or design of the product supplied and which could not be identified by the tests conducted but later manifested during operation of the equipment are termed as latent defects. Bidder shall further be responsible for 'free replacement' for another period of FIVE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

16.0 Support beyond the Guarantee Period

The Bidder shall ensure availability of spares and necessary support for a period of at least 10 years post completion of guarantee period of equipment /technology supplied against this contract. BRPL shall be duly intimated by the Vendor of End of Life Support for the product /technology supplied at least 12 months in advance.

17.0 Return, Replacement or Substitution

BRPL shall give Supplier notice of any defective Commodity promptly after becoming aware thereof. BRPL may at 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.

18.0 Effective Date of Commencement of Contract:

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

19.0 Time – The Essence of Contract

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.

20.0 The Laws and Jurisdiction of Contract:

The laws applicable to this Contract shall be the Laws in force in India. To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this work order. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for adjudication by arbitration. The arbitration shall be undertaken by the sole arbitrator jointly appointed by the parties. In case the parties fail to arrive at consensus to appoint the sole arbitrator, either party may approach the Court for appointing an arbitrator under Section 11 of the Arbitration and Conciliation Act, 1996 and the award of the said sole arbitrator, shall be final and binding upon the parties. The arbitration proceeding shall be conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 (as amended up to date) and the venue of such arbitration shall be the city of New Delhi only. The Arbitration shall be conducted in English language only. The courts at Delhi shall have the exclusive jurisdiction over the subject matter of Arbitration/dispute. The cost of the Arbitration shall be equally shared by the parties as per directions of the Sole Arbitrator.

21.0 Events of Default

21.01 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.

22.0 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 to Bank for forfeiture 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.

23.0 Liquidated Damages

23.01 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 0.5% (half percent) of the total price for every week of delay or part thereof for undelivered units.

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

23.03 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. The levy payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Supply on time or from any other part of his obligation and liabilities under the Contract. Once the maximum is reached, the Company reserves the right for termination of contract without any liabilities to the Company.

In the event of an extension of time being granted by the EIC, in writing for the Completion of the works, this clause shall be applicable after the expiry of such an extended period.

24.0 Statutory variation in Taxes and Duties

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

25.0 Force Majeure

25.01 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.

25.02 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.

25.03 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.

25.04 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.

25.05 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.

25.06 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.

25.07 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

25.08 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.

25.09 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.

25.10 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 an event of Force Majeure."

26.0 Transfer and Sub-Letting

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.

27.0 Recoveries

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.

28.0 Waiver

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

29.0 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.

30.0 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.

31.0 Commissioning Spares

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

32.0 Limitation on Liability

Notwithstanding anything to the contrary in the Purchase Order but subject to clause 33 Consequential Damages, the aggregate liability of either Party to the other Party in respect of all claims for Liabilities arising under the Purchase Order shall not exceed the aggregate value of the Purchase Order(s) under which the Liabilities arose except that such limitation shall not apply to the Contractor's indemnification obligations in accordance with clause 29 Indemnification herein.

33.0 Consequential Damages

Notwithstanding anything to the contrary in the Purchase Order, except for breach of obligations under Non-disclosure and except as expressly provided in a Purchase Order, in no event, as a result of breach of contract or breach of warranty or otherwise, shall either Party hereto or either Party's Affiliates or sub Contractors, be liable under the Purchase Order to the other Party for any consequential, special, indirect, exemplary or incidental damages, and/or for any lost profits, goodwill or revenues of such Party, howsoever arising, before or after Acceptance of the Goods and whether or not such damages are foreseeable.

SECTION V

PRICE FORMAT – SUPPLY

S.No.	Item Description	Quantity	UOM	Basic (Rs)	Freight (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	33kV GIS Panels including LCC (As per Tender SLD)							
1a	33kV GIS Panel Line panel(As per Tender SLD)- Including Power Cable Termination	5	Set					
1b	33kV GIS Panel Bus coupler(As per Tender SLD)	1	Set					
1c	33kV GIS Bus PT(As per Tender SLD)	2	Set					
2	33kV Control Relay Panel							
2a	33kV Control Relay Panel Line Feeder	5	Set					
2b	33kV Control Relay Panel Bus coupler Feeder	1	Set					
3	50V Li-Ion Battery bank	1	Set					
4	DCDB with battery charger	1	Nos					
5	ACDB	1	Nos					
6	SCADA RTU	1	Set					
7	Grounding and earthing of entire substation	1	Set					
8	Indoor LED lighting system including emergency lighting	1	Lot					
9	Air conditioning for complete substation building except Toilet and Pantry	1	Lot					
10	Exhaust and Ventillation for Toilet, Pantry and Cable Celler	1	Lot					
11	Fire detection and alarm system for building	1	Lot					
12	Building lightning protection system	1	Lot					
13	Control cables							
A	6CX4Sqmm	1000	Mtr					
B	6CX2.5Sqmm	1000	Mtr					
C	10CX2.5Sqmm	4400	Mtr					
14	LT power cable including terminations and Glands							
A	2CX10Sqmm	600	Mtr					
B	4CX10Sqmm	800	Mtr					
C	4CX150Sqmm	50	Mtr					
D	2CX2.5Sqmm	250	Mtr					
E	4CX95Sqmm	50	Mtr					

15	Connectors and Clamps with 10% Spare as per requirement	1	Lot					
16	Cable trays as per requirement	1	Lot					
17	Cabling between equipments and RTU as per requirement	1	Lot					
18	Control Cable Terminations and Glands as per requirement	1	Lot					
19	Fire Extinguisher as per spec	1	Lot					
20	Outdoor area LED Lighting -Wall mounted fixtures as per spec	1	Lot					
21	Line current differential relay for remote location as per spec	5	Nos					
22	Video Surveillance system as per spec	1	Set					
23	Spares (as per specs)	1	Lot					
24	Cable entry sealing as per requirement	1	lot					
25	IT Requirements as per spec/BOQ	1	Lot					

BOQ shall be read in conjunction with the Tender Document & General Design Criteria

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 all taxes & duties, freight up to Delhi stores. b)Unloading at stores - in vendor's scope c) Transit insurance in Bidder scope	
3	Payment terms	a. 10% advance against submission of BG of equivalent amount valid up to completion period/handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably. b. 75 % against R/A bills within 30 days against receipt of material at site. c. 10% pro-rata after installation/erection of equipment d. 5% pro-rata after completion of successful acceptance testing, commissioning and Handing Over of the entire Installation and duly certified by BRPL Project-in-charge and submission of BG of 10% of contract value valid up to Defect Liability period i.e. 24 months from the date of Handing over of entire Installation Plus 3 months towards Claim period	
4	Completion time	10 months from date of LOI/Order	
5	Defect Liability period	24 months from the date of Handing over of entire Installation.	
6	Liquidated damages	0.5% of total price for every week delay subject to maximum of 10% of total contract value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to completion period/handing over.	
8	Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to Defect Liability Period plus 3 months towards claim period.	

SECTION VI

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 Bidder / 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 Bidder shall be written in English language.

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

4. SCOPE OF WORK:

The scope includes survey , design , engineering , manufacture , 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 , obtaining statutory clearance & certification from state electrical inspector, Municipal Corporation department (if required), Fire Officer (if required), Horticulture department (if required), and handing over to owner after successful testing & Commissioning of 33 kV GIS Substation at Okhla, New Delhi, BRPL on single point responsibility basis. Schedule of work shall be as per BOQ attached herewith.

After completion of E/T/C work of the scheme, Bidder has to obtain the Electrical Inspectorate's Clearance from the Electrical Inspector of Delhi Govt. Electrical Inspector Clearance fees shall be in Bidder's scope. The related fees, payments and pursuance work shall be in scope of Bidder only.

Bidder shall arrange any permission like road cutting clearance, if required, etc. from the Delhi Civic authorities. The Bidder shall follow-up with local authorities and other connected persons that may be required to carry out the job under this work order.

All the labour, cranes, tool and tackles, and technical supervision etc. are including in your scope of work. Adequate number of engineers, supervisors and laborers shall be posted at site and the list of the same along with certificate of Qualification of technical staff should be submitted by the Bidder to the Engineer In Charge for checking the adequacy immediately (within seven days) after award of contract.

The Bidder shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site. Company will be provided at site the adequate open space for Bidder's site store for storing the materials, tools, tackles etc. The entire Bidder's storage will be within the site premises. All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the custody of Bidder, however company does not hold any responsibility for any loss or damage of Bidder's material etc.

All loading/ unloading, of materials at work-site shall be Bidder's responsibility. Involvement of Crane/ Hydra/ Tractor/ Trailer for this type of work shall be in your scope. Adequate weather protection shall be provided by the Bidder to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins.

The Bidder at his own shall arrange Water and Electricity Power at his cost.

Special Instruction:-

a. All Erection tools and tackles and testing equipment shall be available with Bidder in event of order.

b. Penalty clause shall be incorporated in case any of workmen of Bidder is found violating safety protocol as per GCC-ETC LD Clause no 15.

Any additional work beyond the scope enumerated in the work order above shall be carried out as per the instructions of Engineer-In Charge. The company shall not entertain any claim or increase in the Work Order value due to execution of such additional work if the same is not approved by Engineer in Charge.

5. RATES:

The rates finalized for this order shall be firm for the entire duration of work carried out by the Bidder 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 Bidder's scope and value shall be included in the unit rates finalized.

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

6. TAXES AND DUTIES:

Prices are inclusive of all taxes and duties including GST as applicable. However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS).

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.

7. TERMS OF PAYMENT (Erection, Testing & Commissioning)

Payment shall be made as under:

(i) 10% mobilization advance against submission of Advance Bank Guarantee of equivalent amount valid up to completion period/ handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably.

ii) 75% pro-rata of total installation value shall be payable against R/A bills payable within 45 days after installation / erection of material at site duly certified by Engineer in charge.

iii) 10% pro-rata of total installation value shall be payable against R/A bills payable within 30 days after testing & commissioning of material at site.

iv) 5% of contract value payable after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by Engineer in charge, submission of Electrical Inspector Clearance Certificate & submission of Performance Bank Guarantee of 10% of contract value valid up to defect liability period i.e. 24 months from the date of Handing over of entire Installation Plus 3 months towards Claim period.

All the Bank guarantees shall be submitted as per Company's format (Appendix I) and from any scheduled Bank approved by Company.

Company shall make payments of the bills either; By crossed cheque or by electronic transfer directly to Bidder's designated bank account.

8. Guarantee of Performance

The bidder shall stand guarantee that the equipment and material supplied/service or work rendered under the contract is free from design, manufacturing, material, construction, erection & installation and workmanship & quality defects and is capable of its due, rated and intended quality performance, as an integrated product delivered under the contract for a specific period termed as Guarantee Period. The bidder should also guarantee that the equipment/material is new and unused except for the usage required for the tests and checks required as part of quality assurance.

9. Guarantee period/Defect Liability period:

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical specifications are not part of contract documents or guarantee period is not specified in the Technical specifications, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in Technical specifications, Defect liability period will be 24 Months from the Date of Commissioning or 30 months from the date of delivery of final lot of supplies made, whichever is later.

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.

10. 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 Bidder 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. 7.0 (iii) (TERMS OF PAYMENT (Erection, Testing & Commissioning)), with the validity of the bank guarantee till Defect Liability Period i.e. 24 months from the date of Handing over of entire Installation plus 3 months.

11. 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, Testing & Commissioning work should be completed within 10 months from the date of issue of LOI/WO. 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.

12. 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 Bidder's risk and costs.

13. COMMISSIONING & ACCEPTANCE TEST:

After completion of the work, the Bidder 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 Bidder. If any rectification/modification required during this period the Bidder 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.

14. WORK COMPLETION CERTIFICATION, HANDING OVER.

The work carried out by the Bidder under this order has to be certified by Engineer In-charge for satisfactory completion of work allotted to the Bidder with respect to specifications / Field Quality Procedures as per applicable standards. In case of modification/correction to be carried out, Bidder shall carry out the said modifications/correction without additional cost. The Bidder 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 Bidder 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 Bidder as certified by Engineer In-Charge. Bidder 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 Bidder 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.

15. PENALTY AND LIQUIDATED DAMAGES

15.1 Penalty: A penalty of 2.5% of bill amount shall be levied in each case of non-compliance of safety practices and site cleanliness.

15.2 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 Bidder, the Bidder shall pay to the Company liquidated damages.

If the Bidder 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 0.5 % of the total 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. The levy payment or deduction of such damages shall not relieve the Bidder from his obligation to complete the Works on time or from any other part of his obligation and liabilities under the Contract. Once the maximum is reached, the Company reserves the right for termination of contract without any liabilities to the Company.

In the event of an extension of time being granted by the EIC, in writing for the Completion of the works, this clause shall be applicable after the expiry of such an extended period.

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

16. SAFETY REGULATIONS & SAFETY CODE:

The Bidder shall indemnify the Company from any consequence arising due to Bidder's failure in respect to safety compliance.

First Aid facilities at easily accessible place shall be provided by the Bidder at his own cost as per provisions of Labor act or as advised by the Company wherever works are carried out.

All critical injuries shall be reported promptly to the Company. The report shall cover type, nature, cause, physician's report and actions for prevention of those types again.

To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Bidder shall be open to inspection by the Company.

The cost so incurred by the Bidder in providing for safety standards and requirements as above shall be deemed to be included in the rates quoted for various items under the scope of Contract and no extra amounts shall be payable to the Bidder on this account.

The Bidder shall furnish to the Company within seven days from issue of Work Order whichever is earlier, for approval of Company, the proposed safety program on how it intends to implement the safety procedures and precautions to ensure that the site is accident free.

The Bidder 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 Bidder shall not deploy any worker below the age of 18 years.

The Bidder 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 Bidder that all safety requirements are followed by the employees and staff of the sub-vendor.

The Bidder 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 Bidder 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 Bidder 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 Bidder 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 Bidder shall submit a monthly statement of the accidents to the owner at the end of each month.

17. STATUTORY OBLIGATIONS:

The Bidder 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) An Electrical license issued by Govt. of Delhi.
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 Registration Number/ GSTN Registration.
g) Labour License under Contract Labour Act (R & A) Act 1970

(The Bidder shall provide BRPL Engineer-in-charge a copy of Labour License responsible for execution of the job before start of the work.)

The Bidder 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 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}

18. 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 Bidder 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 Bidder, the Bidder shall certify for the same.

The Bidder 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 Bidder/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 Bidder, moneys paid or payable by way of compensation as aforesaid or cost or expenses in connection with any claims thereto and the Bidder shall abide by the decision of the Company as to the sum payable by the Bidder under the provisions of this clause.

19. STAFF AND WORKMAN

It shall be responsibility of Bidder

(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 Bidder 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 Bidder.

(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.

20. INSURANCE

a) THIRD PARTY INSURANCE

Before commencing the execution of the work the Bidder shall take third party insurance policy at his own cost 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 Bidder shall be responsible for settlement of claims with the underwriters without any liability on

the purchaser/ owner and will arrange replacements/ rectification expeditiously without awaiting settlement by insurance claim at Bidders own cost.

b) ACCIDENTAL INSURANCE POLICY FOR LIFE COVER:

Before commencing the execution of the work, the Bidder 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 Bidder 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 borne by the Bidder. The Bidder shall furnish copy of policy when demanded by BRPL.

c) INSURANCE FOR MAN, MATERIAL & MACHINERY DEPLOYED AT SITE

Bidder shall be responsible for the insurance for his own man, material and machinery deployed at site for the package awarded. Bidder shall furnish the copy of this insurance policy to the purchaser, prior start of work.

21. 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.

22. ENVIRONMENTAL, HEALTH & SAFETY PLAN:

Bidder 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. Bidders 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 Bidders staffs are 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.

23. TEST CERTIFICATE & QUALITY ASSURANCE:

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

24. SUB-CONTRACTING / SUBLETTING:

BIDDER 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 Bidder assigns this work order, Bidder'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, Bidder 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.

25. INDEMNITY:

Bidder 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 Bidder or its employees or agents of any of the provisions of this Work Order.
B. Any act or omission of Bidder or its employees or agents.
C. Any negligence or breach of duty on the part of Bidder, its employees or agents including any wrongful use by it or them of any property or goods belonging to or by COMPANY or any other third party at site including adjoining neighbors.

Bidder shall at all times indemnify COMPANY against all liabilities to other persons, including the employees or agents of COMPANY or Bidder 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.

26. 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 Bidder, if in the opinion of COMPANY, Bidder 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 sub-vendor 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 tender, the contractor shall be liable to COMPANY for any additional costs that may be incurred by COMPANY for the execution of the Work.

27. 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.

28. ARBITRATION:

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this LOA. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration. The arbitration is to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be in the city of New Delhi only.

29. FORCE MAJEURE:

29.1 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

29.2 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:

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, and

b) Explosions or fires

c) Declaration of the Site as war zone.

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

29.3 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.

29.4 Mitigation of events of force majeure:

The Bidder 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.

29.5 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.

29.6 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.

30. 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.

This 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 Bidder 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 Bidder shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

31. TERMINATION

"During the course of the execution, if at any time BRPL observe and form an opinion that the work under the order is not being performed in accordance with the terms of this Agreement, BRPL reserves its right to cancel this Agreement giving 15 days notice mentioning the reason for the termination of the agreement and BRPL will recover all damages including losses occurred due to loss of time from Bidder.

32. QUALITY

Bidder shall ensure that strict quality is maintained and execution of works under the 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 Bidder shall maintain proper records of such tools, tackles, instruments and / or equipment.

33. LIABILITY OF BIDDERS

Subject to the due discharge of its obligations under the Contract and except in case of gross negligence or willful misconduct on the part of the Bidder or on the part of any person acting on behalf of the Bidder, with respect to any loss or damage caused by the Bidder to the Employer's property or the Site, the Bidders shall not be liable to the Employer for the following:

a) For any indirect or consequential loss or damage; and
b) For any direct loss or damage that exceeds:

(i) The total payments made and expected to be made to the Bidder under the Contract including reimbursements, if any; or
(ii) The insurance claim proceeds which the Bidder may be entitled to receive from any insurance purchased by the Bidder to cover such a liability, whichever is higher.
This limitation of liability shall not affect the Bidder's liability, if any, for damage to any third party, caused by the Bidder or any Person or firm acting on behalf of the Bidder in executing the Works.
Notwithstanding anything contained in the Contract, the Bidder shall not be liable for any gross negligence or willful misconduct on the part of the Employer or any of its affiliates, any Bidder, or any party, other than Bidder and/or, its directors, officers, agents or representatives or its affiliates, or Sub-vendor, or the Bidder or any third party engaged by it.
Notwithstanding anything contained in the Contract, including but not limited to approval by the Employer of any drawings, documents, Bidder list, supply of information or data or the participation of the Employer in any meeting and/or discussion or otherwise, shall not absolve the Bidder from any of its liabilities or responsibilities arising in relation to or under the Contract.

SECTION VII

PRICE FORMAT – ERECTION, TESTING & COMMISSIONING

S.No.	Item Description	Quantity	UOM	Basic (Rs)	Freight (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	33kV GIS Panels including LCC (As per Tender SLD)							
1a	ITC of 33kV GIS Panel Line panel(As per Tender SLD)- Including Power Cable Termination	5	Set					
1b	ITC of 33kV GIS Panel Bus coupler(As per Tender SLD)	1	Set					
1d	ITC of 33kV GIS Bus PT(As per Tender SLD)	2	Set					
2	33kV Control Relay Panel							
2a	ITC of 33kV Control Relay Panel Line Feeder	5	Set					
2c	ITC of 33kV Control Relay Panel Bus coupler Feeder	1	Set					
3	ITC of 50V Li-Ion Battery bank	1	Set					
4	ITC of DCDB with battery charger	1	Nos					
5	ITC of ACDB	1	Nos					
6	ITC of SCADA RTU	1	Set					
7	ITC of Grounding and earthing of entire substation	1	Set					
8	ITC of Indoor LED lighting system including emergency lighting	1	Lot					
9	ITC of Air conditioning for complete substation building except Toilet and Pantry	1	Lot					
10	ITC of Exhaust and Ventillation for Toilet, Pantry and Cable Celler	1	Lot					
11	ITC of Fire detection and alarm system for building	1	Lot					
12	ITC of Building lightning protection system	1	Lot					
13	ITC of Control cables							
A	6CX4Sqmm	1000	Mtr					
B	6CX2.5Sqmm	1000	Mtr					
C	10CX2.5Sqmm	4400	Mtr					
14	ITC of LT power cable including terminations and Glands							
A	2CX10Sqmm	600	Mtr					

B	4CX10Sqmm	800	Mtr					
C	4CX150Sqmm	50	Mtr					
D	2CX2.5Sqmm	250	Mtr					
E	4CX95Sqmm	50	Mtr					
15	ITC of Connectors and Clamps	1	Lot					
16	Installation of Cable trays as per requirement	1	Lot					
17	ITC of Cabling between equipments and RTU as per requirement	1	Lot					
18	ITC of Control Cable Terminations and Glands as per requirement	1	Lot					
19	Installation of Fire Extinguisher as per spec	1	Lot					
20	Installation of Outdoor area LED Lighting - Wall mounted fixtures as per spec	1	Lot					
21	ITC of Line current differential relay for remote location as per spec	5	Nos					
22	ITC of Video Surveillance system as per spec	1	Set					
23	ITC of Cable entry sealing as per requirement	1	lot					
24	ITC of IT Requirements as per spec/BOQ	1	Lot					
25	Inspection and Training of BRPL Executives (As per Specs)	1	Lot					

Appendix-II

COMMERCIAL TERMS AND CONDITIONS – E/T/C

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	**Firm**. Prices shall be inclusive of all taxes & duties.	
3	Payment terms	a) 10% mobilization advance against submission of Advance Bank Guarantee of equivalent amount valid upto completion period/ handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably. b) 75% pro-rata of total installation value shall be payable against R/A bills payable within 45 days after installation/erection of material at site duly certified by Engineer in charge. c) 10% pro-rata of total installation value shall be payable against R/A bills payable within 30 days after testing & commissioning of material at site duly certified by Engineer in charge. d) 5% of contract value payable after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by Engineer in charge, submission of Electrical Inspector Clearance Certificate & submission of Bank Guarantee of 10% of contract value valid up to defect liability period i.e. 24 months from the date of Handing over of entire Installation Plus 3 months towards Claim period.	
4	Completion time	10 months from date of LOI/Order	
5	Defect Liability period	24 months from the date of Handing over of entire Installation.	
6	Liquidated damages	0.5 % 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	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to completion period/handing over.	
8	Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to Defect Liability Period i.e. 24 months from the date of Handing over of entire Installation plus 3 months	

		towards claim period.	

SECTION VIII

GENERAL TERMS & CONDITIONS – CIVIL WORKS

1. DEFINITIONS:

The following terms shall have the meaning hereby assigned to them except where the context otherwise requires:

a. Company shall mean BSES Rajdhani Power Limited, having its office at BSES Bhawan, Nehru Place, New Delhi – 110019 and shall include its authorized representatives, agents, successors and assigns.

b. Engineer in Charge (EIC) shall be the person authorized by the Company or from time to time duly appointed by the Company for the purpose of the contract.

c. Contractor shall mean the successful Bidder / vendor to whom the contract has been awarded.

d. Sub-Contractor shall mean the persons, firm or company to whom any part of the contract has been sublet by the Contractor with the prior written consent of the Company.

e. Contract, shall mean and include the general terms and conditions, technical specifications, drawings, priced bill of quantities, schedule of rates and prices, if any, tender, Company's letter of intent, the work order and any correspondence letters concerned to the tender, when completed.

f. Site, shall mean the actual place in over or under which, permanent works or temporary works is to be executed by the Contractor.

g. Contract Price shall mean the sum named in the letter of acceptance, subject to such additions thereto and /or deductions there from as may be made under the provisions hereinafter contained.

h. Specifications shall mean specification referred to in the tender and any modification thereof or addition thereto as may, from time to time be instructed by the Company/ the Structural Consultant.

i. Approved, shall mean approved in writing by Company including subsequent written confirmation of previous verbal approval and "approval" means approval in writing by Company, including as aforesaid.

j. Defect Liability Period: Shall mean the period during which the contractor shall remain liable for repair or replacement of any defective part of the work performed under the contract, free of cost.

2. EXAMINATION OF SITE AND LOCAL CONDITIONS::

The contractor is deemed to have visited the site of the work under the Tender and ascertained therefore all site conditions and information pertaining to his work. Before submitting the bid, all bidders will at their expenses make or obtain any additional information, investigations, explorations, test and studies and obtain any additional information and data which pertains to the physical conditions at or contiguous to the site or otherwise which may affect cost, progress, performance of the work and which the bidder deems necessary to determine its Bid for performing the work in accordance with the time and other terms and conditions of the tender/contract

documents. The company shall not entertain any claim whatsoever arising out of the difficult site/terrain/local conditions, if any.

3. LANGUAGE AND MEASUREMENT:

The Tender issued to the contractor by the company and all correspondence and documents relating to the Tender placed on the Contractor shall be written in English language. Metric System shall be followed for all dimension, units etc., the mode of measurement shall be as per IS 1200.

4. SCOPE OF WORK:

The scope of work shall be civil works of 33KV GIS Grid Substation at Okhla, New Delhi, including all statutory clearances & certification from State Electrical Inspector, Municipal corporation department (if required), Fire officer (if required), Horticulture department (if required) and various local bodies like RWA. Schedule of work shall be as mentioned in the Bill of quantity attached herewith.

All the Labor, plant appliance, ladder, scaffoldings, materials, tool, tackles etc are included in contractor's scope of work. Adequate number of engineers, supervisors and skilled and unskilled Labors shall be posted at site.

The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site.

Company will provide at site the adequate open space for setting up contractor's site store for storing the materials, tools, tackles etc. The entire Contractor's storage will be within the site premises. All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the custody of Contractor, however company does not hold any responsibility for any loss or damage of Contractor's material etc.

All loading/unloading, of materials at work-site shall be your responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in your scope.

Adequate weather protection shall be provided by the contractor to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins.

Water and Electricity Power shall be arranged by the Contractor at his own. 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 including in the above mentioned Tender value. The unit rates mentioned in annexure is inclusive of barricading, watch & ward during execution and no separate charges shall be paid for the same.

5. VALUE OF THE ORDER:

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 rates quoted for each item/ work in the BOQ shall be deemed to include and cover all cost, expenses and liabilities to every description and all risk of every kind to be taken in executing, completing and handing over the work to the satisfaction of the Company.

The Contractor shall on his own and at his own expense obtain all necessary permits and permissions to execute the job, including required registrations, agent's etc. to perform its obligation under this Contract and shall indemnify the Company in all related matters.

6. TAXES & DUTIES:

Prices are inclusive of all taxes, duties, Construction Cess etc. leviable by State or Central Government or local bodies including any duties which may be levied by the Govt. during currency of this order. GST as applicable shall be paid on

submission of GST Registration and self declaration on your letter head stating that you have deposited/or will deposit the Tax as per the applicable GST laws. However, Income Tax as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS).

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 & 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.

7. TERMS OF PAYMENT:

Payment shall be made to you as under:

a) 10% of total civil works value shall be payable as advance against submission of Bank Guarantee of equivalent amount valid up to completion date plus 3 (three) months towards claim period. The advance shall be adjusted against R/A Bills.

b) 80% pro-rata of total civil works value shall be payable against progressive R/A biils payable within 30 days duly certified by Engineer-In-Charge after completion.

c) 10% of total civil works value shall be payable after completion against submission of Bank Guarantee of equivalent amount valid up to Defect liability period plus 3 (three) months towards claim period.

The Contractor shall submit the final bill along with duly checked final measurements and completion certificate towards the successful completion of the Contract as certified by the EIC**.**

Payment of final bill shall not be considered conclusive evidence as to the sufficiency of any work or materials, to which it relates, nor shall it relieve as to the sufficiency of work or materials which it relates, nor shall it relieve the Contractor from his liabilities arising from any defects, which become apparent during the Defects Liability Period.

8. DEFECT LIABILITY PERIOD:

The civil works shall be guaranteed against any defect or failure which may arise due to faulty materials, design or workmanship for a period of 24 months from the date of handing over of the substation. In case any defect in the work is observed during the defect liability period, the same shall be rectified by the Contractor at own cost including supply of all materials, labour, equipments and any other appliance in this regards (as per prevailing rates) for the fulfillment of all obligations under the Contract and to the satisfaction of the Company, with in 10 day s from the date of receipt of intimation from BRPL.

Under no circumstances any extra claim in terms of time and cost shall be entertained for such repair/ rectification.

9. SCHEDULE OF COMPLETION AND PERIOD OF MOBILISATION:

The time schedule for carrying out this work and period for mobilization shall be as under:

9.1 The Contractor shall mobilize their Plants & Equipments, Tools & Tackles, Work Labour Force, project team including Engineering Staff and materials required for execution of work at site for commencement of work immediately on receipt of the order.

9.2 The entire work under this order as indicated in the scope of work shall be carried out and completed within the validity period i.e. 300 days. A detailed L2 Schedule shall be submitted by the contractor within 15 days of WO. The contractor shall plan parallel working (round the clock working) f or completion of work as per schedule and mobilize manpower accordingly .

9.3 Progress Review Meeting between the Contractor and the Engineer In charge shall be held at site at least once in a week. Also the report giving the details of the manpower engaged at site and the details of the major job completion shall be submitted to Engineer In charge.

9.4 The above time schedule must be strictly adhered to and improved upon wherever possible. In the event we find that your work is not progressing in quality or time frame as per above agreed schedule and to our satisfaction, we reserve the right to withdraw the work in whole or in part without further notice and liability of the Company.

9.5 The completion of the work shall have to be certified by Engineer In charge.

9.6 In order to maintain the time schedule, if necessary the Contractor shall carry out the work on all Sunday & Holiday except National Holiday with prior written permission from Engineer-in- Charge.

9.7 Contractor shall arrange any permission like for the Road cutting etc. from the local authorities like DDA, PWD, and DJB. Contractor shall also follow up with local authorities and other connected persons that may be required to carry out the job under this order. All Statutory charges and direct fees except Electrical Inspector Clearance fees shall be borne by BRPL.

10. TEST CERTIFICATE & QUALITY ASSURANCE:

Quality Assurance Program:

The Contractor before the start of work shall submit for approval a quality assurance program to the EIC indicating measures that he proposes to implement to ensure that the quality of work shall be in accordance with requirements, specifications laid down in the Contract. The Contractor shall strictly adhere to this program and any failure attributable to the Contractor shall attract the penal provisions determined by the EIC.

Quality of materials and workmanship and tests:

The Contractor shall procure all equipment from genius sources as approved by the Company & as per Company specifications. Cement shall be of grade 43 ordinary port land cement conforming to IS 8112/53 grade O.P.C. conforming to IS 12269, aggregate for cement concrete shall confirm to IS 383, reinforcement for cold twisted bars shall confirm to IS 1786, the bricks for brick work shall correspond to IS 1077, Structural steel shall confirm to relevant IS code, water to be used shall comply with requirement of IS 456. Contractor shall provide all requisite facilities for field tests and laboratory tests shall be carried out in the laboratory having ISO 9001-2000 Certified Testing Lab for which no extra payment shall be made. The Contractor shall maintain mandatory Test Register with Engineer-in-Charge as provided in latest Indian Standard Specifications.

All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with the Engineer-in-Charge's instructions and shall be subjected from time to time to such tests as the Engineer-in-Charge may direct at the place of manufacture or fabrication or on the site or at such other places as may be specified in the Contract, or at all or any of such places. The Contractor shall provide at no additional cost to the Company such assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used and shall supply samples of materials before incorporation in the works for testing as may be selected and required by the EIC.

Cost of samples and tests:

All samples shall be supplied to Company if required by the Contractor at his own cost. The Contractor shall take approval of the EIC prior to start the work for all samples of materials including mix design of concrete to be utilized for the works to be executed. The mix design of concrete, testing of reinforcement steel and structural steel shall be carried out by an external agency approved by the Company. The cost of all such tests carried out by the external agencies or

consultants shall be borne by the Contractor at his own cost and are deemed to be included in the unit rates quoted in the BOQ.

Sampling and Testing Concrete on Site

The Contractor can also have cubes tested in an approved laboratory in lieu of a testing machine at site but at his own cost and with the prior written consent of the Company.

Inspection of operations:

The Engineer-in-Charge/QC department or any person authorized by them shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the Contractor shall afford every facility for and every assistance in or in obtaining the right to such access.

Examination of work before covering up:

No work shall be covered up or put out of view without the approval of the EIC or his representative and the Contractor shall afford full opportunity to the EIC or his representative to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the EIC or his representative whenever any such work or foundations is or are ready or about to be ready for examination and the EIC or his representative shall, without unreasonable delay, unless he considers it unnecessary, attend for the purpose of the examining such foundations.

11. 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. The Company may approve or reject sub-contractor, which in his opinion do not meet the prerequisite qualifications. The Contractor shall re-submit a fresh name for approval.

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.

12. 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 or any other third party at site including adjoining neighbors.

Contractor shall at all times indemnify COMPANY against all liabilities to other persons, including the 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.

13. 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 17.0 of this tender, the contractor shall be liable to COMPANY for any additional costs that may be incurred by COMPANY for the execution of the Work.

14. 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.

15. 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' staffs are 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.

16. 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.

If required, field findings and for revision of the method for site work if required. Work Completion Certificate shall be issued by the Engineer In charge within 10 days of satisfactory work completion subject to handing over of clear site i/c removal of Labor accommodation, stores, storage arrangements for water, plants, tackles, scaffoldings, ladders, leveling at site. The Contractor shall give undertaking that all standing dues to Labor have been paid and all the statutory obligations have been met with. Completion certificate has to be submitted with the final bill issued by Engineer-in- Charge.

17. PENALTY AND LIQUIDATED DAMAGES:

17.1 Penalty: A penalty of 2.5% of bill amount shall be levied in each case of non-compliance of safety practices and site cleanliness.

17.2 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 to complete the construction of subject work 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 0.5 % of the total 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. The levy payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works on time or from any other part of his obligation and liabilities under the Contract. Once the maximum is reached, the Company reserves the right for termination of contract without any liabilities to the Company.

In the event of an extension of time being granted by the EIC, in writing for the Completion of the works, this clause shall be applicable after the expiry of such an extended period.

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

18. SAFETY REGULATIONS:

18.1 The Contractor shall indemnify the Company from any consequence arising due to contractor's failure in respect to safety compliance.

18.2 First Aid facilities at easily accessible place shall be provided by the Contractor at his own cost as per provisions of Labor act or as advised by the Company wherever works are carried out.

18.3 All critical injuries shall be reported promptly to the Company. The report shall cover type, nature, cause, physician's report and actions for prevention of those types again.

18.4 To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Contractor shall be open to inspection by the Company.

18.5 The cost so incurred by the Contractor in providing for safety standards and requirements as above shall be deemed to be included in the rates quoted for various items under the scope of Contract and no extra amounts shall be payable to the contractor on this account.
18.6 The Contractor shall furnish to the Company within seven days from issue of Work Order whichever is earlier, for approval of Company, the proposed safety program on how it intends to implement the safety procedures and precautions to ensure that the site is accident free.

19. 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.

20. 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) An Electrical license issued by Govt. of Delhi.
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) GSTN Registration.
g) Labour License under Contract Labour Act (R & A) Act 1970

(The Contractor shall provide BRPL Engineer-in-charge a copy of Labour License responsible for execution of the job before start of the work.)

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 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}
i) Group personnel accident insurance shall have coverage of Rs. 10 Lac (Table C- Death + Permanent Total Disability + Partial permanent Disability due to external accidents).

Before issue of order it would be mandatory for the Contractor to furnish the Company the permanent PF code no, ESI registration, registration under W.C.T Act.

21. BOCW ACT:

BOCW Act applies to every establishment which employs, or had employed on any day of the preceding twelve months, ten or more building workers in any building or other construction work .

The Contractor for carrying out any construction work, must get themselves registered with the Registering Officer under Section 7 of the Building and Other Construction Workers Act, 1996 and rules made thereto by the concerned State Govt .and submit certificate of Registration, issued from the Registering Officer of the concerned State Govt. (Labour Dept.). As per this Act, the Contractor shall be levied a cess @1% of cost of construction work, which would be deducted from each bill. Cost of material, when supplied under a separate schedule item, shall be outside the purview of cess. The Contractor shall also comply with all provisions of the said Act applicable to him.

22. 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 involved 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.

23. INSURANCE

a) THIRD PARTY INSURANCE

Before commencing the execution of the work the contractor shall take third party insurance policy at his own cost 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 awaiting settlement by insurance claim at contractors own cost.

b) 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 borne by the contractor. The contractor shall furnish copy of policy when demanded by BRPL.

c) INSURANCE FOR MAN, MATERIAL & MACHINERY DEPLOYED AT SITE

Contractor shall be responsible for the insurance for his own man, material and machinery deployed at site for the package awarded. Contractor shall furnish the copy of this insurance policy to the purchaser, prior start of work.

24. ARBITRATION:

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this LOA. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration. The arbitration is to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be in the city of New Delhi only.

25. Performance Guarantee:

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.

Contract performance bank guarantee of total 10% of the contract price shall be submitted for due performance of this Contract within 15 days of award of contract with the validity till completion of the contract period. The same shall be released after completion of the job

Contractor shall submit the performance bank guarantee equivalent to the 10% of the contract value at the time of claiming the last payment with the validity of the bank guarantee till Defect Liability Period i.e. 24 months from the date of Handing over of entire Installation plus 3 months.

The Company shall reserve the right to invoke the performance bond unconditionally and without recourse to the Contractor, if there is failure to perform any part of the Contract for whatsoever reason. This clause is pertaining to performance of contractual obligations and the decision of Company shall be final in this regard.

In the event, in Company's sole judgment, if the Contractor has fulfilled all its obligations under this Contract, Company shall release the performance bank guarantee without interest, within seven (7) days from the last date up to which the performance bank guarantee is to be kept valid or if it is assessed by the Company that Contractor has not fulfilled its obligation, then the performance bank guarantee shall be extended by the Contractor till that period as requested by the Company.

26. GENERAL CONDITIONS:

26.1) No idle labour charges will be admissible in the event of any suspension of work by the Company or stoppage caused in the work due to any other reason resulting in contractors' labour or equipments being rendered idle at any time during the duration of contract.

26.2) In the event of any ambiguity, the work order shall supersede LOI & all other correspondence and conditions of contract if furnished earlier.

26.3) If the Contractor needs to carry out any work or rework due to change in drawings or structural consultants instructions, the Contractor shall take the prior permission of the Company/ EIC before commencing such works. The Contractors quoted price shall include such rework or incidentals due to quantity variation, or methodology to carry out the works, wherever required and shall not be entitled for any extra payment or extension of time.

26.4) The Company reserves the right to claim and recover from the security deposit the damages/ losses incurred due to non-compliance to work, delay in the progress of work by the Contractor as agreed upon. The decision of the Company in this regard shall be final and binding.

26.5) The Contractor agrees to abide by other terms and conditions stipulated by the Company from time to time in addition to the above for the proper and satisfactory performance of their obligations under this Contract.

27. 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.

28. POLLUTION CONTROL:

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, the contractor 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.

All BRPL vendors and execution engineers are hereby advice to adhere below mentioned guidelines while carrying out any civil work including road/ pit digging, plinth/ fence making, road restoration etc.

I. No construction material/ debris shall be stored on metalled road.
II. Wind breakers of appropriate height on all sides of ear marked area using CGI sheets shall be raised to ensure that no construction material dust fly outside ear marked area.
III. The construction material i.e. coarse sand, stone aggregates, excavated earth, cement and any other material to and from the site shall be transported under wet and covered condition to ensure their non-slippage en-route to avoid air contamination.
IV. The contractor shall provide mask and helmet to every worker working on the construction site and involved in loading/unloading and carriage of construction material and construction debris to prevent inhalation of dust particles.
V. Over loading of vehicles shall be strictly prohibited
VI. The construction material at site shall be stored under wet and covered condition.
The dumping sites for temporarily storing the excavated earth shall be properly leveled, watered and rehabilitated by plantation to avoid flying of dust.
VII. The worker at the site shall be sensitized to adopt / observe the dust controlled measures in true spirit.
VIII. If any C&D waste is generated at site the same will be transported to the C&D waste site only and the record for the same will be maintained by the agency.
IX. Wet jet in grinding and stone cutting is being permitted at site.
X. The necessary record for dust control is being maintained by the department on day to day basis and being monitored regularly.
The Contractor shall be responsible for all the preventive and protective environmental steps as per guidelines.
Execution in- charge has to ensure all vendors comply with these instructions. Any violations from the above

guidelines have been viewed very seriously by the authorities. Concerned agency is liable for the penalties / other action by the authorities, The Agency shall indemnify BRPL from all liabilities on this account.

29. FORCE MAJEURE:

29.1 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

29.2 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:

e) 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

f) Explosions or fires

g) Declaration of the Site as war zone.

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

29.3 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.

29.4 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.

29.5 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.

29.6 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.

30. SECRECY CLAUSE:

The Contractor shall not communicate or use in advertising, publicity, sales release or in any medium photograph or reproduction of the works under this contract, or description of the site, dimensions, quantity or any other information concerning the works unless prior written permission is obtained from Company. The Contractor shall keep all the information obtained directly or indirectly through appointment of this contract confidential and shall not reveal the same to any other party without the prior written permission of the Company.

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.

This 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.

31. APPROACHES:

The Contractor shall have to make his own arrangements for all approaches to the site required for transporting his men and material to site of work. The Company shall entertain no payment or claims on account of "Making of Approaches".

32. SITE LOCATION:

The Contractor must see the site of the work, surrounding locality, local traffic rules, site approaches etc. carefully. No claim of any sort shall be entertained on account of any site conditions. If any approach from main road is required or existing approach is to be improved and maintained, for cartage of materials by the contractor, the same shall be provided, improved and maintained by him at his own cost.

33. CO-ORDINATION WITH OTHER AGENCIES:

The Contractor shall execute the work in strict consultation with the Company and in co-ordination with other agencies appointed by the Company who will also simultaneously execute the components of work allotted to them.

The Contractor at his own cost shall also extend their site facilities, plant and equipments on written request of the Company/ EIC for use by other contractors appointed by the Company

34. TERMINATION OF CONTRACT:

If in case the Contractor;

a) becomes bankrupt or insolvent, has a receiving order issued against it compounds with its creditors, or if the Contractor is a corporation a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction) a receiver is appointed over any part of its undertaking or assets or if the Contractor takes or suffers any other analogous action in consequence of debt.

b) Assigns or transfers the Contract or any right or interest therein in violation of the provision of given work to sub-contractor.

c) In the judgment of the Company, has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this Sub-clause

"Corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in Contract execution.

"Fraudulent practice" means misrepresentation of facts in order to influence a procurement process or the execution of a Contract detriment to Company and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Purchaser of the benefits of free and open competition.

a) Has abandoned or repudiated the Contract

b) Has without valid reason failed to commence work on the Facilities promptly or has suspended days after receiving a written instruction from the Company to proceed.

c) Persistently fails to execute the Contract in accordance with the Contract or persistently neglects to carry out its obligations under the Contract without just cause.
d) Refuses or is unable to provide sufficient materials, services or labour to execute and complete the Facilities in the manner specified in the program furnished and at rate of progress that give reasonable assurance to the Company that the Contractor can attain completion of the Facilities by the time for completion.

The Company may, without prejudice to any other rights it may possess under the Contract, give a notice to the Contractor stating the nature of the default and requiring the Contractor to remedy the same. If the Contractor fails to remedy or to take steps to remedy the same within fourteen (14) days of its receipt of such notice the Company may terminate the Contract forthwith by giving a notice of termination to the Contractor.

In case, Contractor fails to carry out the work as specified in the schedule or left in between, it will be got done through any other agency at contractors' risk and cost, the same shall be recovered from the amount payable to the Contractor.

In case the Contractor fails to start work / to carry out the work within the specified period i.e. mutually agreed schedule and the work is not found to be satisfactory, the Company reserves the right to terminate the contract, at any stage without assigning any reasons thereof. In such case, the Company shall have the right to forfeit the entire / part amount of EMD / Security Deposit.

35. LIABILITY OF CONTRACTORS

Subject to the due discharge of its obligations under the Contract and except in case of gross negligence or willful misconduct on the part of the Contractor or on the part of any person acting on behalf of the Contractor, with respect to any loss or damage caused by the Contractor to the Employer's property or the Site, the Contractors shall not be liable to the Employer for the following:
a) For any indirect or consequential loss or damage; and
b) For any direct loss or damage that exceeds:
(i) The total payments made and expected to be made to the Contractor under the Contract including reimbursements, if any; or
(ii) The insurance claim proceeds which the Contractor may be entitled to receive from any insurance purchased by the Contractor to cover such a liability, whichever is higher.
This limitation of liability shall not affect the Contractor's liability, if any, for damage to any third party, caused by the Contractor or any Person or firm acting on behalf of the Contractor in executing the Works.
Notwithstanding anything contained in the Contract, the Contractor shall not be liable for any gross negligence or willful misconduct on the part of the Employer or any of its affiliates, any Contractor, or any party, other than Contractor and/or, its directors, officers, agents or representatives or its affiliates, or Subcontractor, or the Contractor or any third party engaged by it.
Notwithstanding anything contained in the Contract, including but not limited to approval by the Employer of any drawings, documents, Contractor list, supply of information or data or the participation of the Employer in any meeting and/or discussion or otherwise, shall not absolve the Contractor from any of its liabilities or responsibilities arising in relation to or under the Contract.

SECTION IX

Price format- Civil

S.No.	Item Description	Quantity	UOM	Basic (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	Complete Design & Engineering of Grid Substation. The building foundation shall be designed for Ground floor(Cable Cellar)+ First Floor including survey of plot, if required.	1.00	LS				

2	Substation building with RCC staircase for approach to roof as per layout and specification. In case of increase in length/width of building due to equipment dimension, the same shall be in scope of Vendor. No additional cost will be given. (Payment break up for Running Bill shall be as follows for this item only.) i) up to DPC -15% ii) Lintel and brick work upto GF (Ground floor/Cable Cellar) roof slab -10% iii) Roof casting ground floor/cable cellar- 15% iv) Lintel level and brick work from FF (First floor) floor level to FF (First floor) roof slab- 5% v) Roof casting First floor, Mumty & brick wall of parapet- - 15% vi) Internal/ external finishing and terracing - 10% vii) Structural steel arrangement for supporting cable trays in cable cellar & chequered plate for slab cutouts- 5% viii) Flooring/painting/water supply & sanitary system- 10% ix) Doors, windows, staircase railing, etc- 5% x) Final completion - 10%	1.00	Set				
3	Rain water drainage arrangement all around the building (with final connection to Rain Water Harvesting recharge pit), arrangement for drinking water, sanitary system, etc.	1.00	Lot				
4	Underground water tank of capacity $10m^3$.	1.00	No				
5	Outdoor cable trench (1 m width X 1 m depth, length=550 m) with trench covers (RCC slab or RCC cover), supporting hangers, etc as per specification and system requirement. Variation in quantity shall be payable/ recoverable from 550 metre.	1.00	Lot				

Note: For detail description, kindly refer Technical Specification for Civil Work

Appendix-III

COMMERCIAL TERMS AND CONDITIONS – Civil

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	**Firm**. Prices shall be inclusive of all taxes & duties.	

3	Payment terms	a) 10% of total civil works value shall be payable as advance against submission of Bank Guarantee of equivalent amount valid up to completion date plus 3 (three) months towards claim period. The advance shall be adjusted against R/A Bills. b) 80% pro-rata of total civil works value shall be payable against progressive R/A biils payable within 30 days duly certified by Engineer-In-Charge after completion. c) 10% of total civil works value shall be payable after completion against submission of Bank Guarantee of equivalent amount valid upto Defect liability period plus 3 (three) months towards claim period.	
4	Completion time	10 months from date of LOI/Order	
5	Defect Liability period	24 months from the date of Handing over of entire Installation.	
6	Liquidated damages	0.5 % 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	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to completion period/handing over.	
8	Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to Defect Liability Period i.e. 24 months from the date of Handing over of entire Installation plus 3 months towards claim period.	

SECTION X

GRAND SUMMARY OF THE QUOTED PRICE

Sr. Nos.	SCHEME DESCRIPTION	Total price for supply F.O.R site inclusive all duties taxes	Total for Erection, Testing & Commissioning inclusive all Taxes(INR)	Total for Civil Works inclusive all Taxes(INR)	Grand Total(INR)

1	Survey, Design, Supply, Installation, Testing & Commissioning of 33 kV GIS Switching Substation on Single point responsibility basis at Okhla, New Delhi				
TOTAL Package Cost					
In words :					

We declare that the following are our quoted prices in INR for the entire project/schemes.

Date: Bidder Name:

Place: Bidders Address:

Name & Signature …….

Designation: ……

Common Seal:…….

APPENDIX IV

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 undertake 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).....

Appendix V

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 VI

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____.

THE 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 - VII

LITIGATION HISTORY

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

APPENDIX - VIII

CURRENT CONTRACT COMMITMENTS/ WORK IN PROGRESS

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

APPENDIX - IX

FINANCIAL DATA
(Duly Certified by Chartered Accountant)

	FY 18-19	FY 17-18	FY 16-17
Total assets			
Current assets			
Total Liability			
Current Liability			
Profit before taxes			
Profit after taxes			
Sales Turnover			

APPENDIX X

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

APPENDIX-XI

FORMAT FOR PERFORMANCE BANK GUARANTEE

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

Bank Guarantee No.

BSES RAJDHANI POWER LIMITED

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 all the 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

SECTION XI

VENDOR CODE OF CONDUCT

Bidder shall agree to comply with Vendor code of Conduct as mentioned in BRPL Website. 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

TECHNICAL SPECIFICATIONS

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

TECHNICAL SPECIFICATION

FOR

ERECTION, TESTING & COMMISIONING OF 33kV OKHLA STP GIS GRID SUBSTATION AT NEW DELHI ON TURNKEY BASIS

(SPEC NO. BRPL-EHV-TS- OKHLASTP)

Prepared by	**Javed Ahmed**		**Rev: 1**
Reviewed by	**Abhinav Srivastava**		**Date: 05.08.2022**
Approved by	**Gopal Nariya**		

Technical Specification for 33KV Okhla STP GIS Grid Substation in New Delhi

INDEX

SCHEDULE & ANNEXURE

Volume-2

BSES Rajdhani Power Limited

TECHNICAL SPECIFICATION

FOR

GENERAL DESIGN CRITERIA

Prepared by	**Javed Ahmed**		**Rev: 0**
Reviewed by	**Abhinav Srivastava**		**Date: 17th July, 2022**
Approved by	**Gopal Nariya**		

2.1 Major Equipments:

- 33KV GIS Panels including line side isolator with earthing arrangement (as per Main SLD no BRPL-DJB-STP-DEE-B-0000) -8 Sets
- 33kV Control and Relay Panel (Shall be mounted separate as per Tender Layout)- 6 Sets
- 50V Lithium Ion Battery bank-1 Set
- Battery charger with DCDB -1 Set
- ACDB -1 No.
- SCADA RTU-1 Set
- Gas filling device with filter and leakage detector for above GIS Panel (DILO Make)- 1 Set

2.2 Item as System

- All Numerical protection Relay shall be supplied with Conformal coating
- Grounding and earthing of entire substation
- Indoor illumination including emergency lighting (DC lighting incase of black out). Smart lighting arrangement shall be in the scope of work.
- Air Conditioning, Exhaust and Ventilation for complete substation building.
- Fire detection and alarm system including its SCADA integration.
- Direct stroke lightning protection of building.
- Video Surveillance system including its SCADA integration.
- Material GPS Tracking System.
- Fiber optic Cable including patch cord, LIU splicing inside substation for line differential protection.
- GIS Cable cellar minimum height 2750mm with spare cable entry provision at least 4 nos circuit.
- The building foundation shall be designed for Cable Cellar Fire retardant paint for all cable entering to panels till the cable opening
- O&M from the date of handing over of Substation (refer Annexure-O for Details).
- AC and DC Failure Hooter near Security gate at any pole
- Cyber security readiness substation

2.3 Items as Lot

- LT Power & Control cables (fire retardant type) supply and termination and Glands.
- Building Cable entry Sealing
- Cable trays
- Supply and ETC of GIS Termination Kits
- Supply and installation of Fire extinguisher
- Cabling between equipments and RTU
- Supply Erection testing and commissioning of Line differential protection Relay at remote end
- Rubber Mat for all Indoor equipments front and back side
- Material required for IMS (Entry and Exit Sign,First aid Box)

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- Battery charger with DCDB -1 Set
- ACDB -1 No.
- SCADA RTU-1 Set
- Gas filling device with filter and leakage detector for above GIS Panel (DILO Make)- 1 Set

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- Rubber Mat for all Indoor equipments front and back side
- Material required for IMS (Entry and Exit Sign,First aid Box)

2.4 Civil Works

- As per Civil specification

2.5. Design Work

Design documentation in sufficient copies including design memo, calculations, general arrangement, plans, elevations and sectional drawings, sag/tension calculations, short circuit calculations, electro-dynamic force calculations, single line diagrams, schematic interconnection drawings, wiring diagrams, foundation calculations, foundation plans/details, cable schedules, bill of materials, lighting system design calculations, earthing system design calculations, illumination system design, calculation, conductor sizing, calculation insulation coordination, protection coordination etc.

- Operation & Maintenance Manuals and As-built drawings. (Six sets hard copy & two sets soft copy)
- Documentation required by State Electrical Inspector or by other statutory body for statutory approval/certification of the Substation installation. (as required)
- Temporary sheds for storage of equipment, tools & tackles, construction offices with required fittings & furnishings.

The above equipment and services are specifically listed for the guidance of the Bidder. Apart from the above, Single Line Diagram and Layout Plan (suggestive) may also be referred for further details of equipment. However, it is to be understood that the Contractor's scope is not limited to the items specifically listed above but covers all items required for the completion of a safe and fully functional Substation.

2.6 Tools and Spares

Tools & Commissioning Spares: Contractor should be equipped with all tools, tackles and commissioning spares for successful commissioning of substation.

Recommended Spares: Contractor shall be providing the Owner a list of recommended spares along with quantity and market/budgetary prices. This shall be a recommendation only and shall not be a part of quotation for price bid

3.0 COMPLETION SCHEDULE

The contractor shall be fully responsible to complete the project in time. It is desired that the total project should complete in *300 days* from the date of LOA. The broad completion schedule is attached here under for reference. The detailed completion schedule shall be prepared by contractor in MS-Project or Primavera software and shall be submitted at the time of detail engineering for approval. The detailed schedule shall be finalized with the help of schedule given by Owner.

Activity schedule shall be as tabulated below. The reference date shall be the date of LOA.

Sl. No.	Description of Work	Time Line from Zero Date(in days)	Responsibility
1	Zero Date (Letter of Award)	0	BRPL
2	Mobilization of manpower	15	Contractor
3	Inception Report	15	Contractor
4	PERT chart approval / L2 schedule majorly including : • Manpower & Machinery to be deployed • Procurement of major equipment • Dispatch schedule of the major item • Intermediate milestone schedule	15	Contractor
5	Submission of Drawings/Documents/ calculations for Engineering Approval	30	Contractor
6	Engineering Approval	60	BRPL
7	Civil Works	180	Contractor
8	Procurement/Supplies	210	Contractor
9	Equipment Erection	240	Contractor
10	Commissioning of 66kV line	255	BRPL
11	Testing & Commissioning of entire substation	285	Contractor
12	Handing Over	300	Contractor

4.0 ELECTRICITY & WATER FOR CONSTRUCTION

Electricity Supply and Water for construction purpose shall be arranged by Contractor.

5.0 SUPPLY AND WORKS BY BIDDER

The termination kits/jumpers, Glands, Cable Seal and interconnections for all the Cables/Conductors shall be in the scope of Contractor. Extension of 48 core (12 Single Mode and 36 Multimode) Fiber optic embedded in Infeed Power Cable and interconnections for all the Cables/Conductors (with all the accessories of 48 core FO including LIU, joint box, patch cord and extension of fiber optic from Power Cable to LIU), shall be in the scope of Contractor. Laying of cables and stringing of Conductors including its hardware fitting and insulators in the substation premises shall also be in the scope of Contractor only.

.**WORKS BY OWNER:** The following works shall be carried out by Owners:

1. Soil Investigation and Soil resistivity test

The trenches and cable trays for Incoming/outgoing cables inside the Substation premises shall be in the scope of Contractor.

6.0 SUPPLIES AS FREE ISSUE ITEMS:

The following items shall be supplied free of cost to vendor:

- 33kV 3Cx400 sq. mm XLPE Cables

However, the termination kits/jumpers, Glands and interconnections for the above Cables/Conductors shall be in the scope of vendor. Laying of these free issued cables, stringing of Conductors including its hardware fitting & insulators in the substation premises shall also be in the scope of vendor only.
Free issue and return of items/excess materials Transportation from BRPL Stores to Site or Site to BRPL stores shall be in Vendors Scope of work.

7.0 COORDINATION WITH STATUTORY BODIES & OUTSIDE AGENCIES

The Contractor shall be fully responsible for getting all statutory clearances, including but not limited to Electrical Inspector clearance,, Fire officer or any other statutory bodies for implementation of the work.

The contractor shall be fully responsible for carrying out all co-ordination and liaison work as may be required with Electrical Inspector, Fire officer or any other statutory bodies for implementation of the work.

The application on behalf of BRPL for submission to the Electrical Inspector and other statutory bodies along with copies of drawings complete in all respects shall be done by the contractor & approval / certificates shall be obtained by the contractor well ahead of time so that the actual commissioning of equipment is not delayed for want of inspection and approval by the inspector & statutory bodies. The contractor shall arrange the actual inspection work by Electrical Inspector.

Official fees to electrical inspector / statutory bodies shall be paid by the Contractor.

8.0 COORDINATION WITH OTHER CONTRACTOR & OWNER'S SYSTEM

The contractor shall be fully responsible for carrying out all the co-ordination work required with their sub-contractors, if any, as well as with Owners system for execution and completion of work.

9.0 TERMINAL POINTS OF CONTRACTOR'S SCOPE

9.1 Up to Line take off point and including provision for Cable termination at the incomer and outgoing bays.

9.2 Outdoor Cable Trenches : Upto the boundary wall of substation

9.3 Lighting/Illumination/Lightning : Within Outdoor &Indoor Substation Area

9.4 Earthing : Within Substation area and building.

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10.0 SALIENT FEATURES, BASIC DESIGN CRITERIA AND MINIMUM TECHNICAL REQUIREMENTS OF 66/11 KV SUBSTATION/SUBSTATION EQUIPMENTS

10.1 Introduction

BRPL is setting up 33KV GIS Grid substation at Okhla STP New Delhi. The Substation shall be constructed on turnkey EPC execution. EPC contractor is responsible for detailed design also. In this paragraph only salient features, basic design criteria and Owner's minimum technical requirements are enumerated for the guidance of the Bidder. However, this should be referred in conjunction with SLD enclosed. The salient features of substation have been tabulated as under:

Particulars	Description
Voltage Level	33kV
Infeed Plan	33 kV Double Circuit
Infeed arrangement	33 kV U/G Cables
Present status of Land	In possession of BRPL

10.2 Substation Capacity

The substation capacity shall be as per the table in Clause no. 9.1 above.

10.3 Battery Charger and Battery Bank

The Control supply shall be 50V DC. The Li-Ion Battery bank shall be installed in separate room with proper ventilation system as per safety requirement .The battery charger shall be thyristor controlled installed inside control room building and shall be SCADA compatible.

10.4 Gas Insulated Switchgear

The GIS switch gear shall be of modular design offering high degree of flexibility. Each module shall be complete with SF6 gas circuit breaker, Isolators, fast Earthing switches, Voltage transformers, cable end enclosures, Surge Arrester., local control cubicle, Line Side Isolator shall be integral part of GIS. One set Gas filling device along with filter, Gas leakage detector shall be integral part of GIS.

10.5 Protection coordination through **ETAP Software.**

10.6 Power and Control cable -

All power and control cables within substation premise will be laid in single piece. No cable joint shall be accepted within substation premise.

10.7 Other Parameters for 66 KV Substation

Following parameters /service conditions shall prevail for entire system design under the scope of this turnkey project:

General Service Condition

S. No	Particulars	Data
1	Design Ambient temperature	50 °C
2	Seismic Condition	Zone IV as per IS 1893
3	Wind Pressure	195 kg/M² upto elevation of 30 M as per IS 875
4	Maximum Relative Humidity	100%
5	Maximum Altitude above Sea level	1000M
6	Rainfall	750mm (concentrated in 4 months)
7	Pollution level	Heavy/Dry

System Parameters

S. No.	Parameters	HV Side
1	Nominal Voltage (kV)	33
2	Rated Voltage (kV)	36.3
3	Rated Frequency (Hz)	50 +/- 3%
4	System Neutral Earthing	Solidly Grounded
5	Short Circuit rating (for 3 sec)	26.3kA
6	Basic Insulation Level	
6.1	Impulse frequency withstand voltage (kVp)	170
6.2	Power frequency withstand voltage (kV rms)	70

Parameters for Switchyard Equipments (33kV)

S.No	Particulars	66kV
1	Minimum Creepage	31mm/KV
2	Minimum Clearances	
2.1	Phase to Phase	
2.2	Phase to Earth	
3	Safety Clearances	
3.1	Sectional Clearances	
3.2	Height of lowest live point on the insulator from the ground	
4	Bus Configuration	Double Bus

Site Service Conditions (considering main external road at 0.00 level)

S. No.	Particulars	Level
4	Control Room Building Plinth Level	+750 mm

11.0 CODES & STANDARDS

The contractor shall follow latest Indian Standards or international standard. Refer respective equipment specification for applicable standards.

12.0 ENGINEERING DELIVERABLES

The Bidder shall submit following minimum Engineering Deliverables from award of the Contract. Any other drawing / calculation which is not listed below and may be required for execution of the job shall also be submitted by the bidder.

S. No.	Drawing Title
A.	Inception report including work schedule and PERT chart within two weeks from LOA(Letter of Award)
B.	**Electrical Drawing**
1	Main Single Line Diagram indicating bus/breaker rating, cable/overhead conductor size, fault levels of different voltage grade, Transformer details, metering and protection with CT / PT cores / ratio / burden / accuracy class.
2	Complete BOQ of the substation with technical details.
3	Single Line Diagram of 415 V AC Distribution board
4	Single Line Diagram of 220V DC Distribution board
5	Overall Site Layout Plan
6	Maximum & Minimum fault level calculation for the substations
7	Insulation coordination
8	Switchgear/Control building layout – Plan
9	Cable trench layout Plan & Section – outdoor
10	Cable tray layout Plan & Section – Indoor
11	BOQ of Cable trays and accessories
12	Sizing calculation of LV Cables
13	Power cable schedules
14	Control cable schedules
15	BOQ of Cables
16	Codification of cable trays and cable tray/cable tag marking concept
17	Ground mat design Calculation from actual site soil investigation
18	Drawing of ground mat along with BOQ
19	Drawing of Indoor equipment grounding details
20	Outdoor equipment grounding arrangement and details
21	Input /Output list of SCADA system
22	Outdoor Illumination system design Calculation
23	Indoor Illumination system design Calculation
24	Drawing of Outdoor Illumination with erection details
25	Drawing of Indoor Illumination with erection details
26	Complete BOQ indoor and outdoor illumination system
27	CT/PT sizing/detail calculation of burden, knee point voltage
28	All major equipment sizing calculation
29	Cabling, earthing & lightning concept
30	Power Transformer foundation details, soak pit arrangement, firewall segregation
31	Fire fighting arrangement of Transformers and indoor equipments
32	Relay setting with calculations
33	GIS details and its calculations

S. No.	Drawing Title
34	As built documentation of the drawing / documents
35	DC Sizing Calculation
36	Exhaust and Ventilation
37	All the other required design Documents
C.	**Civil Drawings**
S. No	**Drawing Title**
1	GA & RCC detail of boundary Wall.
2	Layout Plan For Control Building
3	RCC detail of Control Room Building
4	RCC detail of Outdoor Cable Trench including trench cover
16	GA & RCC detail of Septic Tank
18	GA & RCC detail of Underground Water Tank
20	GA and Section of Road & Storm Water Drain

13.0 SUBMISSION OF DRAWINGS & OTHER DOCUMENTS

BOQ, Calculations and other documents etc. shall be on A4 size paper. All the drawings shall be drawn to the scale as far as possible on A3 size or larger size paper and should be legible. The submission shall be

- Two (03) Sets of approved and released for construction drawings/BOQ/Calculation for Owners reference.
- Six (06) Sets of final As Built drawings, design, BOQ, Calculation. O&M manual, for all equipments supplied.
- Soft copies of all drawings/Documents/calculation in Auto CAD and Microsoft office file format as applicable.

Drawings shall be treated as submitted, only if provided with BOQ (If applicable). Transmittal sheet shall be mandatory to attach with all the drawing and documents. Format for transmittal shall be provided to successful bidder for drawing approvals etc.

14.0 TEST CERTIFICATES

All equipments shall be tested as per their corresponding specification in Tender document.
All tests (Type test, Routine test, Acceptance test) shall be carried out at bidders cost. However prices against special test for equipments have to be quoted separately. Special test shall be Owners decision.
Type and Special test has to be carried out at CPRI/ERDA or as mentioned in specification. Routine,and Acceptance tests may be carried out at manufacturer's lab.
Bidder shall submit type test certificate of all the equipment with validity of five years (on the date of bid opening carried out at CPRI/ERDA.

15.0 QUALITY PLAN

15.1 Manufacturing Quality Plan

Manufacturing Quality plan with respect to all major equipment and work has to be submitted by the successful bidder for following as a minimum:

I. An outline of the proposed work and execution plan for approval.
II. The structure of the supplier's organization for the contract

III. The duties and responsibilities assigned to staff ensuring quality of work for the contract
IV. Hold and notification points
V. Submission of engineering documents required as per specification
VI. The inspection of materials and components Inspection during fabrication /construction
VII. Final inspection & tests

Successful bidder shall include submittal of bills invoice, Bill of lading, and factory test certificate for grade, physical tests, dimension, and specific watt loss per kg of core material to the purchaser for verification in quality plan suitably.

14.2 Field Quality Plan

14.2.1 Quality Assurance Plan for various stages of execution work shall be submitted by Contractor for approval of Owner. The plan should include the Organization structure so the Safety personnel to ensure the Manpower and Material safety during the entire duration of execution.
14.2.2 Environment, Health and Safety (EHS) shall be covered in the plan submitted by Contractor.
14.2.3 A checklist to ensure the quality of equipment installation shall be submitted by Contractor for approval

16.0 INSPECTION

As per Chapter Training and Inspection Volume - 1

17.0 TRAINING OF BRPL OFFICIALS

As per Chapter Training and Inspection Volume - 1

18.0 MONITORING OF MATERIAL DISPATCH STATUS

Once the material is dispatched after Final clearance Transport Vehicle shall have GPS Tracking Device (Preferably Map My India Asset Tracking Device) and status of dispatch of material shall be sent to all the stake holders via SMS thru GPS Device. This shall be applicable to all the major equipments like GIS Panels, CRP and RTU.

19.0 OPERATION AND AFTER SALE SERVICES

Contractor shall carry out all day to day operations of entire Substation after successful commissioning for a period of 6Months. Contractor shall assign 24x7 operating personnel for operation activities.
Contractor shall appoint appropriate after sale services staff for all necessary service requirements for a period of 6 Months. Contractor shall keep all necessary spares, tools & tackles, T& P, testing equipments for successful operation and maintenance requirement for said period.
Contractor shall provide after sale support for the tenure of stipulated time.
Responsibility of Contractor O&M Engineer shall include:

a) Training of BRPL officials on successful operation of all the substation equipments including GIS, Relays and SCADA.

b) Operation and Maintenance of entire substation including GIS, Relays and SCADA.

c) Refer Annexure-O for details

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

TECHNICAL SPECIFICATION

FOR

CIVIL WORK

Prepared by	**Amrita Singh**			**Rev: 0**
Reviewed by				**Date: 17th June, 2022**
Approved by	**Rajinder Rajpal**			

1.0 GENERAL REQUIREMENT

1.1. This chapter includes the technical requirements for 33kV GIS Switching Sub-station at STP Okhla including associated design and preparation of all civil & structural drawings and execution of all associated civil works. This chapter deals mainly with technical specifications for the design, supervision and construction of complete civil & structural works.

1.2. The specifications are intended for general description of work, quality and workmanship. The specifications are not however exhaustive to cover minute details and the work shall be executed according to relevant latest Indian Standards/IRC specifications/CPWD specifications. In the absence of the above, the work shall be executed according to the best prevailing practices in the trade, recommendations of relevant American or British Standards or as per the instructions of Engineer. The IS standards/IRC specifications/CPWD specifications to be followed are mentioned in the technical specifications attached hereto. They shall be latest editions/ version of the same. The Contractor is expected to get him clarified on any doubts about the specifications, BOQ, etc. before bidding of the Tender.

1.3. The work shall be carried out according to the design / drawings to be developed by the Contractor and approved by the Owner based on Tender Drawings (tentative layout) supplied to the Contractor by the Owner. For the building necessary layout and details shall be developed by the Contractor keeping in view the functional requirement of the Sub-Station facilities and providing enough space and access for operation, use and maintenance based on the input provided by the Owner. Certain minimum requirements are indicated in this specification for guidance purposes only. However, the Contractor shall quote according to the complete requirements.

1.4. The Contractor shall take all necessary precautions to protect all the existing equipments, structures, facilities & buildings, etc. from damage. In case any damage occurs due to the activities of the Contractor on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be made good by the Contractor at his own cost to the satisfaction of the Engineer. The Contractor shall also take all necessary safety measures, at his own cost, to avoid any harm / injury to his workers and staff from the equipment & facilities of the power station.

1.5. During the progress of work, the Engineer will exercise supervision of the work to ensure that the technical provisions of the contract are being followed and the work is being executed accurately and properly. However, such supervision shall in no way relieve the Contractor of the responsibility for executing the work in accordance with the specifications.

1.6. Before submitting the bid, the Contractor shall inspect and examine the site and its surroundings and shall satisfy himself as to the nature of the ground and subsoil, the availability of materials necessary for completion of the work, means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No extra claim consequent on any misunderstanding or otherwise shall be allowed.

1.7. In view of pandemic, the Contractor shall be bound to follow all guidelines issued by the Government & other statutory bodies, take all necessary arrangements & precautions for his workers & staff.

2.0 GEOTECHNICAL INVESTIGATION

The Owner has carried out Geo Technical Investigation for the given plot. The copy of the report is attached with the tender document as input to Contractor for Civil Design & Estimation Work.

3.0 SITE PREPARATION

3.1. Scope

3.1.1. This clause covers the design and execution of the work and site preparation such as clearing of the site, the supply and compaction of fill material as per requirement upto desired formation levels, excavation and compaction of backfill for foundations, drainage, trenches, etc..

3.2. General

3.2.1. The layout and levels of all structures, etc. shall be made by the Contractor at his own cost from the general grids of the plot and benchmarks finalized / approved by the Owner. The required filling up to formation level shall be in the scope of Vendor. The Contractor shall give all help in instruments, materials and personnel to the Owner for checking the detailed layout and shall be solely responsible for the correctness of the layout and levels.

3.2.2. The Contractor shall develop the site area to meet the requirements of the intended purpose.

3.2.3. If fill material is required, the fill material shall be suitable for the above requirement. The fill shall be designed to prevent the erosion by wind and water of material from its final compacted position or the in-situ position of undisturbed soil.

3.2.4. Material unsuitable for founding of foundations shall be removed and replaced by suitable fill material and to be approved by the Owner.

3.2.5. Backfill material around foundations or other works shall be suitable for the purpose for which it is used and shall be compacted to the density described under Compaction (clause 3.4 of this Specification). Excavated material not suitable or not required for backfill shall be disposed off by the Contractor in areas as directed by Owner upto a maximum lead of 5 km. Backfill material if found having mix of earth and fly ash should not be used for top 30 cm of formation level and should be supplemented with good earth at the cost of Contractor.

3.3. Excavation and Backfill

3.3.1. Excavation and backfill for foundations shall be in accordance with the relevant code.

3.3.2. Whenever water level is met during the excavation, it shall be dewatered and water level shall be maintained below the bottom of the excavation level during excavation, concreting and backfilling. Nothing extra shall be payable by the owner on this account.

3.4. Compaction

3.4.1. The density to which fill materials shall be compacted shall be as per, relevant IS and as per direction of Owner. All compacted sand filling shall be confined as far as possible. Backfilled earth shall be compacted to minimum 95% of the Standard Proctor's density at OMC.

3.5. Requirement for fill material under foundation

3.5.1. The thickness of fill material under the foundations shall be such that the maximum pressure from the footing, transferred through the fill material and distributed onto the original undisturbed soil will not exceed the allowable soil bearing pressure of the original undisturbed soil. For expansive soils the fill materials and other protections etc. to be used below the foundation has to be approved by the Owner.

4.0 CODES AND STANDARDS

All standards, specifications, acts and code of practice (latest revision) shall be followed. In case of conflict between this specification and those (IS standard/ IRC specification/CPWD Specification, etc.) referred to herein, the former shall prevail.

5.0 SUBMISSIONS

The following documents shall be submitted by the Contractor for approval of the BRPL prior to commencement of fabrication and erection / construction.

This list is not exhaustive but indicative only. Final list of drawings shall be prepared by successful Contractor during detailed engineering.

i. Design calculation, general arrangement drawings, foundation drawing & detailed erection / construction drawings including R/F drawings for Sub-Station Building.
ii. Details of Indoor Cable Trenches with cable tray supports and trench covers.
iii. Details of Outdoor Cable Trenches with cable tray supports and trench covers
iv. Design & drawing of sewerage system, water supply arrangement etc.
v. Design & drawing of rain water drainage arrangement.

6.0 SUB-STATION BUILDING GENERAL REQUIREMENTS

6.1. General

6.1.1. The scope includes the design, engineering and construction including anti-termite treatment, plinth protection, DPC of buildings including sanitary, water supply, electrification, fire detection system, etc. The building shall be of RCC framed structure of minimum concrete grade M25. The Sub-Station Building shall include rooms as specified below:

S. No.	Facility
i.	Control Room
ii.	GIS Room
iii.	Maintenance Room
iv.	Pantry
v.	Toilet
vi.	Staircase
vii.	Cable Cellar

6.1.2. Minimum floor area requirements have been given in tender drawings, which may be increased at the time of detailed engineering to suit project requirements.

6.1.3. An open space of 1200 mm minimum shall be provided on the periphery of the rows of panel and equipment generally in order to allow easy operator movement and access as well as maintenance.

6.1.4. The building shall be aesthetically designed. Proper architecture shall be used to design the exterior look and finish (as per BRPL standard pattern of grids or pattern shared by Owner). The architectural drawing shall be submitted for Owner's approval.

6.2. Substation building shall be constructed as per the approved drawings by Owner. CPWD specification shall be followed in all the building works. The clear height (from floor level to bottom of roof slab) of cable cellar shall be of minimum 2.75 m or as per electrical requirement/ design. The clear height of first floor of building shall be of minimum 4.5 m or as per equipment requirement.

6.3. Design

a) The building shall be designed as per the following parameter:

- To follow & fulfill the requirements of the National Building Code of India and the standards quoted therein.
- The specified climatic & loading conditions shall be considered.
- The building shall have RCC framed structure.
- To adequately suit the requirements of the equipment and apparatus contained in the buildings and in all respects to be compatible with the intended use and occupancy.
- To meet functional and economical space arrangement for maximum utilization of the building.
- To be aesthetically pleasing with uniformity and consistency in architectural design.
- To allow for easy access to equipment for their maintenance.

b) Suitable expansion joints shall be provided in the longitudinal direction wherever necessary with provision of twin columns.

c) Individual members of the buildings frame shall be designed for the worst combination of forces such as bending moment, axial force, shear force, torsion etc.

d) Permissible stresses for different load combinations shall be taken as per relevant IS Codes.

e) The building lighting shall be designed in accordance with the requirements of relevant section.

6.4. Design Loads

Building structures shall be designed for the most critical combinations of dead loads, super- imposed loads, equipment loads, wind loads, seismic loads, and temperature loads. Dead loads shall include the weight of structures complete with finishes, fixtures and partitions and should be taken as per IS: 875 (latest revision). Super-imposed loads in different areas shall include live loads, minor equipment

loads, cable trays, small pipe racks & hangers and erection, operation and maintenance loads. Equipment loads shall constitute, if applicable, all load of equipments to be supported on the building frame. The wind loads shall be computed as per IS: 875 (latest revision). Seismic Coefficient method shall be used for the seismic analysis as per IS: 1893 (latest revision) with importance factor 1.5.

For temperature loading, the total temperature variation shall be considered as 2/3 of the average maximum annual variation in temperature. The average maximum annual variation in temperature for the purpose shall be taken as the difference between the mean of the daily minimum temperature during the coldest month of the year and mean of daily maximum temperature during the hottest month of the year. The structure shall be designed to withstand stresses due to 50% of the total temperature variation. Wind and Seismic forces shall not be considered to act simultaneously.

Floors/slabs shall be designed to carry live loads & equipment loads. Cable and piping loads shall also be considered additionally for floors where these loads are expected.

In addition, beams shall be designed for any incidental point loads to be applied at any point along the beams. The floor loads shall be subject to Owner's approval.

For consideration of loads on structures IS: 875 (latest revision), the following minimum superimposed live loads shall however be considered for the design.

Roof	2.5 KN/M2	for accessible roofs
	0.75 KN/M2	for in-accessible roofs
RCC-Floor	(i) 5 KN/M2	for offices, for equipment
	(ii) 15 KN/M2 (min)	for floors or actual requirement if higher than 15 KN/M2 based on equipment weight and layout plan
Stairs & balconies	5 KN/M2	
Toilet Rooms	2 KN/M2	

Any additional load coming in the structure shall be calculated as per IS: 875 (latest revision).

6.5. Submission

The following information shall be submitted for review and approval to the Owner:

a) Design criteria shall comprise the codes and standards used. Applicable climatic data including wind loads, earthquake factors, maximum and minimum temperatures applicable to the building locations, assumptions of dead and live loads, including equipment loads, impact factors, safety factors and other relevant information.

b) Structural design calculations and drawing (including construction/fabrication) for all reinforced concrete and structural steel structures.

c) Fully, dimensioned concept plan including floor plans, cross sections, longitudinal sections, elevations and perspective view of each building. These drawings shall be drawn at a scale not smaller than I:50 and shall identify the major building components.

d) Fully dimensioned drawings showing details and sections drawn to scales of sufficient size to clearly show sizes and configuration of the building components and the relationship between them.

e) Product information of building components and materials, including walls partitions, flooring, ceiling, roofing, door and windows and building finishes.

f) A detailed schedule of building finishes including colour schemes.

g) A door & window schedule showing door types and locations, door lock sets, latch sets and other door hardware.

h) Copy of all tests/ studies/ investigation carried out by bidder as per scope.

Approval of the above information shall be obtained before ordering materials or starting fabrication or construction activity.

6.6. Flooring

Flooring in various rooms of control room building shall be as per detailed schedules given in Table – 1. Pantry countertop shall be of granite stone of required specification as per direction of Engineer-In-Charge

6.7. Walls

Control room building shall be of framed superstructure. All walls shall be non-load bearing walls. Minimum thickness of walls shall be 340 mm upto DPC level in cement mortar 1:6 (1 Cement : 6 Coarse sand) and 230 mm above DPC level in cement mortar 1: 4 (1 Cement :4 coarse sand).

6.8. Plastering

All internal walls shall have minimum 12 mm / 15 mm thick 1:4 (1 Cement : 4 Coarse Sand) cement sand plaster. The ceiling shall have 6 mm thick 1:3 cement sand plaster.

6.9. Finishing

All external surfaces (control room building) shall have washed stone grit/ marble chips plaster with colour pigment (item no.13.72-DSR 2021) with grooves formed over under layer 12 mm thick cement sand plaster 1:4 (1 cement : 4 coarse sand) & top layer 15 mm cement plaster 1:1/2:2 (1 Cement : ½ Coarse sand : 2 Stone chipping). Suitable pigment shall be added to render the surface aesthetically pleasing as per directions of Engineer-in-charge.

6.10. Door & Window

The details of doors and windows of the control room building shall be as per finish schedule Table-I. The details of doors and windows of the sub-station building shall be as under:

a) All entrance/external doors including SGR room and control room will be 2 hours fire rated doors.

b) The details for all other doors and windows shall be as per finish schedule Table-I and tender drawing with the relevant IS code.

c) Floor springs and hydraulic door closer of make Ozone, Hardwyn or equivalent to be provided.

d) To maintain proper size of opening for doors and windows, contractor shall provide rough round aluminium tube of size 40 x 20 mm around all opening before plaster work.

e) The contractor shall provide a door and window sill of granite stone of size 18-20 mm.

6.11. Plumbing & Sanitation

Two toilets (male & female) have to be provided. Suitable size of pantry with arrangement for water cooler to be made.

a) All plumbing and sanitation works shall be executed to comply with the requirements of the appropriate bye-laws, rules and regulations of the Local Authority having jurisdiction over such matters.

b) PVC Sintex or equivalent make water storage tank of adequate capacity depending on the number of users for 24 hours storage shall be provided. Minimum 1 Nos. 1000 litre capacity shall be provided.

c) Chlorinated Polyvinyl- chloride (CPVC) pipe shall be used for internal & external plumbing work for water supply.

d) PVC pipes for all sanitary works.

e) All sanitary fittings shall be of Hindware/ Parryware/ Cera.

f) Each toilet shall have minimum fittings

i) Water closet (European type W.C. pan) 390 mm high (item no. 17.3.1- DSR 2021) with all fittings shall be provided.

ii) Half Stall Urinal (580 x 380 x 350 mm) with all fittings (item no. 17.5.2- DSR-2021) in male toilet.

iii) Wash basin (630 x 450 mm) with all fittings (item no. 17.7.1- DSR 2021).

iv) Bathroom mirror (600 x 450 x 6 mm thick) hard board backing (item no. 17.31- DSR 2021).

v) CP brass towel rail (600 x 20 mm) with C. P. brass brackets.

vi) Soap holder and liquid soap dispenser.

g) Water cooler for drinking water with minimum 40 litres capacity shall be provided and located in pantry/ as directed by Engineer in charge.

h) 1 No stainless steel A ISI 304(18/8) kitchen sink as per IS 13893 with Drain board (510 x 1040 x 225 mm bowl depth for pantry shall be provided complete with all fittings (item no. 17.10.1.2-DSR 2021).

i) All fittings, fastener, grating shall be brass chromium plated.

j) All sanitary fixtures and fittings shall be of approved quality and type manufactured by well known manufacturers. All items brought to site must bear identification marks of the Manufacturer.

k) Suitable size and load min. 6 kg pressure unplasticised PVC pipe to be used for soil, waste and drain pipes for underground works for areas not subject to traffic load.

7.0 STORM WATER DRAINAGE FOR CONTROL ROOM BUILDING

The building drain shall be provided for the collection of storm water from the roofs which shall in turn be connected to rain water harvesting recharge pit or nearest storm drain as per approval from DTC.

Unplasticised Rigid PVC rain water down comers (150 dia) conforming to IS: 13592 Type A, including jointing with seal ring conforming to IS: 5382, leaving 10 mm gap for thermal expansion shall be provided to drain off the rain water from the roof.

8.0 SUB-STATION TRENCHES

8.1. The outdoor cable trenches with precast removable RCC cover (with lifting arrangement) shall be constructed using RCC of minimum grade M25. Trench flooring shall be of cement concrete and neat cement punning for maintaining proper slope.

8.2. The cable trench wall shall be designed for the following loads.

- Dead load of 155 kg/m length of cable support + 75 Kg on one tier at the end.
- Triangular earth pressure + uniform surcharge pressure of 2T/m2.

8.3. Cable trench covers shall be 50 mm thick. All trench covers shall have desired reinforcement welded to M.S. frame of angle 50 x 50 x 6 mm all round the cover. Size of covers shall be as per site requirement / direction of Engineer In Charge.

8.4. Structural steel arrangement in cable cellar for supporting the cable trays.

8.5. All cable trenches/ slab cutouts inside the buildings shall have covers comprising of 6 mm thick MS chequered plates fixed on angle 40 x 40 x 5 mm frame with arrangement of MS holes for lifting of cover.

8.6. Cable trench crossing the road/rails shall be designed for class AA loading of IRC/relevant IS Code

and should be checked for transformer/reactor loading.

8.7. Trenches shall have proper slope. Necessary sumps to be constructed and automatic sump pumps of minimum 2.0 HP capacity of approved make with complete electrical fittings shall be installed if required. Cable trenches shall not be used as storm water drains.

8.8. The top of cable trench shall be such that the surface rain water does not enter the trench.

8.9. The trench bed shall be perpendicular to the run. Trench wall shall not foul with the foundation. Suitable clear gap shall be provided.

8.10. The trench bed shall have a slope of 1/500 along the run & 1/250 perpendicular to the run.

8.11. All the construction joints of cable trenches i.e. between base slab to base slab and the junction of vertical wall to base slab as well as from vertical wall to wall and all the expansion joints shall be provided with approved quality PVC water stops of approx. 230 x 5 mm size for those sections where the ground water table is expected to rise above the junction of base slab and vertical wall of cable trenches.

8.12. Cable trenches shall be blocked at the ends if required with brick masonry in cement sand mortar 1:6 and plaster with 12mm/15mm thick 1:4 cement sand mortar.

Provision of sump and pump is to be done for disposal of rain water from trench

9.0 MISCELLANEOUS GENERAL REQUIREMENTS

9.1. Bricks having minimum 100 kg/cm2 compressive strength can only be used for masonry work. Contractor shall ascertain himself at site regarding the availability of bricks of minimum 100 kg/cm2 compressive strength before submitting his offer.

9.2. Doors and windows on external walls of the building (other than areas provided, with insulated metal claddings) shall be provided with RCC sunshade over the openings with 150 mm projection on either side of the openings. Projection of sunshade from the wall shall be minimum 600 mm over window & door openings.

9.3. RCC staircase shall be provided for access to roof of the entire building. All stairs shall have maximum riser height of 150 mm and a minimum tread width of 300 mm. Minimum width of stairs shall be 1500 mm. Steel doors shall be provided in the Mumty and height of Mumty should be 2.6m.

9.4. The railing of staircase shall be 0.9 m average height comprising of 20 mm square bars of length 1.05 m and 150 mm centre to centre with teak wood handrail on top of railing including fixing of vertical bars in steps by grouting of required hold fast as per direction of Engineer in Charge.

9.5. Angles 50x50x6 mm (minimum) with lugs shall be provided for edge protection all round cut outs/openings in floor slab, edges of RCC cable/pipe trenches supporting covers, edges of manholes supporting covers, supporting edges of manhole precast cover and any other place where breakage of corners of concrete is expected.

9.6. All buildings shall have 750 mm wide plinth protection all around.

9.7. 25-30 mm thick kota stone to be provided at plinth level as DPC.

9.8. BSES Display board with lighting arrangement is to be provided of required size and as per approved pattern /drawing of BRPL with name of the grid.

9.9. The details given in tender drawings shall be considered along with details available in this section of the specification while deciding various components of the building.

Items/components of buildings not explicitly covered in the specification but required for completion of the project shall be deemed to be included in the scope.

10.0 INTERFACING

The proper coordination & execution of all interfacing civil works activities like fixing of conduits in roofs/walls/floors, fixing of lighting fixtures, fixing of supports/ embedment, provision of cutouts, etc for indoor illumination, ventilation & Air conditioning shall be the sole responsibility of the Contractor. He shall plan all such activities in advance and execute in such a manner that interfacing activities do not become bottlenecks and dismantling, breakage etc. is reduced to minimum

11.0 FIELD QUALITY PLAN FOR CIVIL WORKS

The field quality plan for all civil works shall be in accordance with CPWD specification and other relevant Indian Standard Codes. All quality checks and procedures shall be followed as per relevant CPWD norms.

12.0 WATER SUPPLY

12.1. Arrangement of water /electricity for construction work shall be in the scope of Contractor.

12.2. The Contractor shall carry out all the plumbing/erection works for required supply of water in Substation building. The contractor should check the feasibility before tendering.

12.3. A scheme shall be prepared by the Contractor indicating the layout and details of water supply which shall be got approved from the Owner before actual start of' work including all other incidental items not shown or specified but as may be required for complete performance of the works.

12.4. Pumps for water supply shall be in the scope of contractor. The Contractor shall provide an underground water reservoir, near the building of minimum 10 M^3 capacity. Pump house with booster pump for pumping water from underground water tank to the overhead water tank on top of the building shall be of minimum 1.0 HP capacity & electrical fittings of ISI mark.

12.5. The details of tanks, pipes, fittings, fixtures etc for water supply shall be approved by engineer in charge.

13.0 SEWERAGE SYSTEM

13.1. Sewerage system shall be provided for control room building.

13.2. The Contractor shall construct septic tank for 10 users & make connection with nearby soak pit provided by DJB authorities. The contractor should check the feasibility before tendering.

13.3. The system shall be designed as per relevant IS Codes.

14.0 STATUTORY RULES

14.1. Contractor shall comply with all the applicable statutory rules pertaining to factories act (as applicable far the State), Fire Safety Rules of Tariff Advisory Committee. Water Act for pollution control, Energy Conservation Act, etc.

14.2. Statutory clearance and norms of State Pollution Control Board shall be followed.

14.3. All building/construction materials shall conform to the best quality specified in CPWD specifications if not otherwise mentioned in this specification.

14.4. All tests as required in the standard field quality plans of CPWD or as per sound engineering practices.

14.5. The type and treatment of all foundation shall be as per recommendation of geo-technical investigation reports.

15.0 TESTS FOR MATERIAL / WORKMANSHIP

All tests required for various bought out items, materials, quality of workmanship or any other tests as desired by Project Manager and as specified in technical specification shall be carried out by the Bidder at his own cost through BRPL approved labs.

The Bidder shall submit comprehensive Quality Assurance plan for all materials, equipment, workmanship, services etc. and get it approved from the Engineer. This shall include setting up a test laboratory at site. However, such check list shall in no way limit the liability and responsibility of the Bidder in regard to quality of workmanship as detailed out in the specifications.

The sampling & testing of the construction materials shall be in accordance to latest CPWD Specifications related to all activities of the building and other civil construction works.

16.0 DRAWINGS

The successful Bidder shall first submit the structural design calculations along with general arrangement drawings for approval. After the approval of the design calculations by the owner detailed construction drawings shall be prepared and submitted for Employer's approval along with revised design calculations if required within 7 days. Required number of sets of design calculations, drawings and documents shall be submitted by the Bidder.

Calculations and other documents etc. shall be on A4 size paper. All the drawings shall be drawn to the scale as far as possible on A1 size or larger size paper and should be legible. The submission shall be

- Three (03) Sets of approved and released for construction drawings/Calculation for Owners reference.
- Two (02) Sets of final As Built drawings, design, Calculation & O&M manual for all equipments supplied.
- Soft copies of all drawings/Documents/calculation in Auto CAD and Microsoft office file format as applicable.

Transmittal sheet shall be mandatory to attach with all the drawing and documents. Format for transmittal shall be provided to successful bidder for drawing approvals etc.

Table 1- Finishing Schedule

No	Location	Flooring & Skirting 150mm high	Wall Internal	Ceiling	Doors, Windows, Ventilators
1	Control room	Homogeneous PVC sheet 2 mm thick over 52 mm thick CC flooring with concrete hardener topping (item no. 11.4-DSR 2021) over an under layer of RCC/CC.	Plastic emulsion Paint on smooth surface applied with putty	Oil bound washable distemper on smooth surface applied with putty	Powder coated Aluminium Hindalco/ Jindal or equivalent extruded sections (minimum 3.0 mm thick) as per IS 733 & 1285 for door, windows and ventilators (minimum thickness of powder coating 50 micron of approved colour). Glazing for door, windows and ventilators will be hermetically sealed double glazing (DGU) with (6+12+6) i.e 06 mm clear toughened glass +12 mm Air Gap+6 mm toughened Glass (Heat reflective colour glass).
2	Reception Lobby/ Maintenance Room	Polished Kota stone	Oil bound washable distemper on smooth surface applied with putty	Oil bound washable distemper on smooth surface applied with putty	Powder coated Aluminium Hindalco/ Jindal or equivalent extruded sections (minimum 3.0 mm thick) as per IS 733 & 1285 for door, windows and ventilators (minimum thickness of powder coating 50 micron of approved colour). Glazing for door, windows and ventilators will be hermetically sealed double glazing (DGU) with (6+12+6) i.e 06 mm clear toughened glass +12 mm Air Gap+6 mm toughened Glass (Heat reflective colour glass)
3	Toilet	Anti skid Ceramic tiles with white cement.	Ceramic glazed tile 2.1m high for toilet, for pantry above working platform up to 750 mm.	Oil bound washable distemper on smooth surface applied with putty	Powder coated Aluminium Hindalco/ Jindal or equivalent extruded sections (minimum 3.0 mm thick) as per IS 733 & 1285 for door, windows and ventilators (minimum thickness of powder coating 50 micron of approved colour). Glazing for door, windows and ventilators will be hermetically sealed double glazing (DGU) with (6+12+6) i.e 06 mm clear toughened glass +12 mm Air Gap+6 mm toughened Glass (Heat reflective colour glass)

4	Stair	Polished Kota stone	Oil bound washable distemper on smooth surface applied with putty	Oil bound washable distemper on smooth surface applied with putty	Powder coated Aluminium Hindalco/ Jindal or equivalent extruded sections (minimum 3.0 mm thick) as per IS 733 & 1285 for door, windows and ventilators (minimum thickness of powder coating 50 micron of approved colour). Glazing for door, windows and ventilators will be hermetically sealed double glazing (DGU) with (6+12+6) i.e 06 mm clear toughened glass +12 mm Air Gap+6 mm toughened Glass (Heat reflective colour glass)
5	Cable Cellar	52 mm thick CC flooring with concrete hardener topping (item no. 11.4-DSR 2021) with an under layer of RCC/CC.	Oil bound washable distemper on smooth surface applied with putty	Oil bound washable distemper on smooth surface applied with putty	Powder coated Aluminium Hindalco/ Jindal or equivalent extruded sections (minimum 3.0 mm thick) as per IS 733 & 1285 for door, windows and ventilators (minimum thickness of powder coating 50 micron of approved colour). Glazing for door, windows and ventilators will be hermetically sealed double glazing (DGU) with (6+12+6) i.e 06 mm clear toughened glass +12 mm Air Gap+6 mm toughened Glass (Heat reflective colour glass).
6	Other areas not specified	Vitrified tile of approved size	Oil bound washable distemper on smooth surface applied with putty	Oil bound washable distemper on smooth surface applied with putty	Powder coated Aluminium Hindalco/ Jindal or equivalent extruded sections (minimum 3.0 mm thick) as per IS 733 & 1285 for door, windows and ventilators (minimum thickness of powder coating 50 micron of approved colour). Glazing for door, windows and ventilators will be hermetically sealed double glazing (DGU) with (6+12+6) i.e 06 mm clear toughened glass +12 mm Air Gap+6 mm toughened Glass (Heat reflective colour glass).

7	GIS Room	Epoxy flooring (2 mm)thick over 52 mm thick CC flooring with concrete hardener topping (item no. 11.4-DSR 2021) with an under layer of RCC/CC.	Oil bound washable distemper on smooth surface applied with putty	Oil bound washable distemper on smooth surface applied with putty	Powder coated Aluminium Hindalco/ Jindal or equivalent extruded sections (minimum 3.0 mm thick) as per IS 733 & 1285 for door, windows and ventilators (minimum thickness of powder coating 50 micron of approved colour). Glazing for door, windows and ventilators will be hermetically sealed double glazing (DGU) with (6+12+6) i.e 06 mm clear toughened glass +12 mm Air Gap+6 mm toughened Glass (Heat reflective colour glass).
8	The External finishing of Control room building will be of Stone grit/ Wash Marble chip of approved color and quality with color pigments using white / grey cement or combination of both.				
9	External finishing of the building on area other than the area of stone grit/ Wash Marble using Acrylic Smooth exterior paint (painting) shall be of Asian paints or equivalent The paint shade as approved by BRPL				

BSES

Technical Specification

For

33 kV Gas Insulated Switchgear

Specification no – BSES-TS-65-33GIS-R0

Rev		0
Page		1 of 47
Date		28 Apr 2022
Prepared by	Abhishek Harsh	28/4/22
	Alok Mandal	
	Javed Ahmed	
Reviewed by	Srinivas Gopu	
	Abhinav Srivastava	
Approved by	Gaurav Sharma	
	Gopal Nariya	

INDEX

1.0 SCOPE

a. This specification covers the design, manufacture, testing, supply, erection & commissioning of 33kV, Gas Insulated (GIS), metal-enclosed and factory assembled switchgear.

b. This specification shall be used in conjunction with all specifications, switchgear data sheets, 33kV switchgear single line diagrams, and other drawings attached to the specification / purchase requisition.

2.0 CODES & STANDARDS

Materials, equipment and methods used in the manufacture of switchboards shall conform to the latest edition of following –

2.1	Indian Electricity Rules 1956	Latest edition
2.2	Indian Electricity act 1910	Latest edition
2.3	Switchgear and control gear	IEC : 60694, IEC: 60298, IEC : 62271-200, IEC : 60529, IS: 3427, IS: 12729, IS: 12063, IS: 13947, IS: 9046
2.4	Circuit breaker	IEC 62271 - 100, IS 13118, IS 2516
2.5	Isolators & earthing switches	IEC 62271 - 102
2.6	Current transformers	IS:2705, IEC:60185
2.7	Voltage transformer	IS:3156, IEC:60186,
2.8	Indicating Instruments	IS:1248
2.9	Energy meters	IS 13010
2.10	Relays	IS:8686, IS:3231, IS:3842
2.11	Control switches and push buttons	IS 6875
2.12	HV fuses	IS 9385
2.13	Arrangement of Switchgear bus bars, main connections and auxiliary wiring	IS:375
2.14	Code of practice for phosphating iron & steel	IS 6005
2.15	Colours for ready mixed paints	IS 5
2.16	Code of practice for installation and maintenance of switchgear	IS 3072

3.0 SERVICE CONDITIONS

3.1	Location	Indoor
3.2	Average grade atmosphere	Heavily polluted, Dry
3.3	Maximum altitude above sea level	1000M
3.4	Ambient air temperature	Highest 50^0C Average 40^0 C
3.5	Minimum ambient air temperature	0^0C
3.6	Relative Humidity	100%
3.7	Rainfall	750mm concentrated in four months
3.8	Seismic Zone	IV

4.0 ELECTRICAL SYSTEM

4.1	Type	Switchgear shall be 33kV, 3 phase, 3 wire, 50Hz,
4.2	Earthing type	Solidly Earth
4.3	Fault Current	31.5 kA for 3 sec
4.4	Rating	As per Annexure –B (Technical Particulars) and Annexure-F (SLD)

5.0 PANEL CONSTRUCTION

5.1	Structural Requirements	a. Switchgear shall be an indoor gas insulated and metal-clad cubicle design with single/double bus bar system in accordance with tender requirement. Refer technical particulars given in Annexure-B and SLDs given in annexure-F for details. b. Each Panel shall be metal enclosed, free standing, floor mounting, flush fronted and arranged to form a single structure with a common bus bar assembly. Construction, including cable entry, shall be vermin proof.
5.2	Compartments	Switchgear should be completely partitioned from panel to panel. Also, each panel should have separate compartments for the following- a. Busbars b. Circuit breakers c. Incoming/Outgoing power cables d. LV compartment
5.3	High Voltage Compartments for Busbar and CB	a. All high voltage parts (Including bus bars, core module with built in circuit breaker etc.) shall be located in a metal enclosure filled with an insulating inert gas. Gas leakage rate for all gas filled compartments should be less than 0.5 % per annum. b. Bidder shall specify the type, quantity and operating pressure for all gas filled compartments or equipment. Degree of protection for HV compartment should be IP65.
5.3.1	Pressure Indicators	a. A pressure indicator shall be provided for each gas filled compartment and include a set of changeover contacts with two stage alert i.e alarm and lockout. b. Alarm stage shall be set appropriately to alert the operator of the reduction in gas pressure. c. Lockout stage shall be set to avoid any mal-operation in absence of gas pressure.
5.4	HV Cable compartment	a. Each panel shall have an air-insulated cable connection compartment. Cable connection compartment shall contain the cable sockets

		accessible for fitting of the power cable plugs and the test cable sockets. b. Cable compartment shall also include provisions for conventional VT plug in connections. Cable compartment should be IP4X compliant.
5.5	Low voltage compartment	a. It should contain the switch operating mechanisms and all secondary equipment including the protection and control system. All operating mechanisms shall be motorized. b. Manual operation switches and mechanical position indicators shall also be provided. Degree of protection for LV compartment should be IP4X.
5.6	Safety from Internal faults	a. The structure, including doors and panels, shall be capable of withstanding the internal pressures created by faults within the structure (equal to the maximum fault-current rating) without danger to the operating personnel. b. Type test reports regarding internal arc withstand performance shall be available with bids.
5.6.1	Passive Protection from internal faults	a. A passive safety section shall ensure that hot gases shall be guided via pressure relief disks from each compartment. b. The pressure relief duct ends shall be guided to open air or fitted with absorbers to cool the hot gases. c. Relief into a cable basement or cavity below a false floor is not acceptable. d. Hazards to persons or risk of fire shall be reliably prevented. An arcing fault in one compartment should not cause major damage to other compartments. e. Structure shall be provided with barriers to prevent the transfer of ionized gases between two adjacent compartments except bus chamber. f. Separate pressure relief vents shall be provided in bus bar, cable and circuit breaker compartments to release arc fault pressure quickly and safely. g. The orientation of pressure relief vents and gas exhaust ducts as necessary shall be coordinated with BUYER at the bid stage.
5.6.2	Internal arc classification	As per Annexure-B (Technical Particulars)

5.7	Workability	a. Switchgear shall be designed and constructed to facilitate inspection, cleaning, repair and maintenance and to ensure absolute safety during such work. b. Interlocks, busbar shutters and covers shall be provided to prevent incorrect or unsafe operation and to prevent access to live parts. c. It shall be possible to work safely within individual panels, such as equipping and commissioning of spare panels as well as connecting main, control and auxiliary cabling, while the remainder of the switchgear is energized.
5.8	Service continuity	a. Arc faults caused by external reasons shall be positively confined to the originating compartment and shall not spread to other parts of the switchgear. b. In case of any internal arc fault in a busbar, busbar disconnector or circuit breaker, of double bus system, repair works must be possible without shutting down complete substation and at least one busbar and the undisturbed bays must remain in operation. c. For Bus Coupler / sectionaliser - In case of any internal arc fault in a busbar, busbar disconnector or sectionaliser, repair work must be possible without shutting down the complete substation and at least one half of the substation must remain in operation. d. To achieve service continuity, gas tight buffers shall be used at suitable place. e. Documents indicating sequence of repair work steps and description of necessary restrictions during work shall be submitted with the technical bid. Each bay module should be equipped with suitable arrangement for easy dismantling and refitting during maintenance without disturbing other units.
5.9	Interchange-ability	a. Similar parts and components shall be interchangeable wherever practical. An interlock system shall be provided to prevent the interchange of modules with higher current rating with modules of lower current rating. b. Replacement of circuit breaker module shall be without interfering busbar operation and without gas work.

5.10	Doors and Covers	a. All doors, hinged covers, and hinged panels larger than 0.36 m^2 in area shall open at least 95 degrees and be equipped with doorstops to hold them in the open position. Door swing must allow withdrawable equipment to be withdrawn. All such doors and hinged covers shall be equipped with handles and secured by captive bolts, lockable with a key or pad-lockable. b. Breaker compartment door shall open and close without obstruction with and without rubber mats laid in front of the switchgear. Door of one panel should not cause hindrance for opening of adjacent panel.
5.11	Cover Plates	All cover plates that exceed 0.7 m^2 that require removal for installation or maintenance of the equipment shall be equipped with lifting handles and self-supporting lips. With the exception of the backs of panels cover plates shall not exceed 1.1 m^2 in area or 27 kg in weight, unless they are hinged and bolted or locked. Cover plates shall be secured using captive bolt fixings.
5.12	Test Facilities	Each panel shall be provided with test facilities to allow for: a. Voltage testing of the primary circuit at rated voltage with all parts connected to the facility b. Current testing of primary circuit (primary injection test) c. Protection testing suitable for continuous operation at maximum current d. Access for test devices shall be clearly identified and covers shall be secured using captive fixings that require the use of a tool for access. Provision shall be included to secure the test devices in the test position.
5.13	Panel Dimension	Maximum 2700mm, Operating height maximum 1600mm, Width-600 mm, Depth- 1800 mm
5.14	Extensibility	Switchgear shall be arranged to permit future extension at both ends. Bidder shall confirm the minimum safe operational clearances around the switchgear.
5.15	Panel Base Frame	Steel Base frame as per manufacturer's standard. Bidder shall provide facilities for bolting the switchgear to its foundation. Such facilities shall be suitable for the specified seismic service.
5.16	Non- tiered construction	Incoming and bus-section units shall be located in non-tiered separate panels.

6.0 CIRCUIT BREAKER & THREE POSITION DISCONNECTOR

6.1	Circuit Breaker	
6.1.1	Interrupting medium	Vacuum in SF6 filled compartment
6.1.2	Breaker operation	Three separate identical single pole units operated through a common shaft
6.1.3	Operating Mechanism	Re-strike free, Trip free, with electrical anti-pumping feature
6.1.4	Type	Motor wound, spring charged, stored energy type with manual charging facility
6.1.5	Operation on supply failure	One O-C-O operation possible after failure of power supply to the spring charging motor
6.1.6	Shunt Release	For closing and tripping
6.1.7	Number of Trip coils	Two
6.1.8	Push buttons	a. Manual / mechanical ON/ OFF / Emergency trip push button b. Emergency Off push button should be provided with a protective flap. c. Mechanical ON shall have padlocking facility d. Labels giving clear instructions for manual operation should be provided wherever appropriate
6.1.9	Mechanical Indications	a. On-Off b. Operation counter c. Mechanism charge/discharge
6.1.10	Position detection	Through proximity sensors/Aux Switches
6.1.11	Breaker Control	On panel front only
6.1.12	Technical particulars	As per Annexure-B
6.2	Three position disconnector	
6.2.1	Functions	Three phase, three position suitable for- a. Connecting b. Disconnecting c. Earthing
6.2.2	Type	Motorized with provision for local and remote operation. Operation of earth switch should be through local only. Provision for Manual operation shall also be there.
6.2.3	Position detection	Through proximity sensors/Aux Switches
6.2.4	Mechanical indications	Earthing switch close/open.
6.2.5	Padlocking facility	For locking the earthing device in the open and close position.
6.2.6	Rating	Continuous and Short circuit rating should be same as specified for switchgear.

7.0 FUNCTIONAL REQUIREMENTS

7.1	Mechanical and electrical interlock	a. To prevent earthing of an incoming supply which has not been isolated b. To prevent switching on an incoming supply which is earthed c. To prevent earthing of feeder circuit when the circuit breaker is in the closed position d. To prevent switching on a circuit breaker when the feeder is earthed
7.2	Breaker Operation	
7.2.1	Closing from local	Only when local/remote selector switch is in local position
7.2.2	Closing from remote	Only when local/remote selector switch is in remote position
7.2.3	Tripping from local	Only when local/remote selector switch is in local position
7.2.4	Tripping from remote	Only when local/remote selector switch is in remote position
7.2.5	Tripping from protective relays	Irrespective of position of local/remote switch
7.2.6	Trip circuit supervision relay contact	For indication, alarm & to inhibit closing of breaker
7.2.7	Tripping or opening of breaker through relay but not routed through Lockout (Example- SCADA Opening, Under voltage, Overvoltage)	Wired to Contact multiplication Relay and then from CMR to tripping of breaker
7.2.8	Closing of breaker through relay	Wired to Contact multiplication Relay and then from CMR to closing of breaker
7.2.9	Emergency trip push button contact	Wired directly to trip coil (wired to Master trip relay if second trip coil provided)
7.2.10	Emergency trip push button contact	Wired to inhibit closing of breaker
7.2.11	Master trip relay contact (if given)	Wired to inhibit closing of breaker
7.3	DC control supply bus in all panels	Fed by two DC incoming sources in Bus coupler panel with auto changeover facility
7.4	PT supply bus in all panels	Fed normally by bus PT with automatic changeover facility to incomer line PT

8.0 BUSBARS

8.1	Material	Hard drawn electrolytic copper
8.2	Cross section	Uniform throughout length of switchgear

8.3	Phase busbars	The phase busbars shall be enclosed in individual or a combined gas filled compartment. Busbars shall be silver or tin-plated at joints. Provision shall be made at the bolted connections to enable accessibility for maintenance and extension where appropriate.
8.4	Marking	All busbars and cable connections shall be marked to indicate the phase colouring, which shall be red, yellow and blue unless otherwise specified or explicitly precluded by relevant national standards.
8.5	Earth busbar	An earth busbar, sized for the earth fault rating of the electrical system and switchgear, shall be provided along the full length of the switchgear structure. The earth busbar shall have provision for earth cable connections at each end.
8.6	Supports	All phase and earth busbars and connections shall be sized, braced and supported to withstand the dynamic, dielectric stresses and thermal affects resulting from the switchgear rated short circuit current over the full length of the switchgear and carry certification from a recognized testing authority.
8.7	Rating	As per Annexure – B (Technical particulars) and Annexure-F (Single line diagram).

9.0 EARTHING

9.1	Earthing of enclosure & non -current carrying parts	All metallic non-current carrying parts of the switchgear shall be bonded together and connected to the switchgear earth busbar. The frame of each functional unit and each device requiring earthing shall be connected directly to the earth busbar. For direct connection to the station earthing grid, earthing bolts of at least 10mm shall be provided at both ends of the main earth bar.
9.2	Busbar and Feeder Earthing	Through three position switch
9.3	Circuit breaker frame earthing	Integral earthing shall be provided on feeder/incoming circuit breakers for cable earthing, and on incoming or bus coupler circuit breakers for busbar earthing.
9.4	Earthing of withdrawable parts	Withdrawable parts shall be effectively earthed until they are completely withdrawn with all power and control connections disconnected.
9.5	Cable armour Earthing	Provision shall be made, adjacent to the cable termination, for connecting earthing cable armouring to the earth busbar.
9.6	Hinged doors	Earthed through flexible copper braid

9.7	Metallic cases of relays, instruments and other LT panel mounted equipment	Connected to the earth bus by independent copper wires of size not less than 2.5 sq. mm with green colour insulation. For this purpose LT compartment should have a clear designated earth bus to which earth connections from all components are to be connected.
9.8	CT and PT neutral	Earthed at one place at the terminal blocks through links.
9.9	Instructions	Clear instructions, preferably pictorial, shall be provided showing methods of earthing wherever appropriate.

10.0 SURGE SUPPRESSOR

10.1	Provision	To be provided in all panels except bus coupler and BPT.
10.2	Type	Gapless, metal oxide type
10.3	Technical particulars	As per Annexure –B (Technical particulars)

11.0 CURRENT TRANSFORMER

11.1	Type	Solid insulation with class of E or better.
11.2	Location	Shall be located outside the gas compartment. Location shall be suitable for easy access to secondary terminals, testing and replacement.
11.3	Rating plate	Should be located at position so that the details can be easily read.
11.4	Rating	As per Annexure – B (Technical particulars) and Annexure-F (SLD)

12.0 VOLTAGE TRANSFORMERS

12.1	Type	Shall be cast resin type with insulation class of E or better.
12.2	Disconnection provision for Both Bus and Line PT	Motorised Disconnecting switch with provision for Manual operation.
12.3	Rating	As per Annexure – B (Technical particulars) and Annexure-F (SLD)

13.0 CABLE TERMINATION

13.1	Power Cable termination	
13.1.1	Cable entry	Front / rear entry only. Socket and plug assembly shall be provided for the field power cables. Facilities shall be provided for cable testing including current and voltage injection.

13.1.2	Bushing Extender	Bushing extender has to be provided for connecting rear cable directly on panel bushing in absence of front cable. This will enable easy energization of panel with rear cable in event the front cable is faulty. Needs to be removed for energizing the panel to bushing incomer panel in absence of front cable.
13.1.3	Cable size and nos. of runs	2 runs x 3C x 400sqmm XLPE insulated stranded aluminium cable
13.1.4	Cable supports	Cable supports shall be provided (where practicable) by bidder to avoid undue strain on the cable termination.
13.1.5	Gland plates	Termination of single core cables shall be through a non-magnetic metal panel or gland plate. Minimum air clearances shall be maintained over and above cable lugs and fixing bolts.
13.1.6	Armour Earthing	Provision should be made for bonding and earthing any armour and/or concentric earth conductors.
13.2	Control Cable termination	
13.2.1	Cable entry	Bottom and front entry
13.2.2	Gland plate	Undrilled 3mm CRCA

14.0 METERS

14.1	Mounting	Flush mounted
14.2	Multifunction Meter	
14.2.1	SCADA Interfacing	RS485 rear port suitable for integration on Modbus Protocol
14.2.2	Size	96x96 mm^2
14.2.3	Panels where to be provided	All panels except Bus PT Panel
14.2.4	Accuracy Class	1
14.2.5	Signal List	R-Ph Current, Y-Ph Current, B-Ph Current, Neutral Current, R-Y Ph Voltage, Y-B Ph Voltage, B-R Ph Voltage, Active Power, Active Energy, Reactive Power, Power Factor, Max Demand, Phase angle 1, Phase angle 2, Phase angle 3, THD Mean Current, THD Mean Voltage
14.2.6	Data Type	MFI
14.2.7	Compatibility with RTU	ABB 560
14.2.8	Programmability	CT secondary shall be programmable i.e for both 1 A and 5 A
14.2.9	Auxiliary Supply	a. 48 – 240VDC and AC i.e universal type. b. Although in Scheme, MFM must be wired up with DC only
14.3	Voltmeter	Digital type with programmable ratio
14.3.1	Size	96x96 mm^2

14.3.2	Panels where to be provided	Incomer and bus PT panel
14.3.3	Voltmeter switch	Inbuilt in meter
14.3.4	Accuracy Class	1.0
14.4	Energy meter provision	Energy meter is not in supplier's scope. Only space and CT/PT wiring is to be provided in all panels except bus coupler and bus PT. Space for Energy meter shall be 200(w) X 350(h) mm^2

15.0 INDICATIONS & ALARMS

15.1	Indications	Flush mounted, High intensity, clustered LED type
15.1.1	Breaker ON	Red
15.1.2	Breaker Off	Green
15.1.3	Isolator On	Red
15.1.4	Isolator Off	Green
15.1.5	Earth switch On	Red
15.1.6	Earth switch Off	Green
15.1.7	Spring Charged	Blue
15.1.8	DC control supply fail	Amber
15.1.9	AC control supply fail	Amber
15.1.10	Auto trip	Amber
15.1.11	Heater circuit healthy	Yellow (Indication with integrated push button for checking)
15.1.12	Trip circuit healthy	White
15.1.13	PT supply as applicable	R,Y B
15.2	Alarm scheme with isolation switch	a. For DC fail, TC fail and CB auto trip b. For all signals wired to annunciator in 33kV panels

16.0 SELECTOR SWITCHES & PUSH BUTTONS

16.1	Selector switches	Flush mounted on LV compartment door, with shrouded terminals
16.1.1	TNC switch with pistol grip	Lockable, spring return to normal position for CB, Isolator and earth switch control
16.1.2	Local / SCADA selector switch	2 pole Lockable Switch
16.1.3	Rotary ON/OFF switches	For heater / illumination circuit
16.1.4	Rating	16 A

16.2	Push Button	Flush mounted on LV compartment door, with shrouded terminals
16.2.1	Emergency trip push button	Red color with stay put
16.2.2	Accept push buttons	Black color – Trip alarm / DC fail alarm
16.2.3	Reset push buttons	Yellow color – Trip alarm / DC fail alarm
16.2.4	Rating	10 A

17.0 INTERNAL WIRING

17.1	Grade and type	1100 V, PVC insulated, FRLS type stranded flexible copper wire.
17.2	Size	2.5 sq mm for CT circuit, 1.5 sq mm for PT & control circuits
17.3	Colour code	
17.3.1	CT & PT	R Ph – Red Y Ph – Yellow B Ph – Blue Neutral – Black
17.3.2	Others	DC– grey, AC-black, Earth – green
17.4	Ferrules	At both ends of wire
17.5	Ferrule type	Interlocked type (one additional red colour ferrule for all wires in trip circuit)
17.6	Lugs	Tinned copper, pre-insulated, ring type, fork type and pin type as applicable. CT circuits should use ring type lugs only.
17.7	Spare contacts	Spare contacts of relays and contactors etc. should be wired upto the terminal block.
17.8	Panel wiring	Panel wiring shall be on one side of the terminal block only. No more than two wires shall be connected to a terminal.
17.9	Inter-panel wiring	Inter-panel wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided on the same set of terminals in all the panels with proper segregation. Wires with ferrule to be terminated in the adjacent shipping section should be supplied with one end terminated and the other end bunched and coiled.
17.10	Wiring enclosure	Plastic channels for panel wiring, PVC sleeves for Inter panel wiring. Where wiring enters or passes through compartments containing high voltage apparatus, it shall be run in earthed continuous metallic conduit/trunking without gaps, holes or joints.

18.0 TERMINAL BLOCKS

18.1	Rating and Type	1100 V grade, moulded piece, stud type screw driver operated terminals complete with insulated barriers, washers, nuts and lock nuts.
18.2	Suitability	For termination of minimum 6sqmm flexible copper conductor.
18.3	Marking and covers	White fibre markings strip with clear plastic, slip-on / clip-on terminal covers to be provided.
18.4	Disconnecting Facility	To be provided in CT and PT terminals
18.5	Shorting & Earthing Facility	To be provided in CT Terminals
18.6	Spare Terminals	20% in each TB row
18.7	TB shrouds & separators	Moulded non- inflammable plastic material
18.8	Clearance between 2 sets of TB	100 mm min
18.9	Clearance with cable gland plate	250 mm min
18.10	Clearance between AC / DC set of TB	100 mm min
18.11	Test terminal blocks	Screw driver operated stud type for metering circuit

19.0 PROTECTION AND CONTROL

19.1	Protection Relays – General Features	
19.1.1	Technology and Functionality	Numerical , microprocessor based with provision for multifunction protection, control, metering and monitoring
19.1.2	Mounting	Flush Mounting, IP5X
19.1.3	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the protection and control unit to the required level of complexity as per the application.
19.1.4	Programming and configuration	Relay shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required. Programming software and communication cord for offered relays should be included in scope of supply.
19.1.5	Conformal Coating	a. Required on all cards and Components to protect against moisture, dust, chemicals, temperature extremes etc b. Testing shall be as per IEC 60068-2-60
19.1.6	Communication module	Communication Card of Relay shall have galvanic Isolation from all other cards to prevent damage during power system transients/Faults

19.1.7	SCADA Interface port	LC Type Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatible. Through these ports relays shall be connected to Ethernet switches.
19.1.8	Indications Processing	SCADA functions for monitoring shall be executed on SPI (Single Point Input) and DPI (Double Point Input). DPI shall only be used in case of Isolator and Circuit breaker “close” and “open” indication.
19.1.9	Command Processing	Functionality of command processing offered for SCADA interface shall include the processing of single and double commands i.e SCO (Single Command Output) and DCO (Double object command Output). DCO shall only be used in case of Isolator and Circuit Breaker close” and “open” command.
19.1.10	GOOSE messaging	Relays shall communicate all status signals, commands and events on GOOSE messaging.
19.1.11	PC Interface port	Front port (preferably serial) for configuration/data download using PC. Licensed software and communication cord, required for programming of offered protection relays shall be provided with the switchgear.
19.1.12	User Interface	An alphanumeric key pad and graphical LCD display with backlight indicating measurement values and operating messages. It should be possible to access and change all settings and parameters without the use of PC.
19.1.13	SCADA Interface	Relay shall communicate all measured & monitored parameters, analog signals, event record, fault record, DIs , DOs etc to SCADA
19.1.14	Relay Characteristics	Relay shall integrate all necessary protections for different applications in accordance with IS and IEC. Relay shall provide wide setting ranges and choice of all IEC, IEEE and other tripping curves through a minimum of two setting groups.
19.1.15	Event and Fault records	Relay shall have the facility of recording of various parameters during event/fault with option to set the duration of record through settable pre fault and post fault time. Relay shall store records for last 10 events and 10 faults (minimum). It should be possible to download and access all records locally from PC and remotely from SCADA.
19.1.16	Self diagnosis	Relay shall be able to detect internal failures. A

		watchdog relay with changeover contact shall provide information about the failure.
19.1.17	Time synchronization	All relays shall be capable of being synchronized with the system clock using SCADA interface and PC.
19.1.18	Operation Indicators	LEDs with push button for resetting.
19.1.19	Test Facility	Inbuilt with necessary test plugs.
19.1.20	Auxiliary supply	50/220 VDC. Relays should be suitable for continuous operation at 15% overvoltage
19.2	Protection Relays for 33KV Incomer	
19.2.1	Relay 1	Line differential protection (Dual channel, Compatible for Single Mode Fibre having wavelength 1310 nm)
		Distance protection
		Power swing blocking
		Software based CT ratio correction
		Dual Channel ST port for communication with remote end relay through optical fibre. This port should be in addition to PC interface and SCADA interface ports.
	Selection of Relay 1	Selection of Relay-1 (primary protection) will depend on site requirements. In case of Line differential as primary protection, Relays at both ends shall be provided.
19.2.2	Relay 2	Bay control unit having MIMIC with 3-phase Directional Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Trip Circuit Supervision
		Sync check function
		Circuit Breaker failure protection
		Reverse blocking function
		Under Frequency, Over Frequency and Rate of Change of frequency
		PT supervision
		Relay shall communicate all measured and monitored parameters like current, voltage, active power, reactive power, apparent power, power factor, phase angle, event record, fault record, DIs , DOs etc to SCADA
19.2.3	DIs and DOs	a. Relay-1 should have DIs and DOs as per scheme requirement. Same shall be finalized during detailed engineering. 2 DIs and 2 DO shall be spare for future use. b. Relay-2 should have minimum of 32 DIs and 16 DOs exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should be spare for future use.

19.2.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
19.2.5	SLD	Refer annexure – F1/F5
19.3	Protection Relays for 33KV Transformer Feeder Panel	
19.3.1	Relay 1	Biased differential protection
		REF protection
		Software based ratio and vector correction feature (without ICT)
		H2 and H5 harmonic restraint
19.3.2	Relay 2	Bay control unit having MIMIC with 3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Trip Circuit Supervision
		Reverse blocking function
		Under Frequency, Over Frequency and Rate of Change of frequency
		Circuit Breaker failure protection
		Relay shall communicate all measured and monitored parameters like current, voltage, active power, reactive power, apparent power, power factor, phase angle, event record, fault record, DIs , DOs etc to SCADA
19.3.3	DIs and DOs	a. Relay-1 should have DIs and DOs as per scheme requirement. Same shall be finalized during detailed engineering. 2 DIs and 2 DO shall be spare for future use. b. Relay-2 should have minimum of 32 DIs and 16 DOs exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should be spare for future use.
19.3.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
19.3.5	SLD	Refer annexure – F2/F6
19.4	Protection Relays for 33KV Bus-coupler/Bus-sectionalizer Panel	
19.4.1	Relay 1	Bay control unit having MIMIC with 3-phase Overcurrent and earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Trip Circuit Supervision
		Sync check function
		Reverse blocking function
		Circuit Breaker failure protection
		Under Frequency, Over Frequency and Rate of Change of frequency
		PT supervision (fuse failure monitoring) for Bus PT-1

		Relay should have a total of 40 DIs and 20 DOs exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 Dos should be spare for future use.
		Relay shall communicate all measured and monitored parameters like current, voltage, active power, reactive power, apparent power, power factor, phase angle, event record, fault record, DIs , DOs etc to SCADA
19.4.2	Relay 2	PT supervision (fuse failure monitoring) for Bus PT-2
19.4.3	SLD	Refer annexure – F3/F4
19.4.4	Note	One Bus PT should be provided for each bus section
19.5	Protection Relays – SCADA Interfacing Philosophy for all panels	
19.5.1	Configuration and wiring of DIs in Protection Relays for routing status and alarm signals to SCADA through SCADA interface port	DI-1 – TC-1 Healthy DI-2 – TC-2 Healthy DI-3 – CB Autotrip (contact from lockout relay) DI-4 – CB Open DI-5 – CB Close DI-6 – Spring Charged DI-7 – L/R switch in Remote DI-8 – L/R switch in Local DI-9 - DC fail DI-10 - AC Fail DI-11 – Gas pressure low in CB Compartment DI-12 –Gas pressure low in busbar compartment DI-13 – PT MCB trip (metering and protection, for incomer and bus coupler panel only) DI-14 – Isolator-1 Open DI-15 – Isolator-1 Close DI-16 – Earth Switch-1 Open DI-17 – Earth Switch-1 Close DI-18 – Isolator-2 Open DI-19 – Isolator -2 Close DI-20 – Earth switch -2 Open(bus coupler panel only) DI-21 – Earth switch -2 Close(bus coupler panel only) Sequence of DIs should be strictly as mentioned above.
19.5.2	Configuration and wiring of DOs in Protection relays for execution of SCADA commands through SCADA interface port	DOs should be wired for operation of CB and three position disconnectors. Sequence of DO assignment should be same in all panels.
19.5.3	Looping of protection relays	All relays in the switchboard have to be looped to form a common bus for interfacing with SCADA.

19.5.4	Spare DIs and DOs	Should be wired upto terminal block for future use.
19.6	Transformer Monitoring cum AVR Relay	
19.6.1	Features	As per annexure –A
19.6.2	Requirement	To be provided in 33KV Transformer feeder panel
19.7	Auxiliary Relays – General Features	
19.7.1	Relays for auxiliary, supervision, trip and timer relays	Static or electromechanical type.
19.7.2	Reset mechanism for auxiliary relays	Self reset contacts except for lock-out relays.
19.7.3	Reset mechanism for lockout relays	Hand reset type.
19.7.4	Operation indicators	With hand-reset operation indicators (flags) or LEDs with pushbuttons for resetting.
19.7.5	Auxiliary supply	50/220VDC. Relays should be suitable for continuous operation at 15% overvoltage
19.8	Auxiliary relays – Requirement	
19.8.1	Anti pumping (94), lockout (86) relays	For each breaker
19.8.2	PT selection relays	To be provided for selection between Bus PT and Line PT of respective sections.
19.8.3	Switchgear with two incomer & bus coupler	Lockout relay (86) contact of each incoming breakers to be wired in series in closing circuit of other incoming breakers & bus coupler.
19.8.4	Contact Multiplication Relay for Tripping and closing of Breaker	a. One for Tripping and one for closing with each breaker b. Current Rating shall be 30 percent more than closing and tripping coil current rating c. Shall be of closed type i.e. direct unauthorised access shall not be provided.
19.8.5	Auxiliary Relays, contact multiplication relays etc.	To effect interlocks and to exchange signals of status & control
19.8.6	Transformer trouble relays (For Transformer feeder panel only)	Auxiliary relays with indicating flags should be provided for the following trip and alarm commands – a. Buchholz trip b. OSR trip c. PRV trip d. SPR trip e. WTI Trip f. OTI Trip g. Buchholz Alarm h. Low oil level alarm i. OTI Alarm j. WTI Alarm.
19.9	MCBs	
19.9.1	Incoming auxiliary supplies	Shall be protected by MCB at the point of entry to the switchboard

19.9.2	Panel auxiliary supplies	a. All auxiliary supplies (DC, AC, PT supply etc.) shall be protected by MCB of appropriate rating. b. Separate MCBs shall be provided for control, indication and protection circuits of each breaker. For shunt trip circuits the protection shall be rated atleast 300 % of the load.

20.0 ETHERNET SWITCHES & FIBRE OPTICS

20.1	Ethernet Switch	
20.1.1	Numbers	Two at each site
20.1.2	FO Port	16 Nos
20.1.3	RJ 45 Port	4 Nos
20.1.4	Communication Protocol	IEC 61850
20.1.5	Network Protocol	PRP
20.1.6	Downlink Rate	100 MBPS
20.1.7	Uplink Rate	1 GBPS
20.1.8	Coating	Conformal
20.1.9	Power Supply Voltage	220 / 50 VDC as per site condition
20.1.10	Grade	Industrial
20.1.11	Certification required	KEMA,CE & FCC for IEC 61850 compliance
20.1.12	Operating Temperature	
20.1.13	Mounting	In Switchgear Panel
20.1.14	Blinking LED Indicators	On each RJ45 ports
20.1.15	Separate Maintenance/console Part	Required
20.1.16	Latency	Less than or equal to 10 ms
20.1.17	Fibre Optic Compatibility	Multimode, 1310 nm
20.1.18	Placement	Din Rail Arrangement inside Switchgear
20.2	Fibre Optics (Patch Cord) and Ethernet cable	
20.2.1	Connection	From Relays, Meters to Ethernet Switch
20.2.2	Mode of Fibre Optics	Multimode
20.2.3	Wavelength	1310 nm
20.2.4	Ethernet Cable Type	CAT VI
20.2.5	Associated Connectors and Accessories	Required

21.0 SPACE HEATERS, SOCKETS & ILLUMINATION LAMPS

21.1	Space Heaters	
21.1.1	Type	Thermostat controlled with switch for isolation

21.1.2	Location	In Breaker & HV cable compartment, mounted on an insulator. Heater position in cable compartment should be easily accessible after cable termination.
21.2	Illumination lamp with switch	For LV & cable chamber
21.3	Universal type (5/15 A) Socket with Switch	In LV chamber

22.0 NAMEPLATES AND MARKING

22.1	Nameplates	To be provided as per the following description
22.1.1	Equipment Nameplates	a. All equipment mounted on front as well as inside the panels shall be provided with individual name plates with equipment designation/description engraved. b. All front mounted equipment shall be also provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.
22.1.2	Feeder Nameplates	Large and bold name plate carrying feeder identification/ feeder number shall be provided on the top of each panel on front as well as rear side. On rear side, nameplate should be provided on frame.
22.1.3	Panel Rating Plate	Following details are to be provided on Panel rating plate: a. Manufacturers name or trade mark b. Switchgear designation c. Rated system voltage, phases, wires and frequency d. Rated fault current e. Busbar rating f. Insulation Gas Type and rated filling pressure for insulation g. Alarm pressure for insulation h. Minimum functional pressure for insulation i. Minimum functional pressure for operation j. Design pressure of gas filled compartment k. Year of manufacture l. Warranty Period m. Purchasers name n. Serial no o. Customer – BSES p. PO No. & Date – As per respective PO. q. CT rating details r. PT rating details
22.1.4	CB Rating Plate	a. Type / Model No. b. Month /Year of Manufacturing

		c. Current and voltage rating. d. Rated fault making and breaking current.
22.1.5	Material	Non-rusting metal or 3 ply lamicoid. Nameplates shall be black with white engraved lettering. Stickers are not allowed.
22.1.6	Fixing of rating plates and external nameplates	Shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
22.1.7	Fixing of internal nameplates	Internal labels may make use of a durable proprietary labeling system unless specifically indicated otherwise.
22.2	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not otherwise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

23.0 FINISH

23.1	Finish	The colour and finish may be in accordance with the Manufacturer standards for the service conditions specified, subject to BUYER's approval. The switchgear shall be fully tropicalized.

24.0 APPROVED MAKES OF COMPONENTS

24.1	Numerical Relays	Siprotec series of Siemens, Micom series of Schneider/Alstom. Numerical relays used in complete switchboard should be of same make. Use of two different makes of relays in a switchboard is not acceptable.
24.2	Transformer monitoring cum AVR relay	A-eberle
24.3	Electromechanical Relays	Alstom/Schneider/Siemens/ABB
24.4	Contact Multiplication Relays	Alstom/Schneider/Siemens/ABB
24.5	Contactors	ABB/Siemens/Schneider/ Telemechanique
24.6	MCBs	Siemens/Schneider/Legrand/ABB
24.7	Control switches	Switron/Kaycee
24.8	Test terminal blocks	IMP/Schneider/Alstom
24.9	Terminal blocks	Elmex/Connectwell
24.10	Indicating lamps	Siemens/Teknic/ Binay
24.11	Surge Suppressors	Oblum/Tyco/NKT/Nexans
24.12	Cable termination	Pfisterer/Sudkabel/ NKT/ Euromold

24.13	Multifunction Meter	Rishabh
24.14	Ethernet Switches	Ruggedcom/Hirschmann

25.0 INSPECTION AND TESTING

25.1	Type Tests	The product must be of type tested quality as per applicable Indian standards / IEC
25.2	Type test report validity period	Last five years from date of bid submission. Bidder with type test report more than 5 years old needs to re-conduct the tests without any commercial implication to BSES
25.3	Pressure relief device operation	Test certificate for panel to be submitted
25.4	Acceptance & Routine tests	To be done as per this specification and relevant standards. Charges for all these tests shall be deemed to be included in the equipment price. In addition to these tests, following tests have to be carried out as acceptance tests -
25.5	Primary injection test	To be carried out on panels selected for testing
25.6	Temperature rise test	One panel per Purchase order (PO with minimum 10 panels) without any commercial implication to BSES. In-house testing is acceptable.
25.7	Paint Thickness/ Peel off	To be carried out on panels selected for testing
25.8	Inspection	The purchaser/owner reserves the right to witness all the acceptance/routine tests during inspection.
25.9	Notice to purchaser for conducting type tests	At least three weeks in advance
25.10	Test reports before dispatch for approval	Six (6) copies of acceptance and routine test reports
25.11	Vendor quality plan	To be submitted for purchaser approval
25.12	Inspection points	To be mutually identified & agreed in quality plan

26.0 PACKING

26.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, panels may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
26.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification

26.3	Details of Packing Identification Label on each packing case	a. Individual serial number b. Purchaser's name c. PO number (along with SAP item code, if any) & date d. Equipment Tag no. (if any) e. Destination f. Project Details g. Manufacturer / Supplier's name h. Address of Manufacturer / Supplier / it's agent i. Description and Quantity j. Country of origin k. Month & year of Manufacturing l. Case measurements m. Gross and net weights in kilograms n. All necessary slinging and stacking instructions

27.0 SHIPPING

27.1	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
		The Bidder shall be responsible for all transit damage due to improper packing.

28.0 HANDLING AND STORAGE

28.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

29.0 DEVIATION

29.1	Deviation	Deviations from this Specification shall be provided in excel sheet with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.

30.0 ACCESSORIES & SPARES

30.1	Accessories	Should be supplied alongwith the switchgear in accordance with annexure-C
30.2	Spares	Should be supplied alongwith the switchgear in accordance with annexure- D

31.0 DRAWINGS & DATA SUBMISSION MATRIX

Document/Drawing submission shall be as per the matrix given below:

- All documents/drawings shall be provided in soft copy only in returnable Pen drives
- Language of the documents shall be English only.
- Incomplete submission shall be liable for rejection.
- Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure
- No submission is acceptable without check list compliance.
- Deficient/ improper document/ drawing submission shall be liable for rejection.
- Order of documents shall be strictly as per the check list.
- Any drawing not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope.

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
31.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
31.2	Consolidated Deviation Sheet	Required	Required		
31.3	GTP	Required	Required		
31.4	Relevant Type Test as per IS/IEC (including internal arc withstand performance)	Required			
31.5	Power Cable and control cable Philosophy and Schedule		Required		
31.6	Manufacturer's quality assurance plan and certification for quality standards		Required		
31.7	Sizing Calculation of Associated Equipment		Required		
31.8	Recommended Spares Apart from spares stated in Spec(for five years of operation)		Required		
31.9	**33 kV Switchgear drawing**				

31.9.1	General Arrangement	Required	Required		
31.9.2	Sectional Layout				
31.9.3	Door Layout		Required		
31.9.4	LV Box Internal Layout		Required		
31.9.5	Gas Pressure Diagram		Required		
31.9.6	SLD	Required	Required		
31.9.7	Gas SLD	Required	Required		
31.9.8	Schematic Circuit diagram and Scheme of Each type of Panel		Required		
31.9.9	Communication Architecture		Required		
31.9.10	Bus Bar Arrangement		Required		
31.9.11	QAP		Required		
31.9.12	Panel wise BOQ		Required		
31.9.13	Logic Operation Diagram		Required		
31.9.14	Plan		Required		
31.9.15	Synch Logic Diagram		Required		
31.9.16	Foundation Diagram		Required		
31.9.17	DI sheet		Required		
31.9.18	DO Sheet		Required		
31.9.19	TB Details		Required		
31.9.20	Make of all Component as per specification		Required		
31.10	Drawing of Substation Room		Required		
31.11	Ventilation detail requirement of GIS Room		Required		
31.12	Installation, erection and commissioning manual for switchgear		Required		
31.13	Inspection Reports			Required	
31.14	As manufacturing Drawings			Required	
31.15	Operation and Maintenance Manual			Required	
31.16	Trouble shooting manual			Required	
31.17	As built Drawings				Required
31.18	Test Report				Required

ANNEXURE – A – TRANSFORMER MONITORING CUM AVR RELAY

1	General features	
1.1	Technology and Functionality	Microprocessor based with provision for multifunction control and monitoring.
1.2	Mounting	Flush Mounting
1.3	Conformal Coating	a. Required on all cards and Components to protect against moisture, dust, chemicals, temperature extremes etc b. Testing shall be as per IEC 60068-2-60
1.4	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the control unit to the required level of complexity as per the application.
1.5	Programming and configuration	AVR shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required.
1.6	User Machine Interface	UMI with an alphanumeric key pad and graphical LCD display with backlight indicating measurement values and operating messages. Capability to access and change all settings and parameters.
1.7	PC Interface port	Front port (preferably serial) for configuration using PC. Cost of licensed software and communication cord, required for programming of offered protection relays using PC, shall be mentioned separately in the bid.
1.8	SCADA Interface port	LC Type Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatibility. Through these ports relays shall be connected to switches. Ethernet switches at switchgear end shall be suitably mounted in an auxiliary compartment in switchgear panel.
1.9	Self diagnosis	Shall be able to detect internal failures. A watchdog relay with changeover contact shall provide information about the failure.
1.10	Cable Termination	Termination of cable shall be at rear side.
1.11	Auxiliary supply	220VDC or 48VDC
2	Inputs and Outputs	
2.1	CT Input	1/5A selectable through programming
2.2	PT Input	110VAC
2.3	Binary Inputs	Sixteen programmable binary inputs should be provided
2.4	Analog Inputs (4-20mA)	One input to be provided
2.5	PT-100 direct input	Two inputs to be provided
2.6	Direct Resistance Input	For tap position indication (18 steps)

2.7	Binary Outputs	Ten programmable binary outputs should be provided
3	Control	
3.1	Control Tasks	Ability to implement control functions through programmable logics
3.2	Voltage setting	Programmable Voltage set point
3.3	Voltage Regulation	Raise/Lower tap position to maintain the preset value of voltage.
3.4	Voltage Regulation modes	Automatic and Manual
3.5	Operation Modes	Local and Remote
3.6	Fan and Pump control	To be provided
3.7	Transformer Paralleling	Capability to parallel transformers whose AVRs are interconnected via a communication network.
4	SCADA Interfacing	
4.1	Configuration of DIs for routing alarm/trip signals to SCADA.	DI-1 – Buchholz trip DI-2 – OSR Trip DI-3 – PRV trip DI-4 – SPR trip DI-5 – OTI trip DI-6 – WTI trip DI-7 – Buchholz alarm DI-8 – Oil Level low larm (MOG alarm) DI-9 – WTI alarm DI-10 – OTI alarm DI-11 – Tap changer trouble/stuck/out of step DI-12 – Tap changer motor supply fail DI-13 – Tap changer in local control All signals from DI-1 to DI-10 are to be wired up from transformer trouble auxiliary relays.
4.2	Configuration of Dos for executing commands from SCADA through interface port/CRP	DO-1 – Tap raise DO-2 – Tap lower DO-3 – Fan group 1 control DO-4 – Fan group 2 control
4.3	Spare Dis and Dos	To be wired upto the terminal block.
5	Measurement, Event Recording and Monitoring	
5.1	Measured Quantities (optional)	Voltage, Current, Active Power, Reactive Power, Apparent Power, Power factor, frequency
5.2	Event Recording	Facility for recording parameters during various events such as tap change, change in binary input status etc.
5.3	Monitoring	Capability to monitor important transformer parameters such as Oil temperature, Winding Temperature etc and give indication/alarm when the value of a particular parameter exceeds the preset value.

ANNEXURE – B – TECHNICAL PARTICULARS (DATA BY PURCHASER)

1.0	**SWITCHGEAR**		
1.1	Type	Metal clad, SF6 gas insulated with VCB type circuit breaker	
1.2	Service	Indoor	
1.3	Mounting	Free standing, floor mounted	
1.4	System Voltage	33kV	
1.5	Voltage variation	+/- 10%	
1.6	Frequency	50 Hz +/- 5%	
1.7	Phase	3	
1.8	Rated voltage	36 kV	
1.9	Rated current	As per Single line diagram	
1.10	Short time rating for 3 sec.	25kA	
1.11	Internal arc classification and rating		
1.11.1	Classification	IAC – A – FLR	
1.11.2	Rating	25kA for 1 second.	
1.12	Insulation level (PF rms / Impulse peak)	70 kV/ 170 kV	
1.13	System ground	Effectively earthed	Effectively earthed
1.14	Enclosure degree of protection	IP – 65 for gas filled compartments IP – 4X for Cable and LV compartment	
1.15	Bus bar – Main	Rating as per SLD, Short time rating as per clause 1.10.	
1.15.1	Material	Copper	
1.15.2	Bus bar joint plating	As per manufacturer's standard. Tape on joints is not acceptable.	
1.15.3	Bus identification	Colour coded	
1.15.4	Temperature rise	40 deg. C for conventional joints. 55 deg. C for silver plated joints	
1.16	Auxiliary bus bar	Electrolytic grade tinned copper	
1.17	Auxiliary DC Supply	220 V DC / 50 V DC	
1.18	Auxiliary AC supply	240 V AC 50 Hz	
1.19	Hardware	Stainless steel.	
1.20	Earth bus	Aluminium	
1.21	Power cable entry	From bottom and rear	
1.22	Control cable entry	From bottom and front (i.e breaker compartment)	
1.23	Gas leakage rate	Less than 0.5% per annum	
2.0	**CIRCUIT BREAKER**		
2.1	Voltage class, insulation level, short time rating	As specified for switchgear	
2.2	Rated current	As per SLD.	

2.3	Duty cycle	O – 0.3 sec – CO – 3min – CO
2.4	Short circuit rating	
2.4.1	A.C sym. Breaking current	25kA
2.4.2	Short circuit making current	62.5kA
2.5	Operation time	
2.5.1	Break time	Not more than 4 cycles
2.5.2	Make time	Not more than 5 cycles
2.6	Range of Auxiliary Voltage	
2.6.1	Closing	85% - 110%
2.6.2	Tripping	70% - 110%
2.6.3	Spring Charging	85% - 110%
2.7	No. of spare aux. Contacts of Breaker, for Owner's use.	Minimum 4 NO + 4 NC
2.8	Nos. of spare auxiliary contacts of disconnector	Minimum 2 NO + 2 NC
2.9	Nos. of spare auxiliary contacts of earth switch	Minimum 2 NO + 2 NC
3.0	**CURRENT TRANSFORMERS**	
3.1	Voltage class, insulation level and short time rating	As specified for switchgear
3.2	Type	Solid Insulation
3.3	Class of insulation	Class E or better
3.4	Ratio	As per SLD
3.5	Number of secondaries	As per SLD
3.6	Accuracy class	
3.6.1	Protection core	5P20
3.6.2	Protection (Diff. / REF)	PS
3.6.3	Metering	0.2s
3.7	Burden (VA)	Adequate for the protection & instruments offered i.e atleast 1.5 times the connected burden.
3.8	Excitation current of PS Class CTs	30 mA at Vk/4
4.0	**VOLTAGE TRANSFORMERS**	
4.1	Type	Cast resin, single phase unit
4.2	Rated Voltage	
4.2.1	Primary	33000/sq.rt.3
4.2.2	Secondary	110V/sq.rt.3
4.3	No. of phases	3
4.4	No. of secondary windings	2
4.5	Method of connection	Star/Star

4.6	Rated voltage factor	1.2 continuous, 1.9 for 30 seconds
4.7	Class of insulation	Class E or better
4.8	Accuracy class	
4.8.1	Protection	3P
4.8.2	Metering	0.2
5.0	**SURGE ARRESTORS**	
5.1	Rated Voltage	30kV
5.2	Maximum continuous operating voltage (MCOV)	25kV
5.3	Discharge current	10kA
5.4	Discharge class	3

ANNEXURE – C – MANDATORY ACCESSORIES FOR EACH SWITCHBOARD SET

S No.	Description	Qty
1	Current test plug/ adapter	2
2	Voltage test plug/ adapter	2
3	Operating Handles	2 sets
4	Adaptor Plug (For Testing of Cable)	2 sets
5	Bushing Extender	2 sets
6	Gas leak detector – DILO make	1
7	Cable dummy plugs (if required, depending on type of cable termination)	2 sets
8	Special tools and tackles required for erection, testing, commissioning and maintenance of the switchboard should be supplied with the switchboard.	1 set
9	Other accessories required for trouble free operation of switchgear as per manufacturer recommendation.	1 set

ANNEXURE – D – SPARES REQUIREMENT

S No.	Description	Qty
1	Numerical relay of each type	1
2	Auxiliary Relay of each type	5
3	Contactors of each type	5
4	Contact Multiplication Relay of each type	5
5	Line voltage transformer	3 (1 set)
6	Bus voltage transformer	3 (1 set)
7	GIS End Termination Kit	2
8	Ethernet Switch	1 No (Each Site)
9	Optical Fibre	20% of Supplied Items
10	CAT VI Ethernet cable for Communication	20% of Supplied Items
11	Current transformers suitable for incomer panel	3 (1 set)
12	Current transformers suitable for transformer panel	3 (1 set)
13	Current transformers suitable for bus coupler panel	3 (1 set)
14	Trip Coil	4
15	Closing Coil	4
16	CB Spring charging motor	2
17	Auxiliary switch	2 sets (2 Nos. each type)
18	Disconnector motor for isolator	1
19	Disconnector motor for earthswitch	1
20	Gas density switch	2
21	Bursting disc / pressure relief plate complete	2
22	Capacitive voltage indicator	6 (2 sets)
23	Mobile gas filling and evacuation device -DILO make	1
24	SF6 Gas cylinders	4
25	SCADA Spares	20% of Supplied Items
26	Other spares recommended by manufacturer may be added to this list	

Unit price for all the spares should be indicated in price bid.

ANNEXURE – E– GUARANTEED TECHNICAL PARTICULARS (DATA BY BIDDER)

Vendor must submit clause wise compliance in Excel sheet against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

S No.	DESCRIPTION	UNITS	DATA SPECIFIED BY PURCHASER	DATA PROVIDED BY BIDDER
1.00	**SITE CONDITIONS**			
1.01	Altitude	meters	1 -50	
1.02	Maximum Ambient Temperature	°C	45	
1.03	Minimum Ambient Temperature	°C	0	
1.04	Design Ambient Temperature	°C	50	
1.05	Relative Humidity	%	100	
2.00	**PARAMETERS**			
2.01	Voltage	kV	33	
2.02	Phases	-	3	
2.03	Frequency	Hz	50	
2.04	Short Time Rating for 3 Sec	kA	31.5	
2.05	Voltage Class	kV	36	
2.06	Insulation level (PF rms / Impulse peak)	kVrms / kVpeak	70/170	
2.07	Internal arc test			
a	Rated current and duration	kA, sec		
b	Classification			
3.00	**ENCLOSURE TYPE**		IP65 / IP4X	
3.01	Rear Doors	-	Manufacturers Standard	
3.02	Indoor / Outdoor	-	Indoor	
3.03	Arc Resistant	-	YES	
3.04	Tamperproof Category		YES	
3.05	Dust resistant (gasketed)	-	YES	
4.00	**PANEL CONSTRUCTION**			
4.01	Gas pressure – busbar compartment		Bar / MPa	
a	Normal gas pressure		Bar / MPa	
b	Permitted range of Gas pressure for safe operation		Bar / MPa	
c	Alarm level		Bar / MPa	
d	Gas pressure for operation of PRD		Bar / MPa	
e	Withstand gas pressure of enclosure		Bar / MPa	
f	Number of aux.contacts /stages provided for the gas density meter			
4.02	Gas pressure – breaker		Bar / MPa	

S No.	DESCRIPTION	UNITS	DATA SPECIFIED BY PURCHASER	DATA PROVIDED BY BIDDER
	compartment			
a	Normal gas pressure		Bar / MPa	
b	Permitted range of Gas pressure for safe operation		Bar / MPa	
c	Alarm level		Bar / MPa	
d	Gas pressure for operation of PRD		Bar / MPa	
e	Withstand gas pressure of enclosure		Bar / MPa	
f	Number of aux. contacts /stages provided for the gas density meter			
4.03	Material and thickness of gas enclosure			
4.04	Total no. of Gas compartments per panel		No.	
4.05	Number of Gas Density meters provided per panel		No.	
4.06	Rating of Isolator (A)		Same as CB rating	
4.07	Rating of earthing switch (A)		Same as CB rating	
4.07	Guaranteed Gas leakage Rate		< 0.5 %	
4.08	Rodent damage protection		YES	
4.09	Ground and test device		YES	
4.10	Equipment Labeling		Anodized aluminium	
4.11	Lift truck		If required	
4.12	Testing facility			
a	For Cable		Required	
b	For CT		Required	
c	For PT		Required	
5.00	**BUS INFORMATION**			
5.01	Material		Copper	
5.02	Bus Joint Plating		Manufacturers Standard	
5.03	Rated Continuous Current	A rms	2000 A	
5.04	Short time Withstand Current	A rms	31.5kA for 3 Sec	
6.00	**BUS SUPPORTS AND INSULATION**			
6.01	Manufacturer's Standard & Type		Manufacturers Standard	
6.02	Material		Manufacturers Standard	
7.00	**POWER CABLE ACCOMMODATION**			

S No.	DESCRIPTION	UNITS	DATA SPECIFIED BY PURCHASER	DATA PROVIDED BY BIDDER
7.01	Power Cable entry		Bottom	
7.02	Terminal lug type		Socket & Plug for SF6	
7.03	Qty of power cables per phase per compartment	qty	As per specification and SLD	
7.04	Make of termination			
8.00	**CIRCUIT BREAKER INFORMATION**			
8.01	Manufacturer / Model No.			
8.02	Type (SF6/Vacuum)		Manufacturers Standard	
8.03	Rated Short-Circuit Current	kA	31.5 kA	
8.04	Short circuit-Current Withstand Time	sec	3	
8.05	Rated Maximum Voltage	kV rms	36	
8.06	Rated Voltage Range Factor, K		1.1	
8.07	Power Frequency Withstand Voltage	kV rms	70	
8.08	Lightning Impulse Withstand Voltage	kV crest	170	
8.09	Rated Continuous Current	A rms	As per single line drawing.	
8.10	Rated Transient Recovery Voltage Time to Peak (T2)	microsec	Manufacturers Standard	
8.11	Switching duty/capability			
a	Power Transformers (oil filled)	Capacity		
b	Cables	Length		
c	Over head lines	Length		
8.12	Rated Interrupting Time	ms	60	
8.13	Time for Opening Operation	cycles	3	
8.14	Time for Closing Operation	cycles	4	
8.15	Closing and latching capability (peak)	kA	Manufacturers Standard	
8.16	Control Power Voltage Range, Trip Coil	V dc	220/50	
8.17	Control Power Voltage Range, Closing Coil	V dc	220/50	
8.18	Auxiliary Contacts Total	qty	12	
8.19	Min. Auxiliary Contacts for Customer use	qty	6	
8.20	Auxiliary Contact voltage rating	V dc	220 / 50	
8.21	Auxiliary Contact current	Amps	10	

S No.	DESCRIPTION	UNITS	DATA SPECIFIED BY PURCHASER	DATA PROVIDED BY BIDDER
	rating			
8.22	Stored Energy System Minimum Voltage	V dc	187	
8.23	Stored Energy Spring Charging Motor Current	Amps	MS	
8.24	Stored Energy Spring Charging Motor Inrush	Amps	MS	
8.25	Stored Energy Time to Fully Recharge Spring:	seconds	MS	
8.26	Rated Operating duty cycle		O – 0.3Sec – CO - 3min -CO	
8.27	Rated out of phase switching capability to IEC 56			
8.28	Operating Power Consumption			
a	Trip Coil	Watt		
b	Closing Coil	Watt		
c	Operating Motor	Watt		
8.29	Number of trip coils	Nos.	2	
8.30	Quantity of Gas in CB			
a	Mass			
b	Volume at Normal Pressure	CuM		
8.31	Interrupting Gas Pressure Maximum / Normal / Minimum	Bar (Absolute)		
8.32	Number of Close / Open Operation possible without re-charging	No.		
8.33	Number of operations possible before interrupter maintenance required			
a	At rated S.C. current	Nos.		
b	At full load current	Nos.		
c	At no load	Nos.		
8.34	Method used to relieve internal overpressure due to short circuit (Bursting disc / relief valve / none. Etc.)			
8.35	Operating pressure of pressure relief device			
9.00	**PROTECTIVE RELAYS**			
9.01	Manufacturer		By Seller	
9.02	Model no. of each relay			
9.03	Relay functions		As per specification	

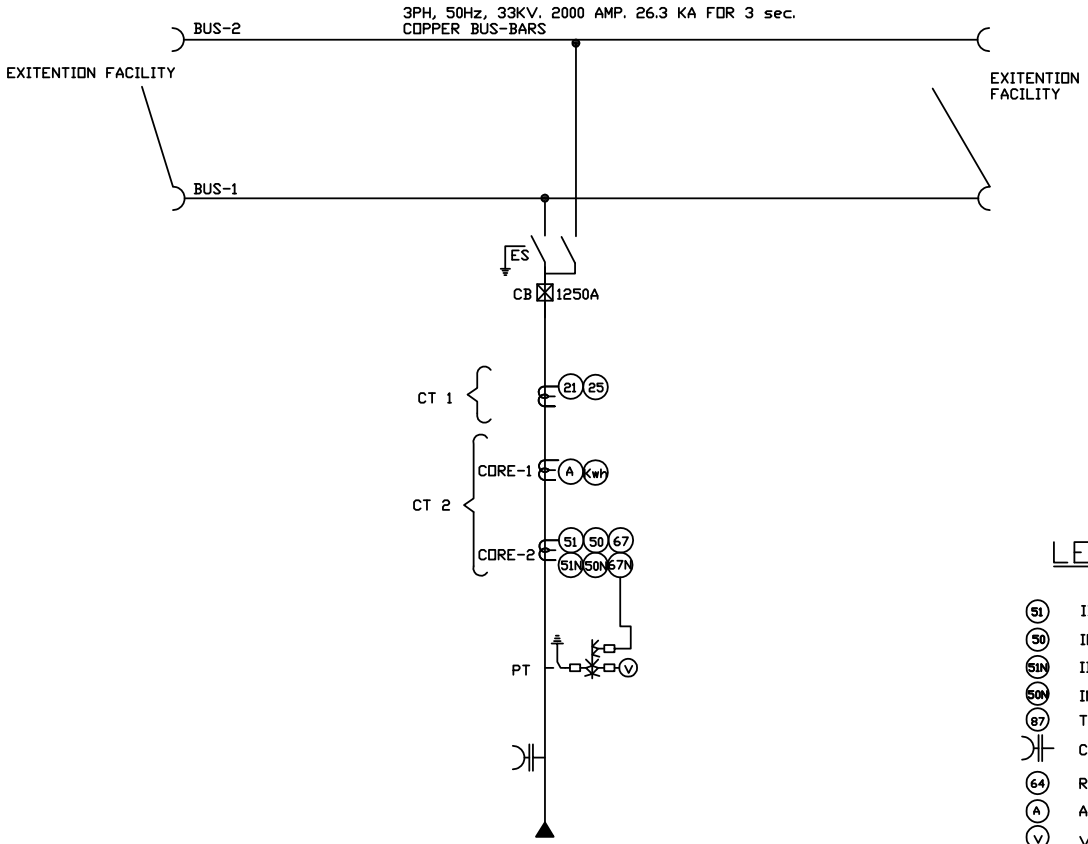
S No.	DESCRIPTION	UNITS	DATA SPECIFIED BY PURCHASER	DATA PROVIDED BY BIDDER
9.04	Relay Communication		IEC 61850	
10.00	**MULTI FUNCTION METER**			
10.01	Model		Rish Delta Energy	
10.02	Make		Rishabh	
10.03	SCADA Interfacing		RS485 rear port suitable for integration on Modbus Protocol	
10.04	Size	mm^2	96x96	
10.05	Panels where to be provided		All panels	
10.06	Accuracy Class		1	
10.07	Auxiliary Supply		48 – 240VDC and AC i.e universal type.	
11.00	**CONTROL WIRING**		See Specification	
11.01	Type		XLPE or PVC	
11.02	Control wire Size minimum:		1.5 mm	
11.03	Voltage Rating:	Vac	600/1000V	
11.04	FRLS type		Yes	
12.00	**CURRENT TRANSFORMERS**		As per SLD	
	(Details to be furnished for each type of CT)			
12.01	Manufacturer/Model Number:			
12.02	Accuracy Class		As per SLD	
12.03	Ratio		As per SLD	
12.04	Burden		As per SLD	
12.05	Knee point voltage		As per SLD	
12.06	Rct			
12.07	Excitation current		As per SLD	
13.00	**VOLTAGE TRANSFORMERS**			
13.01	Manufacturer			
13.02	Model Number			
13.03	Accuracy		As per SLD	
13.04	Secondary MCB		Required	
13.05	Burden		As per SLD	
13.06	Disconnecting switch for VT		Required	
14.00	**PANEL ACCESSORIES**			
14.01	Indications		LED type	
14.02	Control switches			
a	Make			
b	Type			
c	Rating			
14.03	L/R switch			

S No.	DESCRIPTION	UNITS	DATA SPECIFIED BY PURCHASER	DATA PROVIDED BY BIDDER
a	Make			
b	Type			
c	Rating			
14.04	CT & PT Terminal blocks			
a	Make			
b	Type		Disconnecting	
c	Size			
d	Rating			
14.05	Terminal blocks			
a	Make			
b	Type		Non-Disconnecting	
c	Size			
d	Rating			
15.00	**HEAT LOSS**			
15.01	Bus Losses	Watts		
15.02	Heat loss at rated breaker current –2000 A	W/bkr		
15.03	Heat loss of space heater per vertical section	W/vrtl		
16.00	**INSTALLATION INFORMATION**			
16.01	Mass of heaviest piece to be shipped as a unit	kg		
16.02	Largest section to be shipped a unit -Length:	mm		
16.03	Largest section to be shipped a unit -Width:	mm		
16.04	Largest section to be shipped a unit -Height:	mm		
16.05	Total Mass of assembly to be shipped	kg		
16.06	Total assembly (breaker line-up only) -Length	mm		
16.07	Total assembly (breaker line-up only) -Width	mm		
16.08	Total assembly (breaker line-up only) -Height	mm		
16.09	Transition section (breaker line-up only) -Mass	kg		
16.10	Transition section (breaker line-up only) -Length	mm		
16.11	Transition section (breaker line-up only) -Width	mm		
16.12	Transition section (breaker	mm		

S No.	DESCRIPTION	UNITS	DATA SPECIFIED BY PURCHASER	DATA PROVIDED BY BIDDER
	line-up only) -Height			
16.13	Total Number of shipping sections per line up:	qty		
17.00	**PANEL DIMENSIONS**			
17.01	Incomer (Width x Depth x Height)	mm		
17.02	Bus-coupler (Width x Depth x Height)	mm		
17.03	Outgoing (Width x Depth x Height)	mm		
17.04	Overall length of Complete board	mm		
18.00	**CONTROL AND AUXILIARY SUPPLY**			
18.01	Buyer Control power supply (Volts)		220 V / 50V , +15% & -15%V DC	
18.02	Buyer Control power current rating (A)		15 A	
18.03	Buyer control power supply short circuit level		30 kA	
18.04	Buyer AC power supply (Volts)		240 V + 10%	
18.05	Buyer AC power supply current rating (A)		20A	
18.06	Buyer AC power supply short circuit rating (kA)		50 kA	
19.00	**PAINTING / FINISHING**			
19.01	Manufacturer's Standard		Manufacturer's Paint Spec doc. No.	
19.02	Color		RAL7032	
20.00	**MODULE REPLACEMENT**			
20.01	Complete panel replacement duration (at site)	Hours		
20.02	CB Module replacement duration (at site)	Hours		
20.03	Bushing Replacement duration (at site)	Hours		

ANNEXURE – F – SINGLE LINE DIAGRAMS

ANNEXURE-F1



CT-1
800-400/1A
ACCURACY-PS
Ie<-30mA at VK/4
Vk>40(Rct+4)V

CT-2
CORE1-800-400/1A
ACCURACY-0.2S
BURDEN-7.5VA
ISF>=10

CORE2-800-400/1A
ACCURACY-5P20
BURDEN-15VA

PT
WINDING 1-33KV/√3/110/√3
CL-0.2
BURDEN-25VA
WINDING 2-33KV/√3/110/√3
CL-3P
BURDEN-25VA

LEGEND:

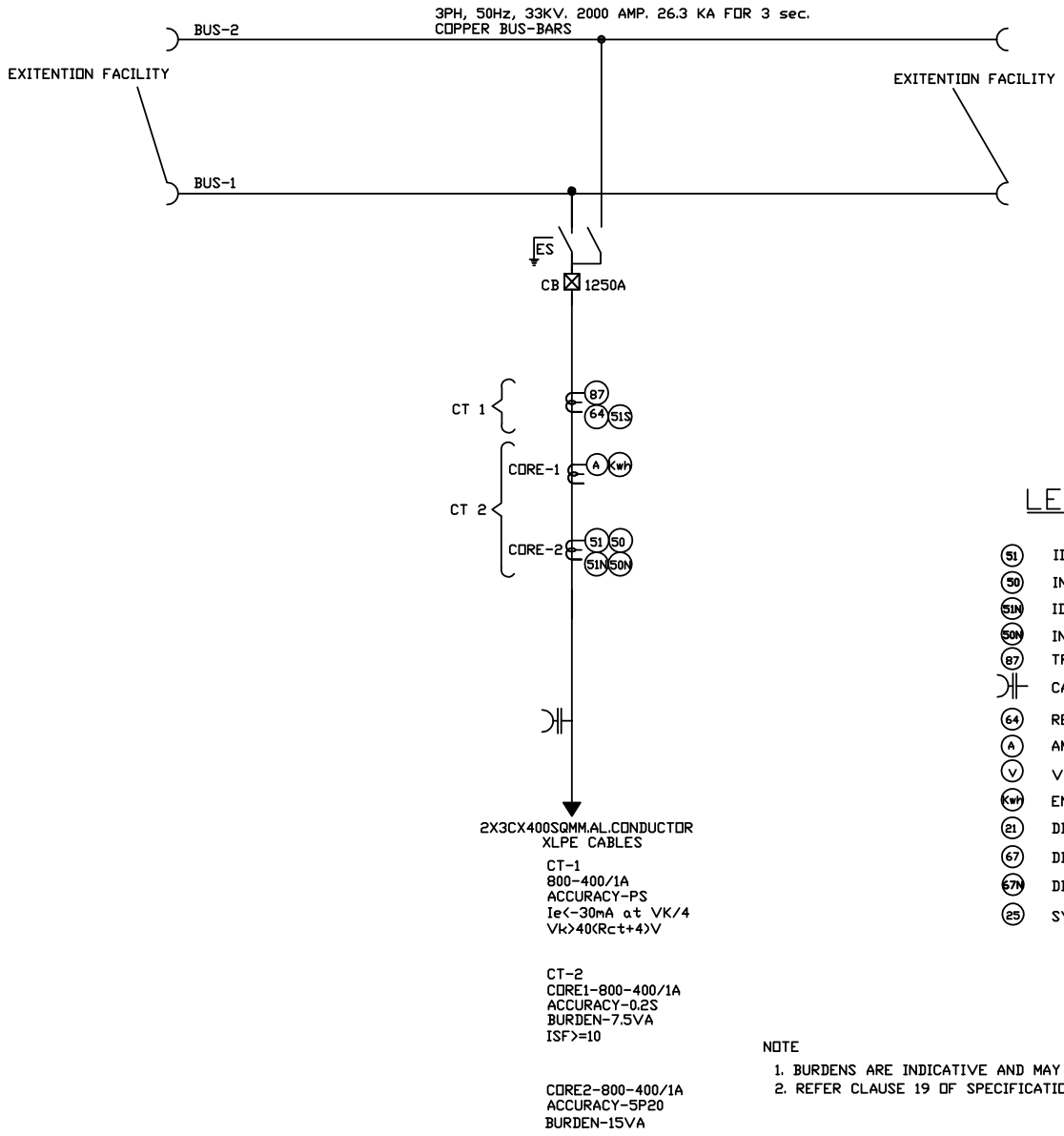
51	IDMT PHASE OVER CURRENT RELAY
50	INSTANTANEOUS PHASE OVER CURRENT RELAY
51N	IDMT EARTH FAULT RELAY
50N	INSTANTANEOUS EARTH FAULT RELAY
87	TRANSFORMER DIFFERNTIAL RELAY
	CAPACITIVE VOLTAGE INDICATOR
64	RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
A	AMMETER WITH SELECTOR SWITCH
V	VOLTMETER WITH SELECTOR SWITCH
kWh	ENERGY METER
21	DISTANCE RELAY
67	DIRECTIONAL OVER CURRENT RELAY
67N	DIRECTIONAL EARTH FAULT RELAY
25	SYNCHRO CHECK RELAY

NOTE

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.

DRAWN	R.K/A.H J.A/A.M	TITLE:- STANDARD SLD FOR 33KV INCOMER	BSES
CHECKED	S.G/A.S		SPECIFICATION NO. BSES-TS-65-33GIS-R0
APPD.	G.S/G.N		SLD-GIS-33KV-01
DATE	28.04.22		
SCALE	NTS		

ANNEXURE-F2



LEGEND:

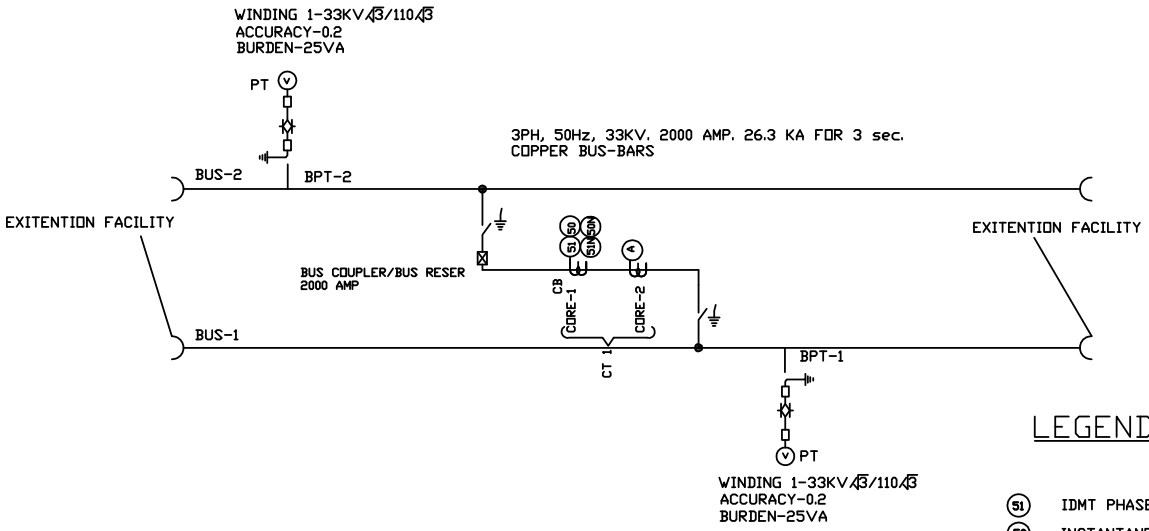
51	IDMT PHASE OVER CURRENT RELAY
50	INSTANTANEOUS PHASE OVER CURRENT RELAY
51N	IDMT EARTH FAULT RELAY
50N	INSTANTANEOUS EARTH FAULT RELAY
87	TRANSFORMER DIFFERNTIAL RELAY
	CAPACITIVE VOLTAGE INDICATOR
64	RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
A	AMMETER WITH SELECTOR SWITCH
V	VOLTMETER WITH SELECTOR SWITCH
Kwh	ENERGY METER
21	DISTANCE RELAY
67	DIRECTIONAL OVER CURRENT RELAY
67N	DIRECTIONAL EARTH FAULT RELAY
25	SYNCHRO CHECK RELAY

NOTE

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.

DRAWN	R.K/A.H J.A/A.M	TITLE:- STANDARD SLD FOR 33KV TRANSFORMER FEEDER	BSES
CHECKED	S.G/A.S		
APPD.	G.S/G.N		SPECIFICATION NO. BSES-TS-65-33GIS-R0
DATE	28.04.22		SLD-GIS-33KV-02
SCALE	NTS		

ANNEXURE-F3



CT-1

CORE1-800-400/1A
ACCURACY-5P20
BURDEN-15VA

CORE2-800-400/1A
ACCURACY-0.5
BURDEN-7.5VA

LEGEND:

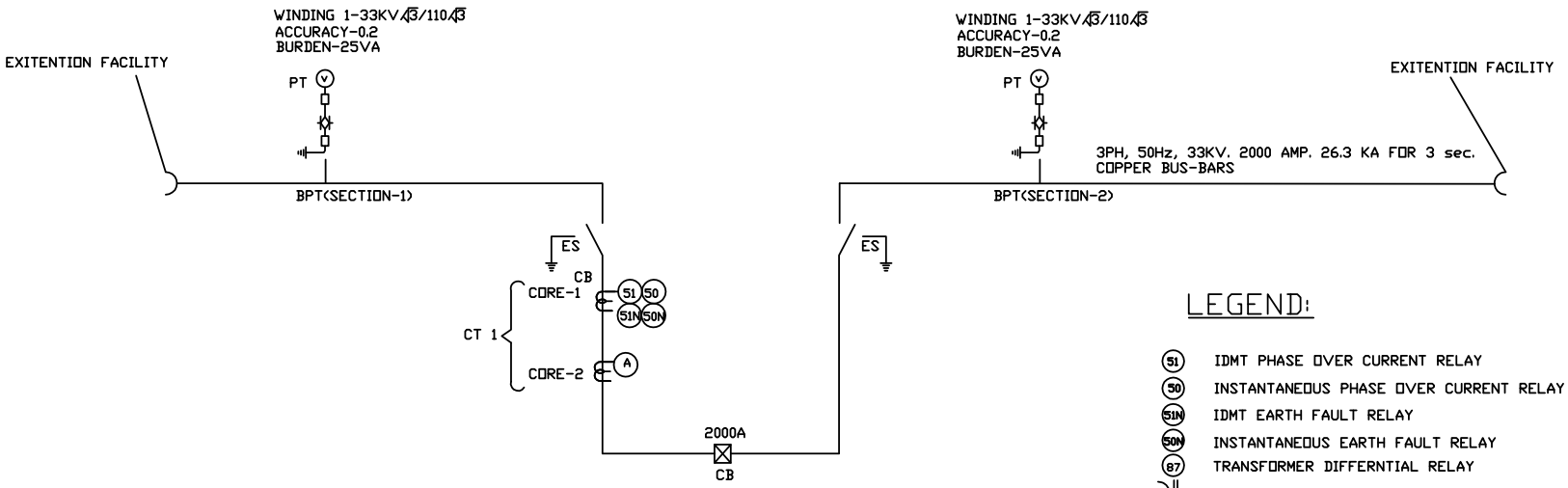
51	IDMT PHASE OVER CURRENT RELAY
50	INSTANTANEOUS PHASE OVER CURRENT RELAY
51N	IDMT EARTH FAULT RELAY
50N	INSTANTANEOUS EARTH FAULT RELAY
87	TRANSFORMER DIFFERNTIAL RELAY
	CAPACITIVE VOLTAGE INDICATOR
64	RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
A	AMMETER WITH SELECTOR SWITCH
V	VOLTMETER WITH SELECTOR SWITCH
kWh	ENERGY METER
21	DISTANCE RELAY
67	DIRECTIONAL OVER CURRENT RELAY
67N	DIRECTIONAL EARTH FAULT RELAY
25	SYNCHRO CHECK RELAY

NOTE

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.
3. ONE BPT TO BE PROVIDED FOR EACH BUS SECTION.

DRAWN	R.K/A.H J.A/A.M	TITLE:- STANDARD SLD FOR 33KV BUS COUPLER CUM BUS PT	BSES
CHECKED	S.G/A.S		
APPD.	G.S/G.N		SPECIFICATION NO. BSES-TS-65-33GIS-R0
DATE	28.04.22		SLD-GIS-33KV-03
SCALE	NTS		

ANNEXURE-F4



LEGEND:

51	IDMT PHASE OVER CURRENT RELAY
50	INSTANTANEOUS PHASE OVER CURRENT RELAY
51N	IDMT EARTH FAULT RELAY
50N	INSTANTANEOUS EARTH FAULT RELAY
87	TRANSFORMER DIFFERNTIAL RELAY
	CAPACITIVE VOLTAGE INDICATOR
64	RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
A	AMMETER WITH SELECTOR SWITCH
V	VOLTMETER WITH SELECTOR SWITCH
kWh	ENERGY METER
21	DISTANCE RELAY
67	DIRECTIONAL OVER CURRENT RELAY
67N	DIRECTIONAL EARTH FAULT RELAY
25	SYNCHRO CHECK RELAY

CT-1

CORE1-800-400/1A
ACCURACY-5P20
BURDEN-15VA

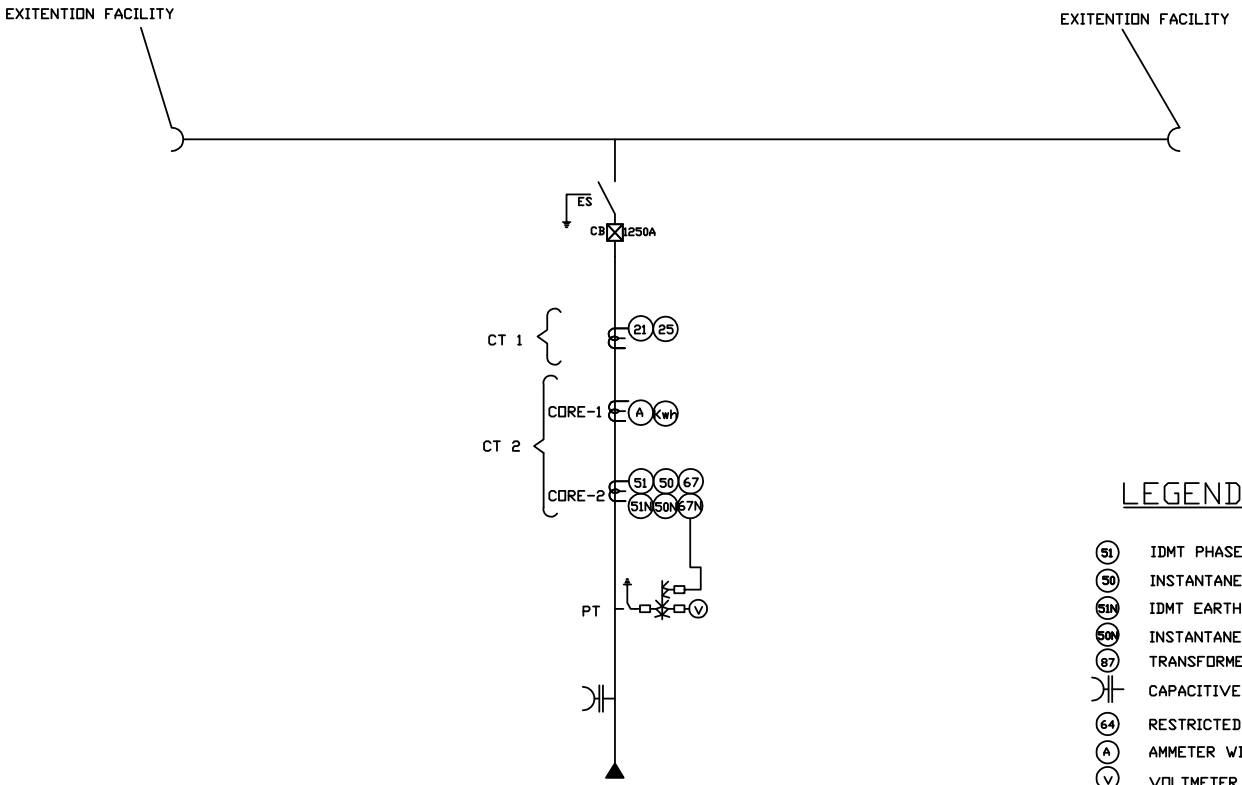
CORE2-800-400/1A
ACCURACY-0.5
BURDEN-7.5VA

NOTE

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.
3. ONE BPT TO BE PROVIDED FOR EACH BUS SECTION.

DRAWN	R.K/A.H J.A/A.M	TITLE:- STANDARD SLD FOR 33KV BUS SECTIONALIZER CUM RISER CUM BUS PT	BSES
CHECKED	S.G/A.S		
APPD.	G.S/G.N		SPECIFICATION NO. BSES-TS-65-33GIS-R0
DATE	28.04.22		SLD-GIS-33KV-04
SCALE	NTS		

ANNEXURE-F5



CT-1
800-400/1A
ACCURACY-PS
Ie<-30mA at VK/4
Vk>40(Rct+4)V

CT-2
CORE1-800-400/1A
ACCURACY-0.2S
BURDEN-7.5VA
ISF>=10

CORE2-800-400/1A
ACCURACY-5P20
BURDEN-15VA

PT
WINDING 1-33KV/√3/110/√3
CL-0.2
BURDEN-25VA
WINDING 2-33KV/√3/110/√3
CL-3P
BURDEN-25VA

LEGEND:

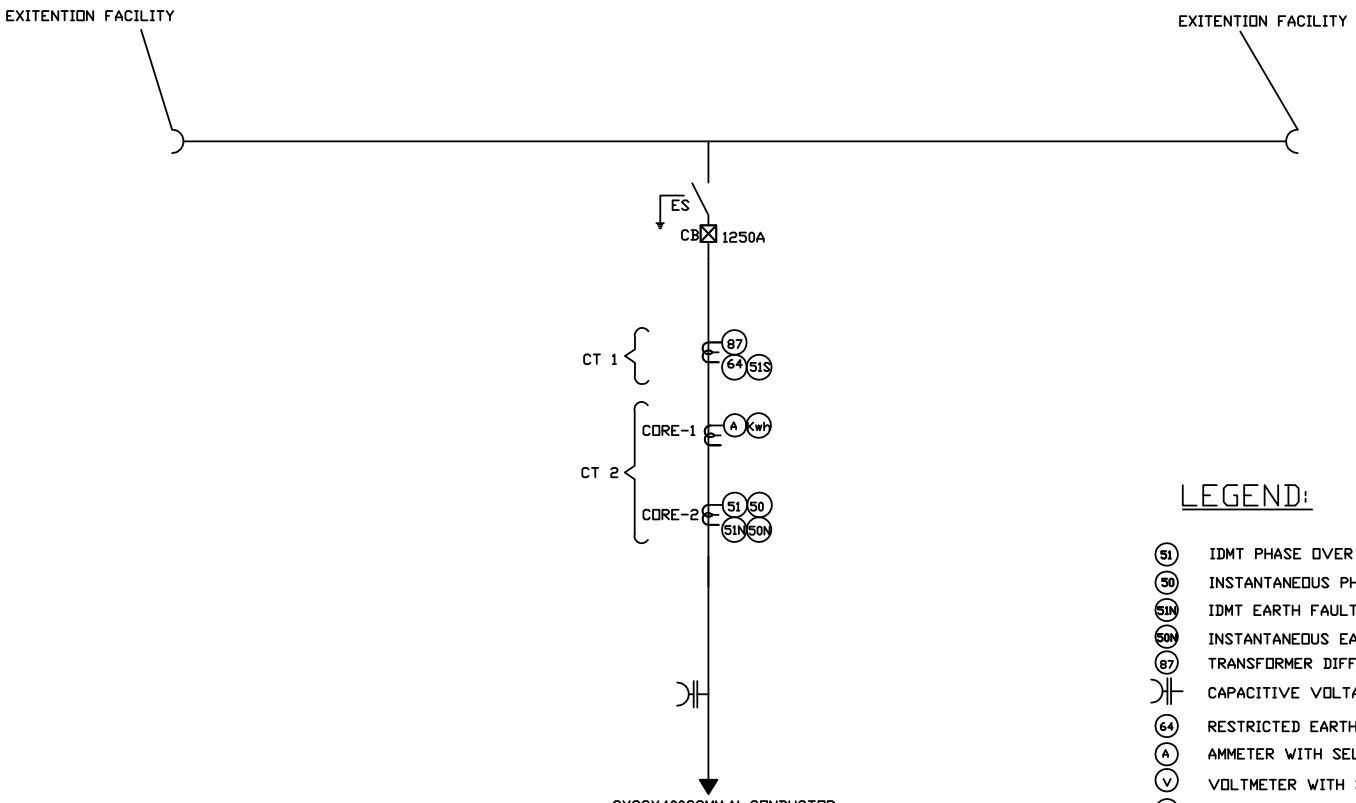
51	IDMT PHASE OVER CURRENT RELAY
50	INSTANTANEOUS PHASE OVER CURRENT RELAY
51N	IDMT EARTH FAULT RELAY
50N	INSTANTANEOUS EARTH FAULT RELAY
87	TRANSFORMER DIFFERNTIAL RELAY
	CAPACITIVE VOLTAGE INDICATOR
64	RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
A	AMMETER WITH SELECTOR SWITCH
V	VOLTMETER WITH SELECTOR SWITCH
Kwh	ENERGY METER
21	DISTANCE RELAY
67	DIRECTIONAL OVER CURRENT RELAY
67N	DIRECTIONAL EARTH FAULT RELAY
25	SYNCHRO CHECK RELAY

NOTE

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.

DRAWN	R.K/A.H J.A/A.M	TITLE:- STANDARD SLD FOR 33KV INCOMER	BSES
CHECKED	S.G/A.S		
APPD.	G.S/G.N		SPECIFICATION NO. BSES-TS-65-33GIS-R0
DATE	28.04.22		SLD-GIS-33KV-05
SCALE	NTS		

ANNEXURE-F6



LEGEND:

51	IDMT PHASE OVER CURRENT RELAY
50	INSTANTANEOUS PHASE OVER CURRENT RELAY
51N	IDMT EARTH FAULT RELAY
50N	INSTANTANEOUS EARTH FAULT RELAY
87	TRANSFORMER DIFFERNTIAL RELAY
	CAPACITIVE VOLTAGE INDICATOR
64	RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
A	AMMETER WITH SELECTOR SWITCH
V	VOLTMETER WITH SELECTOR SWITCH
Kwh	ENERGY METER
21	DISTANCE RELAY
67	DIRECTIONAL OVER CURRENT RELAY
67N	DIRECTIONAL EARTH FAULT RELAY
25	SYNCHRO CHECK RELAY

NOTE

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.

DRAWN	R.K/A.H J.A/A.M	TITLE:- STANDARD SLD FOR 33KV TRANSFORMER FEEDER	BSES
CHECKED	S.G/A.S		
APPD.	G.S/G.N		SPECIFICATION NO. BSES-TS-65-33GIS-R0
DATE	28.04.22		SLD-GIS-33KV-06
SCALE	NTS		

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

NEW GRID

TECHNICAL SPECIFICATION

FOR

SCADA INTERFACE WORK & AUTOMATION

Prepared by	**K A SENTIL KUMARAN**		**Rev: 1**
Reviewed & Approved by	**BHUWANESH DWIVEDI**		**Date: 29-07-22**

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

For substation, it is proposed to lay and terminate panel wirings / control cables if any between the equipments 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 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/BCPU, Transformer Monitoring Modules, Smoke detector, NIFPS panel, 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, 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.
- Seprate earth pit with connections for Electronic cards,gateway,Switches,DCU.,etc.. earthing.
- 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, 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 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.
- 2 C X 2.5 MM2 multi strained copper cable, ARM FRLS 1.1KV HRPVC for external AC / DC Power Supply.
- 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/Transformer Monitoring Devices) RS 485 connections.

The supplied cable shall be as a 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. Separate tray in trench is required for SCADA Communication 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).**

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 (11,33,66KV)**

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).

Hot Standby/Dual Power Supply Unit shall be supplied along with BCPU.It will increase the BCPU availability, if any one Power supply card fails the other one should keep the bay control unit continuous live.

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 **Transformer Signal -** TMD (REGDA, A-EBERLE relays):

OTI, WTI, TPI, AVR and Transformer auxiliary protection signals should be integrated with RTU via IEC 61850 Protocol. TMD 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:**

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.**

2.6 **Data Concentrator Unit/Gateway & Remote Terminal Units**

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

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.

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,Schneider-SAITEL DP,Siemens A8000
Bidders who are OEM of RTU and Numerical Relays are only acceptable & Pilot (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 are agree to fulfill the following terms & Conditions, It is applicable for all OEM products.

- AMC period should be given 3 years along with this proposal.
- AMC period should be started after handovering the system to BSES.
- During AMC period all the issues pertaiting to RTU/Gateway/BCU should be handled by OEM at site(this included unlimited site visit)
- 5 Year replacement warranty is applicable for all OEM for Electronic cards & Gateway Units…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.
- 5 years 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.

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.

Spare Ports – 20% Spare ports **(Minimum – 3 to 4 No's Serial ports are essential)** for IEC 103/Mod Bus Protocol Connections

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.

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.
- Seprate room / Cabinet with AC Provision to be considered for RTU and IT Equipments.
- 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.

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

- 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.
- 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.

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- 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 :
    - 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.**

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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		√		√		
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		

Essential inbuilt Spare in BCPU	3 DI	2 DO				

Signals - 11KV 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 phase viz. 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				

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Signals - 11KV Bus Coupler	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input/Output 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	
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 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	√			√		IEC-61850 with Dual Communication Ports
Breaker OFF				√	DPI	
Bank ISO ON	√					
Bank ISO OFF					DPI	
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	

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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 phase viz. 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	

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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.Ptot 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 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) ,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				

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	Signal Type	Protocol

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				backup		
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	

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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) ,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	√				DPI	
L/R Switch in Remote	√					
Auto Mode	√				DPI	
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				

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Signals - 33 & 66KV BusCoupler	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 PT02 3Phase votages.	√				AI/MV	

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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) ,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	

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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 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) ,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 Out Put soft through N.Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU 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 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 Communication Ports
All Manual Call Points - MCP-1,MCP-2.etc…	√	SPI	

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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

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R,Y,B Phase Current		√	AI

Signals - Fire Fighting(All Transformers)	Digital Input Hard Wire to RTU	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 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
- 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) in Relay(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 equipments 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 Equipments) 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 Speifications : 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.

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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 Ehernet/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 downloadable and Uploadable from RTU,CPU,BCPU,BCU and Gateway.

9 Separate Room/Cabinet With AC for RTU and IT Equipments.

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 equipments 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.

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12 **Spares:** 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
- 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 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) – 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 and Ethernet ports) must have in-built or external surge protection devices and optical isolation.

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

15 Following tools to be supplied

- laptop 1 No to be supplied with following specification

  Make : Lenova & Model : Think Pad L Series
  10^{th} 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

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

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

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

Technical Specification

For

SMPS Based Battery Charger

Specification no – BSES-TS-73-SMPSBC-R0

Rev		0
Page		1 of 11
Date		05 May 2022
Prepared by	Abhishek Harsh	
	Amar Singh	
Reviewed by	Srinivas Gopu	
	Abhinav Srivastava	
Approved by	Gaurav Sharma	
	Gopal Nariya	

INDEX

1 SCOPE OF SUPPLY

This specification covers the design, manufacturing, testing, supply, erection & commissioning of 20 VDC/ 50 VDC SMPS based 2X100% Float Cum Boost Charger at site for indoor installation with all necessary accessories associated with it.
Specification covers Type 1 and Type 2 Battery Charger. Type 1 Battery Charger is for Grid Substations while Type 2 Battery Charger is for BSES HT Customers.

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2 CODES & STANDARDS

Material, equipment and methods used in the manufacture of battery charger shall confirm to the latest edition of following

Indian Electricity Rules	
Indian electricity act	
CBIP manual	
IS 3895	Specification for rectifier equipment in general
IS 5921	Printed circuit boards
IS 6619	Safety code for semiconductor devices
IS 4540	Semiconductor rectifier assemblies and equipment
IS 694	PVC Insulated Cables for Working Voltage up to and including 1100V
IS 1248	Direct Acting Electrical indicating instruments
IS 2705	Current transformer
IS 3156	Voltage transformer
IS 3231	Electric relay for power system protection
IS 5578	Guide for making of insulated conductors
IS 8623	Low voltage switchgear and control gear assemblies
IS 13703	Low voltage fuses for voltages not exceeding 1000AC
IS 12063	Degree of enclosure protection
IS5	Color of mixed paints
IS 6297	Transformer & inductors for electronic equipment
IS 6553	Environment requirements for semiconductor device
IS 4007	Terminals for electronic equipment

3 SERVICE CONDITIONS

3.1	Max Ambient Temperature	50 deg C
3.2	Max Daily average ambient temp	40 deg C
3.3	Min Ambient Temp	0 deg C
3.4	Maximum Humidity	95%
3.5	Minimum Humidity	10%
3.6	Maximum annual rainfall	750 mm

3.7	Average no of rainy days per annum	60
3.8	Rainy months	June to Oct
3.9	Altitude above MSL	300 M
3.10	Seismic Zone	IV

4 CHARGER DESIGN FEATURES

4.1	Type	SMPS Based
4.2	Rating	For Type-1 Battery Charger a. 70 A for 50 V b. 35 A for 220 V For Type-2 Battery Charger a. 35 A for 50 V b. 20 A for 220 V
4.3	Configuration	2X100% Float cum Boost Charger.
4.4	Incoming Supply	Provision of Two Incoming Supply with Auto Changeover Facility
4.5	Panel type	Metal enclosed frame construction
4.6	Overall Dimension	L - 1500 mm x D - 700 mm x H - 1900 mm
4.7	Cable Entry	Bottom
4.8	Location	Indoor, non air conditioned environment
4.9	Doors for front access	With anti theft hinge &handle
4.10	Cover for rear access	With Allen screw M6 size & handle
4.11	Construction	Sheet metal 2.0mm thick CRCA
4.12	Base frame	75mm ISMC
4.13	Lifting lugs	Four number
4.14	Gland plate	3mm metallic, un drilled & removable type
4.15	Enclosure protection	IP42 Minimum
4.16	Power terminal	Bus bar type, minimum 300mm above gland plate
4.17	Control terminal	Nylon66 with brass clamp
4.18	Bus bar	Tinned copper with insulation sleeve
4.19	Earth bus bar	Aluminum sized for rated fault duty for 1sec
4.20	Earth bus internal connection to all non current carrying metal parts	By copper flexible wire 2.5 sqmm
4.21	Earth bus external connection to owner earth	Al bus on both sides of panel with two holes for M10 bolt
4.22	Cooling	With Exhaust Fan
4.23	Panel heater	Thermostatically controlled through MCB
4.24	Panel internal wiring	Multi strand flexible color coded PVC insulated copper wire 1.5 sqmm 1100volt grade with 1.5 sqmm ferruling (other than circuit wiring related to PCB cards)
4.25	Isolation & protection device	Mounted at height minimum 1000mm from bottom
4.25.1	MCCB	For charger input, output & battery input

4.25.2	Battery & test resistor load	Lockable change over switch with one position for charger, second for 'OFF' & third position for external test resistor.
4.26	Hardware (Nut, bolts & handle)	Stainless steel
4.27	Essential provision	Surge suppression, harmonic suppression, blocking diodes, filters for ripple control
4.28	Insulating shrouds	On all live parts, power semi conductors & electronic components
4.29	Ripple content in DC output	0.5 % maximum
4.30	DC output voltage regulation	Maximum ±1% of rating with AC input supply variation of ±10% from 415 volts, frequency variation of ±5% from 50 HZ and simultaneous load variation of 0-100%
4.31	Reverse polarity connection	Protected against reversed battery polarity
4.32	Charger efficiency	90% minimum at Rated Load
4.33	Noise output	65DB maximum
4.34	Charger selector switch	For auto/manual and float/boost selection, lockable type inside panel
4.35	Charging current settings	25% to 100% of rating
4.36	Charging current accuracy	2% of set current with input voltage variation of ±10% and frequency variation of ±5%
4.37	Auto and Manual DC output adjustment range for float & boost charge (voltage & current)	By potentiometers inside panel, range suitable for battery bank. Charger suitable for other type of batteries if offered, shall be subject to buyer's approval.
4.38	Louvers	With stainless steel wire mesh
4.39	Gasket	Neoprene rubber
4.40	Panel illumination lamp with door switch	MCB controlled, with 5/15amp switch socket
4.41	Panel door keys	4 no. per panel, identical key for all panels
4.42	PCBs for electronic circuitry	With protective layer finish at back
4.43	PCB soldering	Preferably by wave soldering process
4.44	PCB/ electronic card mounting	With press fit type locking arrangement
4.45	Semiconductor component mounting	Shall not be on bakelite sheet

5 METERING, ANNUNCIATION & INDICATION

5.1	Ammeter (96x96mm)	Digital type, for AC input, DC output & battery current. Auxiliary supply for meters should be 48V to 230V AC/DC (Universal type)
5.2	Voltmeter (96x96mm)	Digital type, with selector switch for AC input, DC output & battery voltage. Auxiliary supply for meters should be 48V to 230V AC/DC (Universal type)
5.3	LED indication on panel front	
5.3.1	Status	
5.3.1.1	Input AC supply available on	Red/yellow/blue color LED

	R,Y & B phase	
5.3.1.2	Float cum Boost charger AC MCCB 'ON'	Red color LED for each charger module
5.3.1.3	Charger output DC 'ON'	Red color LED for each charger module
5.3.1.4	Outgoing DCDB feeder ON	Red color LED for each other
5.3.2	Fault	
5.3.2.1	DC earth fault	Amber color LED
5.3.2.2	Battery MCCB OFF	Amber color LED
5.3.2.3	Charger output DC under/ over voltage	Amber color LED
5.3.2.4	AC mains undervoltage	Amber color LED
5.4	Annunciation	Hooter with isolating switch for fault annunciation.
5.5	Potential free contacts for remote indication to be wired upto terminal block	a. AC under voltage b. AC over voltage c. CH-A AC MCCB trip/OFF d. CH-B AC MCCB trip/OFF e. CH-A Rect/Cond. fuse fail f. CH-B Rect/Cond. fuse fail g. CH-A DC MCCB trip/OFF h. CH-B DC MCCB trip/OFF i. Battery MCCB trip/OFF j. CH-A DC under voltage k. CH-B DC under voltage l. CH-A DC over voltage m. CH-B DC over voltage n. Battery DC under voltage o. Battery DC over voltage p. DC Bus over voltage q. DC Earth fault r. Battery Charger in boost mode
5.6	Microprocessor based monitoring unit cum controller	Charger should have a microprocessor based controller
5.6.1	Analog signals to be monitored by controller	a. AC Input Voltage and current b. DC output voltage and current for Charger -1 and Charger -2 c. Battery voltage and current
5.6.2	Alarms/Faults signals to be monitored by controller	a. AC under voltage b. AC over voltage c. CH-A AC MCCB trip/OFF d. CH-B AC MCCB trip/OFF e. CH-A Rect/Cond. fuse fail f. CH-B Rect/Cond. fuse fail g. CH-A DC MCCB trip/OFF h. CH-B DC MCCB trip/OFF i. Battery MCCB trip/OFF j. CH-A DC under voltage k. CH-B DC under voltage l. CH-A DC over voltage

		m. CH-B DC over voltage n. Battery DC under voltage o. Battery DC over voltage p. DC Bus over voltage q. DC Earth fault r. Battery Charger in boost mode
5.6.3	SCADA Interfacing	Microprocessor controller should have RS485 port capable of transmitting all analog and alarm/fault signal to RTU on open MODBUS protocol. Any hardware/software required to achieve the said compatibility shall be in bidder's scope.
5.6.4	Display	Backlit display capable of displaying all the analog and fault/alarm signals mentioned above.

6 APPROVED MAKE OF COMPONENTS

6.1	Switch	Siemens / L&T (Salzer)
6.2	HRC Fuse Links	GE/ Siemens/ L&T
6.3	Diodes & SCR	Hirect/USHA/IOR
6.4	Meters	AE/Rishabh
6.5	AC Contractors &O/L Relay	L&T/Siemens/Telemechanique/GE/ABB
6.6	Terminals	Connectwell/Elmex/Wago/Phoenix
6.7	Push buttons / Actuator	L&T/Siemens/Vaishno
6.8	MCCB	L&T/Siemens/ ABB/GE
6.9	MCB	Datar/Legrand/Hager/Schneider
6.10	Indicating lamps LED type	Vaishno/Binay/Teknic/Siemens/Mimic

7 MIMIC DIAGRAM, LABEL & FINISH

7.1	Mimic diagram	To be provided
7.2	Name plate on panel front	
7.2.1	Material	Anodized aluminum 16SWG
7.2.2	Background	SATIN SILVER
7.2.3	Letter, diagram & boder	Black
7.2.4	Process	Etching
7.2.5	Name plate details	a. Manufacturer name b. Month & year of manufacture c. Equipment type d. Input & Output rating e. Owner name & order number f. Guarantee period g. Weight of panel h. Degree of protection i. Sr. No.
7.3	Labels for meters, indication & all cards / sub assemblies in panel	Anodized aluminum with white character on black background
7.4	Danger plate on front & rear	Anodized aluminum with white letters on red

	side	background
7.5	Painting surface preparation	Shot blasting or chemical 7 tank process
7.6	Painting external finish	Powder coated polyester base grade A, shade –RAL 7032, uniform
7.7	Painting internal finish	Powder coated polyester base grade A, shade – white, uniform thickness 50 micron minimum
7.8	Labels for all components in panel	Anodized aluminum with white character on black background, fixed by rivets only
7.9	SLD	SLD of charges shall be provided at backside of the main door of Charger on Aluminium plate

8 QUALITY ASSURANCE, INSPECTION & TESTING

8.1	Vendor quality plan	To be submitted for purchaser approval
8.2	Inspection points	To be mutually identified & agreed in quality plan
8.3	Type test	Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
8.4	Routine test	As per relevant Indian standard
8.5	Acceptance test	To be performed in presence of Owner at manufacturer works a. Physical inspection & BOM, wiring check b. Insulation resistance test c. HV test for one minute d. Voltage regulation test e. Heat run test for 12 hours f. Measurement of efficiency, power factor & ripple content

9 DEVIATIONS

Deviation from this specification shall be stated in writing with the tender by reference to the specification clause/ GTP/ Drawing and description of alternative offer. In absence of such a statement, it shall be assumed by the buyer that the seller complies fully with this specification.

10 GTP

Vendor must submit clause wise compliance against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

11 DRAWING AND DATA SUBMISSION MATRIX

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
11.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
11.2	Deviation Sheet (as per “Deviations” Clause)	Required			
11.3	GTP		Required		
11.4	Relevant Type Test as per IS/IEC/UL	Required	Required		
11.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
11.6	Sizing Calculation of Associated Equipment		Required		
11.7	Recommended Spares for five years of operation)		Required		
11.8	**Battery Charger Drawing**				
11.8.1	General Arrangement	Required	Required		
11.8.2	Sectional Layout		Required		
11.8.3	Cabinet Layout		Required		
11.8.4	SLD	Required	Required		
11.8.5	Schematic Circuit diagram and Scheme of Each type of Panel		Required		
11.8.6	Communication Architecture		Required		
11.8.7	QAP		Required		
11.8.8	BOQ		Required		
11.8.9	Plan		Required		
11.8.10	Foundation Diagram		Required		
11.8.11	Make of all Component as per specification		Required		
11.8.12	Drawing of Substation Room		Required		
11.9	Installation, erection and commissioning manual		Required		
11.10	Inspection Reports			Required	
11.11	As manufacturing Drawings			Required	

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
11.12	Operation and Maintenance Manual			Required	
11.13	Trouble shooting manual			Required	
11.14	As built Drawings				Required

12 PACKING

12.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
12.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
12.3	Packing Identification Label to be provided on each packing case with the following details	
12.3.1	Individual serial number	
12.3.2	Purchaser's name	
12.3.3	PO number (along with SAP item code, if any) & date	
12.3.4	Equipment Tag no. (if any)	
12.3.5	Destination	
12.3.6	Project Details	
12.3.7	Manufacturer / Supplier's name	
12.3.8	Address of Manufacturer / Supplier / it's agent	
12.3.9	Description and Quantity	
12.3.10	Country of origin	
12.3.11	Month & year of Manufacturing	
12.3.12	Case measurements	
12.3.13	Gross and net weights in kilograms	
12.3.14	All necessary slinging and stacking instructions	
12.4	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
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12.6.6	Project Details
12.6.7	Manufacturer / Supplier's name
12.6.8	Address of Manufacturer / Supplier / it's agent
12.6.9	Description and Quantity
12.6.10	Country of origin
12.6.11	Month & year of Manufacturing
12.6.12	Case measurements
12.6.13	Gross and net weights in kilograms
12.6.14	All necessary slinging and stacking instructions

13 SHIPPING

13.1	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
		The seller shall be responsible for all transit damage due to improper packing.

14 HANDLING AND STORAGE

14.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

BSES

Technical Specification

Of

Direct Current Distribution Board

Specification no – BSES-TS-71-DCDB-R0

Rev:		0
Pages:		1 of 16
Date:		02 May 2022
Prepared by	Abhishek Harsh	
	Amar Singh	
Reviewed by	Srinivas Gopu	
	Abhinav Srivastava	
Approved by	Gaurav Sharma	
	Gopal Nariya	

INDEX

1 SCOPE

This specification covers the design, engineering, manufacture, assembly and testing at Manufacturer's works and supply of 220 VDC/50 VDC Distribution board (DCDB) along with all hardware and accessories required for installation and operation.
Specification covers Type 1 and Type 2 DCDB. Type 1 DCDB is for Grid Substations while Type 2 DCDB is for BSES HT Customers.

2 STANDARDS AND CODES

2.1	IS:8623	Specification for factory built assemblies of switchgear & control gear for voltages up to and including 1000V AC/1200 V DC.
2.2	IS 60947-1	Specification for Low-voltage Switchgear and Controlgear - Part 2 :Circuit Breakers
2.3	IS:10118	Code of practice for selection, installation and maintenance switchgear and control gear
2.4	IS:2705	Current transformers
2.5	IS:3231	Electrical relays for power system protection
2.6	IS:1248	Electrical Indicating instruments
2.7	IS:4794	Switches and push buttons
2.8	IS:6005	Code of practice of phosphating iron and steel
2.9	IS:5082	Wrought Aluminium and aluminum alloys for electrical purposes
2.10	IS 3043	Code of practice for Earthing

3 SERVICE CONDITION

3.1	Location	Indoor
3.2	Average grade atmosphere	Heavily polluted, Dry
3.3	Maximum altitude above sea level	1000M
3.4	Ambient air temperature	Highest 50Deg C Average 40Deg C
3.5	Minimum ambient air temperature	0 Deg C
3.6	Relative Humidity	100%

3.7	Rainfall	750mm concentrated in four months
3.8	Seismic Zone	IV

4 CONSTRUCTION

4.1	General construction	It shall be free-standing type comprising dust-tight and vermin-proof sheet steel cabinets suitable for indoor installation with IP-54 degree of protection. Necessary busbar support insulators, cable glands, cable supports and terminal blocks etc. The board shall preferably be of single front type.
4.2	Material	The Board shall be made cold rolled steel sheet having Thickness of 2.5 mm of load bearing member and 2 mm for Doors and covers , suitably reinforced to provide flat level surfaces. No welds, rivets, hinges or bolts shall be visible from outside.
4.3	Equipment Mounting	All switches provided on the distribution board shall be on front side of the cabinets, operable from outside. All instruments and control devices shall be mounted on the front of cabinets and fully wired to the terminal blocks.
4.4	Busbar housing	The busbars shall be housed in totally enclosed busbar chambers. Incoming connections from the busbar to various feeders shall be designed so as not to disturb cable connections. Busbar arrangement should ensure safety of the operation/maintenance personnel and facilitate working on any outgoing module without the need for switching off in-feed to the adjacent modules, as far as possible
4.5	Cable alleys	A cable alley preferably 230 mm wide shall be provided in each vertical section for taking cables into the compartments. Cable alleys shall be provided on sides of busbar chamber.
4.6	Cable entry	Cable entry should be from bottom
4.7	Cable glands	Compression type cable glands shall be provided to hold the cables to avoid any pressure or tension on the terminal block connections.
4.8	Gland Plate	Gland plate shall be 3.0mm thick.
4.9	Doors	The doors of cabinets shall be lockable and shall be fitted with double lipped gaskets.
4.10	Gasket	All doors, removable covers and panels shall be gasketed all around with neoprene gaskets. Gaskets shall be embedded through machine only.
4.11	Ventilating louvers	Ventilating louvers shall have screens and filters. The screens shall be made of either brass or GI wires mesh.

4.12	Foundation	The panels shall be fixed on the embedded foundation channels with intervening layers anti vibration strips made of shock absorbing materials.
4.13	Base Frame	Base frames shall be supplied along with panels. 100mm channel painted black.
4.14	Mounting	Equipment on front of panel shall be flush mounted. No equipment shall be mounted on the doors.
4.15	Working level	The center lines of switches, push buttons and indicating lamps shall not be less than 750mm and higher than 1600mm from panel base.
4.16	Dimension	500(L)X500(D)X1800(H) mm^3

5 CONFIGURATION

5.1	Incomers	One incomers having Double Pole DC MCB with Aux Switch.
5.2	Outgoing feeders	All outgoing feeders shall have MCB. Number of outgoing feeders shall be as per table attached

Application	No of Poles	Type-1		Type-2	
		Rating of MCB (In Amp)	Quantity	Rating of MCB (In Amp)	Quantity
Incomer	2	100	1	50	1
Emergency Lighting DB	2	32	1	16	1
Fire Alarm System	2	32	1	16	0
SCADA	2	32	2	16	1
CRP/33 kV/66 kV Switchgear	2	32	4	16	1
11 kV Switchgear	2	32	4	16	0
Testing Purpose	2	32	1	16	1
NIFPS	2	32	4	16	0
Spare 1	2	100	1	50	1
Spare 2	2	32	4	16	2

6 BUSBARS

6.1	Material	Busbar shall be of tinned electrolytic copper or Aluminium
6.2	Size	Suitable for carrying the rated continuous current of 100 A and short circuit current of 15 kA. Busbars shall be continuous throughout the panel. Temperature rise should be limited to 40 degrees over ambient.
6.3	Supports	The busbar shall be supported by means of durable non-hygroscopic, non-combustible and non-tracking polyester fiberglass material or porcelain. Supports shall be capable of withstanding the maximum short circuit stresses.
6.4	Sleeves and shrouds	Busbars shall be encased in heat-shrinkable sleeves of insulating material which shall be suitable for the operating temperature of busbars during normal service. The busbar joints shall be provided with removable thermosetting plastic shrouds.

7 TERMINALS AND WIRING

7.1	Wiring	
7.1.1	Grade and type	1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.
7.1.2	Ferruling	Each wire shall bear an identifying ferrule or tag at each end or connecting point.
7.1.3	Spare	20% Spare Wiring
7.2	Terminals	Terminals of appropriate size shall be provided inside each cabinet for incoming and outgoing cables.
7.2.1	Grade	1100 V grade, moulded piece terminals complete with insulated barriers, washers, nuts and lock nuts.
7.2.2	Power Terminals type	Stud type, nut driver operated
7.2.3	Control terminals type	Stud type, screw driver operated
7.2.4	Spare terminals	20% spare terminals should be provided in each terminal block.
7.2.5	Accessibility	Placement of terminals shall enable proper cable termination. Terminals shall be readily accessible for inspection and maintenance.
7.2.6	Marking	The terminals shall be serially numbered to facilitate installation and maintenance.

8 METERS, INDICATIONS, PUSH BUTTONS & HEATERS

8.1	Meters	
8.1.1	Ammeter	DC Moving coil ammeter of size 96 sq.mm. with external shunt. Rating of Ammeter shall be 0-100A DC.
8.1.2	Voltmeter	DC Moving coil voltmeter of size 96.sq.mm to read the DC Bus voltage. Rating of Voltmeter shall be 0-300VDC
8.1.3	Type	Digital type, connected through instruments transformers of suitable rating.
8.2	Indicating lamps	Indicating lamps shall be of low wattage cluster LED type.
8.2.1	Incomer/ Outgoing On	Red
8.2.2	Incomer/ Outgoing Off	Green
8.2.3	Incomer/ Outgoing Trip	Amber
8.3	Push buttons	For manual operation of incomer MCB
8.4	Heaters	Cubicle space heater having rating of 100W. Thermostat for space heater shall be provided with temperature range $0\text{-}90^{0}$
8.5	CFL	Cubicle lamp shall be provided in DCDB having rating of 11 W.

9 NAME PLATES & MARKINGS

9.1	Panel nameplate	Panel shall have a nameplate clearly indicating the following: a. Panel Serial No.- b. Customer Name - BSES Yamuna/Rajdhani Power Ltd c. PO No. & date - d. Type of Panel - e. Current rating - f. Guarantee period -
9.2	Feeder nameplate	Large and bold name plate carrying the feeder identification shall be provided on the top.
9.3	Equipment nameplate	a. All equipment mounted on front side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. b. All front mounted equipment shall be also provided

		at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.
9.4	Material	Non-rusting metal or 3 ply lamicoid. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
9.5	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
9.6	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not other wise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

10 FINISH

10.1	Primer	Two coats
10.2	Paint	Two finishing coats of epoxy based paint of Shade RAL 7032 with glossy finish.
10.3	Paint thickness	50 microns (minimum)

11 APPROVED MAKES OF COMPONENTS

11.1	Switch	Siemens / L&T (Salzer)
11.2	HRC Fuse Links	GE/ Siemens/ L&T
11.3	Meters	Rishabh/Schneider/AE
11.4	Terminals	Connectwell/Elmex/Wago/Phoenix
11.5	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
11.6	MCB	Datar/Legrand/Hager/Schneider/ABB
11.7	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

12 INSPECTION AND TESTING

12.1	Type test	Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
12.2	Acceptance & Routine tests	As per relevant Indian standard

13 PACKING, SHIPPING, HANDLING AND SITE SUPPORT

13.1	Packing Protection	The packing shall be fit to withstand rough handling during transit and storage at destination. The test set should be properly protected against corrosion, dampness & damage.
13.2	Packing for accessories and spares	Robust non-returnable packing case with all the above protection & identification Label. The bidder should get the packing list approved before dispatching the material.
13.3	Packing Identification Label	On each packing case, following details are required:
13.3.1	Individual serial number	
13.3.2	Purchaser's name	
13.3.3	PO number (along with SAP item code, if any) & date	
13.3.4	Equipment Tag no. (if any)	
13.3.5	Destination	
13.3.6	Manufacturer / Supplier's name	
13.3.7	Address of Manufacturer / Supplier / it's agent	
13.3.8	Description	
13.3.9	Country of origin	
13.3.10	Month & year of Manufacturing	
13.3.11	Case measurements	

13.3.12	Gross and net weight	
13.3.13	All necessary slinging and stacking instructions	
13.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.
13.5	Handling and Storage	Manufacturer instruction shall be followed.
13.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.	

14 DEVIATIONS

14.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.

15 DOCUMENT SUBMISSION

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A3/A4 sheet in box file with separators for each section. Also provide USB containing pdf with bid for soft copy. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
15.1	Contact Person Name, Email ID and Mobile Number	Required			
15.2	Deviation Sheet	Required	Required		
15.3	Type Test	Required			
15.4	Any Technological Advancement in DCDB	Required			
15.5	Manufacturer's quality assurance plan and certification for quality standards				
15.6	General Arrangement		Required		
15.7	Door Layout		Required		

15.8	Internal Layout		Required		
15.9	SLD		Required		
15.10	Schematic Circuit diagram		Required		
15.11	Bus Bar Arrangement		Required		
15.12	Cable Alley Arrangement		Required		
15.13	GTP	Required	Required		
15.14	QAP		Required		
15.15	BOQ		Required		
15.16	Foundation diagram		Required		
15.17	TB Detail		Required		
15.18	Name Plate Detail		Required		
15.19	Make of all Component as per specification		Required		
15.20	Inspection Report			Required	
15.21	As manufacturing Drawings			Required	
15.22	Operation and Maintenance Manual			Required	Required
15.23	Trouble shooting manual			Required	Required
15.24	As built Drawings				Required
15.25	Test Report				Required

16 GUARANTEED TECHNICAL PARTICULARS

Vendor must submit clause wise compliance in Excel sheet against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

S. No.	Description	Specification requirement	Bidder's Data
16.1	**GENERAL FEATURES**		
16.1.1	Make		
16.1.2	Type		
16.1.3	Reference Standard		

16.1.4	Rated Operational voltage	220 VDC/50 VDC	
16.1.5	Rated Nominal Current	100	
16.1.6	Rated Insulation voltage	1100V	
16.1.7	Rated Impulse withstand voltage	8kV	
16.1.8	Service supply for heating, lighting and power sockets	240VAC±10%	
16.1.9	Mounting	Floor (Free standing)	
16.1.10	Connections	Cable entry – Bottom	
16.1.11	Configuration	Single front	
16.1.12	Enclosure thickness		
a	Load Bearing Member	>=2.5mm	
b	Doors and Covers	>=2 mm	
c	Gland Plate	3 mm	
16.1.13	Enclosure Material	CRCA Sheet	
16.1.14	Enclosure degree of protection	IP 54	
16.1.15	Power Cable Termination	Suitable for 4CX50 Sq.mm Al	
16.1.16	Paint shade	RAL 7032 (Siemens Grey)	
16.1.17	Typical vertical section (Overall dimension (mm) and weight (Kg))	Required	
16.1.18	Incomer		
16.1.19	Outgoings		
16.1.20	Dimensions of the DCDB Panel	500(L)X500(D)X1800(H) mm3	
16.1.21	Weights of the DCDB Panel	(in kg.)	
16.1.22	Marking on the panel	As per the specification	
16.1.23	Cable Alley Width	230 mm	
16.1.24	Cable Gland	Compression Type	

16.1.25	Gasket Material	Neoprene	
16.1.26	Ventilating louvers	Required	
16.1.27	Base Frame	100mm channel	
16.2	**MCB**		
16.2.1	Make	**Datar/Legrand/Hager/Schneider/ABB**	
16.2.2	Incomer	100A/50 A	
16.2.3	Emergency Lighting DB	32A/16 A	
16.2.4	Fire Alarm System	32A/16 A	
16.2.5	SCADA	32A/16 A	
16.2.6	CRP	32A/16 A	
16.2.7	11 kV Switchgear	32A/16 A	
16.2.8	Testing Purpose	32A/16 A	
16.2.9	NIFPS	32A/16 A	
16.2.10	Spare 1	100A/50 A	
16.2.11	Spare 2	32A/16 A	
16.3	**BUS AND BUS TAPS**		
16.3.1	Make		
16.3.2	Material	Tinned electrolytic copper or Aluminum	
16.3.3	Reference standard		
16.3.4	Continuous Current (at site condition, 50°C ambient) within cubicle		
16.3.5	Short Circuit withstand Current for 1 sec	15 KA	
16.3.6	Cross sectional Area		
16.3.7	DC resistance	ohm/m/ph	

16.3.8	Reactance	ohm/m/ph	
16.3.9	Losses-middle phase	w/m/ph	
16.3.10	Minimum clearance of bus bar and joints	Required	
16.3.11	Phase to phase (mm)		
16.3.12	Phase to earth (mm)		
16.3.13	Bus bar insulation	i. Heat shrinkable sleeves rated for maximum operating voltage	
		ii. Cast resin shrouds for joint	
16.3.14	Bus joints	Silver	
16.3.15	Bus bar support insulator	Required	
16.3.16	Spacing (mm)		
16.3.17	Make		
16.3.18	Type		
16.3.19	Reference standard		
16.3.20	Voltage class (kV)		
16.3.21	Minimum creepage distance (mm)		
16.3.22	Cantilever strength (Kg/sq.cm.)		
16.4	**Wiring and Terminals**		
16.4.1	**Wiring**		
a	Grade and type	1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.	
b	Ferruling	Each wire shall bear an identifying ferrule or tag at each end or connecting point.	
c	Spare	20% Spare Wiring	
16.4.2	**Terminals**		
a	Grade	1100 V grade, moulded piece terminals complete with insulated barriers, washers, nuts and lock nuts.	
b	Power Terminals type	Stud type, nut driver operated	
c	Control terminals type	Stud type, screw driver operated	

d	Spare terminals	20% spare	
e	Accessibility	Placement of terminals shall enable proper cable termination. Terminals shall be readily accessible for inspection and maintenance.	
f	Marking	The terminals shall be serially numbered to facilitate installation and maintenance.	
16.5	**METERS, INDICATIONS, PUSH BUTTONS & HEATERS**		
16.5.1	Ammeter	DC Moving coil ammeter of size 96 sq.mm. with external shunt. Rating of Ammeter shall be 0-100A DC.	
a	Model No Ammeter		
b	Make of Ammeter		
16.5.2	Voltmeter	DC Moving coil voltmeter of size 96.sq.mm to read the DC Bus voltage. Rating of Voltmeter shall be 0-300VDC	
a	Model No Voltmeter		
b	Make of Voltmeter	Rishabh/Schneider/AE	
c	Type	Digital type	
16.5.3	Indicating lamps	Cluster LED type.	
a	Make of Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C &S	
b	Incomer/ Outgoing On	Red	
c	Incomer/ Outgoing Off	Green	
d	Incomer/ Outgoing Trip	Amber	
e	Push buttons Make	L&T/Siemens/Vaishno/Schneider	
16.5.4	Heaters	Cubicle space heater having rating of 100W. Thermostat for space heater shall be provided with temperature range $0\text{-}90^0$	
16.5.5	CFL	Cubicle lamp shall be provided in DCDB having rating of 11 W.	

16.6	**NAME PLATES & MARKINGS**		
a	Panel nameplate	Panel Serial No.-	
b		Customer Name - BSES Yamuna/Rajdhani Power Ltd	
c		PO No. & date -	
d		Type of Panel -	
e		Current rating -	
f		Guarantee period -	
16.6.1	Feeder nameplate	As per Spec	
a	Equipment nameplate	As per Spec	
b	Material	As per Spec	
c	Fixing	As per Spec	
d	Markings	As per Spec	
16.7	**FINISH**		
a	Primer	Two coats	
b	Paint	Two finishing coats of epoxy based paint of Shade RAL 7032 with glossy finish.	
c	Paint thickness	50 microns (minimum)	

BSES

Technical Specification

Of

50 V and 220 V Lithium Ion Battery Bank

Specification no – BSES-TS-72-LiBB-R0

Rev:		0
Pages:		1 of 14
Date		29 Apr 2022
Prepared by	Abhishek Harsh	
	Amar Singh	
Reviewed by	Srinivas Gopu	
	Abhinav Srivastava	
Approved by	Gaurav Sharma	
	Gopal Nariya	

TABLE OF CONTENT

1 SCOPE

This specification covers the design, manufacture, testing, supply, erection & commissioning of 50 V & 220 V Li Ion Battery Bank.

Specification covers Type 1 and Type 2 Li Ion Battery Bank. Type 1 Battery Bank is for Grid Substations while Type 2 Battery Bank is for BSES HT Customers.

2 CODES & STANDARDS

Material, equipment and methods used in the manufacturing of Li Ion battery shall confirm to the latest edition of following standard

S. No	Standard Name / No	Standard's Description
2.1	Indian Electricity Act	Latest Edition
2.2	CBIP manual	Latest Edition
2.3	IEC 62281,62619, 61000-4-2	Safety of primary and secondary lithium cells and batteries, Safety requirements for secondary lithium cells and batteries, for use in industrial applications, Electrostatic Discharge Immunity Test
2.4	IEC 62133, IEC 62620:2014,	Battery Safety
2.5	IEC 61960	Performance tests, Designations, markings, dimensions, and other requirements
2.6	IEC 61959	Tests and requirements for verifying the mechanical behavior.
2.7	IS 5	Paint and Enamels
2.8	IS 13703	LV Fuses
2.9	IS 5578	Guide for marking insulated conductors
2.10	IS 694	Polyvinyl Chloride Insulated Unsheathed And Sheathed Cables/Cords With Rigid And Flexible Conductor For Rated Voltages Up To And Including 450/750 V
2.11	IS 1248	Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories
2.12	IEEE	Relevant Standard
2.13	UL 1642	Individual cell compliance
2.14	UL 1973	Battery module complies, test methods and requirements to ensure safety during transport other than for recycling or disposal
2.15	UL 2054	Household and commercial Batteries

DocUUID : 80b262c0-4bf3-4141-9342-27e739c3a690

3 SERVICE CONDITIONS

3.1	Max Ambient Temperature	50 deg C
3.2	Max Daily average ambient temp	40 deg C
3.3	Min Ambient Temp	0 deg C
3.4	Maximum Humidity	95%
3.5	Minimum Humidity	10%
3.6	Maximum annual rainfall	750 mm
3.7	Average no of rainy days per annum	60
3.8	Rainy months	June to Oct
3.9	Altitude above MSL	300 M
3.10	Seismic Zone	IV

4 DC DISTRIBUTION SYSTEM DATA

4.1	DC Supply	2 wire, with positive & negative polarity
4.2	Earth reference	Unearthed system
4.3	Voltage	50 VDC/ 220 VDC
4.4	Application	Standby DC back up for switchgear control supply & SCADA RTU

5 GENERAL FEATURES

5.1	Number of Modules	6 (Maximum)
5.2	Connection of Modules	Parallel
5.3	DC battery bank Ah rating	For Type-1 Li Ion Battery Bank a. 600 Ah for 50 V b. 300 Ah for 220 V For Type-2 Li Ion Battery Bank a. 200 Ah for 50 V b. 100 Ah for 220 V
5.4	Voltage Output	50 V / 220 V
5.5	Battery Efficiency	>90%
5.6	Gas Evolution from Battery	None
5.7	DC load curve	With High discharge characteristics.
5.8	Location of Module	Indoor
5.9	Ingress Protection	IP 4X
5.10	Installation	On cabinet, painted with anti-corrosive paint.

5.11	Battery type	Li Ion Battery
5.12	Cell Chemistry	Different chemistry with material Manganese /Cobalt/iron/titanium etc subject to fulfillment of required parameters as mentioned in this specification.
5.13	Battery lifting/withdrawing arrangement	Suitable arrangement on Module
5.14	Battery Module marking	PO Number and Date, Customer Name- BSES Yamuna/Rajdhani Power Limited, Manufacturer name, month & year of manufacturer, Warranty Period, Nominal voltage, rated Ah capacity & cell number , Customer Care Number
5.15	Terminal polarity marking	Positive& negative marked on Module
5.16	Battery cell shorting metal links	Nickel plated copper with protective insulating sleeve
5.17	Insulating shrouds	For all battery terminals & shorting links
5.18	Insulating pads for battery rack	At the bottom of rack supports, made from high impact material
5.19	Battery suitable for Ripple content	5% minimum in DC charger output

6 BATTERY MANAGEMENT SYSTEM

Module must comprise BMS (Battery Management System) which monitors battery internal vital parameters, measures and displays various alarms/warnings; establish a communication link with the external system i.e. Charger, SCADA.

6.1	Arrangement	a. Battery shall comprise of two strings of equal rating. b. In Type-1 Battery Bank, for 220 VDC, two strings of 150 Ah capacity shall be provided c. In Type-1 Battery Bank, for 50 VDC, two strings of 300 Ah capacity shall be provided d. In Type-2 Battery Bank, for 220 VDC, two strings of 50 Ah capacity shall be provided e. In Type-2 Battery Bank, for 50 VDC, two strings of 100 Ah capacity shall be provided f. Each battery string should have its own dedicated BMS. g. Refer Annexure –A for architecture
6.2	Display	BMS shall have a display showing all measured parameters.
6.3	Communication	
6.3.1	Protocol For SCADA Interface	Modbus
6.3.2	Port	RS-485

6.3.3	Key Battery Parameters to be Integrated With SCADA	As per Annexure-A
6.3.4	Status LED	Dual color type
6.3.5	SOC LED	Dual color type
6.3.6	In-built data logging	Upto 6 months
6.3.7	Protection feedback to SCADA	From S.No 7.4.7 to 7.4.13
6.4	Safety Feature	
6.4.1	Module reverse polarity protection	
6.4.2	Internal fuse	
6.4.3	Controllable internal fuse	
6.4.4	Protective terminal covering to avoid unintentional contact	
6.4.5	Secondary level hardware protection for overvoltage	
6.4.6	Heat propagation resistant cell holding structure	
6.4.7	Overvoltage protection	
6.4.8	Under voltage protection	
6.4.9	Over charging current protection	
6.4.10	Over discharge current protection	
6.4.11	Over temperature during discharge protection	
6.4.12	Over temp during charge protection	
6.4.13	Over internal FET temp protection	
6.5	Arrangement for Bypassing the BMS	

7 CABINET

7.1	Panel Type	a. Separate compartment shall be provided for both battery strings b. Simplex panel with Dimension 0.6x0.6x1.4 m^3
7.2	Pocket	Pocket for Drawing is required
7.3	Display	a. Local LED Display on Cabinet shall be provided having key battery Parameters. b. Battery key parameters shall be as per Annexure-A
7.4	Ingress Protection	IP4Xin accordance with IS 13947
7.5	Cooling	Natural
7.6	Enclosure material	Pre-galvanized, cold-rolled sheet steel of thickness not less than 2.0 mm. Stiffeners shall be provided wherever necessary.
7.7	Doors	Double leaf doors shall be provided at the rear. Doors shall have handles with built-in locking facility
7.8	Gland Plate	At least two separate gland plates of removable type with gasket shall be provided for each panel. They shall be of sheet steel of thickness not less than 3.0 mm.

7.9	Gaskets	All doors, removable covers and panels shall be Gasketed all around with neoprene gaskets
7.10	Foundation	The panels shall be fixed on the embedded foundation channels with intervening layers anti vibration strips made of shock absorbing materials
7.11	Base Frame	Base frames shall be supplied along with panels.
7.12	Earthing	50x6 sqmm GI Earth bus shall run through the cabinet and same shall be extended to outside of the panel from both sides for earthing purpose.
7.13	Pocket	Pocket shall be Provided for drawing placement purpose

8 NAMEPLATES AND MARKING

8.1	Panel nameplate	a. BSES Logo b. Property of BSES c. Name of manufacturer d. Name of customer e. Battery Rating f. PO no. & Date g. Serial Number h. Month & year of manufacturing i. Guarantee period j. Manufacturer Call center no. & email id k. Weight of Panel
8.2	Name Plate Material	Anodized Aluminum 16SWG
8.3	Background	Satin Silver
8.4	Letter, Diagram & Border	Black
8.5	Process	Etching
8.6	Equipment ID Marking	Shall be given at the time of drawing approval. Following will be the features: a. Equipment ID shall be painted on any appropriate face of the equipment at a clearly readable height from the base level of the equipment.

		b. Font: Recommended type face for the signage is True type or Post script. c. Font Size: All painting should be in UPPERCASE. Recommended height of 50 mm with spacing between alphabets of 3 mm. d. Total No's of Character: 18 e. Height of Font: 50 mm f. Height of Base: 100 mm g. Spacing between alphabets: : 3 mm h. Paint: Base coat – Dense Yellow. Letters – Black Quick Drying paint 2 coats.

9 EQUIPMENT LIST

9.1	Battery Cabinet
9.2	Battery Module
9.3	Communication cable
9.4	DC power cable
9.5	Cable terminal block/bus-bar
9.6	Earth cable
9.7	Tools and Accessories for Maintenance
9.8	Mandatory and Recommended Spares if Any

10 INSPECTION & TESTING

10.1	Type test	Equipment shall be type tested from CPRI/ERDA accreted lab as per IEC/IS/UL standard.
10.2	Routine test	As per relevant standard
10.3	Acceptance test	To be performed in presence of Owner at manufacturer works shall be as per approved QAP
10.4	Heating Compliance	JIS C8712
10.5	ROHS Compliance	Required

11 GTP

Vendor must submit clause wise compliance in Excel sheet against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

12 DEVIATIONS

Deviation from this specification shall be provided in excel sheet with the tender by reference to the specification clause/ GTP/ Drawing and description of alternative offer. In

absence of such a statement, it shall be assumed by the buyer that the seller complies fully with this specification.

13 DRAWING AND DATA SUBMISSION MATRIX

Document submission shall be as per the matrix given below. All documents/drawing shall be provided in soft copy (in pen drive) for each section. Language of the documents shall be English only. Deficient/improper drawing submission may liable for rejection.

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
13.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
13.2	Deviation Sheet(as per “Deviations” Clause)	Required			
13.3	GTP		Required		
13.4	Relevant Type Test as per IS/IEC/UL	Required	Required		
13.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
13.6	Sizing Calculation of Associated Equipment		Required		
13.7	Recommended Sparesfor five years of operation)		Required		
13.8	**Li Ion drawing**				
13.8.1	General Arrangement	Required	Required		
13.8.2	Sectional Layout		Required		
13.8.3	Cabinet Layout		Required		
13.8.4	Battery Layout		Required		
13.8.5	SLD	Required	Required		
13.8.6	Schematic Circuit diagram and Scheme of Each type of Panel		Required		
13.8.7	Communication Architecture		Required		

13.8.8	QAP		Required		
13.8.9	BOQ		Required		
13.8.10	Plan		Required		
13.8.11	Foundation Diagram		Required		
13.8.12	Make of all Component as per specification		Required		
13.8.13	Drawing of Substation Room		Required		
13.9	Installation, erection and commissioning manual		Required		
13.10	Inspection Reports			Required	
13.11	As manufacturing Drawings			Required	
13.12	Operation and Maintenance Manual			Required	
13.13	Trouble shooting manual			Required	
13.14	As built Drawings				Required

14 PACKING

14.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
14.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
14.3	Packing Identification Label to be provided on each packing case with the following details	
14.3.1	Individual serial number	
14.3.2	Purchaser's name	
14.3.3	PO number (along with SAP item code, if any) & date	
14.3.4	Equipment Tag no. (if any)	
14.3.5	Destination	

14.3.6	Project Details
14.3.7	Manufacturer / Supplier's name
14.3.8	Address of Manufacturer / Supplier / it's agent
14.3.9	Description and Quantity
14.3.10	Country of origin
14.3.11	Month & year of Manufacturing
14.3.12	Case measurements
14.3.13	Gross and net weights in kilograms
14.3.14	All necessary slinging and stacking instructions

15 SHIPPING

15.1	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
		The seller shall be responsible for all transit damage due to improper packing.

16 HANDLING AND STORAGE

16.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

17 QUALITY AND ASSURANCE

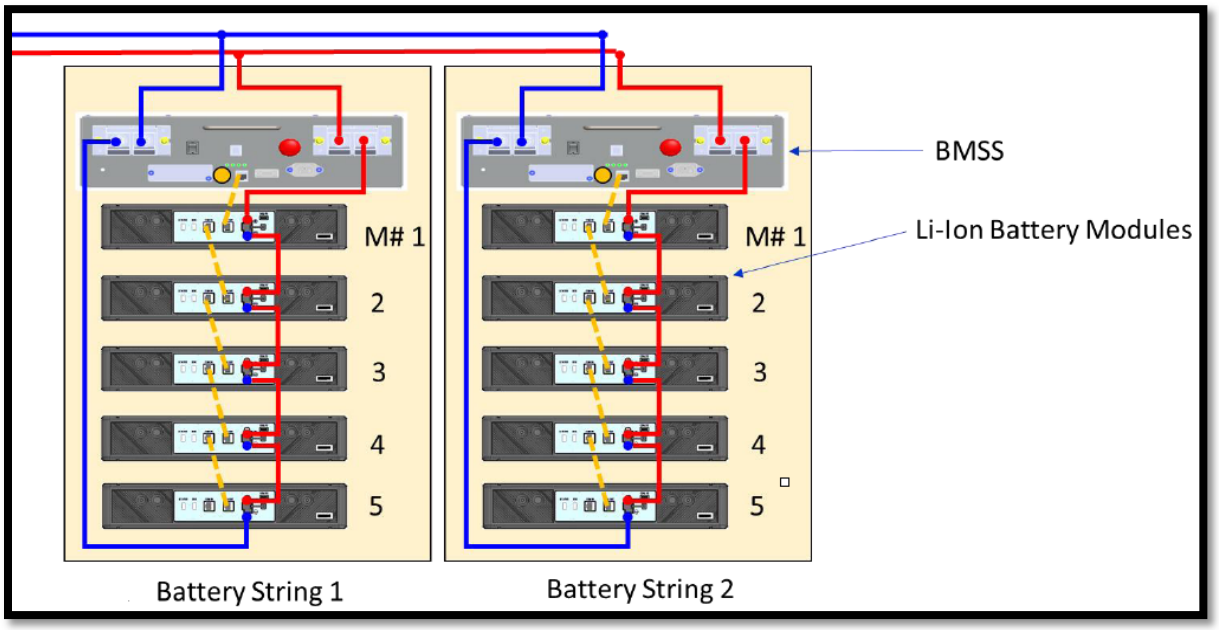
17.1	Vendor quality plan	To be submitted for purchaser approval
17.2	Inspection points	To be mutually identified & agreed in quality plan

18 ANNEXURE A- BATTERY KEY PARAMETERS

S.NO.	Description	BSES Requirement		Data to be filled by Manufacturer	
		50V	220V	50V	220V
18.1	Battery (as per scope of supply) – Yes / No	Yes	Yes		
18.2	Battery type	Li-Ion	Li-ion		
18.3	Type/Model No.				
18.4	Cell Chemistry				
18.5	Battery nominal voltage with variation upto ±5%				
18.6	Total battery bank CC-CV charging required in volts				
18.7	Nominal Voltage of each Cell				
18.8	No of cells in each module				
18.9	No. of modules				
18.10	Input charge voltage				
18.11	Charge current				
18.12	Discharge current				
18.13	Battery DOD	80% (minimum)	80% (minimum)		
18.14	Life cycle with 80% DOD	3000 (minimum)	3000 (minimum)		
18.15	Battery efficiency (watt hour round trip)	>92%	>92%		
18.16	Service life	10 Years	10 Years		

18.17	Self-discharge rate per month	3% @ 25°C	3% @ 25°C		
18.18	Cut off voltage	45V	210V		
18.19	Submitted of deviation sheet for each specification clause no - Yes / No	Furnish each deviation if yes	Furnish each deviation if yes		
18.20	Battery rating offered in AH	600 AH/200 AH	300 AH/100 AH		
18.21	Rating at temperature 45 deg C	600 AH/200 AH	300 AH/100 AH		
18.22	Battery bank dimensions in mm (length x depth x height)	As required	As required		
18.23	Battery Module weight in kg	As required	As required		
18.24	Heat generated by battery at rated full load (in Kw)	Less than 0.025kW/module	Less than 0.025kW/module		
18.25	Manufacturer of Li-Ion Battery Cells and Modules	Yes	Yes		
18.26	Manufacturer of Battery management system (BMS)	Yes	Yes		
18.27	Availability of Service team in India	Yes	Yes		
18.28	Built In Battery Management System	Yes	Yes		

19 ANNEXURE B-BATTERY ARRANGEMENT



Battery System

BSES

Technical Specification

For

415 V AC Distribution Board

Specification no – BSES-TS-70-ACDB-R0

Rev		0
Page		1 of 17
Date		05 May 2022
Prepared by	Jeena Borana	
	Abhishek Harsh	
	Amar Singh	
Reviewed by	Srinivas Gopu	
	Abhinav Srivastava	
Approved by	Gaurav Sharma	
	Gopal Nariya	

INDEX

1 SCOPE

This specification covers the design, engineering, manufacture, assembly and testing at manufacturer's works and supply of 415V AC Distribution board (ACDB)along with all hardware and accessories required for installation and operation.
Specification covers Type 1 and Type 2 ACDB. Type 1 ACDB is for Grid Substations while Type 2 ACDB is for BSES HT Customers.

2 STANDARDS & CODES

2.1	IS:8623	Specification for factory built assemblies of switchgear & control gear for voltages up to and including 1000V AC/1200 V DC.
2.2	IS 60947-1	Specification for Low-voltage Switchgear and Control gear - Part 2 : Circuit Breakers
2.3	IS:10118	Code of practice for selection, installation and maintenance switchgear and controlgear
2.4	IS:2705	Current Transformers
2.5	IS:3231	Electrical relays for power system protection
2.6	IS:1248	Electrical Indicating instruments
2.7	IS:4794	Switches and push buttons
2.8	IS:6005	Code of practice of phosphating iron and steel
2.9	IS:5082	Wrought Aluminum and aluminum alloys for electrical purposes
2.10	IS 3043	Code of practice for Earthing

3 SERVICE CONDITIONS

3.1	System Configuration	3 Phase 4 Wire with neutral solidly grounded
3.2	Supply Voltage	415 volt +/- 10%
3.3	Supply frequency	50Hz
3.4	Location	Indoor
3.5	Average grade atmosphere	Heavily polluted, Dry
3.6	Maximum altitude above sea level	1000M
3.7	Ambient air temperature	Highest 50Deg C Average 40Deg C
3.8	Minimum ambient air temperature	0 Deg C
3.9	Relative Humidity	100%
3.10	Rainfall	750mm concentrated in four months

4 ACB CONFIGURATION

4.1 TYPE 1 ACDB CONFIGURATION

4.1.1	Incomers	a. Two incomers, each having Motorized 630A MCCB. MCCBs shall have microprocessor based over current and earth fault release. b. Auto changeover shall be provided between the two incomers c. Manual castle keyinterlock required between two incomers d. Castle key for Local /Remote operation
4.1.2	Outgoing feeders	a. The number of outgoing feeders from AC boards shall be such that each substation equipment is fed by separate feeder (refer below). b. Utilization category of MCBs shall be C.

	Application	Type of Switchgear	No of Poles	Rating (A)	Quantity
4.1.3	Transformer Oil filtration	MCB	4	200	2
4.1.4	Welding(Outdoor)	MCB	2	63	4
4.1.5	Power Socket(Indoor)	MCB	4	32	5
4.1.6	Outdoor Lighting	MCB	4	32	2
4.1.7	Indoor Lighting	MCB	4	32	2
4.1.8	Battery Charger	MCB	4	63	2
4.1.9	BMK	MCB	4	32	8
4.1.10	Marshalling Box(PTR)	MCB	4	32	3
4.1.11	AC Supply	MCB	4	32	2
4.1.12	UPS	MCB	2	16	1
4.1.13	11kV Switchgear	MCB	2	32	3
4.1.14	CRP	MCB	2	32	2
4.1.15	RTU/SCADA	MCB	2	16	2
4.1.16	Fire Fighting	MCB	2	16	2
4.1.17	EPAX	MCB	2	16	1

4.1.18	Power Socket (Outdoor)	MCB	2	16	4

4.2 TYPE 2 ACDB CONFIGURATION

4.2.1	Incomers	a. Two incomers, each having Motorized 400 A MCCB. b. Auto changeover shall be provided between the two incomers c. Manual castle key interlock required between two incomers d. Castle key for Local /Remote operation
4.2.2	Outgoing feeders	a. The number of outgoing feeders from AC boards shall be such that each substation equipment is fed by separate feeder (refer below). b. Utilization category of MCBs shall be C.

	Application	**Type of Switchgear**	**No of Poles**	**Rating (A)**	**Quantity**
4.2.3	Welding	MCB	2	63	1
4.2.4	Power Socket	MCB	4	32	3
4.2.5	Outdoor Lighting	MCB	4	16	2
4.2.6	Indoor Lighting	MCB	4	16	2
4.2.7	Battery Charger	MCB	4	32	2
4.2.8	AC Supply	MCB	4	32	2
4.2.9	Switchgear	MCB	2	32	2
4.2.10	RTU/SCADA	MCB	2	16	2
4.2.11	Fire Fighting	MCB	2	16	2

5 CONSTRUCTION

5.1	General construction	a. Board shall be of modular construction with provision for compartmentalization for Incomer and non-compartmentalization for outgoing feeders. b. It shall be free-standing type comprising dust-tight and vermin-proof sheet steel cabinets suitable for indoor installation with IP-54 degree of protection. c. Necessary busbar support insulators, cable glands, cable supports and terminal blocks etc. The board shall be of single front type.

5.2	Material	The Board shall be made out of at least 2.5 mm thickcoldrolled steel sheet (CRCA), suitably reinforced to provide flat level surfaces. No welds, rivets, hinges or bolts shall be visible from outside.
5.3	Equipment Mounting	a) All switches provided on the distribution board shall be on front side of the cabinets, operable from outside. b) All MCBs shall be flush mounted operable from front side of ACDB. c) All instruments and control devices shall be mounted on the front of cabinets and fully wired to the terminal blocks.
5.4	Operating Height	$\leq$ 1.6 meter
5.5	Busbar housing	a) The busbars shall be housed in totally enclosed busbar chambers. b) Incoming connections from the busbar to various feeders shall be designed so as not to disturb cable connections. c) Busbar arrangement should ensure safety of the operation/maintenance personnel and facilitate working on any outgoing module without the need for switching off in-feed to the adjacent modules, as far as possible
5.6	Outgoing Cable Termination	For Outgoing cable termination, vertical arrangement of Terminal Blocks shall be provided with ratings in descending order.
5.7	Cable glands	Compression type cable glands shall be provided to hold the cables to avoid any pressure or tension on the terminal block connections.
5.8	Gland Plate	Gland plate shall be 3.0mm thickwith metallic knockout punches
5.9	Doors	a) The doors of cable cabinets shall be lockablehinged type b) Doors shall be fitted with double lipped gaskets. c) Bus bar side shall have bolted doors.
5.10	Drawing Pocket	Shall be Provided to keep “As Built Drawings”

6 BUSBAR

6.1	Material	Busbar shall be of aluminum.
6.2	Size (phase and neutral)	a) Main busbar - 80x10 sqmm for Type 1 ACDB b) Main busbar – 50X10 sqmm for Type 2 ACDB c) Busbar dropper size Incomers - MCCB-80x10 sqmm for Type 1 ACDB d) Busbar dropper size Incomers - MCCB-50x10 sqmm for Type 2 ACDB
6.3	Supports	The busbar shall be supported by means of durable non-hygroscopic, non-combustible and non-tracking polyester fiberglass material or porcelain. Supports shall be capable of withstanding the maximum short circuit stresses
6.4	Sleeves and shrouds	Busbars shall be encased in heat-shrinkable sleeves of insulating material which shall be suitable for the operating temperature of busbars during normal service. The busbar joints shall be provided with removable thermosetting plastic shrouds.

7 MCCB

7.1	MCCB type	4 pole
7.2	MCCB design ambient temperature	50deg C
7.3	MCCB Housing	Thermoplastic material resistant to fire & abnormal heat , non hygroscopic
7.4	MCCB Terminal	Silver coated copper with phase barriers, spreader terminals & shrouds
7.5	De-rating at 50Deg ambient temperature	No derarting (0%)
7.6	MCCB rated 3 phase short circuit breaking capacity Ics = Icu	36kA minimum at 415v and 50Hz
7.7	MCCB rated 3 phase short circuit withstand capacity, Icw	8kA for 1sec
7.8	MCCB SC making current capacity	75kA peak
7.9	MCCB rated insulation level	1000V
7.10	MCCB mechanical & electrical endurance	As per IS 13947 / IEC
7.11	MCCB utilization category	B as per IS / IEC 947
7.12	MCCB indications	ON, OFF & TRIP
7.13	MCCB protection	MCCBs shall have microprocessor based over current and earth fault release.

7.14	Tripping characteristic required	
7.14.1	Overload setting	Range 60-100%In (Set on 95%)
7.14.2	Short Circuit setting	Range 200-1200%In (Set on 300%)
7.14.3	Earth fault setting	To be provided
7.15	MCCB Clearances in air	As per table XIII of IS 13947-1
7.16	MCCB temperature rise limits	As per table 2 & 3 of IS 13947-1
7.17	MCCB Ingress Protection	IP2X Minimum (pollution degree minimum 2)
7.18	MCCB additional features	Sealing/padlocking of operating knob in OFF position Sealing/padlocking of operating knob in OFF position isolation suitable with positive contact

8 CURRENT TRANSFORMER

8.1	Type	Cast-resin type, Class-E insulation, rated for 120% current continuous
8.2	Provision	Shall be provided in incomer for metering. Separate Neutral CT shall be connected in the neutral for detecting earth fault for both the incomer.
8.3	Secondary current	5A
8.4	Metering CT Class	1.0
8.5	Burden	Based on requirement

9 TERMINALS AND WIRING

9.1	Secondary Wiring	
9.1.1	Grade and type	1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.
9.1.2	Ferruling	Each wire shall bear an identifying ferrule or tag at each end or connecting point.
9.1.3	Size	Appropriate size copper based on rated current and application subject to a minimum of 2.5sqmm copper
9.2	Terminals	Terminals of appropriate size shall be provided inside each cabinet for incoming and outgoing cables.
9.2.1	Grade	1100 V grade, molded piece terminals complete with insulated barriers, washers, nuts and lock nuts.
9.2.2	Power Terminals type	Stud type, nut driver operated

9.2.3	Control terminals type	Stud type, screw driver operated suitable for minimum 6sqmm wire.
9.2.4	Spare terminals	20% spare terminals should be provided in each terminal block.
9.2.5	Accessibility	Placement of terminals shall enable proper cable termination. Terminals shall be readily accessible for inspection and maintenance.
9.2.6	Marking	The terminals shall be serially numbered to facilitate installation and maintenance.
9.3	Cable troughs	Shall be provided for wiring of each terminal block with 50% spare capacity

10 METERS, INDICATIONS AND PUSH BUTTONS

10.1	Meters	
10.1.1	Multifunction Meter	For incomer feeders. Meter should have facility to store peak load current in memory.
10.1.2	Type	Digital with inbuilt phase selector
10.1.3	Communication Protocol	RS485 on MODBUS
10.1.4	Accuracy Class	1.0
10.1.5	Auxiliary supply	240VAC with 10% tolerance
10.2	Indicating lamps	Indicating lamps shall be of low wattage cluster LED type.
10.2.1	Incomer/ Outgoing On	Red
10.2.2	Incomer/ Outgoing Off	Green
10.2.3	Incomer/ Outgoing Trip	Amber
10.3	Push buttons	For manual operation of incomer

11 NAME PLATES & MARKINGS

11.1	Panel nameplate	Panel shall have a nameplate clearly indicating the following: a) Manufacturer's Name & Country: b) Panel Serial No.: c) Customer Name: BSES Yamuna / Rajdhani Power Ltd d) PO No. & date: e) Type of Panel: f) Current rating: g) Rated Voltage and Frequency: h) Month and year or Manufacture: MM/YYYY i) Guarantee period:
11.2	Feeder nameplate	Large and bold name plate carrying the feeder identification

		shall be provided on the top of each module. Blank insert type name plates shall be provided on each outgoing feeder.
11.3	Equipment nameplate	a) All equipment mounted on front side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. b) All front mounted equipment shall also be provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.
11.4	Danger plate	Panel shall have a danger plate of anodized aluminum clearly indicating the danger logo and voltage details.
11.5	Material	Non-rusting metal or 3 ply lamicoid. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
11.6	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
11.7	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not otherwise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

12 FINISHING

12.1	Primer	Two coats
12.2	Finish	Powder Coating
12.3	Colour shade	RAL 7032 (Siemens Grey)
12.4	Paint thickness	70 microns (minimum)

13 APPROVED MAKE OF COMPONENTS

13.1	Switch	Siemens / L&T (Salzer)
13.2	HRC Fuse Links	GE/ Siemens/ L&T
13.3	Meters	Rishabh/Schneider/AE
13.4	AC Contractors	L&T/Siemens/Telemechanique/GE/ABB
13.5	Terminals	Connectwell/Elmex/Wago/Phoenix
13.6	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
13.7	MCCB	L&T/Siemens/ ABB/GE/Schneider
13.8	MCB	Datar/Legrand/Hager/Schneider/ABB
13.9	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

14 QUALITY ASSURANCE PLAN, INSPECTION AND TESTING

S No.	Parameters	Technical Requirements
14.1	Quality Assurance Plan	QAP Shall be submitted by vendor for approval. Inspection and testing of the material shall be carried out accordingly.
14.2	Type test	Equipment should be of type tested quality only, type test certificate to be submitted along with offer. Test reports from CPRI/ERDA accredited laboratory only acceptable.
14.3	Routine /Acceptance test	As per relevant Indian standard
14.4	Inspection	a) The buyer reserves the right to inspect equipment at the Seller's works at any time prior dispatch, to verify compliance with the specifications. b) In-process and final inspection call intimation shall be given in 15 days advance to purchaser. c) In the event of any discrepancy in the test reports i.e. test reports not acceptable or any type tests (including special /additional tests, if any) not carried out, same shall be carried out without any cost implication to BSES before dispatch of equipment.
14.5	Test certificates	Test certificates (routine and acceptance) shall be submitted along with the dispatch documents.

15 PACKING, SHIPPING, HANDLING & SITE SUPPORT

15.1	Packing Protection	The packing shall be fit to withstand rough handling during transit and storage at destination. The test set should be properly protected against corrosion, dampness & damage.
15.2	Packing for accessories and spares	Robust non-returnable packing case with all the above protection & identification Label. The bidder should get the packing list approved before dispatching the material.
15.3	Packing Identification Label	On each packing case, following details are required: a) Individual serial number b) Purchaser's name c) PO number (along with SAP item code, if any) & date d) Equipment Tag no. (if any) e) Destination f) Manufacturer / Supplier's name g) Address of Manufacturer / Supplier / it's agent h) Description i) Country of origin j) Month & year of Manufacturing

		k) Case measurements l) Gross and net weight m) All necessary slinging and stacking instructions
15.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.
15.5	Handling and Storage	Manufacturer instruction shall be followed.
15.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.	

16 DEVIATIONS

16.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.

17 DOCUMENT SUBMISSION MATRIX

Drawing submission shall be as per the matrix given below.

- All documents/ drawing shall be provided in soft copy only through mail.
- Language of the documents shall be English only.
- Incomplete submission shall be liable for rejection.
- Document check sheet compliance shall be the first sheet for each submission stage i.e.Technical bid, Drawing Approval, Pre Dispatch
- No submission is acceptable without check list compliance.
- Order of documents shall be strictly as per the check list.
- Any drawing not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope.

S No.	Documents to be submitted	Bid	Approval	Pre Dispatch
17.1	Guaranteed Technical Particulars (GTP)	Required	Required	
17.2	Deviation Sheet, if any	Required	Required	
17.3	GA drawing, SLD, Wiring Diagram	Required	Required	

S No.	Documents to be submitted	Bid	Approval	Pre Dispatch
17.4	Type test reports(not more than 5 years old) from CPRI/ERDA	Required	Required	
17.5	Reference List of major customers using the offered product from last 5 years	Required		
17.6	Performance certificates executed in last 5 years			
17.7	Make of Raw Materials	Required	Required	
17.8	Manufacturer's Quality Assurance Plan		Required	
17.9	Complete product catalogue and Manual		Required	Required
17.10	Test certificates of all raw materials			Required
17.11	Inspection and routine test reports, carried out in manufacturer's works			Required

ANNEXURE AGUARANTEED TECHNICAL PARTICULARS

S. No.	Description	Specification requirement	Vendor Data
1.0	**GENERAL FEATURES**		
1.1	Make		
1.2	Type		
1.3	Reference Standard		
1.4	Rated Operational voltage	415V AC ± 10%	
1.5	Rated Nominal Current	630A	
1.6	Rated frequency	50 Hz (+3%, -5%)	
1.7	Rated Insulation voltage	1100V	
1.8	Rated Impulse withstand voltage	8kV	
1.9	Service supply for heating, lighting and power sockets	240VAC±10%,	
1.10	Mounting	Floor (Free standing)	
1.11	Connections	Cable entry – Bottom	
1.12	Configuration	Single front	
1.13	Enclosure thickness		
1.13.1	Load Bearing Member	>=2.5mm	
1.13.2	Doors and Covers	>=2 mm	
1.14	Enclosure Material	CRCA Sheet/GI	
1.15	Enclosure degree of protection	IP 54	
1.16	Mechanical safety interlocks	As specified in technical specification	
1.17	Incomer Power Cable Termination	2Rx4Cx300sqmm	
	Outgoing Cable Termination	a) 200A MCB- 4Cx150sqmm b) 63A MCB- 4Cx50sqmm c) 32A MCB- 4Cx25 sqmm d) 16A MCB- 2Cx10 sqmm	
	Cable Termination Type	From Bottom of Panel	
	Clearance	150 mm clearance to be maintained from the bottom of the TB and the gland plate	
1.18	Paint shade	RAL 7032 (Siemens Grey)	
1.19	Typical vertical section (Overall dimension (mm) and weight (Kg))	Required	
1.19.1	Incomer		
1.19.2	Outgoings		
1.20	Dimensions of the ACDB Panel	L (mm) X D (mm) X H (mm)	

S. No.	Description	Specification requirement	Vendor Data
1.21	Weights of the ACDB Panel	(in kg.)	
1.22	Marking on the panel	As per the specification	
2.0	**INCOMER MCCB**		
2.1	Make & Model of MCCB	Required	
2.2	Catalogue of MCCB	Required	
2.3	Continuous Current at 40 deg C/ 50 deg C	630A	
2.4	Rated ultimate breaking capacity at rated voltage	50kA	
2.5	Rated service breaking capacity Ics	Ics = 100% Icu at rated voltage	
2.6	Rated making current	Icm = 220% Icu	
2.7	Utilization Category	A	
2.8	Overload setting	50 -100% (Inverse time characteristics)	
2.9	Overcurrent setting	200-1000% (Instantaneous characteristics)	
2.10	Earthfault setting	20-100% (Instantaneous)	
2.11	Dimension(HxWxD)	Required	
2.12	Weight	Required	
3.0	**BUS AND BUS TAPS**		
3.1	Make		
3.2	Material and grade of buses and joints	High conductivity electrolytic grade aluminum	
3.3	Reference standard		
3.4	Continuous Current (at site condition, 50°C ambient) within cubicle	630A	
3.5	Cross sectional Area		
3.6	DC resistance	ohm/m/ph	
3.7	Skin-effect ratio		
3.8	Reactance	ohm/m/ph	
3.9	Losses-middle phase	w/m/ph	
3.10	Minimum clearance of bus bar and joints	Required	
3.10.1	Phase to phase (mm)		
3.10.2	Phase to earth (mm)		
3.11	Bus bar insulation	a. Heat shrinkable sleeves rated for maximum operating voltage b. Cast resin shrouds for joint	

S. No.	Description	Specification requirement	Vendor Data
3.12	Bus joints	Silver	
3.13	Bus bar support insulator	Required	
3.13.1	Spacing (mm)		
3.13.2	Make		
3.13.3	Type		
3.13.4	Reference standard		
3.13.5	Voltage class (kV)		
3.13.6	Minimum creepage distance (mm)		
3.13.7	Cantilever strength (Kg/sq.cm.)		
4.0	**CURRENT TRANSFORMER**		
4.1	Make		
4.2	Type	Resin Cast	
4.3	Reference standard		
4.4	CT ratios		
4.5	Class of Insulation	Class-E	
4.6	Protection class	5P20	
4.7	Metering class	5	
4.8	VA burden for Relaying CT-Incomer	Based on requirement.	
5.0	**AMMETERS/MULTIFUNCTION METERS AND VOLTMETERS**		
5.1	Make & Model no.		
5.2	Type	Digitalwith inbuilt phase selector	
5.3	Communication Protocol	RS485 on MODBUS	
5.4	Accuracy class	1	
6.0	**CONTROL & INDICATIONS**		
6.1	Push button		
6.1.1	Make and model no.		
6.1.2	Type	Flush mounted type with touch proof terminals	
6.2	LEDs		
6.2.1	Make & Model no.		
6.2.2	Type	Flush mounted type with touch proof terminals	
7.0	**TERMINAL BLOCKS**		
7.1	Make & Model no.		
7.2	Spare terminals	Equal to 20% of active terminals in each TB	
7.3	Power terminals	Stud type, screw driver operated	

S. No.	Description	Specification requirement	Vendor Data
7.4	Control terminals	Stud type, screw driver operated suitable for minimum 6sqmm wire.	
8.0	**TESTS**		
8.1	Confirmation of routine tests to be performed as per IS 60947	Yes/No	
8.2	IP 55 test shall be carried out during inspection	Yes/No	
8.3	Confirmation of Type tests to be performed (or report submitted) as per IS 60947	Type test report no./date	
8.4	Confirmation of Acceptance tests to be performed during inspectionas per IS 60947	Yes/No	
8.5	Temperature rise test to be carried out at NABL accredited lab.	Yes/No	
9.0	Deviation sheet against each clause of the specification	To be submitted	

Technical Specification

For

Grounding and Lightening Protection System

Specification no – BSES-TS-76-GES-R0

Rev:		0
Date:		06 May 2022
Prepared by	Bhanu Gehlot	
	Uttam Shukla	
Reviewed by	Abhinav Srivastava	
Approved by	Gopal Nariya	

INDEX TABLE

1. SCOPE

This specification covers the guidelines of earthing & lightening protection at 66/11, 33/11, 66/33/11 kV Grid substation and the technical requirements of material required for earthing system.

2. STANDARDS & CODES

2.1.	CEA guidelines	Technical standards for construction of electrical plants and electrical lines
2.2.		IE Rules of 1956
2.3.	IEEE Std 80	IEEE guide for safety in AC substation grounding
2.4.	CBIP :2006 – publication no. 229	Manual on substation layout
2.5.	IS 3043: 1987	Code of practice for earthing
2.6.	IS 2629 (1985)	Recommended practice for hot dip galvanizing of Iron & Steel
2.7.	IS 2633 (1986)	Method for testing uniformity of coating on zinc coated article
2.8.	IS 5358 (1969)	Specification for hot dip galvanized coating on fasteners
2.9.	IS 4759 (1996)	Specification of Hot dip zinc coatings on structural steel and other allied products
2.10.	IS 1239 (2004)	Steel tubes, tubular and other wrought steel fittings- specification
2.11.	IEC 62561-2	Requirements for conductors and earth electrodes
2.12.	IEC 62561-7	Requirements for earthing enhancing compounds
2.13.	UL 467	Standard for safety - Grounding and bonding equipment
2.14.		Handbook on Electrical Earthing (Ministry of Railways)

3. REQUIREMENT OF EARTHING

3.1.	Primary guidelines	Following are primary guidelines for a good earthing system in a Grid substation: a. The impedance to ground should be as low as possible. In general it should not exceed **0.5ohm**. b. The step and touch potentials shall be within safe limits. c. The contractor shall do the calculation for number of earthing rods being used in a substation for achieving the desired earth resistance.

3.2.	Design Parameters	Earthing Calculation parameters shall be taken as: 1) Duration of shock current ts=1sec. 2) Top Gravel resistivity shall be 3000 Ohm Meter. 3) Split/ Diversion Factor shall be considered as 1 4) Earth conductor/ electrodes size calculation based upon corrosion considered for next 40 years. 5) The final diameter of earth conductors/rod shall be maximum of calculated dia or 25 mm (prescribed in clause 5)
3.3.	Earthing lead size	a. The actual size of earthing lead will depend on the maximum fault current which the earthing lead will be required to carry safely. b. Please refer **AnnexureA1** for HT fault level.
3.4.	Earthing type	a. Rod earthing shall be provided for the Grid substation. b. The size of the rod depends upon the current to be carried and the type of the soil. Soil resistivity testing will be carried out by vendor. c. The Earth Electrode should be embedded vertically. Wherever hard rock is encountered, the rod can be inclined at an angle of about 30deg to the horizontal as per clause 9.2.2 of IS 3043. d. The vertically driven rods shall be interconnected with each other using horizontal grid conductors.
3.5.	Earth Pit	a. As per clause 20.5.2 of IS 3043, the minimum distance between the vertical earth electrodesshall not be less thanthe length of rod. b. Minimum of 1m distance of earth pit from electrical equipment and structures shall be maintained. c. The earth pits shall be backfilled with earth enhancing material as per Drawing . d. Treated Earth pits shall be used where earth resistance value is getting over the prescribed value in specification i.e. 0.5 ohms. e. Treated Pipe earthing required for 2 nos. each for PTR & Station TRF neutral and RTU/ SCADA. f. 50% quantity of the total earth electrodes to be provided with earth enhancing material (Terec++/ marconite).
3.6.	Horizontal Conductor	a. The entire earth rod driven in ground vertically shall be interconnected with earth grid conductors horizontally under the ground. b. The Horizontal conductors shall be laid 600mm below FGL. c. Minimum earth coverage of 300 mm shall be provided between the Horizontal conductor and the bottom of trench/foundation/underground pipe at the crossing. d. Horizontal conductors around a building /switchyard fence shall be buried outside the boundary at a minimum distance of 2000 mm. e. Risers shall be provided 300mm above the ground level for equipment earthing. Two number treated earth pits shall be provided with riser for connection of transformer neutral. f. All the joints between rods flats shall be **exothermic** type for creating better electrical contact between two. Welding between rods to flat, flat to flat should be arc welding type. g. Wherever bolted connection is done, it shall be done through two bolts at each joint to ensure tightness and avoid loosening with passage of time. h. Where a 66 kV overhead line terminates at the substation, a

		metallic continuity between the end tower and the substation earth grid should be established with two independent connections. i. To ensure good welding, it should be carried out only after scratching off the galvanization, dirt, grease etc by thorough cleaning of contact surface. After welding it will be made with anticorrosive zinc rich paint.
3.7.	Equipment earthing	a. GI strips shall be used for the equipment earthing. b. Two separate and distinct earth connections shall be provided for earthing of electrical frameworks. c. The connection of GI strip with riser of earth mat shall be electric arc welding arrangement;connection ofequipment with earthing end shall be double bolted arrangement. d. The transformer neutral shall be earthed with two independent grounding conductors connected to two separate earth pits. e. Fence within the earth grid shall be bonded to the plant earth system at regular interval not exceeding 10 meters. Fence gate shall be separately earthed with flexible Copper braid to permit movement. f. Bolted connection shall be made only for earthing of equipment/devices and for some removable structures. The contact surfaces shall be thoroughly cleaned before connection to ensure good electrical contact. g. Cable armor shall be earthed at both ends for multi core cables. For single core cables, the earthing shall be at switchgear end only. h. For prefabricated cable trays, a separate ground conductor shall run along the entire length of cable tray and shall be suitably clamped on each cable tray at periodic intervals. Each continuous laid out lengths of cable tray shall be earthed at minimum two places by GS flats to Owner's earthing system, the distance between earthing points shall not exceed 30 metre. Wherever earthmat is not available Contractor shall do the necessary connections by driving an earth electrode in the ground. i. Earthing conductor's crossings the road shall be installed at 1000 mm depth and where adequate earth coverage is not provided it shall be installed in Hume pipes. Earthing conductors embedded in the concrete floor of the building shall have approximately 50mm concrete cover. j. Metallic stairs and hand rails shall be earthed as for columns. Additionally a 25x6 GI flat shall run the entire length of the stairs. The GI flat shall be welded to the stairs and hand rails at intervals of 1500 mm. k. The main earth conductor shall be securely fixed to the columns /walls/trays by welding /clamping at the intervals not exceeding 1500 mm. The earth conductors shall be interconnected between them and to the main earth grid through risers. l. **In case of GIS substation, earthing rods to be considered in RCC floor as per GIS OEM recommendation.**
3.8.	Lightening protection	a. Direct stroke lightning protection (DSLP) shall be provided in the EHV switchyard by shield wires/ High mast spike gaurd. The final arrangement shall be decided after approval of the DSLP calculations. The Contractor is required to carry out the DSLP

		calculations and submit the same to the Owner for approval of the same at detailed engineering stage after award of contract. b. DSLP protection shall be provided for control room building as per design calculation following Indian standards. The down conductor should be high conductivity bare copper tape with minimum size of 75 sqmm. c. Connection between each down conductor & Test link shall be located approximately 2000mm above ground Level. d. Separate earth electrodes shall be provided for building DSLP connecting the down conductors to the risers & finally to the Earthmesh. Minimum electrodes to be provided – 4 Nos.

4. SPECIFICATION OF EARTHING MATERIALS

4.1.	GI earthing strip	a. Fully galvanized iron strips shall be used conforming to IS 2629. b. The zinc deposition shall not be less than 610gm/sqm of the galvanized surface area of the MS Earthing strips. c. The zinc coating used for the galvanization shall be of 9.99 % purity grade as per IS 209. d. All the galvanized material shall be checked for uniformity and weight as per IS. e. The standard length of galvanized iron earthing strip shall be minimum 7Mtrs.
4.2.	Vertical and Horizontal Earth Electrode	a. Copper clad steel rod driven in the earth vertically shall be a high tensile-low carbon steel rod of adequate diameter(as per the clause 6.0 of the specs) and 3m length complying UL467, IEC62561-2 and IS 3043, molecularly bonded by 99.99% pure high conductivity copper on the outer surface with copper coating thickness 254 microns or more with sufficient amount of earth enhancement compound as per IEC 62561-7. b. Copper bonding must be UL/CPRI/ERDA certified. c. Rod shall be tested and certified from CPRI/ERDA for a short circuit current withstanding of desired value. d. There shall be following marking on the rod-Dimension Detail, product model no, Reference number of certification. e. It shall have high corrosion resistance and shall eliminate electrolytic action. f. The rod shall have thread profile at both the ends to ensure no copper is removed from the steel.

5. SIZES OF THE EARTHING MATERIALSFOR EQUIPMENT EARTHING

S.No.	Title	Material	Sizes of the earthing	Type	UOM	No of Lead
	Main Earthing Grid					
5.1	Vertical Rods	Cu Bonded Rods	25	Rod	mm (dia)	
5.2	Above Ground risers	GI	50x10	Flat	Sqmm	2
5.3	Horizontal Rods	Cu Bonded Rods	25	Rod	mm (dia)	
5.4	Treated Earth Pit	Cu Bonded Rods	25	Rod	mm (dia)	
	Power Transformers					
5.5	Frame	GI	75X10	Flat	Sqmm	2
5.6	Marshalling Box	GI	50X6	Flat	Sqmm	2
5.7	Radiator	GI	50X6	Flat	Sqmm	2
5.8	Neutral	GI	75X10	Flat	Sqmm	2
5.9	Fan	GI		As per sizes mentioned for fans		
	11 KV System					
5.10	11 KV Swithcgear	GI	50X6	Flat	Sqmm	2
5.11	11 KV Bus Duct	GI	50X6	Flat	Sqmm	2
5.12	11 KV Cable Box	GI	50X6	Flat	Sqmm	2
	415 V System					
5.13	ACDB	GI	50X6	Flat	Sqmm	2
5.14	Station Trafo Frame	GI	50X6	Flat	Sqmm	2
	DC System					
5.15	Battery Charger	GI	50X6	Flat	Sqmm	2
5.16	DCDB	GI	50X6	Flat	Sqmm	2

	Other Electrical Items					
5.17	Three phase receptacles, welding outlet	GI	25x3	Flat	Sqmm	1
5.18	C&R Panel	GI	50X6	Flat	Sqmm	2
5.19	Push Button	GI	8	Wire	Swg	1
5.20	Cable Trays(one run along the tray section)	GI	50X6	Flat	Sqmm	1
	Other Non Electrical Items					
5.21	Railway Tracks	GI	25x6	Flat	Sqmm	At suitable Points
5.22	Metallic noncurrent carrying structures like stair case	GI	25x6	Flat	Sqmm	1
5.23	Columns, Structures	GI	50X6	Flat	Sqmm	2
5.24	Steel pipe racks	GI	25x6	Flat	Sqmm	1
5.25	Fence/Gate	GI	50X6	Flat	Sqmm	As per clause 3.7 (e)
5.26	Hand Rail	GI	8	Wire	Swg	1

6. TESTING AND INSPECTION

6.1.	Earthing materials	a. The purchaser reserves the right to inspect the material at the time of tests. All tests shall be performed in the presence of BYPL/BRPL representative. The bidder shall give intimation in advance to witness the test. b. Acceptance test for GI earthing strips – Tests for Visual examination, dimensional verification and galvanization shall be witnessed at the time of inspection. c. Acceptance test of Earth enhancement compound – Tests for leaching, sulphur determination, corrosion and resistivity shall be done as per IEC 62561-7 d. Type test reports of the earthing materials from CPRI/ERDA/Equivalent lab shall be submitted. The bidder shall submit UL-467/CPRI/ERDA test reports for copper clad steel rod.

6.2.	Measurement of Earth resistance	a. After the completion of work ground resistance of each installation shall be measured by BYPL/BRPL/Contractor. b. The measurement of resistance shall be witnessed and signed by representative of BYPL/BRPL as well as the contractor. The test certificates shall be generated for each installation clearly indicating the details of the transformer, name of the substation, location, district, serial no. of testing equipment and name of testing engineer. c. The desire ground resistance shall be measured after interconnection of earth pits is completed. The value of earth resistance shall not be more than **0.5 ohm**. d. In case where this value exceeds 0.5 ohms, the earthing design shall be redesigned. The pit location, earth electrode, soil treatment, earth conductor, GI strip used shall be checked whether properly used at site. If not, these shall be changed as per the redesigned plan.

7. DEVIATIONS

7.1.	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.

8. DOCUMENTS SUBMISSION

The bidder has to submit the following documents along with bid:-

8.1.	Complete earthing calculation
8.2.	Complete product catalogue, Manual and calibration certificate of the equipment
8.3.	Type test reports
8.4.	Deviation Sheet (if any)

9. GUARANTEED TECHNICAL PARTICULARS

S. No	Parameter	BYPL/BRPL Requirement	Vendor Data
9.1	Rod to rod welding	Exothermic	
9.2	Zinc deposition of GI earthing Strip	610gm/sqm	
9.3	Length of GI Strip	7m (Minimum)	

9.4	Diameter of Cu clad Rod	25 mm or calculated Dia whichever is higher	
9.5	UL/CPRI/ERDA Certification of Cu Bonding	Test certificate to be provided	
9.6	Cu bonding	250 Micron	
9.7	Length of Copper bonded rod	3 m	
9.8	Purity of Copper	99.99%	
9.9	Short circuit withstand test of Rod	31.5kA	
9.10	Marking on the rod-Dimension Detail, product model no, Reference number of certification	Sample Required	
9.11	ROHS Certificate from NABL accredited lab for not having toxic chemical in earth enhance material	Test certificate to be provided	
9.12	Resistivity of earth enhancing material	0.12 ohm-m(Max)	
9.13	Exothermic welding material	IEEE 837 Complied	
9.14	Make of Steel	SAIL/ESSAR/TATA	

ANNEXURE A1 : REFERENCE FAULT LEVEL

Voltage Level(kV)	Design Fault Level
66/11	31.5 KA
33/11	25 KA

BSES

Technical Specification of

LT Power Cable(Single & Multi-Core)

Specification no – BSES-TS-01-LTPC-R0

Rev:		0
Date:		31 Mar 2022
Prepared by	Abhishek Vashistha	
	Rohit Patil	
Reviewed by	Puneet Duggal	
	Amit Tomar	31/03/2022
Approved by	Gaurav Sharma	
	K. Sheshadri	31/3/22

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Contents

1.0 SCOPE OF SUPPLY

The specification covers design, manufacture, shop testing, packing and delivery of 1100 Volts grade, Aluminium conductor XLPE insulated power cables.

2.0 CODES & STANDARDS

The cables shall be designed, manufactured and tested in Accordance with the following Indian & IEC standards.

2.1	IS- 7098 (Part-1)	Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V.
2.2	IS- 6474	Polyethylene insulation & sheath of electric cables.
2.3	IS- 5831	PVC insulation and sheath of electrical cables.
2.4	IS : 10810	Methods of tests for cables.
2.5	IS : 8130	Conductors for insulated electrical cables and flexible cords.
2.6	IS : 3975	Low carbon galvanized steel wires, formed wires and tapes for armouring of cables.
2.7	IS- 4026	Aluminum ingots, billets and wire bars (EC grade)
2.8	IS-5484	EC Grade aluminium rod produced by continuous casting and rolling
2.9	IS : 10418	Specification for drums for electric cables.
2.10	IS : 3961	Recommended current ratings for cables.
2.11	IS:1255	Installation and Maintenance of power cables upto and including 33 kV rating.
2.12	IS:4826	Specification for hot-dipped galvanized coatings on round steel wires
2.13	IS:1717	Metallic Materials – Wire – Simple torsion test
2.14	IEC 60228	Conductors of insulated cables. Guide to the dimensional limits of circular conductors.
2.15	IEC 60331	Fire resisting characteristics of electric cables.
2.16	IEC 60332 – 3	Tests on electric cables under fire conditions. Part 3: Tests on bunched wires or cables.
2.17	IEC 60502	Extruded solid dielectric insulated power cables for rated voltages from 1kV to 30 kV.
2.18	IEC 60754 – 1	Test on gases evolved during combustion of materials from cables. Part 1: Determination of the amount of halogen acid gas evolved during combustion of polymeric material taken from cables.
2.19	IEC 60811	Common test methods for insulating and sheathing materials of electric cables
2.20	IEC 60885	Electric test methods for electric cables
2.21	IEC 60304	Standard colours for insulation for low frequency cables and wires.
2.22	IEC 60227	PVC insulated cables of rated voltages up to and including 460/760 V.

2.23	IEC 1034	Measurement of smoke density of electric cables burning under defined conditions
2.24	ASTMD 2843	Standard Test Method for density of Smoke from the burning or decomposition of cables
2.25	ASTM 2863	Standard Test Method for measuring of minimum oxygen concentration
2.26	IEC 60754-1	Test on gases evolved during combustion of materials for cables. Part 1 – Determination of the Halogen Acid gas Content
2.27	IS 1554 part 1	Specification for PVC insulated (Heavy duty) Electric cable

3.0 CABLE DESIGN

Description of each item mentioned in the specification (the text, BOQ, GTP or any site specific requirement) shall be followed along with IS: 7098 – P1

<table>
<tr><td>3.1</td><td>Conductor</td><td>a) Electrolytic Grade Stranded Aluminium Conductor
b) Grade: H2 as per IS: 8130/1984
c) Class 2
d) Chemical Composition as per IS 4026
e) Shape& Size:
<table>
<tr><th>S. no.</th><th>Shape</th><th>Single core (sq.mm)</th><th>Multi core (sq.mm)</th></tr>
<tr><td>1</td><td>Compacted Circular</td><td>• 1cx25
• 1cx95
• 1cx300
• 1cx630
• 1cx1000</td><td>• 2cx10</td></tr>
<tr><td>2</td><td>Sector</td><td>---</td><td>• 2cx25
• 4cx25
• 4cx50
• 4Cx150
• 4Cx300
• 4Cx400</td></tr>
</table></td></tr>
<tr><td>3.2</td><td>Insulation</td><td>Extruded XLPE insulation as per IS : 7098 part-1</td></tr>
<tr><td>3.3</td><td>Core Identification</td><td>a) Single Core Cable – Natural
b) Two Core Cable – Red & Black
c) Four Core Cable – Red, Yellow, Blue and Black</td></tr>
<tr><td>3.4</td><td>Inner Sheath</td><td>a) For Single Core Cable – Inner Sheath Not Required
b) For 2 Core cable- Pressurized Extruded, Black PVC type ST-2 (IS 5831-1984)
c) For 4 core cable –Extruded Black PVC type ST-2 (IS 5831-1984)</td></tr>
<tr><td>3.5</td><td>Armour</td><td>a) For 2C X 10 mm^2 – Galvanized Steel round wire.
b) For all sizes above 10 mm^2-Galvanized Steel Strip
c) Armour not required for single core cables
d) Minimum area of coverage of armouring shall be 90%</td></tr>
</table>

		e) The breaking load of armour joint shall not be less than 95% of that of armour wire / strip f) Zero negative tolerance for thickness of armour strip shall be as per IS:3975 g) Zinc rich paint shall be applied on strip/wire and its joint surface.
3.6	Outer Sheath	a) Extruded FRLS outer sheath of PVC (ST-2) shall be as per IS:5831 b) Colour : • For multi core cables-**Orange/Yellow as per tender requirement** • For single core cables **– Orange/Black as per tender requirement** c) FRLS Outer sheath of all the LT cables shall be UV resistant; as these cables are laid in air exposed to sun. Bidder to ensure the same for these requirements supported by required test. d) Shape of the cable over the outer sheath shall be circular, when manufactured/completed. e) The FRLS outer Sheath shall be embossed with following minimum text: i) The voltage designation ii) Type of construction /cable code (For e.g. A2XWY/A2XFY) iii) FRLS iv) Manufacture name/Trade mark v) Number of Cores and nominal cross section area of conductor vi) Name of buyer i.e BSES vii) Month & year of manufacturing viii) IS reference , i.e. IS:7098 ix) P.O No. and Date x) Font size shall be 5/5mm xi) ISI mark The embossing shall be progressive, automatic, in line and marking shall be legible and indelible. Following points shall be printed on every meter of cable i. Progressive (Sequential) length of cable at every meter, starting from zero for every drum. Colour filled in for the progressive marking, shall be with proper contrast in colouring. ii. Drum number marking on every meter of the cable length
3.7	Bending Radius	Bending Radius of cable shall comply to IS:1255
3.8	Sealing of cable end	Both ends of the cable shall be sealed by means of non-hygroscopic

		heat shrinkable PVC caps
3.9	FRLS Properties	Oxygen Index : Not less than 29% as per ASTM 2863
		Temperature Index : 250 Deg C at Oxygen Index 21 (when tested as per ASTM D 2863)
		Max Acid Gas Generation – Not more than 20% as per IEC -60754-1
		Light Transmission - Minimum 40% when tested as per ASTMD 2843 (Smoke Density rating shall be max 60%)
		Flammability Test – IEC 60332 part -1

4.0 CABLE DRUM

4.1	Reference Standard	Cable drum shall comply with IS: 10418.
4.2	Type of Drum	Wooden drums with anti termite treatment. (The drums shall be provided with M.S spindle plate and nut-bolts arrangement as per IS : 10418)
4.3	Drum Length & Tolerance	• For 2C X 10 mm^2 Cable - 1000+/-5% Mtr • For all Other cable sizes - 500 +/-5% Mtr
4.4	Overall Tolerance	-2 % for the total cable length for the entire order.
4.5	Short Length of Cable	a) Minimum acceptable length (Max. is 525 mtr) shall be 1 % of the total ordered qty. & no length shall be less than 250 mtr. Manufactures shall be taken prior approval from BSES Engineering for any short length supply. Short length will be accepted in last lot. b) Manufacture shall not be allowed to put two cable pieces of different short length in same cable drum
4.6	Preventive Measure for cable Drum	a) The surface of the drum and outer most cable layer shall be covered with water proof layer b) Ferrous part of wooden drum shall be treated with suitable rust preventive paint/coating to minimize rusting during storage.
4.7	Drum Identification Labels	a) Drum identification number b) Cable voltage grade c) Cable code (eg. A2XFY/A2XWY) d) Number of cores and cross sectional area e) Cable quantity i.e cable length (Meters) f) Purchase order number, date & SAP item code g) Total weight of cable and drum (kg) h) Manufacture's and Buyer's name i) Month & year of manufacturing j) Direction of rotation of drum; an arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled. k) Cable length final end-marking (i.e reading at the inner end

		and reading at the outer end, just before packing shall be marked on the drum.

5.0 PACKING, SHIPPING, HANDLING & STORAGE

5.1	Shipping information Plan	The seller shall be give complete shipping information concerning the weight ,size of each package
5.2	Transit Damage	The seller shall be held responsible for all transit damage due to improper packing/inside cable damaged found in store/site
5.3	Cable Drum Handling	The drum shall be with M.S spindle plate(with nut –bolts) of adequate size to suit the spindle rod , normally required for handling the drums , according to expected weight of the cable drums as per IS:10418

6.0 QUALITY ASSURANCE, TESTING& INSPECTION

All the tests shall be carried out in accordance with IEC / IS standards.

6.1	Quality Assurance Plan	In event of order manufacturer has to submit the signed copy of QAP.
6.2	Inspection hold points	AS per approved QAP (QAP shall be approved at the time of GTP approval)
6.3	Routine Test	a) Measurement of Electrical Resistance b) HV test with power frequency AC voltage
6.4	Type Test	**For bid participation–** (a) Bidder must be submitted cable type tested report from CPRI/ERDA/NABL approved lab for the type, size & rating of similar or higher sizes of offered cable along with bid. **After award of P.O.-** (b) If a bidder has valid type test report from CPRI/ERDA lab for the type, size & rating of similar or higher sizes of offered cable (including FRLS)—No need to conduct fresh type test from CPRI/ERDA lab. (c) If a bidder has valid type test report from CPRI/ERDA lab for the type, size & rating of similar or higher sizes of offered cable (except FRLS)—Need to conduct only fresh type test of FRLS properties test from CPRI/ERDA/NABL lab(list of tests mentioned in clause 3.9)without any commercial implication to BSES. (d) If a bidder has valid type test report from NABL lab for the type, size & rating of similar or higher sizes of offered cable (including FRLS)—Need to conduct complete type test (including FRLS properties) from CPRI/ERDA lab without any

		commercial implication to BSES. (Type test shall not be more than 5 years old. If the type test report is more than 5 years old (max 10 years), it can be considered subject to no change in their design) (e) UV resistance test to be carried out on one sample from CPRI/ERDA/NABL Accredited Lab as per ASTM standard (sample shall meet minimum 80% retention in tensile strength and elongation after exposure of 21 days as per ASTM standard).
6.5	Acceptance Test (Shall be conducted as per Cl.15.2 of IS 7098 Part-1 & IS 1554 part 1 for each lot of cable)	a) For cable sizes up to 25 mm^2 – one sample for chemical composition and purity test of aluminium shall be conducted per300km of ordered quantity and multiple thereof. b) For cable sizes 50mm^2 – one sample for chemical composition and purity test of aluminium shall be conducted per 100km of ordered quantity and multiple thereof. c) For cable sizes above 50 mm^2 – one sample for chemical composition and purity test of aluminium shall be conducted upto 50km of ordered quantity and multiple thereof. d) Chemical composition and purity test of aluminium shall be conducted from the lot offered to BSES on each size involved in the purchase order. Test shall be carried out at NABL accredited third party lab without any price implication to BSES. e) The sample will be selected either during acceptance test or after receipt of cable in BSES Stores.
6.6	Inspection	a) The buyer reserves the right to witness all tests specified on completed cables b) The buyer reserves the right to inspect cables at the seller's works at any time prior to dispatch either in finished form or during manufacturing, to prove compliance with the specifications. c) In-process and final inspection call intimation shall be given in 10 days advance to purchaser/CES.
6.7	Test Certificates	Complete test certificates (routine & acceptance tests) need to be submitted along with the delivery of cables.

7.0 DOCUMENT SUBMISSION MATRIX

Document/Drawing submission shall be as per the matrix given below:

a. All documents/drawings shall be provided in soft copy only via mail or in returnable Pen drives
b. Language of the documents shall be English only.
c. Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure

d. No submission is acceptable without check list compliance.
e. Deficient/ improper or incomplete document/ drawing submission shall be liable for rejection.
f. Order of documents shall be strictly as per the check list.
g. Any document not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope

S No.	Detail of Document	Bid	Approval	Pre Dispatch
1	Guaranteed Technical Particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Detailed cross sectional drawing of cable	Required	Required	
4	Dimensional drawing of cable drum	Required	Required	
4	Type test reports of offered type and rating of cable	Required	Required	
5	BIS certificate	Required		
6	Complete cable catalogue	Required		
7	Make of Raw Materials	Required	Required	
8	Cable de-rating factors	Required	Required	
9	Armour coverage calculation		Required	
10	Inspection test reports and Routine Test Certificates carried out in manufacturer's works			Required
12	Test certificates of all raw materials			Required
13	Calibration test reports of instruments			Required

8.0 PROGRESS REPORTING

8.1	Outline Document	To be submitted for purchaser approval for outline of Production-inspection, testing-inspection, packing, dispatch, documentation programme.
8.2	Detailed Progress Report	To be submitted to purchaser once a month containing a) Progress on material procurement b) Progress on fabrication (As applicable) c) Progress on assembly (As applicable) d) Progress on internal stage inspection e) Reason for any delay in total programme f) Details of test failures if any in manufacturing stages. g) Progress on final box up constraints/forward path.

9.0 DEVIATION

a) Deviations from this specification shall be listed separately by bidder clause wise (format given below) along with optional offer and has to submit the list along with bid/quotation. BSES will review the deviations and if BSES is agreed with the deviation, seller has to take written confirmation from BSES on deviation during tender evaluation.

b) In the absence of any separate list of deviations from the bidders with bid as well as written confirmation from BSES on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.

c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not consider as a deviation from this tech spec at any stage of contract.

Deviation sheet format

Sl. No.	Document Name	Clause No.	Deviation	Reason	Merit to BSES

10.0 Annexure -A

GUARANTEED TECHNICAL PARTICULARS (Multi-core)

(Standard Cable sizes are 2cx10, 2cx25, 4cx25, 4cx50, 4C X 95, 4cx150, 4cx300, 4cx400)

For each size /rating separate GTP need to be furnished

Sr. No.	Description	Buyer's Requirement	Seller's data
	Manufacture Contact Person & Number		
	Purchase Req. No.	……..	
	Guarantee Period: (Min)	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by vendor	As mentioned in the clause no – 2.0	
1	Make	…	
2	Type (as required by purchaser)		
A	For 2CX10Sqmm	A2XWY	
B	For Sizes above 10 mm^2	A2XFY	
3	Voltage Grade (kV)	1.1	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl.3.1	
B	Make of Al	Ref Annexure D	
C	Size (mm^2)	…… mm^2	
D	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
E	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	

Sr. No.	Description	Buyer's Requirement	Seller's data
F	Shape of Conductor	As per Cl.3.1 (e)	
G	Diameter over conductor (mm)	……	
H	Maximum Conductor resistance at 20 ° C(Ohm/Km)	As per Table 2 of IS 8130	
6	Insulation		
A	Insulation Material	As per Cl. 3.2	
B	Nominal thickness (mm)	As per Table 3 of IS 7098 Part-1	
C	Diameter over Insulation (mm) Approx.	……	
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath		
A	Material and Type	As per Cl. 3.4	
B	Minimum thickness	As per Table 5 of IS 7098 Part-1	
C	Approx. dia. Over sheath (mm)	……	
8	Galvanized Steel Armour	as per purchaser's site - specific condition	
A	Material		
a)	For 2CX10 mm^2	G.I. Wire	
(i)	Wire Dia. (mm)	1.4+/-0.040	
(ii)	No. of wires	As per Manufacturer Standard	
b)	For sizes above 10 mm^2	G.I. Strip	
(i)	Strip size (Width and Thickness)	4x0.8 (Zero negative tolerance for thickness)	
(ii)	No. of Strips	As per Manufacturer Standard	
B	Area covered by Armour	Min 90% and calculations shall be strictly as per Annexure-D	
C	Dia. over Armour – Approx.(mm)	……	

Sr. No.	Description	Buyer's Requirement	Seller's data
9	Outer Sheath (FRLS)		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Orange	
D	Embossing Details	As per Cl.3.6 (e)	
10	Approx. overall dia. (mm)	……	
11	Overall order tolerance	- 2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl. 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	……	
a)	Net Weight of cable (Kg/Km.) – Approx		
b)	Weight of empty drum	Kg	
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	……	
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	

Sr. No.	Description	Buyer's Requirement	Seller's data
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius	..... x O/D	
19	De-rating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed? Yes /No	
23	FRLS Properties	As per IS 1554, Part-1	
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	
	Light Transmission / Smoke Density	As per IS 1554, Part	

11.0 ANNEXTURE- B

GUARANTEED TECHNICAL PARTICULARS (Single Core)

(Separate GTP needs to be furnished for 25, 95, 300, 500, 630 & 1000 mm^2 cables)

S.No.	Description	Buyer's Requirement	Seller's data
	Manufacture Contact Person & Number		
	Purchase Req. No.	……..	
	Guarantee Period: (Min)	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by Vendor	As mentioned in the clause no-2.0	
1	Make	……	
2	Type	A2XY (Un-armoured)	
3	Voltage Grade (kV)	1.1kV	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl. 3.1	
B	Size (mm^2)	.....mm^2	
C	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
D	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	
E	Shape of conductor	Compacted Circular	
F	Diameter over conductor (mm)	……	
G	Maximum Conductor resistance at 20 ° C(Ohm/Km)	As per Table 2 of IS 8130	
H	Make of Al	Ref Annexure D	
6	Insulation	As per Table 3 of IS7098 Part-1	
A	Insulation Material	As per Cl. 3.2	

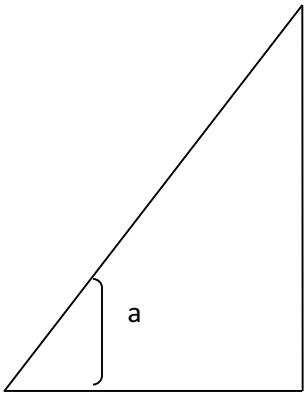
S.No.	Description	Buyer's Requirement	Seller's data
B	Nominal thickness (mm)		
(i)	For 1Cx300 mm^2	1.8 mm	
(ii)	For 1Cx500 mm^2	2.2 mm	
(iii)	For 1Cx630 mm^2	2.4 mm	
iv)	For 1Cx1000 mm^2	2.8 mm	
C	Diameter over Insulation (mm) Approx.	……	
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath	Not applicable	
8	Armour	Not applicable	
9	FRLS Outer Sheath		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Orange	
D	Embossing Details	As per Cl.3.6 (e)	
10	Approx. overall dia. (mm)	……	
11	Overall order tolerance	-2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl. 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	……	
a)	Net Weight of cable (Kg/Km.) – Approx		
b)	Weight of empty drum	Kg	

S.No.	Description	Buyer's Requirement	Seller's data
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	……	
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius	..... x O/D	
19	Derating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed?	

S.No.	Description	Buyer's Requirement	Seller's data
		Yes /No	
23	FRLS Properties		
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	
	Light Transmission / Smoke Density	As per IS 1554, Part	

12.0 ANNEXTURE – C

ARMOUR COVERAGE PERCENTAGE



Percent coverage = $\frac{N \times d}{W} \times 100$

Where,
N = number of parallel wires / Strips
d = diameter of wire / width of formed wires
W = π x D x Cos a,
D = diameter under armour
a = angle between armouring wire / formed wires and axis of cable
tan a = π x D/C, and
C = lay length of armouring wires / formed wires.

Min 90% armour coverage shall be provided both in case of wires and strips.

The gap between armour wires / formed wires shall not exceed one armour wire / Formed wire space and there shall be no cross over / over-riding of armour wire / Formed wire so, the minimum area of coverage of armouring shall be 90%.

13.0 ANNEXTURE – D

LIST OF SUB-VENDORS

Sr. No.	Description of Material	Sub-Vendors
1	E.C Grade Aluminium Rod	Bharat Aluminium Co. Ltd. (BALCO) Hindustan Aluminium Co. Ltd. (HINDALCO) National Aluminium Co. Ltd. (NALCO)
2	XLPE Compound	Kkalpana Industries Ltd. KLJ Polymers and Chemicals Ltd. Dow Chemical, U.S.A Borealis, Sweden Hanwha, Seoul, South Korea
3	PVC Compound	Kkalpana Industries Ltd. KLJ Polymers and Chemicals Ltd. Universal SCJ Plastic Sriram Polytech Shri Ram Vinyl, Kota
4	GI Strip	Tata Balaji Systematic Mica Wires Pvt Ltd. Bansal Industries

BSES

TECHNICAL SPECIFICATION

FOR

FRLS CONTROL CABLE

SPECIFICATION NO. – BSES-TS-57-CCAB-R0

Rev:		0
Pages:		11
Date:		20 April 2022
Prepared by	Abhishek Vashistha	
	Rohit Patil	
Reviewed by	Puneet Duggal	
	Amit Tomar	
Approved by	Gaurav Sharma	
	Gopal Nariya	

INDEX

1.0 SCOPE

The scope of supply includes Design, Manufacture, Testing at manufacturer's works before dispatch, packing, delivery including unloading and stacking at site/store of Control Cable complete with all accessories.

2.0 STANDARDS & CODES

Materials, equipments and methods used in the manufacture of Cable shall conform to the latest edition of following:

S No.	STANDARD	DESCRIPTION
2.1	IS- 1554 Part-1	PVC insulated Cables
2.2	IS- 5831 : 1984	PVC insulation & sheath of electric cables.
2.3	IS- 10810 : 1984	Methods of test for cables.
2.4	IS- 8130 : 1984	Conductors for insulated electric cables and flexible cords.
2.5	IS- 3961 Part 2	Recommended current ratings for PVC insulated and PVC sheathed heavy duty Cables
2.6	IS- 3975 : 1999	Mild steel wires, formed wires and tapes for armouring of cables.
2.7	IS- 10418 : 1982	Drums for Electric Cables
2.8	IEC 60228 Ed.3.0 b	Conductors of insulated cables.
2.9	IEC 60332-3-21 Ed.1.0 b	Tests on electric cables under fire conditions. Part 3-21. Tests on bunched wires or cables.
2.10	IEC 60502-1 Ed. 2.1 b	Power cables with extruded insulation and their accessories for rated voltage from 1kV upto 30kV –Part 1: cables for rated voltages of 1kV and 3kV
2.11	IEC 60811	Common test methods for insulating and sheathing materials of electric cables.
2.12	IEC 60885 Ed.1.0 b	Electric test methods for electric cables.
2.13	IEC 60227	PVC insulated cables of rated voltages up to and including 450/750 V.
2.14	IEC 60028 Ed. 2.0 b	International Standard of Resistance for Copper
2.15	ASTMD 2843	Standard Test Method for density of Smoke from the burning or decomposition of cables
2.16	ASTM 2863	Standard Test Method for measuring of minimum oxygen concentration
2.17	IEC 60754-1	Test on gases evolved during combustion of materials for cables. Part 1 – Determination of the Halogen Acid gas Content

3.0 SERVICE CONDITIONS

Control Cables to be supplied against this specification shall be suitable for satisfactory operation under the following conditions-

3.1	Average grade atmosphere	Heavily polluted, Dry
3.2	Maximum altitude above sea level	1000M
3.3	Relative Humidity	100%
3.4	Ambient air temperature	Highest 50 Deg C Average 40 Deg C Minimum 0 Deg C
3.5	Operating temperature	0 Deg C - 50 Deg C
3.6	Rainfall	750mm concentrated in four months

4.0 DESIGN FEATURES

(Refer Annexure – "A")

S No.	Parameters	Technical Requirements
4.1	Cable construction Features	Size & dimensions of each item mentioned under this clause shall be followed as detailed out in GTP, refer Annexure A
4.2	Conductor	• Stranded, plain copper, circular • Shall be made from high conductivity copper rods
4.3	Insulation	Extruded PVC Insulation Type A as per IS 5831
4.4	Core Identification	As per IS 1554 Part 1
4.5	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 as per IS 5831
4.6	Armour	• As per Clause 13.2 of IS 1554 Part-1: Galvanized steel round wire armour. • Minimum area of coverage of armouring shall be not less than 90 %. (refer Annex C of IS 1554-part 1 for % calculation)

S No.	Parameters	Technical Requirements
4.7	Outer Sheath	a) Extruded outer sheath of PVC type ST-2 as per IS 5831 having FRLS properties b) Color : Black c) The Outer Sheath shall be embossed with: i. The voltage designation ii. Type of construction / cable code (for e.g. AYWY) iii. Manufacturers Name or Trade mark iv. Number of Cores and nominal cross sectional area of conductors v. The drum progressive length of cable and individual drum number at every meter. (By Printing) vi. Name of buyer i.e. BSES vii. Month & Year of Manufacturing viii. P.O. No. and P.O. Date
4.8	FRLS Properties	a) Oxygen Index : Not less than 29% as per ASTM 2863 b) Temperature Index: 250°C at Oxygen Index 21 (when tested as per ASTM D 2863) c) Max Acid Gas Generation – Not more than 20% as per IEC -60754-1 d) Light Transmission - Minimum 40% when tested as per ASTMD 2843 (Smoke Density rating shall be max 60%) e) Flammability Test – As per IEC 60332-III, Cat – B, IEC 60332- I, IS- 10810 – Part 53, IS:10810 – Part 61 & 62 (Category A)
4.9	Sealing of cable end	Both ends of the cable shall be sealed with PVC Cap.
4.10	Drum length & tolerance	500 mtr (+/- 5%)
4.11	Overall tolerance in cable length	- 2 %
4.12	Short length of cables	a) Minimum acceptable short length shall be above 100 meters. Manufacturer shall be required to take prior approval from engineering for any short length supply. b) Manufacturer shall not be allowed to put two cable pieces of different short lengths in same cable drum. c) Only 1% of the total ordered quantity.

5.0 QUALITY ASSURANCE PLAN, INSPECTION AND TESTING

S No.	Parameters	Technical Requirements
5.1	Quality Assurance Plan	QAP Shall be submitted by vendor for approval. Inspection and testing of the material shall be carried out accordingly.
5.2	Type test	Cables must be of type tested as per relevant IS/IEC/ASTM. Type test conducted either from CPRI/ERDA/NABL third party accredited lab will be treated as valid. Type test reports shall be submitted for the type, size & rating of cable offered along with bid.
5.3	Routine test	Each drum length of cable shall be subjected to the routine tests as mentioned in IS 1554 part -1
5.4	Acceptance Tests	The sampling & acceptance tests Shall be conducted, as per IS 1554 Part-1 and approved QA plan, for each lot of cable during the inspection of lot at manufacturer's works.
5.5	Inspection	a) The buyer reserves the right to inspect cables at the Seller's works at any time prior dispatch, to verify compliance with the specifications. b) In-process and final inspection call intimation shall be given in 15 days advance to purchaser. c) In the event of any discrepancy in the test reports i.e. test reports not acceptable or any type tests (including special /additional tests, if any) not carried out, same shall be carried out without any cost implication to BSES before dispatch of cable.
5.6	Test certificates	Test certificates (routine and acceptance) shall be submitted along with the dispatch documents.

6.0 PACKING, SHIPPING, HANDLING & SITE SUPPORT

6.1	Packing	The cable shall be wound on wooden drums (with anti termite treatment and M.S. spindle plate with nut-bolts). Cable should be packed conforming to Indian / international standards. The drum shall be fully enclosed by suitable packing preferably PP sheeting.
6.2	Drum identification label	The following information shall be marked on the drum: a) Drum identification number b) Trade name or trade mark; if any c) Name of manufacturer d) Name of buyer i.e. BSES e) Cable voltage grade f) Cable code (e.g. YWY) g) Number of cores and cross sectional area h) Purchase order number with SAP item code i) Year and month of manufacturing j) Direction of rotation of drum (an arrow) k) Net weight of cable in drum and gross weight of cable with drum l) Batch no or Lot no. m) Cable length initial reading & end reading shall be marked on drum. Cable starting end shall be taken out from winding to read this drum reading with proper sealing to protect against external damage.
6.3	Shipping	The seller shall give complete shipping information concerning the gross weight, size of each packing.
6.4	Handling & Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet/manual needs to be furnished before commencement of supply.
6.5	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

7.0 DEVIATIONS

7.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification.

8.0 DOCUMENT SUBMISSION MATRIX

Document/Drawing submission shall be as per the matrix given below. All documents/drawings shall be provided in soft copy only in returnable Pen drives. Language of the documents shall be English only. Incomplete submission shall be liable for rejection.

S No.	Description	Bid	Approval	Pre Dispatch
8.1	Guaranteed Technical Particulars (GTP)	required	required	
8.2	Deviation Sheet, if any	required	required	
8.3	Detailed cross sectional drawing of cable	required	required	
8.4	Dimensional drawing of Cable Drum		required	
8.5	Type test reports for the offered type and rating of cable	required	required	
8.6	BIS Certificate	required		
8.7	Make of Raw Materials	required	required	
8.8	Cable de-rating factors	required	required	
8.9	Manufacturer's Quality Assurance Plan		required	
8.10	Detailed installation & commissioning instructions		required	
8.11	Test certificates of all raw materials			required
8.12	Inspection and routine test reports, carried out in manufacturer's works			required

Annexure – A: Guaranteed Technical Particulars (Data by Supplier)

(Standard Cable sizes are 2Cx2.5, 4Cx2.5, 6C X 2.5, 8Cx2.5, 10Cx2.5, 12C X 2.5 mm^2)

For each size separate GTP need to be furnished

***For any size other than standard sizes mentioned, GTP should be as per IS or requirement whichever applicable**

Sr.	Description	Buyer's requirement	Vendor's Data
	Purchase Req. No.	….	
	Guarantee Period: 5 Years	60/66 Months	
1.0	Make	To be specified by vendor	
2.0	Type (AS PER IS 1554 part -1)	YWY	
3.0	Voltage Grade (KV)	1.1	
4.0	Maximum Conductor temperature		
a)	Continuous (° C)	70°C	
b)	Short time (° C)	160°C	
5.0	Conductor		
a)	Size (mm^2)	2.5	
b)	No. of wires in each conductor	As per Manufacturer standard	
c)	Dia. of wires in each conductor before compaction (mm)	As per Manufacturer standard	
d)	Shape of Conductor	As per Clause 4.2 of specification	
e)	Diameter over conductor mm	To be specified by vendor	
f)	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
6.0	Insulation	As per Table 1 of IS:5831 – 1984	
a)	Nominal thickness (mm)	As per Clause 4.3 of specification & Table 2 of IS 1554(Part-1)	
b)	Minimum thickness (mm)		
c)	Core Identification	As per IS 1554 Part 1	
d)	Approx. dia. over Insulation (mm)	To be specified by	

Sr.	Description	Buyer's requirement	Vendor's Data
		vendor	
7.0	Inner Sheath	As per Table 2 of IS:5831 – 1984	
a)	Minimum thickness (mm)	As per Table 4 of IS 1554(Part-1)	
b)	Approx. dia. Over sheath (mm)	To be specified by vendor	
8.0	Galvanized Steel Armour	As per IS 1554-part 1	
a)	Number of armour wire	As per Manufacturer Std.	
b)	Nominal dia. of Round Wire	As per Table 5 of IS 1554(Part-1)	
c)	Dia. over armour – approx.	To be specified by vendor	
d)	Lay Ratio	To be specified by vendor	
e)	Confirm minimum 90% coverage (submit calculation)		
9.0	Outer Sheath (FRLS)	As per Table 2 of IS:5831 – 1984	
a)	Thickness (min)	As per Table 7 of IS 1554(Part-1)	
b)	Color	Black	
10.0	Approx. overall dia. (mm)	To be specified by vendor	
11.0	Drum length & tolerance	As per clause 4.10 of specification	
12.0	End Cap	Required	
13.0	Drums provide with MS Spindle plate & Nut bolts arrangement	Required	
14.0	Net Weight of cable (Kg/Km.) – approx.	To be specified by vendor	

Sr.	Description	Buyer's requirement	Vendor's Data
15.0	Continuous current rating for standard I.S. condition laid Direct		
a)	In ground 30° C Amps	To be specified by vendor	
b)	In duct 30° C Amps	To be specified by vendor	
c)	In Air 40° C Amps	To be specified by vendor	
16.0	Short circuit current for 1 sec of conductor. (KAmp)	To be specified by vendor	
17.0	Electrical Parameters at Maximum Operating temperature:		
a)	Resistance (Ohm/Km) (AC Resistance)	To be specified by vendor	
b)	Reactance at 50 C/s (Ohm/Km)	To be specified by vendor	
c)	Impedance (Ohm/Km)	To be specified by vendor	
d)	Capacitance (Micro farad / KM)	To be specified by vendor	
18.0	Recommended minimum bending radius	…. x O/D	
19.0	FRLS Properties		
a)	Oxygen Index	To be specified by vendor	
b)	Temperature Index	To be specified by vendor	
c)	Max Acid Gas Generation	To be specified by vendor	
d)	Light Transmission / Smoke Density	To be specified by vendor	

Technical Specification

of

Illumination and Lighting System

Specification no – BSES-TS-98-ILS-R0

Rev		0
Page		1 of 12
Date		17 May 2022
Prepared by	Bhanu Gehlot	
	Uttam Shukla	
Reviewed by	Abhinav Srivastava	
Approved by	Gopal Nariya	

INDEX

1. SCOPE

The specification covers the design, engineering, manufacture, assembly and testing at manufacturer's work, supply and installation of Illumination system for substation including normal distribution pillars, normal lighting board, emergency distribution pillar, emergency lighting board, Junction boxes, Illumination lamps with required lux level.

2. STANDARDS AND CODES

Standard Code	Standard Description
IS 16101 : 2012	General Lighting -LEDs and LED modules – Terms and Definitions
IS16102(Part 1) 2012	Self-Ballasted LED Lamps for General Lighting Services, Part 1 Safety Requirements
IS16102(Part 2) 2012	Self-Ballasted LED Lamps for General Lighting Services, Part 2 Performance Requirements
IS16103(Part 1) 2012	Led Modules for General Lighting, Part 1Safety Requirements
IS16103(Part 2) 2012	Led Modules for General Lighting, Part 2 Performance Requirements
IS15885(Part2/Sec13)	Safety of Lamp Control Gear , Part 2 Particular Requirements , Section 13 dc. or ac. Supplied Electronic Control gear for Led Modules
IS16104 : 2012	d.c. or a.c. Supplied Electronic Control Gear for LED Modules - Performance Requirements
IS16105 : 2012	Method of Measurement of Lumen Maintenance of Solid State Light (LED) Sources
IS16106 : 2012	Method of Electrical and Photometric Measurements of Solid-State Lighting (LED) Products
IS 16107(Part 1)2012	Luminaires Performance ,Part 1 General Requirements
IS 16107(Part 2)2012	Luminaires Performance, Part 2 Particular Requirements ,Section 1 LED Luminaire
IS 16108 : 2012	Photo biological Safety of Lamps and Lamp Systems
IS 10322 : 2012	Luminaires: Part 5 Particular requirements, Section 3 Luminaires for road and street lighting
IS 5	Colours for Ready Mixed Paints and Enamels
IS 613	Copper Rods and Bars for electrical purposes
IS 694	PVC Insulated cables for working voltages up to and including 1100 V
IS 2551	Danger notice plates
IS 5082	Wrought Aluminium and Aluminium alloy bars, rods, tubes and sections for electrical purpose
IS 6665	Code of practice for industrial lighting
IS 13703	LV Fuses for voltage not exceeding 1000V ac or 1500V dc
IS 10118	Code of Practice for Selection, Installation and Maintenance of

	Switchgear and Controlgear
International Standard	
IEC 62612	Self-ballasted LED lamps for general lighting services for voltage above 50 V — Performance requirements
IEC : 60598-2-3	Particular requirements - Luminaries for road and street lighting
IEC 62471	Photo biological safety of lamps and lamp systems
IEC 62778	Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaries
IEC 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
IEC 60439	Low Voltage Switchgear and Controlgear assemblies - Type tested and partially type tested assemblies
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 60947-1	Low Voltage Switchgear and Controlgear - General Rules
IEC 60947-2	Low Voltage Switchgear and Controlgear - Circuit breakers
IEC 61643	Low-voltage surge protective devices

3. ILLUMINATION SYSTEM

3.1.	Lux level requirement	3.1.1. The design of the illumination system shall ensure availability of the average illumination levels as specified below with the maximum possible uniformity in the entire substation. The illumination system shall consist of the normal lighting system and emergency lighting system. The minimum illumination levels shall be as specified below(Reference IS3646(Part II)). 3.1.1.1. Roads within substation : 20 lux 3.1.1.2. Boundary wall of the substation : 10 lux 3.1.1.3. Control room : 300 lux 3.1.1.4. Switchgear Room : 200 lux 3.1.1.5. Battery room : 100 lux 3.1.1.6. Stair case : 100 lux 3.1.1.7. Power Transformers : 100 lux 3.1.1.8. Cable cellar/ Indoor trench : 70 lux 3.1.1.9. Outdoor switchyard : 70 lux 3.1.1.10. APFC/ station trafo : 70 lux 3.1.2. Contractor shall design the lighting system with the help of desired software. Owner shall verify the same post commissioning with lux meter to check the levels. In case desired lux levels are not met contractor has to install addition fitting in outdoor and indoor location as per requirement. 3.1.3. Complete design calculation sheets for arriving at the number of luminaires required for the normal and emergency requirements shall be furnished by the bidder. Design calculation sheets for the selection of cables, MCB, HRC fuses, bus bars, etc. are also required to be furnished for Owner's approval.

3.2.	Illumination circuit	3.2.1.	The illumination system load and welding load in the substation area shall be supplied from 415/230 volt ACDBs to be provided in the substation control room. Requisite numbers of 3-phase, 4-wire, cable circuits for illumination system and welding socket outlets shall be extended from the above board. The laying of cables from the Board to the illumination system/welding socket outlets and their installation are included in the Bidder's scope.
		3.2.2.	Each outgoing cable circuit for illumination loads from the 415 volt switchboard shall terminate in the respective outdoor pillar boxes located in the substation. Outgoing feeders from the illumination shall be taken to the various illumination points in the substation. Necessary fuses shall be provided near light fixtures in the substation.
		3.2.3.	The emergency illumination load shall be supplied from the main emergency illumination board located in the control room. Necessary cable circuits with appropriate fuses shall be provided by the Contractor for the supply system for emergency illumination load of the substation.
		3.2.4.	Emergency DC lighting system shall be provided in the substation wherever required. The emergency lighting shall be adequate for safe movement by the operating personnel in the substation in the event of failure of normal lighting system. Number of lights shall be decided at the time of detailed engineering. A total of minimum 12 no's individually controllable 18 watt LEDs shall be provided in the substation.
		3.2.5.	6 Nos. welding sockets to be provided, 4 Nos. in Outdoor Yard & 2 Nos. in Control room building.
		3.2.6.	Illumination to be provided inside the Indoor trenches as per required lux level.
3.3.	Wiring	3.3.1.	All lighting fixtures and 5A convenience outlets shall be wired with 1.1 KV grade PVC insulated extra flexible, multistranded, copper conductor cables of size not less than 2.5 sq.mm.
		3.3.2.	For 15A heavy-duty outlets copper conductor cables of size not less than 6 sq. mm shall be used.
		3.3.3.	The wiring shall consist of phase, neutral and ground. For grounding the lighting fixtures/convenience outlets etc. Green CU wire of size 2.5 sqmm shall be used. The phase and neutral conductor shall be suitably colour coded. For DC black & white wires to be used.
		3.3.4.	Supply shall be looped between the lighting fixtures of the same circuit by using junction boxes. For this purpose one (1) 100 mm x 100 mm square junction box shall be provided for each lighting fixture. For recessed lighting fixtures, supply shall be extended from the junction boxes to the fixtures by means of flexible conduits. The conduits shall be of HMS (High mechanical stress) type and of minimum dia 25 MM. While for stem-mounted/wall-mounted lighting fixtures the junction box shall be

		mounted below one of the mounting stems. 3.3.5. For lighting branch circuits the nos. of lighting switches shall be decided keeping in mind the ease of control, as well as to limit the current to 2.5A per circuit. 3.3.6. For convenience outlets, the bidder shall design the wiring scheme so as to limit 6 nos. of 5A outlets per branch circuit and two nos. of 15A outlets per branch circuit. 3.3.7. All wiring materials such as terminals, crimping lugs, ferrules etc. shall also be provided by the Contractor. 3.3.8. No section of the conduit shall be filled with more than 70% of its area. Any consumable material that is required for pulling the wires through conduit shall also be provided by the Contractor. 3.3.9. Lighting fixtures coming in one area shall be evenly distributed between three phases so that tripping of one phase or two phases does not cause total loss of illumination in that area.
3.4.	Required documents to be submitted	Complete manufacturer's literature/catalogues, performance curves, illumination distribution curves, G.A. drawings, specification sheets, etc. as relevant in respect of all materials/equipment to be supplied shall be submitted by the Contractor.
3.5.	Illumination system check after installation	After completion of installation of the illumination system in the substation, the actual illumination level at different locations shall be measured by the Contractor in the presence of Owner's authorised representative. If the average value of the measured illumination levels is found to fall short of the specified levels, the Contractor shall have to provide additional lighting fixtures so as to achieve the specified levels of illumination at no additional cost to the Owner. While measuring the illumination levels due allowance shall be made on account of maintenance factor. The specified lux levels shall be suitably increased to cover maintenance factor of 0.6 for outdoor areas.

4. DISTRIBUTION PILLARS FOR NORMAL ILLUMINATION SYSTEM

4.1.	Construction	4.1.1. Distribution pillars of adequate dimensions shall be constructed from sheet steel having a thickness not less than 2 mm. 4.1.2. The pillars shall be totally enclosed weather-proof, dustproof, vermin-proof, having hinged doors with locking arrangement and shall be capable of being mounted in the substation. 4.1.3. The pillars suitable for cable entry at the bottom shall be designed for easy access of connections to terminals and inspection of equipment mounted therein. 4.1.4. The degree of protection of the board shall be IP55. 4.1.5. The enclosure shall be painted externally with Shade No., 692 of IS:5 and internally with brilliant white of semi-glossy finish of IS:5. 4.1.6. Location of LDB, ELDB & PDB to be finalized during

		detailed engineering.
4.2.	Configuration	4.2.1. Each pillar shall accommodate the following: 4.2.2. One incoming, 4-pole (3 phase and neutral) isolating switch with MCB of appropriate current rating. 4.2.3. 3-phase and neutral bus bars of appropriate current rating. 4.2.4. Single-poleearth leakage circuit breakers of suitable current ratings on all outgoing circuits. 4.2.5. Neutral links for all outgoing circuits. 4.2.6. Cable lugs, compression type cable glands, name plates, circuit numbers, earthing lugs, etc. to make the pillar complete in all respects. 4.2.7. 20% spare outlets shall be provided for outgoing feeders. 4.2.8. Three (3) indicating lamps with fuses to indicate that supply is 'ON'.

5. LIGHTING DISTRIBUTION BOARDS

5.1.	Construction	5.1.1. Metal-clad enclosure with minimum 2 mm CRCA sheets for load-bearing members and 1.6 mm for non load-bearing members suitably reinforced with structural. 5.1.2. 3-phase, 4-wire bus bar system with high conductivity aluminium busbars mounting on FRP insulators having anti-tractive property with minimum 25 mm phase-to-phase and minimum 19 mm phase-to-earth clearances. The busbars shall be uniform throughout the length of the LDB and busbar joints shall be silver plated and covered with shrouds. 5.1.3. All cables shall enter from the bottom. 5.1.4. The degree of protection for the LDB shall be IP-54. 5.1.5. The enclosure shall be painted externally with Shade No., 692 of IS:5 and internally with brilliant white of semi-glossy finish of IS:5.
5.2.	Configuration	Each LDB shall accommodate the following: 5.2.1. One incoming, 4-pole (3 phase and neutral) isolating switch with MCB of appropriate current rating. 5.2.2. 3-phase and neutral bus bars of appropriate current rating. 5.2.3. 4 Pole outgoing MCBs of appropriate rating 5.2.4. Cable lugs, compression type cable glands, name plates, circuit numbers, earthing lugs, etc. to make the pillar complete in all respects. 5.2.5. 20% spare outlets shall be provided for outgoing feeders. 5.2.6. Three (3) Nos. indication lamps (Red, Yellow, Blue) shall be provided to indicate that the incoming supply is available. Similarly, 3 Nos. indication lamps shall be provided to indicate that the busbar is energised.
5.3.	Busbar	5.3.1. The busbars shall be suitable for short-time current rating of 40KA for 1 Sec.

		5.3.2. The busbar temperature rise shall not exceed 35 Deg C over an ambient of 50 Deg C. 5.3.3. The LDBs shall be provided with a continuous busbar of 25 x 6 sq.mm (electrolytic copper) with suitable hardware for connection to the main grounding grid

6. MAIN EMERGENCY LIGHTING BOARD

6.1.	Construction	6.1.1. Metal-clad enclosure with minimum 2 mm CRCA sheets for load-bearing members and 1.6 mm for non load-bearing members suitably reinforced with structural. 6.1.2. All cables shall enter from the bottom. 6.1.3. The degree of protection for the LDB shall be IP-54. 6.1.4. The enclosure shall be painted externally with Shade No., 692 to IS:5 and internally with brilliant white of semi-glossy finish to IS:5.
6.2.	Configuration	6.2.1. Each Board shall accommodate the followings: 6.2.2. Automatic changeover contactor. 6.2.3. Voltage sensing relays. 6.2.4. Time delay relay. 6.2.5. Bus Bars. 6.2.6. Two pole MCBs of adequate ratings for incoming and outgoing feeders. 6.2.7. Test switch, push button type. 6.2.8. Indicating lamps, ac - Green, dc - Red. 6.2.9. Terminals for remote indication 6.2.10. Cable lugs, compression type cable glands, name-plates, circuit numbers, earthing lugs and remote indication wiring upto substation 415V a.c. control board, to make the board complete in all respects.
6.3.	Changeover facility	The main emergency lighting board shall have an automatic changeover switch to energise the dc lighting system in the event of AC power failure. It shall have voltage-sensing relays to perform the changeover automatically when AC voltage of any one phase falls below 60 percent of 240 volts and continues at that low level for more than 10 seconds. These shall changeover from DC to AC again when 70 percent of 240 volt is restored and this continues for 10 seconds.
6.4.	Emergency Lighting Pillar	Local Emergency Lighting Pillar shall be identical in details to Lighting Distribution Pillar specified in clause 4 except that it shall have two pole isolating switch fuse unit on the incoming side and only two busbars and shall be without neutral links.

7. LUMINAIRES

7.1.	Luminaires type	Luminaires for use in normal and emergency illumination systems in the substation shall be suitable for LED lamps. All the luminaires shall be supplied complete with all accessories and lamps. The LED lamps ratings shall be adequate to achieve the required Lux level and calculation for number of luminaires shall be in the bidder's scope. Minimum rating shall be a follows - 7.1.1. Outdoor –90W minimum 7.1.2. Indoor –36W minimum
7.2.	Flood lights	The flood light luminaires in the substation shall be fixed at suitable height on the substation structures/ building, so as to provide the specified average illumination in the substation area without causing any glare to the operational/ maintenance staff working in the substation. While fixing the luminaires it shall be ensured that the stipulated electrical clearances are not violated. The Contractor shall supply and install suitable type of non-mettalic street light poles or octagonal galvanished poles required for installing the fittings for illuminating the roads, fence boundary wall etc.
7.3.	Reliability	Substation lighting circuits shall be divided into two or three sections and provided with time switches of suitable ratings.
7.4.	Design features for Outdoor Luminaires	
7.5.	Fixture	7.5.1. The luminaries housing shall be either extruded or pressure die casted aluminium of minimum 1.6 mm thickness. Body must be Corrosion Resistant Powder Coated and UV resistant. 7.5.2. The entire housing shall be dust and waterproof having Ingress protection of housing as IP65 or above as per IEC 60529. 7.5.3. Luminaire should be covered with suitable Glass or diffuser with high Transitivity. All luminaires shall be supplied with either clear toughened glass or clear polycarbonate cover for better IP retention and higher life.
7.6.	LED	7.6.1. Theluminousefficacy of LEDluminaireshall be atleast 85 lumen/watt. 7.6.2. LED module efficacy shall not be less than 90 percent of the rated LED module Efficacy. 7.6.3. Color Rendering Index (CRI) shall be at least 70 7.6.4. Color Temperature shall be 5500-6500K 7.6.5. Uniformity Emin/Eavg> 0.4, Emin/Emax>0.33
7.7.	LED Driver	LED driver shall have following features: 7.7.1. LED driver shall be applicable for Power supply 240V AC±10%, at 50Hz+3% / -5%. 7.7.2. Output voltage of the driver shall bedesigned to meet the

			Power Requirementsof the system.
		7.7.3.	Power factorofcompletefitting shall bemorethan 0.90atfull load.
		7.7.4.	Total Harmonic Distortion (THD) shall be< 10 %
7.8.	General Requirements	7.8.1.	The connecting wires used inside the Luminaire, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided in input side.
		7.8.2.	Thelumenmaintenanceof all theLEDfixturesshallnotbelessthan70%after50,000 hours.
		7.8.3.	Built in protection features for Short circuit, Surges (at least upto 5kV), and overvoltage shall be provided.
		7.8.4.	High /Low voltage cut-off shall be provided.
		7.8.5.	The whole luminaire shall be eco-friendly green technology based i.e. mercury free.
		7.8.6.	No UV and IR radiations shall be produced.
		7.8.7.	Access of driver for maintenance shall be provided at the top/side of the luminaire fixture.
		7.8.8.	All fasteners must be of stainless steel.

8. JUNCTION BOXES/WALL BOXES

8.1.	Size	100 mm x 100 mm junction boxes and wall boxes of standard size shall be provided.
8.2.	Construction	Wall boxes and junction boxes shall be made of FRP with a thickness of 2.0mm. Necessary conduit termination fittings such as bushings, locknuts etc. also be provided.

9. AUTOMATIC LIGHTING CONTROLLER

9.1.	Size	Contractor shall provide microprocessor based automatic lighting controller for controlling switching arrangement of indoor and outdoor lighting. The controller shall have provision of setting 52 week ON / OFF time as per astronomical clock or as per user requirement. All abnormal events shall be recorded in the controller. Secure / Genus or equivalent are approved makes.

10. SOCKETS & SWITCHES

10.1.	Indoor	All sockets and switches shall be modular and universal type suitable for 5/15A
10.2.	Outdoor	Two nos transformer oil filtration sockets shall be provided, one at each transformer bay. These sockets shall be three phase industrial type and rated for 100A.

11. NAMEPLATE & MARKING

11.1.	Name plate details of LED housing	Followings shall be clearly engraved/embossed on the die cast housing of LED: Rated voltage or voltage range (marked 'V' or 'Volt'); 11.1.1. Rated current (marked A' or 'Ampere'); 11.1.2. Rated wattage (marked 'W' or 'Watts'); 11.1.3. Rated frequency (marked in 'Hz') 11.1.4. Rated lumen 11.1.5. Indian/International Standards to which it is manufactured 11.1.6. Month and year manufacture 11.1.7. Customer Name - BSES Yamuna / Rajdhani Power Ltd 11.1.8. Fitting serial number 11.1.9. PO no and date 11.1.10. Guarantee period
11.2.	Panel nameplate and marking details	
11.2.1.	Panel nameplate	Panel shall have a nameplate clearly indicating the following: 11.2.1.1. Panel Serial No.- 11.2.1.2. Customer Name - BSES Yamuna/Rajdhani Power Ltd 11.2.1.3. PO No. & date - 11.2.1.4. Panel Name - 11.2.1.5. Current rating - 11.2.1.6. Guarantee period -
11.2.2.	Feeder nameplate	Large and bold name plate carrying the feeder identification shall be provided on the top of each module.
11.2.3.	Danger plate	Panel shall have a danger plate of anodized Aluminium clearly indicating the danger logo and voltage details.
11.2.4.	Material	Anodized Aluminium 16SWG. Nameplates shall be satin silver in colour with black letters engraved on them. Stickers are not allowed.
11.2.5.	Fixing	All nameplates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.

12. APPROVED MAKE OF COMPONENTS

12.1.	Relays	ABB/Jyoti/Omran
12.2.	HRC Fuse Links	GE/ Siemens/ L&T
12.3.	AC Contractors/ DC contactor	L&T/Siemens/Telemechanique/GE/ABB

12.4.	Terminals	Connectwell/Elmex/Wago/Phoenix
12.5.	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
12.6.	MCB	Legrand/Hager/Schneider/ABB
12.7.	LED	NICHIA/ OSRAM/ CREE/ PHILIPS//EDISON
12.8.	Luminaire fittings	GE/Philips/Crompton/Bajaj
12.9.	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

13. INSPECTION & TESTING

13.1.	Type test	All Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
13.2.	Acceptance & Routine tests	As per relevant Indian standard

14. DEVIATION

14.1.	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.

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

TECHNICAL SPECIFICATION

FOR

CABLE INSTALLATION & ACCESSORIES

Prepared by	**Javed Ahmed**		**Rev: 1**
Reviewed by	**Abhinav Srivastava**		**Date: 12th June 2018**
Approved by	**K.Sheshadri**		

Technical Specification for Cable Installation and Accessories

1.0 INSTALLATION OF CABLES:

1.1 The cable shall be laid as per IS 1255. The Contractor shall prepare cable schedules for all the cable circuits associated with the equipment in the substation showing length, size and routing of each cable which shall be given suitable code numbers and submit the same for Owner's/Engineer's information/approval. Cable and Conduit laying shall be done strictly in accordance with the cable schedules.

1.2 The control and power cables shall be laid in conduits, concrete pipes, ducts, trays or cable trenches unless indicated otherwise. The power and control cables shall be laid in different trays. Cables shall be cleated to the cable tray after properly dressing.

1.3 Ducts shall be provided wherever cable trenches cross roads with provision of one spare duct for future use.

1.4 All civil works, viz, excavations, sand cover, providing brick cover on directly laid cables, construction of foundations, trenches with cable tray supports, cable ducts under roads, back filling, finishing associated with cabling work shall be duly completed.

1.5 The Contractor shall supply and install all the surface mounted/ embedded rigid and flexible conduits, their connections, and associated clamps, bushings, lock-nuts, caps etc required in the cabling work.

1.6 All conduits and their accessories shall be made of galvanized heavy gauge steel as per BIS Specification. The internal bore of all pipes shall be smooth and suitable for pulling PVC sheathed cables without damage.

1.7 The Contractor shall supply all fittings including ordinary tees and elbows, check nuts, male and female fittings pull boxes, junction boxes, conduit outlets, outlet boxes, splice boxes, terminal boxes, gaskets and box covers, saddles and all supporting steel work and all such arrangements which are required to complete the conduit installations.

1.8 Pre-fabricated junction boxes, conduit boxes and conduits shall be shop fabricated out of malleable iron or steel plates and shall be galvanized and provided with galvanized malleable iron or steel plate covers and rubber gaskets

1.9 All the apparatus, connections and cable work shall be designed and arranged to eliminate the risk of fire and minimize damage which might be caused in the event of fire. Wherever cables pass through floor or wall openings or other partitions, suitable bushes of approved type shall be supplied and put in position by the Contractor.

1.10 Standard cable grips, reels and rollers shall be utilized for cable pulling.

1.11 Each cable, whether power or control, shall be provided with a metallic or plastic tag of an approved type, bearing cable reference number indicated in the cable schedule prepared by the Contractor, at every 10 meter run and at both ends of the cable, adjacent to the

terminations as well as where cables enter or leave ducts. Cable routing shall be so done that cables are accessible for identification and maintenance easily, and are arranged neatly.

1.12 In no case the cables shall be bent sharply or kinked with the radius of bending falling below 15D where D is the overall diameter of the cable.

1.13 When power cables are laid in the proximity of communication cables, the minimum horizontal and vertical separation between power and communication cables shall be 600 mm. Wherever possible the power and communication cables shall be located as far from each other as possible. The power and communication cables shall cross each other at right angles.

1.14 Wherever cables cross roads, water, oil, sewage or steam-lines, special care shall be taken while designing the trenches/ducts for protection of the cables.

1.15 In each cable run, some extra length shall be provided at a suitable location to enable making of one or two straight-through joints for carrying out repairs if the cable develops fault at a later date.

1.16 Cable splices shall not be permitted except where called for as per the construction drawings, or where permitted by the Engineer. Straight-through joints in the run of cables wherever unavoidable shall be through joint-boxes.

1.17 The termination of cables at various equipments shall be carefully made in accordance with the manufacturer's instructions and detailed connection diagrams.

Termination materials for all cables shall match with the type of cable insulation and have thermal and electrical ratings and chemical properties similar to those of the associated cable.
All terminating materials except for those already supplied with the electrical equipment shall be provided by the Contractor.

1.18 Control cable terminations shall be made in accordance with the color code marked wiring diagrams of control circuits. Multi-conductor control cable jackets shall be removed as required to train and terminate the conductors. The cable jacket shall be left on the cable, to the extent possible. The insulated conductors from which the jacket is removed shall be neatly trained in bundles and terminated. The bundles shall be firmly, but not tightly, tied utilizing plastic or nylon ties or specially treated fungus-proof cord.

1.19 The connectors for control cables shall preferably terminate in Ross Courteny terminals and washers and be covered with transparent insulating sleeves so as to prevent accidental contact with ground or adjacent terminals. The insulating sleeves shall be fire resistant and shall be long enough to overlap the conductor insulation.

1.20 When control cables are to be fanned out and tied together with cord, the Contractor shall make connections to terminal blocks and test the equipment for proper operation before tying the cables together with cord.

1.21 Jointing of cables shall be made in accordance with the applicable Bureau of Indian Standards Code of practice, Owners approval and manufacturer's special instructions. The materials and tools required for cable jointing work shall be in the Contractor's scope.

1.22 The supply of joint boxes shall include all hardware fittings, compounds, tapes and other materials required for making the joints.

Special tools, clips and saddles, glands, seals, PVC sealing compound, locknut, etc, required for connection and termination of cables shall be in the Contractor's scope.

1.23 All cables shall be megger-tested before jointing. After jointing is completed all L.V cables shall be megger-tested.

Cable cores shall be tested for:

i. Continuity.
ii. Absence of cross phasing
iii. Insulation resistance to earth.
iv. Insulation resistance between conductors.

2.0 CABLE TRAYS, ACCESSORIES & TRAY SUPPORTS, CONDUITS, PIPES AND DUCTS

2.1 Cable trays shall be run either in concrete cable trench or overhead supported from building steel. The cable trays shall be ladder type for power cable and perforated type for Control cable. The trays shall be supplied with matching fittings and accessories.

2.2 Cable tray shall be fabricated out of rolled mild steel sheets free from flaws such as laminations, rolling marks, pitting etc. Minimum thickness of cable trays shall be 2.0mm.

2.3 Cables shall be clamped to the cable trays in the horizontal runs with 18 gauge GI wires. For vertical runs the cables shall be clamped with suitable site-fabricated clamps.

2.4 All cable trays including perforated sheet trays, weld mesh trays, vertical raceways shall be hot-dip galvanized and epoxy coated. The trays shall be of standard width of 150mm, 300mm, 450mm & 600mm and standard length of 2.5M. Trays upto 300mm shall be perforated type and above 300 mm shall be ladder type.

2.5 The conductors carrying AC and DC supplies shall not be bunched together in a conduit. Where single-core cables are individually drawn into separate pipes, HDPE pipes shall be used.

Technical Specification for Cable Installation and Accessories

2.6 Flexible metallic conduits shall be used for termination of connections to equipment to be disconnected at periodic intervals and also for termination of connections to level switches, limit switches, pressure switches etc.

2.7 In order to minimize condensation or sweating inside the conduit, all outlets of the conduit system shall be properly drained and ventilated so to prevent entry of insects and water as far as possible.

2.8 The conduits or pipes shall be run along walls, floor and ceilings, on steel supports, embedded in soil, floor, wall or foundation, in accordance with the relevant layout drawings, approved by the Owner.

2.9 All fittings in the conduit systems having threaded connections shall be tightened with full thread engagement and with a minimum of wrench work in order to avoid wrench outs.

2.10 Embedded conduits running parallel to a masonry surface shall, wherever possible, have a cover of at least 38 mm.

2.11 The conduits shall be lead into terminal boxes through the entry points provided by the equipment manufacturers unless otherwise shown in the drawings or unless otherwise directed by the Engineer.

2.12 While installing asbestos pipe or other fiber conduit, cracked pieces shall not be used. The sections cracked or broken during or after placement shall be replaced.

2.13 For underground conduit runs the Contractor shall excavate and backfill as necessary.

2.14 Exposed conduit shall be adequately supported by racks and clamps or straps or by other approved means.

2.15 Where conduits are stubbed out of masonry for future extension outside the structure, they shall be specially protected against corrosion and shall be boxed in against possible physical damage.

2.16 Each conduit run shall be marked with its designation as indicated on the drawings - 'Identification'.

2.17 Where conduit and boxes in locations of severe exposure require, painting of galvanized surfaces with Alkyd Resin Zinc Dust paint following by a finish coat of Aluminum paint, shall be performed by the Contractor in a good and approved manner.

2.18 The Contractor shall bond of metal pipes or conduits in which cables have been installed to the main earthing system.

2.19 The conduits and accessories shall be adequately protected against mechanical damage as well as corrosion.

Technical Specification for Cable Installation and Accessories

3.0 TERMINATION AND STRIGHT THROUGH JOINTS

3.1 Termination and jointing kits for 11KV and 33KV grade XLPE insulated Aluminum cables shall be proven design and make already been extensively used and type tested. Termination kit and jointing kits shall be pre moulded type, taped type or heat shrinkable. The joints and termination shall be tested as per IS 13573. The kit contents shall be of proven design and type tested. Kit contents shall be supplied from the same source as were used for type tested. The kit shall be complete with Aluminum solderless crimping cable lugs and ferrules as DIN standard

The termination kit make and specification shall be strictly as per approval of the Owner.

3.2 The straight through and termination kit shall be suitable to withstand the fault level for 11KV and 33KV system

4.0 CABLE GLANDS, LUGS & ACCESSORIES

4.1 The cable shall be terminated using double compression type cable glands. The cable glands shall confirm to BS 6121 and of robust construction capable of clamping the cables and armour firmly without injury to the insulation. The cable glands shall be made out of heavy duty brass machine finished and nickel chrome plated. The thickness of plating shall not be less than 10 micron. The rubber component shall be made out of neoprene and tested quality.

4.2 The trefoil clamps for single core cables shall be pressurized die cast Aluminum or fiber Glass or Nylon and shall include necessary fixing accessories such as GI bolts and nuts. Trefoil clamps shall have adequate mechanical strength to withstand the forces generated by short circuit current.

4.3 Cable End seal (Roxtec/MCT Brattberg) shall be provided for all Control Cable and Power Cable (including outgoing HT panels) at all the points wherever cable entries in the control room building or between room to room. 30% Spare modules shall be provided along with centre core has to be provided. System shall take up variation margin of +/-3mm in diameter of Cable. For details refer specs.

5.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

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

TECHNICAL SPECIFICATION

FOR

EXHAUST & VENTILATION SYSTEM INCLUDING AIRCONDITIONING

Prepared by					**Rev: 0**
Reviewed by					**Date:**
Approved by					

Technical Specification Exhaust and Ventilation System

1.0 INTENT OF SPECIFICATION

1.1 This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport for site of Air Conditioning system and Ventilation system for substation control room building complete with all materials and accessories for efficient and trouble free operation

1.2 In the event of any discrepancy with the listed documents, the stipulation this specification shall govern.

2.0 SCOPE OF SUPPLY

The following equipment shall be furnished with all accessories.

a) Exhaust Fan system.
b) Air Conditioning
c) All necessary components for operation of the above equipment.
d) All wiring & accessories to complete the installation.
e) All relevant drawings, data & instruction manuals.
f) Mandatory spares.
g) Commissioning spares and recommended spare part list for three (3)

3.0 GENERAL REQUIREMENT

3.1 All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards except where modified and/or supplemented by this specification.

3.2 Equipment and materials conforming to any other standard, which ensures equal or greater quality, may be accepted. In such case copies of the English version of the standard adopted shall be submitted along with the bid.

3.3 In particular, the following standards and specifications are applicable.

3.4 Air conditioners suitable for 230V, 50 Hz single phase AC supply shall be capable of performing the functions as cooling, dehumidifying, air circulating and filtering. The air conditioners shall be complete with automatic temperature control and cut-in and cutout etc. for temperature range 16 to 25 degree C.

3.5 Outdoor unit of the air conditioners shall be fitted discharge cooled type rotary Compressor.

3.6 Air Conditioner shall be 5 Star rated

3.7 Air Conditioning shall maintain 22 Degree Celsius in summers and Winters, Environment condition shall be referred from General Design Criteria Chapter 1

3.8 Approved make of AC is Voltas/LG/Carrier.

3.9 The minimum thickness of the base in outdoor unit shall be 1.20 mm & sheet thickness for rest of the body shall be 0.70 mm (Min.) with galvanized coating thickness of 120 g/ sq. m and shall be provided with stiffeners for robust construction and shall have rounded corners.

3.10 The casing of the indoor units shall be made of ABS/HIPS/GS and shall be impact resistant. The control box of indoor unit shall withstand flame retardant.

3.11 Remote cordless control with LCD/LED Display for Air conditioner shall be provided with one On/Off timer, selecting fan speed (three speed) and setting up of temperature. Display shall be provided on indoor unit or on handset or on both.

3.12 Maximum power consumption of the split air conditioners shall be measured at capacity rating test conditions. Overall power factor of the unit shall be at least 0.85 at capacity rating test conditions

This specification shall be read and constructed in conjunction with the bid documents and annexure to determine the scope of work.

DESIGN CRITERIA

	Air Conditioning shall be supplied in Control Room and Switchgear Room including GIS Room, maintenance room and SCADA room. Exhaust system shall be supplied in following rooms -Toilet – one Pantry- One Cable Celler- Industrial type numbers shall be as per calculation
Number and details of wall mounted/Ceiling fan	Battery room – 1 No Control room – 3 No's Switchgear Room – 6 No's GIS Room-As per Calculation, 6 Nos(Minimum). **Note: Wall mounted fan shall be industrial type, domestic fans shall not be acceptable**
Power Point & socket	Each room shall be provided with at least 2 No's 15 Ampere Switch socket and 2 no's 5 ampere switch sockets. Two no's industrial 16 ampere points shall be provided in control room for installation of air conditioning system for future.

	All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.

4.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

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

TECHNICAL SPECIFICATION

FOR

FIRE EXTINGUISHER

Prepared by					**Rev: 1**
Reviewed by					**Date: 24.05.21**
Approved by					

Technical Specification Fire Extinguisher

1.0 INTENT OF SPECIFICATION:

This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport FOR site of Portable wall and trolley mounted Fire extinguisher and fire buckets for substation control room building complete with all materials and accessories for efficient and trouble free operation.

In the even of any discrepancy with the listed documents, the stipulation of this specification shall govern.

2.0 SCOPE OF WORK

2.1 Scope of Supply

The following equipment shall be furnished with all accessories:-

a) Wall mounted fire extinguisher-15 Nos. of 4.5kG (CO_2 Type)
b) Trolley mounted fire extinguisher- 5 Nos. of 22.5kg (CO_2 Type)
c) Sand buckets with stand- 4 Set with 4 bucket in each stand
d) All installation hardware.
e) All relevant drawings, data & instruction manuals.
f) Mandatory spares.
g) Commissioning spares and recommended spare part list for three (3) years of operation.
h) Rubber Mat for entire Indoor equipments front and backside(as per latest IS)

3.0 GENERAL REQUIREMENT

3.1 Codes and Standard

All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards except where modified and/or supplemented by this specification.

Equipment and materials conforming to any other standard which ensures equal or greater quality may be accepted. In such case copies of the English version of the standard adopted shall be submitted along with the bid.

In particular, the following standards and specifications are applicable.

Indian Electricity Rules	Relevant safety regulation of CEA
Indian electricity act	
IS 2190	Selection, installation & maintenance of first aid, fire extinguisher.
	Tariff Advisory Committee Manual
IS 1646	Code for practice for fire safety of buildings
IS 940	Portable fire extinguisher, Water type - specification
IS 2878	Fire extinguisher CO2 type
IS 2171	Specification for fire extinguisher dry powder.
IS 10204	Specification for fire extinguisher Mechanical foam type.

This specification shall be read and constructed in conjunction with the bid documents and annexure to determine the scope of work.

4.0 DESIGN CRITERIA

General	The contractor shall supply the required type and quantities of fire extinguisher and Sand buckets. The quantity shall be as per TAC recommendations.
Location	Fire extinguisher and sand buckets shall be installed in Control room, battery room, switchgear room, ACDB & battery charger room, Cable cellar, Transformer yard, Outdoor switchyard and Capacitor bank.
Distribution	The fire extinguishers in various locations shall be as per the guidelines of TAC-India.
Tests	All equipment shall be completely assembled wired, adjusted and routine tested at the factory as per relevant standards.

5.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

TECHNICAL SPECIFICATION

FOR

VIDEO SURVEILLANCE SYSTEM

Prepared by	**Javed Ahmed**		**Rev: 2**
Reviewed by	**Abhinav Srivastava**		
Approved by	**K.Sheshadri**		**Date: 2rd Feb 2021**

1. SCOPE:

Design, Engineering, procurement of bought out items, manufacture, integration, inspection, factory testing and supply of complete CCTV System for the entire plant as per requisition consisting of following including necessary hardware, software and accessories as applicable.

2. STANDARDS:

In accordance with Latest Relevant IS/IEC.

3. SCOPE OF SUPPLY:

- CCTV cameras suitable for remote operation with all necessary accessories and installation hardware consisting of, but not limited to the following:

1. High speed zoom lens.
2. 360 Degree Cameras
3. Automatic Iris
4. Pan & tilt unit
5. Receiver unit
6. Weatherproof junction box
7. Weatherproof housing for unit camera.
8. Glass Dome with reflector shield on outside.
9. Night Vision.
10. One set of 360 camera shall be installed before start of work

- System cabinet consisting of following:-

1. Video encoder, network switches, etc.
2. Central control unit with all control functions like pan, tilt, focus and consisting of switching unit.
3. Video Motion Detection system
4. Video recorder to record video images

- 2 Nos -21'' FULL HD, LED Monitor with HDMI interface to CPU with Keyboard, Optical Mouse for monitoring at Main Control Room & Security Security Room.

- Monitoring unit also including Programming unit consisting of programming Monitor LED 21", keyboard and optical mouse, independent of monitoring unit with all required hardware and software for CCTV functioning.

- All furniture required in the Control room and Security Gate, to mount the CCTV equipment like TV, PC, keyboard , DVR, etc.

- All types of Cables (Video, Control/data, Optic Fiber and Power Supply etc.), cable glands, plugs, connectors and accessories, for interconnection of all the equipments supplied by vendor.

- Junction boxes, Power distribution boxes, repeaters, cable glands, etc. as necessary.

- Mounting poles for mounting the camera along with a climbing ladder.

- The Ladder to be provided with wheels & brakes for easy movement on roads.

- HDPE pipe with required pipe fittings for laying optical fiber cables between CCTV Cameras and main control room, and between main control room and security control room (gate / security house).
- Cable trays for CCTV cables within control rooms with required accessories in case required at site. Cable trays outside control room (where main cable duct is not available). Buried cable trench for cabling along the boundary walls.
- All necessary supports for installation of all items supplied by vendor.
- All mounting accessories required to mount various items supplied by vendor.
- Earthing material required for earthing of CCTV equipment installed by Vendor.
- Necessary base frame support for mounting CCTV cabinets in main control room.
- Any other item necessary but not specifically listed for successful operation of CCTV system.
- Packing, forwarding, transportation and storage at site of complete CCTV system and accessories.
- Supply of special instrument or tools needed for testing, calibration and maintenance of offered CCTV system.
- Supply of consumables and commissioning spares as per requisition for CCTV system.
- Any other item or/and activity not listed/indicated specifically but necessary for successful operation of CCTV system.
- CCTV monitoring of the site & image capture in case of an intrusion
- Future hardware expansion facility.
- The CCTV system shall be support high resolution viewing & recording.
- The images shall be transferred to a central location or on Mobile using Internet connectivity.
- The System shall be CE & FCC certified
- Complete system shall be from the same manufacturer.
- System should be design to work on low bandwidth WAN with following considerations:

1) Camera stream : H.265
2) Camera resolution : 4CIF (704x480)
3) Video quality : Medium
4) Number of cameras : 01
5) Frame rate per camera at site :25FPS
6) Frame rate per camera at Centre :15FPS
7) Recording type : Continuous 24 Hours per day
8) Desired days of storage per camera : 30 Days

All cameras should support dual stream and configured in such a way that one stream should provide feed to central control centre and other stream should be capable to support edge recording (memory card on camera or NVR). System should be intelligent to monitor WAN and whenever there is outage or central control centre not reachable camera should start recording on memory card or NVR present on camera and capable to restore the data to the central system in the missing area.

4. SCOPE OF SERVICE :

- Installation, integration of complete CCTV system and associated accessories including calibration, cabling, junction boxes, power supply, distribution boxes, etc.
- Installation of CCTV Cameras. The Cameras to be mounted on top of Pole, so as no blind spot is created due to pole.
- Installation of CCTV monitors for monitors located in main control room and monitors located in security control room (gate / security house).
- Installation of monitor located in MCR and security control room.
- Installation of mounting poles wherever applicable.
- Installation of CCTV cabinets for various units.
- Installation of programming unit PC.
- Installation of various junction boxes (signal, power, control) supplied by vendor.
- Laying of co-axial / optical fiber cable between CCTV Camera & Control Console Cabinets.
- Laying of power cable between CCTV Cameras and CCTV Cabinet in MCR.
- Laying of CCTV Cables (video, control, data, power).
- Laying of CCTV fiber optic Cables between MCR and security control room.
- Termination, ferruling and glanding at both ends and interconnection of various cables (video, optical, control, power) supplied by vendor for complete CCTV system.
- Distribution of power supply and reduction to required levels to various CCTV equipment supplied by vendor.
- Integration of CCTV Camera with BRPL Network

The entire IP surveillance system to be designed to control and monitor the locations provided based on following considerations:

- Camera to be of 4 MP (all to be integrated in the VMS present and future)
- CCTV system should be design to work on WAN with at lower bandwidth as low as (256Kbps per camera). Objects or persons should be identified under low bandwidth Scenario
- Bandwidth should be configurable

- System should be design to work and record on 15fps and 1 MP centrally
- System should be design with event based and continuous recording as and when required

Four types of cameras shall be considered to monitor the movement of the people as follows:

1) Indoor
2) Outdoor
3) PTZ
4) 360 degrees outdoor

- All cameras shall be True Day/Night function IP camera
- Analytics to be in built at camera side like – Face capture, Trip Wire, Counter, Object removal, Motion detection.
- All accessories with the outdoor cameras like JBs, power supply, media converter etc. should be in water poof and dust proof housing
- All cabling including LAN network will be in scope of vendor in case of open through ISI mark PVC / GI pipes or concealed through ISI mark PVC / HDPE pipe
- L2 POE Cisco switches should be used to power-up the camera in case of 4 or more at a location else power adapter to be used to power up the cameras
- Servers should be either HP / IBM
- Servers should be planned in redundancy

5. TESTS.

All equipment with their terminal connectors, and other hardware etc., shall conform to type tests and shall be subjected to routine and acceptance tests in accordance with Latest Relevant IS .

6. COMPLETENESS OF EQUIPMENT:

Any fittings, accessories or apparatus which may not have been specifically mentioned in this specification but which are usually necessary for the satisfactory operation of the equipment, shall be deemed to have been included in this specification.

7. PACKINGS:

All material shall be suitably packed for transport, direct to site and Manufacturer shall be responsible for all damages/losses due to improper packing. All boxes shall be marked with signs indicating the up and down sides of the boxes along with the unpacking instructions, if considered necessary by the Manufacturers.

Note: All critical areas/rooms to be covered fully leaving no grey area. Placement of cameras shall be such that there should be no shadow portion.

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

TECHNICAL SPECIFICATION

FOR

FIRE DETECTION AND ALARM SYSTEM

Prepared by					**Rev: 0**
Reviewed by					**Date:**
Approved by					

Technical Specification Fire Detection and Alarm System

1.0 INTENT OF SPECIFICATION:

This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport FOR site of Fire and smoke Detection & Alarm System for substation control room building complete with all materials and accessories for efficient and trouble free operation.

In the even of any discrepancy with the listed documents, the stipulation of this specification shall govern.

2.0 SCOPE OF WORK

2.1 Scope of Supply

The following equipment shall be furnished with all accessories :-

a) Smoke and heat detectors and installation.
b) Manual call point for the substation building.
c) Fire detection alarm panels which shall be SCADA compatible along with its integration with SCADA.
d) All wiring & accessories to complete the installation.
e) All installation hardware.
f) All relevant drawings, data & instruction manuals.

3.0 GENERAL REQUIREMENT

3.1 Codes and Standard

All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards except where modified and/or supplemented by this specification.

Equipment and materials conforming to any other standard which ensures equal or greater quality may be accepted. In such case copies of the English version of the standard adopted shall be submitted along with the bid.

In particular, the following standards and specifications are applicable.

Indian Electricity Rules	Relevant safety regulation of CEA
Indian electricity act	
CBIP manual	
IS 2189	Code of practice for selection, installation & maintenance of automatic fire alarm system.
IS 2190	Selection, installation & maintenance of first aid, fire extinguisher.
IS 1646	Tariff Advisory Committee Manual
	Code for practice for fire safety of buildings

Technical Specification Fire Detection and Alarm System

This specification shall be read and constructed in conjunction with the bid documents and annexure to determine the scope of work.

4.0 DESIGN CRITERIA

General	1. The fire detection system shall consist of various types of fire detectors, control cabling, fire alarm panels, central monitoring station, annunciation/control panels, local panels. 2. The fire detection and alarm system shall be microprocessor based, analogue addressable system. 3. A central monitoring system shall be provided in the control room covering complete substation. 4. The control system shall be compatible to be interfaced with SCADA system through separate communication port.
Location	Fire detectors shall be provided for the entire substation building including control room, switchgear room, battery charger, corridors, Cable Celler etc.Fire detectors shall be located at strategic location in various rooms of the building.
Operation	The operation of any of the fire detectors / manual call point should result in the following : a) A visual signal exhibited in the alarm panel indicating the area where the fire is detected. b) An audible alarm (Hooter) sounded in the panel. c) An external alarm sounded in the building, location of which shall be decided during detailed engineering. d) An alarm should be signaled to the control room.
Detection & Alarm system	1. Each zone shall be provided with two zone cards in the panel so that system will remain healthy even if one the cards become defective which shall be indicated at SCADA . 2. The control panel shall be suitable for 230V AC and 220V DC as power supply.
Cabling	The detector cable and the other control cable shall be armoured, screened and twisted FRLS type in external areas and shall be of unarmoured FRLS type inside building (in conduits)
Tests	All equipment shall be completely assembled wired, adjusted and routine tested at the factory as per relevant standards.
	Following tests shall be performed on the system a) Response characteristics of fire detectors. b) Performance test on fire extinguisher as required in the code. c) A comprehensive visual and functional check for the fire alarm panel. d) Verification of wiring as per approved schematic. e) Testing of fire detection panel as per BS3116 Part IV.
Site Test	All the detectors installed shall be tested for actuation by bringing a suitable smoke source near the detector creating a stream smoke over the detector. After each test smoky atmosphere should be cleared so that the detector shall reset.

	Certify proper operation of all detectors and call points.
	One of each type of extinguisher shall be tested for its performance.

5.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

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

TECHNICAL SPECIFICATION

FOR

PACKING & TRANSPORTATION

Prepared by					**Rev: 0**
Reviewed by					**Date:**
Approved by					

1.0 PACKING AND TRANSPORTATION

1.1 Packing shall be sturdy and adequate to protect all assemblies, components and accessories from injury by corrosion, dampness, heavy rains, breakage and vibration encountered during transportation, handling and storage at the plant site. All accessories, which are likely to get damaged during transit if transported mounted on the equipment, shall be removed, adequately packed and shipped separately. All openings shall be sealed. Spare parts shall be packed separately and clearly marked. They shall be specially packed for long storage without injury.

1.2 The bidder shall after proper painting, pack and crate all plant equipment for sea shipment/air freight in a manner suitable for export to a tropical humid and saline air borne climate region as per Internationally accepted export practice in such a manner so as to protect it from damage and deterioration in transit by road, rail and/or sea and during storage at site till the time of erection. The bidder shall be held responsible for all damages due to improper packing.

1.3 The bidder shall give complete shipping information concerning the weight, size, contents of each package including any other information the Owner may require. The weight and size of the package shall be such that they can be easily transported from the maker's works to the plant site by ship/air, road ways and railways.

1.4 The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, overhead lines, free access etc. from the manufacturing plant to the project site; and furnish to the Owner confirmation that the proposed packages can be safely transported, as normal or oversize packages, upto the plant site. Any modifications required in the infrastructure and cost thereof in this connection shall be done and borne by the bidder.

1.5 The bidder shall prepare detailed packing list of all packages and containers, bundles and loose materials forming each and every consignment dispatched to 'site'. The bidder shall further be responsible, for making all necessary arrangements for loading, unloading and other handling right from his works; and from Indian port for equipment under the Off-shore Supply till the 'site' and also till the equipment is erected, tested and commissioned. The bidder shall be solely responsible for proper storage and safe custody of all equipment.

1.6 All packages must be marked consecutively from number one upwards covering all shipments until completion of the plant equipment execution without repeating the same number. Each box, crate, case bundle or each piece of lose material shall be painted with a combination of one white band and one yellow band of a least 4 cm wide each, round the body of the box, crates, etc as the case be for easy identification.

2.0 GPS instrument must be installed for proper tracking of material during transit of major equipment like Transformer, GIS Panel,11KV & 66 KV panels etc. of MAP my india make (asset tracking system)

3.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

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

TECHNICAL SPECIFICATION

FOR

MATERIALS WORKMANSHIP & TEST

Prepared by					**Rev: 0**
Reviewed by					**Date:**
Approved by					

1.0 MATERIAL, WORKMANSHIP & TESTS

1.1 General

All materials used in the manufacture of the offered plant equipment shall be of high grade, free from defects and imperfections, of recent manufacture and unused. Materials not specifically described elsewhere, shall as far as applicable and practicable conform to the latest specification of ISS where applicable and equivalent International Standards. Liberal factors of safety shall be used throughout the design for all parts of plant equipment when subjected to the most severe operating conditions. The working stress in all parts of the plant equipment shall be bestowed with ample margins for possible overstressing due to shock.

All work shall be performed and completed in accordance with the best modern shop practice in manufacture of high grade equipment.

Castings shall be free from blow-holes, flaws, cracks or other defects; and shall be smooth, close-grained and of true form and dimensions. No plugged or filled-up holes or other defects will be accepted. No casting shall be burned, plugged, patched or welded; and no repairs or defects will be accepted.

All materials, supplies, parts and assemblies supplied under this specification shall be tested as far as reasonably practical.

All welded joints shall be free from defects such as blow-holes, slag inclusions, lack of penetrations, under-cuts, cracks etc; and shall be made by qualified and tested welders. Slag shall be ground after joint completion; and well reinforced smooth welds shall be made.

1.2 Inspection, Testing program and Notification

Before manufacture commences, the contractor shall submit an outline of the proposed inspection and testing programmes (Quality Assurance Programme - QAP) for all major stages during manufacturing of major equipment. This inspection and testing programme shall include for the various items, the designation number, the kind of test, test standard and the extent of witness by the Owner/Engineer or third party.

The notification of the individual witness inspections made by the Owner/Engineer or the third party, shall be given by the contractor using facsimile or telex or e-mail in a format to be agreed upon. The contractor shall notify the Owner/Engineer within 21 days prior to the date on and the place at which item shall be ready for testing. If any postponement becomes necessary, the contractor shall provide written notification of same at least 72 hours prior to the originally scheduled date.

If the Owner/Engineer does not attend the test at the place and at the date which the contractor has stated in his notification, the contractor shall proceed with the test, which shall

be deemed to have been made in their presence and shall forthwith forward to them duly certified copies of the test readings.

Before erection commences, the contractor shall submit an outline of the proposed erection inspection and test programme during the erection of major systems. The individual testing procedure shall be submitted as progress of erection work of the equipment, systems and/or units, coordinated with relevant work of the complete plant.

Before commissioning commences, the contractor shall submit an outline of the proposed commissioning test procedure. The test programmes shall be maintained by the contractor during erection and commissioning.

1.3 Test : General

During manufacture, the Owner's representative shall have the right to expedite and/or inspect design, materials, workmanship and progress of manufacture of the contractor's and his sub-contractor's plant system equipment and may reject any defective materials considered unsuitable for the intended purpose or which does not comply with the intent of this specification. The contractor, upon any such rejection by the Owner or his representative, shall rectify or replace the defective or unsuitable material. The contractor shall provide every reasonable inspection facility to the Owner's inspector or representative at his own and his sub-contractor's works.

Material being furnished against this order shall only be shipped when factory inspection satisfactory to the Owner and/or his representative has been conducted. Such inspection and acceptance for shipment shall not however, relieve the contractor from entire responsibility for furnishing the plant system equipment conforming to the requirement of this specification nor shall prejudice any claim, right or privilege which the Owner may have, because of the use or supply of defective or unsatisfactory materials for the plant system equipment. Should the inspection be waived by the Owner, such waiver shall not also relieve the contractor in any way, from his entire obligations under this order.
The plant system equipment shall at factory or after installation be demonstrated capable of performing satisfactorily upto the contractor's guaranteed performance. All tests required by this specification, including retests and inspection, that may be necessary owing to failure to meet any tests specified, shall be made at the contractor's expense. Additional tests, as necessary, shall be made to locate any such failure and after determining the causes of failure and rectifying it, specified tests shall be repeated to establish that the rebuilt plant system equipment meets with the specification in every respect. Should the equipment ultimately fail to pass the tests specified, the Owner will have the option to reject the unit.

The bidder shall state in the proposal, the shop testing facilities available. Should full capacity testing equipment be not available, the bidder shall state the method proposed to be adopted with detailed computations and justification for adopting such a method to reliably ascertain the equipment characteristics corresponding to full capacity testing.

1.4 Test Certificate

In accordance with approved QCP, the results of the tests shall be certified by the Owner/Engineer or independent agency as applicable. As and when the item of the plant equipment has passed the tests, the Owner/Engineer shall furnish to the contractor a certificate in writing to that effect. The Quality Control Plan (QCP) shall be issued by the contractor within 1 months after NTP. Document files containing material certificates, test reports, etc shall be compiled for each QCP item of plant equipment; and shall be suitably identified (including equipment classification reference) and bound. Copies of compiled file shall be submitted as per distribution schedule

1.5 Tests at Manufacturers Works

The major equipment of the plant to be supplied under this contract shall be subjected to shop inspection and tests. After NTP, the contractor shall issue within 1 months a QCP indicating the kind and extent of inspection and tests to be carried out on the offered plant equipment components to prove whether the equipment fulfills the requirement of the contract in view of:

- Safety Conditions
- Consideration of the applied standards and regulations
- Execution of workmanship

SITE TESTS

Tests conducted at sites shall be indicated by bidder.

2.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

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

TECHNICAL SPECIFICATION

FOR

MISCELLANEOUS ACTIVITIES

Prepared by					**Rev: 0**
Reviewed by					**Date:**
Approved by					

Chapter 6b Technical Specification Misc Activities

1.0 SERVICE AFTER SALES

1.1 The bidder shall furnish in detail about his organization for rendering service after sales, covering deployment of personnel and supply of spares, for ensuring efficient operation and maintenance of the offered plant equipment. The details of spares and service facilities possessed by them should be elaborated.

1.2 The bidder shall guarantee furnishing of the following in respect of after sales services including spares:-

i) Providing services of his specialists on indent from the Owner for periodical or special maintenance of the plant; as well as for identifying sources of trouble, if any, reported and measures for immediate rectification.

ii) The bidder shall guarantee maintenance of adequate spares at his works to be supplied on indent from the Owner at short notice during the life of the plant.

2.0 BID DATA, DRAWINGS AND INFORMATION REQUIRED

2.1 Technical data sheets, drawings, schedules with supporting information incorporating the details in compliance to spec but not limited to the following shall be furnished along with the proposal:

2.2 Duly filled in 'Schedule of Guaranteed and other Technical Particulars Schedules ‘C’ except for data which cannot be finally furnished with the Bid. The Price and Delivery Schedule-B duly filled in.

2.3 Dimensioned outline drawings of the offered overall plant and separately for equipment including cross-sectional drawings showing dimensions, net weights, shipping weights and suggested arrangement layout of proposed plant & equipment with auxiliaries etc. Technical Literature/leaflets of the above plant equipment.

2.4 Manufacturers' catalogues showing the construction details of various equipments should be furnished indicating clearly the technical preference of the offered equipment over the specified equipment.

2.5 List of users of comparable plant equipment with the year in which the Diesel plant and other critical plant equipment was put actually into service. For technical acceptability of the bid, proven experience of the bidder in manufacture and satisfactory and trouble free performance of the critical plant equipment for at least three (3) years is essential for which the bidder shall furnish necessary documents in support of the above.

2.6 A bar chart of design, engineering, procurement, manufacture, testing, delivery, installation, commissioning and site testing including civil structural and architectural works of the proposed plant equipment.

2.7 Technical description of the proposed plant equipment and materials particularly outlining any additional list out features proposed for safety & reliability. List out items of work & services not included and which has to be provided by the Owner for satisfactory commissioning of the offered plant equipment supplied.

2.8 The bid shall not be considered if the bidder fails to submit all the details asked for. Proposal should be complete without ambiguity and should be clearly written against each item.

2.9 Bidder shall furnish Quality Assurance Programme for design, manufacture, assembly, erection, testing & commissioning including civil, structural and architectural works along with the proposal for all equipment covered under this specification whether manufactured by the bidder or procured from other sources.

2.10 Technical deviations from the specification, if any, shall be clearly listed in the Schedule-E. In absence of any deviation given in Schedule-E and accepted by Owner, it will be bidder's responsibility and his contractual obligation to supply the Plant equipment as per specification to Owner/Engineer's approval.

2.11 List of shop and site tests, the bidder proposes to carry out including those pertaining to their sub-suppliers works shall be clearly brought out in Schedule – G. In addition to above tests, the bidder shall conduct any other tests, to Owner/Engineer's approval, which are considered important for satisfactory operation of plant equipment.

2.12 Bidder shall furnish all required mandatory and startup commissioning spare parts as well as maintenance tools and tackles with unit prices for the offered plant equipment.

3.0 POST CONTRACT DATA AND DRAWINGS

3.1 The contractor shall submit within thirty (30) days from the date of the order and Notice to Proceed (NTP) certified dimensioned drawings and technical schedules giving every detail of the offered plant equipment particularly the following:

3.2 Completely filled in schedule of guaranteed particulars and other technical particulars.

3.3 Single line diagrams; logic diagrams, dimensioned general arrangement and equipment layout drawings showing front and side elevations, plan and sectional views of the offered equipment forming part of the contractor's supply; The drawings should also indicate structures & supporting details including foundation outline and loading data etc.

3.4 Final version of all drawings and data submitted along in the proposal mentioned above.

3.5 Structural, thermodynamic and pressure part calculations showing compliance with specifications and codes as and when required.

3.6 Any other drawings/details not specified herein and required by the Owner/Engineer to correctly coordinate the offered plant equipment with other contractor's work.

3.7 Civil design calculations.

3.8 Detailed specifications and data sheets of the plant equipment with auxiliaries.

3.9 Detail drawings of critical equipment units, assemblies, parts etc. as deemed necessary.

3.10 Design calculations of conductor sizing, cable sizing, main equipment sizing etc.

3.11 Schematic wiring diagrams along with write-ups for control, interlocks, instrumentation, protection, circuits. Terminal blocks and terminals arrangement drawings showing power & control cable connections.

3.12 Owner/Engineer will return to the contractor one (1) print of each drawing either.

(a) stamped approved or (b) marked up with the comments. In case of (a), no further submission of a drawing will be required. In case of (b), the contractor shall correct his original drawings to conform to comments made by the Owner/Engineer and resubmit within two (2) weeks of receipt of comments in the same manner as stated in the Distribution Schedule. The Owner/Engineer's approval shall not relieve the contractor from any of his obligation and responsibility to manufacture and supply equipment conforming to this specification, unless a written amendment to the specification is issued by the Owner.

3.13 After approval of the drawings, reproducible of each drawing shall be supplied. Final drawings shall be certified as Approved for Construction. Should any minor revision be made after approval the contractor shall re-distribute prints and reproducible as per the Distribution Schedule. Every revision shall be marked by a number, date and subject in a revision block provided in the drawing.

3.14 Reproducible shall be of quality to produce clear and legible prints and any inferior reproducible will be returned by the Owner for replacement with suitable reproducible. All reproducible shall be mailed rolled (not folded) on the outside of regular mailing tubes except for small sizes which can be mailed unfolded in envelope with a cardboard backing. The prints and reproducible shall be mailed in the most expeditious manner and shall be accompanied with a letter of transmittal.

4.0 INSTRUCTION MANUAL

4.1 At least one (1) month prior to the dispatch of the plant equipment, fifteen (15) copies of installation, testing and adjustments after installation, operation and maintenance manuals shall be furnished. These manuals shall be sturdily bound volumes and shall contain every drawings and information required for installation, testing, setting and adjustment of all components after installation, operation and maintenance of the equipment and all its components. Separate tabs shall be used for such instructions concerning each equipment control components, electrical and other accessories. The other data needed for servicing the components and ordering their spare parts.

4.2 Marked erection prints identifying the components parts of the equipment, as transported, with its assembly drawings.

4.3 Detailed dimensioned assembly and cross sectional drawings and description of all the plant system equipment with auxiliaries and drawings identifying all spare parts for re-order.

4.4 Documentation

Correspondence, drawings, progress reports, schedules, tests reports and instruction manuals shall be mailed in requisite copies in accordance with Distribution Schedule.

5.0 WORK SCHEDULE

5.1 Time being the essence of the proposal, preference will be given for the offers quoting earlier deliveries. The bidder shall include in his proposal his programme for furnishing and erecting the offered plant & equipment.

5.2 The programme shall be in the form of master network identifying the key phases in various areas of total plant work, such as design work, procurement of raw materials, manufacture of components & subassemblies; complete erection of equipment and all other field activities. The master network shall conform to completion of trial operation from the date of Letter of Award within a period of 4 months. The trial operations shall commence any day within 15 days prior to the date of completion indicated above.

5.3 This master network shall be discussed and agreed before the issue of letter of award. Engineering drawings as well as technical data sheets submission schedule shall also be discussed and finalized before the issue of letter of award. Provisions of the liquidated damages leviable for delays in completion of trial operation shall become effective after the above mentioned date.

5.4 After the contract award, the contractor shall plan the sequence of work of manufacture and erection including associated civil works to meet the Owner's power plant commissioning requirements; and shall ensure that all work/manufacture, shop testing, inspection & shipment of the equipment in accordance with the required construction/erection sequence.

5.5 Within seven (7) days of acceptance of the letter of award, the contractor shall submit, for review and approval, two copies (1 reproducible and 1 print) of Detailed Network schedules, based on the Master Network (mutually agreed by the Owner & contractor) to the Owner/Engineer showing the logic & duration of the activities in the following areas

i) Engineering, Procurement, Manufacturing & Supply Detailed engineering activities in regard to procurement of raw materials including bought out items, manufacture, dispatch/ shipment & receipt at site.

ii) Civil, Structural & Architectural Works:

Detailed engineering activities in regard to civil & structural works execution based on the offered equipment and approved drawings including detailed execution of execution activities covering the complete scope of work.

iii) Erection, Testing and Commissioning:

Detailed erection, testing and commissioning activities, covering the complete scope of work of the offered plant equipment coordinated with the civil and structural works executed.

5.6 Detailed Manufacturing Program

Detailed manufacturing PERT/PRIMAVERA programme for all the manufacturing activities of the offered plant equipment at contractor's/subcontractor's works shall be furnished within 7 days of letter of award.
The manufacturing network shall be supported by detailed procurement programme for critical bought out items/raw materials

Pre-erection Activity Programme
A) Manpower Deployment
B) Tools and plant mobilization plan
C) Detailed Site Mobilization Plan

5.7 Within a week of approval of the Network schedule, the contractor shall forward to the owner/Engineer copies of the Computer initial run data in an acceptable manner

5.8 The network shall be updated every month; or as frequency as possible to mutual agreement. Within seven (7) days following the monthly review, a progress meeting shall be held at the work (possible) wherein the major items of the plant or equipment are being produced. The meeting will be attended by the Owner/Engineer and responsible representatives of the contractor. The contractor shall be responsible for minuting the proceedings of the meeting, a report of which shall reach the Owner or the Owner/Engineer not later than 7 days following the meeting.

5.9 Access to the contractor's and/or sub-contractor's work shall be granted to the Owner/Engineer at all reasonable times for the purpose of ascertaining the progress

6.0 PROGRESS REPORTS

During execution of the contract either in manufacture or erection/commissioning, the contractor shall furnish monthly progress report to the Owner or the Owner/Engineer in a format as specified indicating the progress achieved during the month, and total progress upto the month as against scheduled and anticipated completion dates in respect of key phase of work or manufacture and shipment such as release of drawings for fabrication, procurement of raw materials, inspection and testing. If called for by the Owner/Engineer, the contractor shall also furnish to the Owner or the Owner/Engineer resources data in a specified format and time schedule. The contractor shall also furnish any other information necessary to ascertain progress if called for by the Owner/Engineer

Chapter 6b Technical Specification Misc Activities

7.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

TECHNICAL SPECIFICATION

FOR

CABLE SEAL SOLUTION

Specification No- SP-GMS-01-R0

Prepared by	**Javed Ahmed**		**Rev: 1**
Reviewed by	**Abhinav Srivastava**		
Approved by	**Sheshadri Krishnapura**		**Date: 16th April 2022**

Index

1.0. SCOPE:

This specification covers design, engineering, manufacture, assembly, stage testing, inspection & testing before supply & delivery at site and installation testing and commissioning including handover the system to BRPL after successful execution of Cable Seal Solution
This Scope includes the following

a) Supply of Cable Seal System including its transportation to BRPL Site
b) Installation testing commissioning of Cable seal solutions with all the accessories including minor civil work if any.

2.0. Basic Features:

Following requirements shall be fulfilled and supported with valid test reports/certificates:

1. Minimum IP 65 Protection level Certificate for protection from Dust and Water.
2. Heat sink test report of Cable transit system.
3. Certificate/ Test Report for Protection from Rats and Rodents.
4. ATEX, PESO Approval for Explosive atmosphere.
5. NEMA Certificate as per UL 508A for the safety of Cabinets & Enclosures mandatory.
6. Material of Frame shall be of Stainless Steel.
7. System must have Bonding & grounding (Armour Earthing) feature as per IS 3043-1987 using a suitable Tin Plated Copper Braid to be used wherever required. It should be also tested for Impulse withstands as per IEC 62305-1 for minimum 50kA for 1 sec.
8. Manufacturer should have direct presence in India with all the after Sale & Service support from last 10 years.
9. Cable sealing system should have been tested for F- Rating Fire for 3 hrs as per UL 1479/ EN, Insulation and Integrity for 120 mins as mentioned in Indian National Building Code(EI 120) Certificate from BS 476 are mandatory.
10. Cable sealing system should have been tested for GAS tightness of 2.5 bar pressure.
11. EPDM modules in System must have Halogen content less than 200ppm with low smoke index-F1 Classification as per NF16-101 & NF16-102, Heat Radiation test in compliance with M2 classification, UV Ageing Test as per ISO-4892-2:2006 & ISO-815- 1:2008, Oxygen Index Test as per ASTM D 2863-00, Shock & Vibration Test as per NES 510.
12. System must have Bonding & grounding (ArmourEarthing) feature as per IS 3043-1987 using a suitable Tin Plated Copper Braid to be used wherever required. It should be also tested for Impulse withstand as per IEC 62305-1 for minimum 50kA for 1 sec.
13. Smoke Index shall be low. Type test reports for the same shall be provided by the supplier.
14. Shelf life of module - 25 Years
15. Solubility – Insoluble in water.

3.0. SERVICE CONDITIONS:

S.No	Particulars	Data
1	Design Ambient temperature	0°C to 50 °C
2	Seismic Condition	Zone IV as per IS 1893
3	Wind Pressure	195 kg/M² upto elevation of 30 M as per IS 875
4	Maximum Relative Humidity	100%
5	Maximum Altitude above Sea level	1000M
6	Rainfall	750mm (concentrated in 4 months)
7	Pollution level	Heavy/Dry
8	Average of no thunderstorm days	40 per annum

4.0. SYSTEM DESIGN

1. Modules with concentric peel able/removable layered multi-diameter cable sealing system consisting of frames, blocks and accessories shall be installed where the cables enter or leave any type of Electrical Panel/Cabinet/Transformer cable box.Each concentric module shall have a minimum of 10 mm range between smallest and largest adaptable diameter. System should be designed with minimum **+/-** 3 mm design margin. System should have provision for usable spares of 30**%** with no loose/ hanging / add layer / plug in type or to be stored components of modules / seals, each spare module should be concentric peelable/removable multi-diameter layered with complete range installed on Frame and solid Block are not acceptable..

2. It Shall cover following openings

   For all Cable entry from outside to control room building and between room to room

5.0. MAINTENANCE

Bidder shall furnish a maintenance manual and support maintenance activity.

6.0. APPROVED MAKES

Roxtec, MCT Brattberg

7.0. APPROVED MAKES

8.1	Submissions along with the bid	
8.1.1	Duly filled GTP and copy of	2 copies + 1 soft copy

	specification	

8.0. SHIPPING

9.1	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
		The Bidder shall be responsible for all transit damage due to improper packing.

9.0. HANDLING AND STORAGE

10.0	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

10.0. QUALITY

11.1	Vendor quality plan	To be submitted for purchaser approval
11.2	Inspection points	To be mutually identified & agreed in quality plan

11.0. DEVIATION

12.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that

		the bidder complies fully with this specification. No deviation will be acceptable post order.

12.0. TESTING AND INSPECTION

Shall be as per latest relevant standards

13.0. TRAINING

Training on installation, commissioning, operation and maintenance shall be included in the proposal.

- at factory/site- 1 Manday

TECHNICAL SPECIFICATION

SPARES MAINTENANCE TOOLS AND TACKLES

Prepared by	**Javed Ahmed**		**Rev: 1**
Reviewed by	**AS**		**Date: 11.07.2018**
Approved by	**KS**		

Volume-1 Technical Specification for Spares and maintenance tools and tackles

1.0 Spares Requirement: Following Spares shall be supply shall be in scope of Vendor for each package in addition to spares mentioned in individual equipment specifications, however in case of duplicacy/repetition only once shall be considered with quantity most stringent one quantity.

1. 33kV GIS Termination Kit- 4 Nos
2. Spare SF6 Gas cylinder 20 Liter size-2 Nos
3. Spare Relay for 66kV CRP Panels
    a. O/C and E/F Relay- 1 Nos
    b. Trip Circuit Supervision relay- 2 No.
4. Communication cable and Probes one of each type
5. Indication lamp for GIS and HT panel each colour- 20 Nos
6. TNC Switches- 2 Nos each type
7. Voltmeter- 2 Nos each type
8. Ammeter- 2 Nos Each type
9. Push buttons for GIS and HT panels- 5 Nos for each type
10. MCB – 2 Nos for each type in loose.
11. Laptop – i7 1TB 8GB RAM of Dell/Lenovo- 2 No

2.0 Maintenance tools and tackles: Following supply shall be in scope of Vendor for each package in addition to maintenance tools and tackles mentioned in individual equipment specifications, however in case of duplicacy/repetition only once shall be considered with quantity most stringent one quantity.

1. Torque Spanners---4 Nos
2. Multimeter-1No

Note: Approval of Model no and make wherever not defined shall be done at the time of Bid evaluation

TECHNICAL SPECIFICATION OF IT DEVICES FOR GRID COMMUNICATION

DOCUMENT NO.: BRPL-IT-SCADA-0001

Rev.: 00

BSES RAJDHANI POWER LIMITED
BSES Bhawan, Nehru Place,
New Delhi - 1100049

DOCUMENT CONTROL SHEET

DOCUMENT : TECHNICAL SPECIFICATION OF IT DEVICES FOR GRID COMMUNICATION

DOCUMENT NO. : BRPL-IT-SCADA-001

REV. NO. : 00

ENDORSEMENT

00	05.02.2019	First issue	Suman Kumar	Mrityunjay Kumar
Rev No.	Date	Description	GM - IT	HOD - IT
			Prepared by	Approved By
			BSES Rajdhani Power Limited	

Contents

POINTS TO BE CONSIDERED DURING DESIGNING OF NEW GRID

1.0 INTENT OF SPECIFICATION

1.1 Tender Specification is intended to cover design, engineering, manufacture, assembly, inspection, shop testing, supply, packing, forwarding to site, unloading, storage and preservation, handling at site, insurance, erection & supervision of erection, pre–commissioning, testing & commissioning, completion of facilities, conducting reliability run tests and performance guarantee tests and handing over the complete IT system to IT department of BSES Rajdhani power limited.

The scope shall also cover the following activities and services in respect of all the equipment and works specified in various sections of this specification.

a) Basic engineering of all equipment and equipment systems.

b) Detailed design of all the equipment and equipment system(s).

c) Providing engineering drawings, data, instruction manuals, as built drawings and other information for owner's review, approval and records.

d) Compliance with statutory requirements and obtaining clearances from statutory authorities, wherever required.

e) Complete manufacturing including shop testing.

f) Packing and transportation from the manufacturer's works to the site including customs clearance, port charges, if any.

g) Receipt, movement to proper storage, storage, preservation and conservation of equipment at the site, movement from storage area to interim/ final foundation location.

h) Supply of spares as per specified list.

i) All items and equipment though not specifically mentioned in the specification, but needed to complete the system to meet the intent of the specification shall be deemed to be included in the scope of the bidder.

It is not the intent to completely specify all details of design and construction, but only to lay down broad sizing and quality criteria for the major equipment and systems and it is expected that the equipments shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation up to the contractor's guarantee in a specified manner acceptable to the owner.

2.0 SCOPE OF SUPPLY AND SERVICES

The scope of supply and services shall be complete but not limited to the following:

2.1 IT RACK ROOM REQUIREMENT

2.1.1 Air conditioned room shall be provided for proper functioning of all IT devices. The temperature shall be maintained to 22^0 to 24^0 C

2.1.2 Room size shall be minimum as –

a) Length – 3.5 mtrs
b) Width – 2.5 mtrs.
c) Height – 3 mtrs.

2.1.3 Cable trench/ duct – 200mm wide cable trench/ duct shall be provided below the finished floor for proper routing of cables up to IT rack. 100mm size conduit shall be provided for cable entry from outside of the building to inside cable trench/ duct. The cable trench / duct shall be connected to nearest DCDB for proper power cable routing up to IT rack.

2.1.4 Room door width shall be minimum 4 ft. for ease of rack entry and height shall be as per standard norms. Door shall have locking arrangement.

2.1.5 Room's front side shall be provided with glass partition to have the clear view of IT rack from outside the room.

2.1.6 Towers (2nos.) for communication link shall be installed at the roof the building. The area required for base of the tower shall be 5 ft X 5 ft and the tower load shall be maximum 250 kg. Link shall be delivered by RCOM/ Airtel/ Sify ISPs. These links delivery shall be directly taken care by owner. Bidder to provide the suitable platform as motioned in the clause for tower erection.

2.2 POWER SUPPLY REQUIREMENTS

2.2.1 Required power supply for communication devices inside the IT rack shall be provided. Two numbers 48V DC power through suitable MCB shall be provided for owner's use in the IT rack this power supply shall be used for communication link's POE devices.

2.2.2 All internal wiring of rack for various ratings of power supply required by other devices i.e switch, routers, cooling fan, light etc shall be provided.

2.2.2 All communication equipments/ devices inside the IT rack shall be on DC supply .

2.3 EARTHING REQUIREMENTS

2.3.1 Dedicated electronic earthing shall be provided for IT rack and their devices. The earth pit resistance should be between 0.6 ohm to 1 ohm.

2.3.2 Electronic Earthing cable from earth pit to IT rack shall be of minimum 16 sq.mm multi stranded copper cable PVC insulated and internal devices shall be done with minimum of 06 sq.mm multi stranded copper cable PVC insulated.

2.4 IT RACK SPECIFICATION

2.4.1 The design of IT rack and layout of all equipment, terminal blocks etc. shall be based on human engineering considerations, fully keeping in view the convenience of operation and maintenance personnel and shall be subject to Owner's approval during detailed engineering.

2.4.2 Rack shall be free standing type and have bottom/ top entry for cables to be decided application wise during detailed engineering. The bottom of rack shall be sealed with bottom plate, double compression cable glands and fire proof sealing material to prevent ingress of dust and propagation of fire.

2.4.3 Rack size shall be 12U and made of CRCA sheet with 1.6 mm thickness. The rack shall be of front and back opening with 2 mm thick door frame. Front and back door shall have full length of 3 mm thick glass panel for clear view of inside equipments. Cable gland plate shall be detachable type and of 2mm thickness. Door hinges and locks shall be as per manufacturer standards. Special key type locks are not acceptable. Rack colour shade shall be powder coated RAL 7035.

2.4.4 Two nos. adjustable height tray shall be provided in the rack for routers and ISP devices.

2.4.5 Following are the minimum equipment/ accessories shall be provided in the rack however same shall be decided during detail engineering –

1. DC Power supply converter -

   i) Input source – 48V DC – 1 no.

   ii) Output – 12V DC - 4 nos., 5VDC – 2 nos.

   iii) Input and output connection shall be of terminal type.

   iv) Input terminals - suitable for 4 sq.mm cable

   v) Output terminals - suitable for 2.5 sq.mm cable

2. AC power supply extension board -

   i) Input source – 230V AC – 1 no.

   ii) Output sockets with individual switch – 230V AC – 5 nos.

3. Rack Fan and filter – size 6"

4. MCB and Terminal blocks – MCB DP type and terminals shall be mounted on DIN rail. Minimum four nos. MCB shall be provided in the rack. One no. for 48 V DC (20A), one no.

for 230V AC (10A) and one no. of each rating shall be kept as spare. Terminal blocks shall be fused type and suitable to respective voltage rating and intended cable size mentioned elsewhere in the specification.

2.4.6 All inter panel wiring shall be with FRLS type wires with proper routing inside the cable alley. Cross ferruling shall be provided for easy identification of wires. Cable shall have proper cable tagging.

2.4.7 Panel name plate shall be provided at top portion of front and back doors. It shall be engraved type and made of acrylic plate.

2.5 IT devices

2.5.1 Router – Router shall have minimum 2 nos. WAN ports and 8 nos. LAN port. Router shall also support the 3G/ 4G dongle connectivity.

2.5.2 Switch – Switch shall have minimum 12 LAN ports. Switch shall be provided with all mounting accessories.

3.0 Terminal Points

3.1 Power supply – From PDB to IT rack including cable supply, erection and termination at both end (PDB and IT rack). PDB details shall be part of Electrical section of technical specification

3.2 LAN cabling – From RTU to IT rack router/ switch including CAT 6 cable (armour type) supply, erection and termination at both end (RTU and IT rack).

3.3 Communication link – Shall be provided by respective ISP upto router WAN ports.

4.0 Exclusions –

4.1 Communication tower and link.

5.0 Bill of Quantity and vendor list of each item per rack for each grid –

Sr. No.	Item Description	Make / Model No.	Quantity (in nos.)
1	Rack – 12U	Rittal / Pyrotech	01
2	Router	Fortigate / CISCO	01
3	Switch	CISCO	01
4	Power Supply converter	Meanwell/ Phoenix	01
5	MCB	Havells / Legrand	04
6	Terminal blocks	Wago/ phoenix	1 lot

7	AC extension board	Havells / Anchor	1
8	Wires for Internal wiring	RR cable, Finolex, Havells	1 lot
9	Spare Terminal blocks with fuses (mounted in the rack)	Wago/ phoenix	20%
10	Terminal fuses of each rating (loose supply)		20%

TECHNICAL SPECIFICATION

TRAINING AND INSPECTION

Prepared by	**Javed Ahmed**		**Rev: 0**
Reviewed by	**Abhinav Srivastava**		**Date: 17.05.2022**
Approved by	**Gopal Nariya**		

Training and Inspection

The Scope includes training and inspection of BRPL Officials at site and at OEM's factory on overall product and all its sub-components. Cost of travel by flight and

1. Training of BRPL officials

   The Scope includes training of BRPL Officials at site and at OEM's factory on overall product and all its sub-components.
   BRPL official will include departmental personnel from Operation & Maintenance, Protection, SCADA and Engineering.
   Training will include, but not limited to, verbal and written communication on aspects ranging from operation, maintenance, safety, features and functions.
   It will be the responsibility of contractor to arrange the following:

   i) To arrange Air travel and Taxi for local conveyance at the contractors cost for the engineers/ officers deputed for carrying out the inspection of the material.

   ii) To arrange the minimum 4 star accommodation at the contractors cost for the boarding/ lodging and meals thereof for the engineers/ officers deputed for carrying out the inspection of the material.

   ii) To depute his competent representative to impart training of the material.

Following Table defines mandays required for training of each equipment.

S. No.	Equipment	Training at Site (No. of Days)	Training at Factory (No of Days)	No. of BRPL Representatives for Factory Visit
1	C&R Panels	6	2	3
2	GIS Panels	6	5	5
3	SCADA – RTU	3	2	2
4	Battery Bank	1	1	1
5	Battery Charger	1	1	1
6	Video Surveillance System	1	0	0
7	Fire Detection System	1	0	0

2. Inspection & Testing

2.1 Independent Inspection
BRPL may at his discretion delegate inspection and testing of material to an independent inspector.
2.2. Dates for Inspection and Testing
The Contractor shall give the Owner reasonable notice (minimum 10 days) in writing of the date and the place at which any material will be ready for testing as provided in the Contract and Owner shall attend at the place so named within fifteen (15) days of the date, which the Contractor has stated in his notice. The Owner shall give the Contractor twenty four (24) hours notice in writing of his intention to attend the tests. The above notices shall be given at first by the quickest possible means and confirmed later in writing.
If on receipt of the Contractor's notice of testing, the Owner's representative does not find the material to be ready for testing, the costs incurred for re-deputation of inspector and re-inspection shall also be in Contractor's Scope.

2.3 Inspection charges:

Detailed Breakup of no. of inspectors for each inspection shall be as under.

S. No	Equipment	No of Inspectors
1	GIS Panels	3
2	CRP	3
3	RTU	2
4	For all other equipments	1
5	For all testing and measuring instruments including GIS handling equipments	2
6	For all Stage inspections	1

It will be the responsibility of contractor to arrange the following:

i) Cost of all the inspections within India and abroad (including re inspections) including flight Tickets, local conveyance, Boarding and lodging (Minimum 4 Star Hotel for India and Minimum 4 Star for Abroad) shall be in scope of Vendor. The Factory visits will be held at OEM Factory only.

ii) To depute his authorized representative to associate during the inspection of the material.

In case of fake call or rejection of material or any other cause, the Owner is not liable for reimbursement of the expenditure so incurred by the contractor.

2.4 Rejection

If as-a-result of the inspection, examination or testing as per approved QAP, the Owner decides that any equipment is defective or otherwise not in accordance with the Contract, he may reject such equipment and shall notify the Contractor there-of, immediately. The notice shall state the Owner's objections with reasons.
The Contractor shall then with all speed make good the defect or ensure that any rejected equipment complies with the Contract.
If the Owner requires such Equipment to be re-tested, the tests shall be repeated under same terms and conditions. All costs incurred for re-deputation of inspector and re-inspection shall also be in Contractor's Scope.

TECHNICAL SPECIFICATION

APPROVED MAKES & VENDERS

Prepared by	**Javed Ahmed**		**Rev: 2**
Reviewed by	**Abhinav Srivastava**		**Date: 08.08.2022**
Approved by	**k.Sheshadri**		

Technical Specification for Approved Makes & Vendors

1.0 APPROVED MAKES & VENDORS

S NO.	Vendors
1.0	**Power Transformer**
1.1	BHARAT BIJLEE LIMITED
1.2	ABB LIMITED
1.3	SCHNEIDER ELECTRIC LIMITED.
1.4	BHEL
1.5	CGL
1.6	Toshiba
2.0	**Station Transformers**
2.1	SCHNEIDER ELECTRIC LIMITED.
2.2	TOSHIBA
2.3	DANISH
2.4	CGPISL
3.0	**LT Control, Communication and special cables**
3.1	POLYCAB
3.2	PARAMOUNT COMMUNICATIONS LIMITED
3.3	TARUNA METALS PVT. LIMITED.
3.4	ALPHA COMMUNICATION
3.5	KEI INDUSTRIES LIMITED.
4.0	**LT(1.1 KV grade) XLPE Insulated Power Cables**
4.1	PARAMOUNT COMMUNICATIONS LIMITED
4.2	KEI INDUSTRIES LIMITED.
4.3	HINDUSTAN VIDYUT PRODUCTS LIMITED
4.4	GEMSCAB INDUSTRIES LIMITED
4.5	KRISHNA ELECTRICAL INDUSTRIES LIMITED
4.6	POLYCAB WIRES PRIVATE LIMITED
4.8	KEC INTERNATIONAL LIMITED (RPG CABLES LIMITED)
4.9	HAVELLS
5.0	**11KV 500MVA Indoor Switchboard**
5.1	SIEMENS LIMITED
5.2	ABB LIMITED
5.3	SCHNEIDER ELECTRIC LIMITED.
5.4	Stelmec
5.5	L&T
6.0	**66KV Outdoor Circuit Breakers**
6.1	ABB LIMITED
6.2	SIEMENS LIMITED
6.3	GE
6.4	CGPISL

Technical Specification for Approved Makes & Vendors

7.0	**66KV & 11KV Outdoor CT/PT**
7.1	CROMPTON GREAVES LIMITED
7.2	KAPCO ELECTRIC PVT. LIMITED.
7.3	GE
7.4	MEHRU ELECTRICAL & MECHANICAL ENGINEERS P LIMITED.
7.5	ABB LIMITED
7.6	BHEL
8.0	**CVT**
8.1	CROMPTON GREAVES LIMITED
8.2	ABB LIMITED
8.3	MEHRU
8.4	GE
8.0	**33&66KV Lightening Arrestor**
8.1	ALSTOM
8.2	OBLUM ELECTRICAL INDUSTRIES PVT. LIMITED.
8.3	LAMCO INDUSTRIES PVT. LIMITED.
8.4	ABB LIMITED
8.5	CROMPTON GREAVES LIMITED.
8.6	ELECTROLYTE
8.7	RAYCHEM
9.0	**66KV Isolators**
9.1	ABB LIMITED.
9.2	SIEMENS LIMITED.
9.3	CROMPTON GREAVES LIMITED.
10.0	**66KV Control & Relay Panel**
10.1	ABB LIMITED.
10.2	SCHNEIDER ELECTRIC LIMITED.
10.3	SIEMENS LIMITED.
11.0	**11KV Capacitor Bank**
11.1	UNIVERSAL CABLES LIMITED.
11.2	SHREEM ELECTRIC LIMITED
11.3	ABB LIMITED
11.4	LARSEN & TOUBRO LIMITED
11.5	EPCOS INDIA PVT. LIMITED
12.0	**ACDB &BMK**
12.1	NEPTUNE
12.2	CMKL
12.3	NEC
12.4	EATHUN
12.5	POPULAR SWITCHGEAR

Technical Specification for Approved Makes & Vendors

12.6	SHIVALIC
13.0	**St. through jointing and Termination Kits – 1.1KV,11KV**
13.1	RAYCHEM RPG LIMITED
13.2	3M ELECTRO & COMM. INDIA (P) LIMITED.
13.3	DENSON
14.0	**St. through jointing and Termination Kits – 66KV**
14.1	RAYCHEM RPG LIMITED
14.2	3M ELECTRO & COMM. INDIA (P) LIMITED.
15.0	**LED/HPSV/Fluorescent Lamps, Ballasts, Starters / Igniters, Fittings, Lamp Holder**
15.1	PHILIPS ELECTRONICS INDIA LIMITED
15.2	CROMPTON GREAVES LIMITED
15.3	BAJAJ ELECTRICALS LIMITED
15.4	SURYA ROSHNI LIMITED
16.0	**Transformer oil**
16.1	APAR INDUSTRIES LIMITED
16.2	SAVITA OIL TECHNOLOGIES LIMITED
16.3	RAJ PETRO SPECIALITIES PVT. LIMITED.
17.0	**Protective Relays (Refer Technical specification for details)**
17.1	SIEMENS LIMITED
17.2	A-EBERLE
17.4	ABB LIMITED
17.5	SCHNEIDER ELECTRIC
17.6	GE
18.0	**Overhead Line accessories e.g. Clamps, Connectors, Line Hardware fitting**
18.1	RAYCHEM RPG PVT.LIMITED
18.2	RASHTRA UDHYOG LIMITED.
18.3	KLEMMEN ENGINEERING
18.4	LEGION
18.5	BURMA
19.0	**Disc and Pin Insulators**
19.1	ADITYA BIRLA INSULATORS
19.2	MORDEN INSULATORS LIMITED.
19.3	BHEL
19.4	IEC
19.5	W.S. INDUSTRIES
20.0	**STEEL TUBULAR POLES**
20.1	FABRICO (INDIA) PVT. LIMITED.

20.2	ADVANCE STEEL TUBES LIMITED.
20.3	GOOD LUCK STEEL TUBES LIMITED.
20.4	RAMA STEEL TUBES LIMITED.
21.0	**ACSR Conductors**
21.1	HINDUSTAN VIDYUT PRODUCTS LIMITED
21.2	GUPTA POWER
21.3	LUMINO INDUSTRIES LIMITED
21.5	POLYCAB WIRES PRIVATE LIMITED
22.0	**Battery Bank**
22.1	Panasonic
22.2	Samsung
22.3	Coslite
22.4	Okaya
23.0	**Battery Charger cum DC DB**
23.1	MASS-TECH CONTROLS PRIVATE LIMITED
23.2	CALDYNE AUTOMATICS LIMITED.
23.3	CHABI ELECTRICALS
24.0	**PAINTS & CHEMICALS**
24.1	BERGER PAINTS INDIA LIMITED BRITISH PAINTS DIVISION
24.2	SHALIMAR PAINTS LIMITED.
24.3	NEROLAC PAINTS LIMITED.
24.4	ASIAN PAINTS LIMITED.
25.0	**CEMENT**
25.1	ACC
25.2	ULTRA TECH
26.0	**STEEL**
26.1	TATA
26.2	SAIL
27	NIFPS
27.1	CTR
28	High Mast
28.1	Bajaj Electricals Ltd
29	Cable Seal
29.1	Roxtec
29.2	MCT Brattberg
30	EOT Crane
30.1	REVA
30.2	DEMAG

Technical Specification for Approved Makes & Vendors

31	66kV GIS
31.1	Siemens
21.2	GE
31.3	ABB
32	**GIS Gas Handling kit(Gas filling, filter and evacuation kit)**
32.1	DILO
33	Cable Sealing
33.1	Roxtec
33.2	MCT Bratberg
33.3	UGA Cable and Pipe systems Pvt ltd

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

VOLUME – II

SCHEDULE AND ANNEXURE

TECHNICAL SPECIFICATION

FOR

CABLE SEAL SOLUTION

Specification No- SP-GMS-01-R0

Prepared by	**Javed Ahmed**		**Rev: 1**
Reviewed by	**Abhinav Srivastava**		
Approved by	**Sheshadri Krishnapura**		**Date: 16th April 2022**

Index

1.0. SCOPE:

This specification covers design, engineering, manufacture, assembly, stage testing, inspection & testing before supply & delivery at site and installation testing and commissioning including handover the system to BRPL after successful execution of Cable Seal Solution
This Scope includes the following

a) Supply of Cable Seal System including its transportation to BRPL Site
b) Installation testing commissioning of Cable seal solutions with all the accessories including minor civil work if any.

2.0. Basic Features:

Following requirements shall be fulfilled and supported with valid test reports/certificates:

1. Minimum IP 65 Protection level Certificate for protection from Dust and Water.
2. Heat sink test report of Cable transit system.
3. Certificate/ Test Report for Protection from Rats and Rodents.
4. ATEX, PESO Approval for Explosive atmosphere.
5. NEMA Certificate as per UL 508A for the safety of Cabinets & Enclosures mandatory.
6. Material of Frame shall be of Stainless Steel.
7. System must have Bonding & grounding (Armour Earthing) feature as per IS 3043-1987 using a suitable Tin Plated Copper Braid to be used wherever required. It should be also tested for Impulse withstands as per IEC 62305-1 for minimum 50kA for 1 sec.
8. Manufacturer should have direct presence in India with all the after Sale & Service support from last 10 years.
9. Cable sealing system should have been tested for F- Rating Fire for 3 hrs as per UL 1479/ EN, Insulation and Integrity for 120 mins as mentioned in Indian National Building Code(EI 120) Certificate from BS 476 are mandatory.
10. Cable sealing system should have been tested for GAS tightness of 2.5 bar pressure.
11. EPDM modules in System must have Halogen content less than 200ppm with low smoke index-F1 Classification as per NF16-101 & NF16-102, Heat Radiation test in compliance with M2 classification, UV Ageing Test as per ISO-4892-2:2006 & ISO-815- 1:2008, Oxygen Index Test as per ASTM D 2863-00, Shock & Vibration Test as per NES 510.
12. System must have Bonding & grounding (ArmourEarthing) feature as per IS 3043-1987 using a suitable Tin Plated Copper Braid to be used wherever required. It should be also tested for Impulse withstand as per IEC 62305-1 for minimum 50kA for 1 sec.
13. Smoke Index shall be low. Type test reports for the same shall be provided by the supplier.
14. Shelf life of module - 25 Years
15. Solubility – Insoluble in water.

3.0. SERVICE CONDITIONS:

S.No	Particulars	Data
1	Design Ambient temperature	0°C to 50 °C
2	Seismic Condition	Zone IV as per IS 1893
3	Wind Pressure	195 kg/M² upto elevation of 30 M as per IS 875
4	Maximum Relative Humidity	100%
5	Maximum Altitude above Sea level	1000M
6	Rainfall	750mm (concentrated in 4 months)
7	Pollution level	Heavy/Dry
8	Average of no thunderstorm days	40 per annum

4.0. SYSTEM DESIGN

1. Modules with concentric peel able/removable layered multi-diameter cable sealing system consisting of frames, blocks and accessories shall be installed where the cables enter or leave any type of Electrical Panel/Cabinet/Transformer cable box.Each concentric module shall have a minimum of 10 mm range between smallest and largest adaptable diameter. System should be designed with minimum **+/-** 3 mm design margin. System should have provision for usable spares of 30**%** with no loose/ hanging / add layer / plug in type or to be stored components of modules / seals, each spare module should be concentric peelable/removable multi-diameter layered with complete range installed on Frame and solid Block are not acceptable..

2. It Shall cover following openings

   For all Cable entry from outside to control room building and between room to room

5.0. MAINTENANCE

Bidder shall furnish a maintenance manual and support maintenance activity.

6.0. APPROVED MAKES

Roxtec, MCT Brattberg

7.0. APPROVED MAKES

8.1	Submissions along with the bid	
8.1.1	Duly filled GTP and copy of	2 copies + 1 soft copy

	specification	

8.0. SHIPPING

9.1	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
		The Bidder shall be responsible for all transit damage due to improper packing.

9.0. HANDLING AND STORAGE

10.0	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

10.0. QUALITY

11.1	Vendor quality plan	To be submitted for purchaser approval
11.2	Inspection points	To be mutually identified & agreed in quality plan

11.0. DEVIATION

12.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that

		the bidder complies fully with this specification. No deviation will be acceptable post order.

12.0. TESTING AND INSPECTION

Shall be as per latest relevant standards

13.0. TRAINING

Training on installation, commissioning, operation and maintenance shall be included in the proposal.

- at factory/site- 1 Manday

Technical Specification of Three Phase Four Wire CT operated Static Tri-vector ABT Meter

Document number: BR/18-19/M/ABT_V2

January 2019

Prepared By	Reviewed by	Approved By
Md. Akhtar Ansari 07.01.19	07/01/19	
Md. Akhtar Ansari	Rishi Goyal	Sheshadri Krishnapura

VERSION CONTOL

SN	Date	Previous Version No.	Current Version No.	Author
1	28.05.18	NA	BR/18-19/M/ABT_V1	Md. Akhtar Ansari, Rishi Goyal
2	07.01.19	BR/18-19/M/ABT_V1	BR/18-19/M/ABT_V2	Md. Akhtar Ansari, Rishi Goyal

CHANGE MANAGEMENT

SN	Date	Version No.	Major Changes
1	07.01.19	BR/18-19/M/ABT_V2	- Display parameters (SN 7) - Load Survey parameters (SN 16) - Other Salient Features added (SN 20)

CONTENTS

1. SCOPE

This specification shall cover design, engineering, manufacture, assembly, inspection, testing at manufacturers works before dispatch, supply and delivery to BRPL, Class 0.2s accuracy class static 3 phase–4 wire CT operated three-vector energy meter. The meter shall be suitable for measurement of energy and power, demand requirement in an AC balanced/unbalanced system over a power factor range of zero lag to unity. These meters should have communication port to interface for remote meter reading.

2. STANDARDS

The meter shall be ISI marked (vendor shall be BIS certified) and conform to CEA Metering (Installation and Operation of Meters) Regulation 2006 and latest amendments, Indian Electricity Acts and Indian Electricity Rules.

The CT operated energy meter shall be of accuracy Class 0.2 for active/ reactive / apparent energy and conform to relevant clauses of following standards or report: -

IS 14697: 1999	Specification for A.C Static Transformer operated Watt Hour & VAR – Hour meters, class 0.2s
CBIP Technical Report No. 304 with	Specification for A.C. Static Electrical Energy Meters.
IS 15959 (Companion specification)	DLMS Indian Companion Standard – Category 'B' for Ring fencing/Boundary/ABT Metering

Unless otherwise specified elsewhere in this specification the static meters shall conform to the latest version available of the standard as specified above.

3. TECHNICAL SPECIFICATION

SN	Parameters	Technical Requirements
1	Rated Secondary Voltage	63.5 V (Phase to Neutral)
2	Rated secondary Current (I Basic)	1A or 5 A
3	Maximum Current	200% of Ib
4	Rated Frequency	50 Hz.
5	Accuracy class	• 0.2s (the meter should meet the same class of accuracy for reactive energy also) • The reactive accuracy class of the meter shall be same as the active accuracy class
6	Power Factor	Unity to Zero (all power factor lag / or lead)
7	Temperature	The standard reference temperature for performance shall be 27 °C. The mean temperature co-efficient shall not exceed 0.03%.

The meter shall start and continue to register on application of 0.1% of basic current at Unity P.F., as per relevant standards and shall work satisfactorily up to maximum continuous current of 2 times rated basic current with the following supply system variation:

Voltage: Vref ± 30%
Frequency: 50 Hz ±5%

4. CONSTRUCTIONAL SPECIFICATION

The case, winding, voltage circuit, sealing arrangements, registers, terminal block, terminal cover & name plate etc, shall be in accordance with the relevant standards. The meter should be compact & reliable in design, easy to transport & immune to vibration & shock involved in the transportation & handling. The construction of the meter should ensure consistence performance under all conditions especially during storms/heavy rains/very hot weathers. The insulating materials used in the meter should be non-hygroscopic, non-ageing & have tested quality. The meter should be sealed in such a way that the internal parts of the meter become inaccessible.

The meter should employ latest technology such as Application Specific Integrated Circuit (ASIC) to ensure reliable performance. The mounting of the components on the PCB should be Surface Mounted Technology (SMT) type except some power supply related component. The electronic components used in the meter should be of high quality.

4.1 GENERAL MECHANICAL REQUIREMENT

The construction of the meter shall be rigid & suitable to withstand shock & vibration involved in transportation & handling, as specified in IS14697. Meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially personal safety against electric shook, safety against effect of excessive temperature, protection against spread of fire, protection against penetration of solid objects, dust and water. The design of meter shall conform to IP51 class degree of protection against dust and moisture as per relevant standards.

4.2 TROPICAL TREATMENT

All parts, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions. Meters shall withstand solar radiation. The meters shall be suitably designed and treated for normal life & satisfactory operation under the hot and hazardous tropical climatic conditions as specified in clause no. 2. The meter shall work from -10°C to +55°C and RH 95% non-condensing type.

4.3 METER CASE

The housing of the meter shall be safe high-grade Engineering plastic or any other high quality insulating material and shall be very compact in design. All the insulation materials used in the construction of meter shall be non-hygroscopic, non ageing & of tested quality, capable of withstanding resistant to heat & fire. The construction of the meter offered shall be such that it can be sealed independently and the cover cannot be removed with the use of a

tool, without breaking the seal. The case of offered meters shall be so constructed that any non-permanent deformation shall not prevent the satisfactory operation of the meter.

4.4 TERMINALS -TERMINAL BLOCK

a. The base of the meter shall have a terminal block at the bottom made out of high grade engineering plastic so as to facilitate bottom connection and houses solid nickel plated brass terminals having capability to carry maximum value of current.

b. The material of the terminal block shall be capable of passing the tests given in IS14697: 1999.

c. The terminal holes in the insulating material shall be of sufficient size to accommodate the insulation of the conductors. The diameter of the terminal hole for current terminals shall not be less than 5.0 mm & shall be of adequate length in order to have proper grip of conductors / crimping pins with the help of two screws.

d. The terminal block shall satisfy all the conditions such as clearance & creepage distance between terminals & surrounding part of the meter as specified in relevant clause of IS 14697: 1999.

e. The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there shall have no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure shall not be transmitted through insulating material.

4.5 TERMINAL BLOCK COVER

The terminals block cover for the energy meters shall be extended transparent type, which can be sealed independently of the meter cover. The ETBC shall have a clear space of min 40±5mm, thus allowing sufficient clearance space for inserting cables. The terminals, their fixing screws and the insulated compartment housing them shall be enclosed by extended terminal cover in such a way that no part of meter or accessories at terminal block shall be accessible from the front of the meter. There shall be provision of fixing of seals so that screws cannot be loosened without breaking the seals.
The terminals shall not be accessible without removing the seal(s) of terminal cover when energy meter is mounted on the meter board.

4.6 WINDOW

The energy meter cover shall be made of high-grade engineering plastic with one window.
The window shall be of transparent material ultrasonically welded with the meter cover such that it cannot be removed undamaged without breaking the meter cover seals.

4.7 QUALITY

Overall the quality of the meter should be good and the service life of the meter shall be more than the guarantee period. The material, components used for manufacturing the meter shall be of premium quality. The LCD display shall not fade with time and the display annunciators should be visible. Functionality of the meter shall not be affected by the harsh environmental conditions. Quality meters shall be given preference and the performance of previous installed meters shall be analyzed before awarding the tender. Aesthetically, the meter shall be of premium quality.

5. COMMUNICATION PORT

5.1 LOCAL COMMUNICATION PORT

The energy meter shall have a galvanically isolated optical communication port located in front of the meter for data transfer to or from a hand held Data Collection Device. The sealing provision should be available for optical port.

5.2 REMOTE COMMUNICATION PORT

Meter shall have an additional communication port (RS 232) in the form of RJ11 port to interface external modem for remote data collection. RS232 port should have sealing provision. It should facilitate to read meter remotely via GSM/GPRS/3G/4G modem.

6. DATA DOWNLOADING CAPABILITY

Meter shall support a minimum baud rate of 9600 on optical port as well as RS 232 remote communication port. It shall be possible to read selective data from the meter using base computer software.

7. DISPLAY OF MEASURED VALUE

The measured value(s) shall be displayed on seven segments, six digit Liquid Crystal Display (LCD) display unit/register, having minimum character height of 10 mm.

The data should be stored in non-volatile memory. The non-volatile memory should retain data for a period of not less than 10 years under unpowered condition. Battery back-up memory will not be considered as NVM.

It should be possible to easily identify the single or multiple displayed parameters through symbols/legend on the meter display itself or through display annunciators.

The register shall be able to record and display starting from zero, for a minimum of 1500 hours, the energy corresponding to rated maximum current at reference voltage and unity power factor. The register should not roll over in between this duration.

The principle unit for the measured values shall be Wh/kWh for active energy, VArh/kVArh for reactive energy & VAh/kVAh for apparent energy based on secondary current. Bidder shall mention the scale in which the meter displays the energy values.

Following parameters should be made available on display:

1. Real Time
2. Date
3. Line currents
4. Phase to Neutral Voltages
5. Phase wise Power Factor
6. Frequency
7. Active, Reactive and Apparent Power
8. Cumulative tamper count
9. Cumulative MD reset Count
10. Cumulative active import energy
11. Cumulative active export energy
12. Cumulative reactive lag While active import
13. Cumulative reactive lead While active import
14. Cumulative reactive lag While active Export
15. Cumulative reactive lead While active Export
16. Cumulative apparent import energy
17. Cumulative apparent export energy
18. Active net energy(Imp – exp)
19. Reactive net energy(Imp – exp)
20. Reactive high energy(V>103 percent)
21. Reactive low energy (V<97 percent)
22. THD in % for Voltage R Phase
23. THD in % for Voltage Y Phase
24. THD in % for Voltage B Phase
25. THD in % for Current R Phase
26. THD in % for Current Y Phase
27. THD in % for Current B Phase
28. THD in % for Power R Phase
29. THD in % for Power Y Phase
30. THD in % for Power B Phase
31. Present PT status
32. Present CT status
33. High resolution active import energy
34. High resolution active export energy
35. High resolution reactive lag While active import
36. High resolution reactive lead while active import
37. High resolution reactive lag While active Export
38. High resolution reactive lead While active Export
39. High resolution apparent forwarded energy
40. High resolution apparent import energy
41. High resolution apparent export energy

The meter should have visual quadrant representation on the LCD for energy measurement. Relevant quadrant in which metering is taking place should be in on state for ease of understanding.

8. ELECTROMAGNETIC COMPATIBILITY

The static energy meters shall conform to requirements listed in relevant standards and shall also be protected against radiated interference from either magnetic or radio-frequency source.

8.1 IMMUNITY TO ELECTROMAGNETIC DISTURBANCE

The meter shall be designed in such a way that conducted or radiated electromagnetic disturbance as well as electrostatic discharge do not damage or substantially influence the meter and meter shall work satisfactorily under these conditions as per relevant standards

NOTE: the disturbances to be considered are: -

(a) Harmonics
(b) Voltage dips and short interruptions
(c) Conducted transients
(d) D.C. and A.C. magnetic fields
(e) Electromagnetic fields
(f) Electrostatic discharges

8.2 RADIO INTERFERENCE SUPPRESSIONS

The meter shall not generate noise, which could interfere with other equipment, and meter shall work satisfactorily as per relevant standards

8.3 INFLUENCE OF HIGH MAGNETIC FIELD

The meters shall be provided appropriate magnetic shielding so that any external magnetic field (AC/DC electromagnet) as per CBIP Technical Report no. 304 applied on meter would not affect the proper functioning of the meter and meter shall work satisfactorily as per relevant standards.

9. STARTING CURRENT

The meter shall start and continue to register at the current 0.1% of Ib.

10. RUNNING WITH NO LOAD

When the 115% of rated voltage is applied with no current flowing in the current circuit, the meters shall not register any energy and test output of the meter shall not be more than one pulse/count on "no load".

11. POWER CONSUMPTION

11.1 The active and apparent power consumption in each voltage circuit of the CT Operated meters at reference voltage; temperature and frequency shall not exceed 1.0 W and 4 VA per phase respectively.

11.2 The apparent power consumption in each current circuit for the CT Operated meters at basic current, reference frequency and reference temperature shall not exceed 1.0 VA per phase.

12. CALIBRATION & TEST OUTPUT

All the meters shall be tested, calibrated and sealed at works before dispatch. Further, no modification of calibration shall be possible at site by any means.

However, it shall be possible to check the accuracy of kWh and kVArh energy measurement of the meter in the field by means of LED/LCD output on meter for accuracy. Resolution of the test output shall be sufficient to enable the starting current test in less than 10 minutes

13. CONNECTION DIAGRAM

The connection diagram of the meter shall be clearly shown for 3 phase 4 wire system, on the terminal cover. The meter terminals shall also be marked and this marking should appear in the above diagram.

14. QUANTITIES TO BE MEASURED

The meter shall be able to provide the following data:

a. Instantaneous Parameters (Phase wise THD in % for Voltage and Phase wise THD in % for Current).
b. Block Profile / Load Survey data
c. Daily load profile/Mid night data
d. Abstract quantities
   - Name Plate Details
   - Programmable parameters
e. Event Conditions.(Parameter snapshot of Phase wise THD% in Current and Voltage along with other parameters & kWh (total & fundamental), kVAh, Phase wise Current and Voltage for 3^{rd}, 5^{th}, 7^{th} and 9^{th} Harmonics).

Meter should store previous 12 month billing data into meter memory.

15. ABNORMALITY EVENTS DETECTION

The meter should have features to detect the occurrence and restoration of, at least, the following common abnormal events:

a. **Missing Potential:** The meter shall be capable of detecting and recording occurrence and restoration with date and time the cases of Potential failure (one phase or two phases). All potential missing cases shall be considered as power failure.
b. **Current imbalance**: The meter shall be capable of detecting and recording occurrence and restoration with date and time of Current unbalance (for more than a defined persistence time).
c. **Current Reversal:** The meter shall be capable of detecting and recording occurrence and restoration with date and time if the current is flowing in reverse direction in one or more phases.
d. **Power on/off**: The meter shall be capable to record power on /off events in the meter memory. All potential failure should record as power off event.

e. **Voltage unbalance** – Meter shall detect voltage unbalance if there is unbalance in voltages.
f. **Over Current** – When load condition at any phase i.e. Line current at any phase goes more than defined limit , this will be detected as Over current condition.
g. **CT Open** – The meter should detect phase wise current circuit open when the circuit is opened from meter side.
h. **CT Bypass** – The condition should be detected whenever the current terminal is bypassed in the meter
i. **High and Low Voltage**: The meter should detect under and over voltage events respectively if voltage falls / rise from defined limits.
j. Phase wise voltage THD% more than 5% for 5 min
k. Phase wise current THD% more than 8% for 5 min.

The meter shall keep records for the minimum last 250 events (occurrence + restoration) for above abnormal conditions. Each event shall be logged with date and time of occurrence/restoration. It shall be possible to retrieve the abnormal event data locally using a hand held unit (HHU) through the meter's optical port & same can be viewed / analyzed at base computer end in simple and easily understandable format.

16. LOAD SURVEY

Following parameters shall be made available for last 60 days with integration period of 15 min.

i. Frequency
ii. Three Phase Average Voltage
iii. R Phase Voltage
iv. Y Phase Voltage
v. B phase Voltage
vi. Phase R Current
vii. Phase Y Current
viii. Phase B Current
ix. Energy Active Import (with & without harmonics)
x. Energy Active Export (with & without harmonics)
xi. Energy Apparent Import (with & without harmonics)
xii. Energy Apparent Export(with & without harmonics)
xiii. Energy Reactive Import with voltage as per ABT requirement
xiv. Energy Reactive Export with voltage as per ABT requirement
xv. Energy Net Active Energy
xvi. THD for phase wise voltage, current, power
xvii. Average and phase wise power factor

These load survey and history data can be retrieved with the help of Meter Reading Instrument on local interrogation or remotely using the remote communication interface.

17. MID NIGHT ENERGY PARAMETER

The parameters shall be logged at midnight (00:00 hrs).The meter should store these parameters for 35 days.

i. Real time clock , date and time
ii. Cumulative Energy , kWh Import
iii. Cumulative Energy , kWh Import
iv. Reactive energy high (V>103 percent)
v. Reactive energy low (V<97 percent)

18. MD RESET

The meter shall have provision to store two Maximum Demand occurred during the integration period selected for kW / kVA parameters during a month. The meter shall monitor the demand during the period set and record for each of the TOD zones the maximum registered values during the particular month. Default demand integration period shall be 15 min.

The meter shall have any of the following MD resetting options:

a. Automatic reset at the end of a certain predefined period (say, end of the month)
b. Manual resetting arrangement (MD reset button) with sealing facility.
c. MD reset through authenticated transaction

19. SELF DIAGNOSTIC FEATURE

The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location at all time. The meter shall have indication for unsatisfactory/non-functioning/malfunctioning of the following:

a. Time and date on meter display
b. All display segments on meter display
c. Self diagnostic (RTC, NVM information) on display

20. OTHER SALIENT FEATURES OF METER

a. It should be possible to check the healthiness of phase voltages by phase indicator available on meter display.
b. The meter shall have provision for TOD tariff as per latest DERC regulations. The following features.
- Programmable upto 8 energy and 2 Demand registers.
- Programmable upto 4 seasons per year.

c. The meter should work accurately irrespective of phase sequence of the supply.
d. The meter shall compute the reactive power on 3-phase, 4-wire principle, with an accuracy as per relevant IS/ IEC standards, and integrate the reactive energy algebraically into two separate reactive energy registers, one for the period for which the average RMS voltage is greater than 103% (Reactive High), and the other for the period for which the average RMS voltage is below 97.0% (Reactive Low). When lagging reactive power is being sent out from substations bus bars, reactive registers shall move forward. When reactive power flow is in the reverse direction, reactive registers shall move backwards.
e. The meter shall continuously compute the average of the RMS values of the three line-to-neutral VT secondary voltages as a percentage of 63.51 V, and display the same on demand.

21. TEST AND TEST CONDITIONS

a. Acceptance test: All acceptance tests as per relevant standards shall be carried out in the presence of utility representatives.

b. Routine Test: All the routine tests as per – IS 14697 shall be carried out and routine tests certificates shall be submitted for approval of purchaser.

--End of Doc--

Annexure-O

Technical specification for New Grids 24x7 O&M support

Scope:

24x7 (8 Hours per shift) O&M support for equipment supplied by bidder inclusive of GIS and Terminations after Handing over of Grid by Vendor to BRPL

O&M Shall cover following

Operation:

- Handling equipment with training (on job) to BRPL staff.
- Knowledge of sequence of operation (bidder to provide flow chart for the same in laminated form so that the same may be pasted on grid notice board).
- Competency level in electrical as well as mechanical operations.

Breakdown:

- Attending any breakdown in equipment supplied and replacement of faulty parts (within 10-12 hrs).
- Presence in experienced engineer during entire restoration sequence till equipment get energized.

General Guidance:

- Work force required to attend the outages – built a QRT (quick response team to attend breakdown during that tenure).
- Tools tackles and spares necessary for attending outage.- 1 set of special tools to be incorporated in tech doc to be handed over to user during HOTO.
- Skill level suitable to carry out the operation for 66kV/33kV.

Manpower Requirement:

- One Operator (Minimum ITI qualified), one Skilled worker and one reliever shall be assigned per shift.
- Qualification documents of Manpower assigned shall be submitted to BRPL for approval.

SCHEDULE – A

GENERAL PARTICULARS

(This shall from part of Technical Bid)

1.0 Bidder

1.1	Name	:	
1.2	Postal Address	:	
1.3	Telegraphic Address	:	
1.4	Telex number / Answer back code	:	
1.5	Phone(s)	:	
1.6	Name and Designation of the person who should be contacted in case of clarifications / details etc. not received expeditiously form the officer mentioned in item 1.6 above	:	
1.7	Brief write-up giving details of the organization, years of establishment and and commercial production activities, manufacturing, fabrication, shop testing, erection, testing, commissioning and after-sales service facilities, key personnel with their qualifications and experience, collaboration agreements, if any number of employees in various categories and last three (3) years turn over	:	
2.0	Bid Validity	:	
3.0	All the Schedules filled-in	:	Yes
4.0	All the Deviations brought out in Schedule – E1and E2	:	Yes
5.0	All the drawings, write-ups, literature, leaflets, calculations, details, etc as called for in the specification attached	:	Yes
6.0	Is the Bidder agreeable to undertake this contract, if deviations stipulated by him are not acceptable to the Purchaser	:	Yes/No

Schedules & Annexure **Schedule A**

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C2

66 kV CONTROL & RELAY PANEL

	Parameter	Technical Particulars	
1.00.00	**CONTROL PANEL BOARD**		
1.01.00	Make		
1.02.00	Type		
1.03.00	Reference Standard		
1.04.00	Construction		
1.04.01	Degree of protection		
1.04.02	Sheet metal thickness mm		
1.04.03	Floor channel sills, vibration damping pads and kick plate furnished?		
1.05.00	Equipment Mounting		
1.05.01	All relays, meters and switches are flush mounted?		
1.05.02	Relays furnished in draw out cases with built in test facilitate?		
1.06.00	Name plate		
1.06.01	Material		
1.06.02	Thickness		
1.06.03	Size for:-		
	Equipment		
	Panels		
1.07.00	Mimic		
1.07.01	Material		
1.07.02	Width		
1.08.00	Internal Illumination		
1.08.01	Volt		
1.08.02	Watt		
1.08.03	Door switched controlled		
1.09.00	Space Heater		
1.09.01	Volt		
1.09.02	Watt		
1.09.03	Thermostat Controlled?		
1.10.00	Plug Socket		
1.10.01	Type		
1.10.02	Rating		
1.11.00	Panel Illumination, space heater & plug socket circuits provided with individual switch fuse units?		
1.12.00	AC/DC Supply - Type & rating of isolating switch fuse units for		
1.12.01	Incoming AC Supply		
1.12.02	Incoming DC Supply		
1.13.00	Internal Wiring		
1.13.01	Wire Type		
1.13.02	Voltage Grade		

1.13.03	Conductor Material		
1.13.04	Conductor Size for		
	i) Current / control circuit		
	ii) Voltage Circuit		
1.13.05	Wires identified at both ends with ferrules?		
1.14.00	Terminal block		
1.14.01	Make		
1.14.02	Type / Catalogue No		
1.14.03	20% spare terminals furnished?		
1.15.00	Ground Bus		
1.15.01	Materials		
1.15.02	Size (mm)		
1.16.00	Painting		
1.16.01	Type of finish		
1.16.02	Colour Shade - Inside/Outside		
1.16.03	Details of Painting procedure finished?		
2.00.00	**BREAKER CONTROL SWITCH**		
2.01.00	Make		
2.02.00	Type		
2.03.00	Reference Standard		
2.04.00	Contact Rating	220V DC	240V AC
2.04.01	Make & Continuous (A)		
2.04.02	Break (inductive) (A)		
3.00.00	**ISOLATING CONTROL SWITCH**		
3.01.00	Make		
3.02.00	Type		
3.03.00	Reference Standard		
3.04.00	Contact Rating	220V DC	240V AC
3.04.01	Make & Continuous (A)		
3.04.02	Break (inductive) (A)		
4.00.00	**METER SELECTOR SWITCH**		
4.01.00	Make		
4.02.00	Type		
4.03.00	Reference Standard		
4.04.00	Contact Rating	220V DC	240V AC
4.04.01	Make & Continuous (A)		
4.04.02	Break (inductive) (A)		
5.00.00	**PUSH BUTTON**		
5.01.00	Make		
5.02.00	Type		
5.03.00	Reference Standard		
5.04.00	Contact Rating		
5.04.01	Make & Continuous (A)		
5.04.02	Break (inductive) (A)		
5.05.00	NO & type of Contacts provided per button		
6.00.00	**LAMPS**		
6.01.00	Make		
6.02.00	Type		
6.03.00	Reference Standard		
6.04.00	Rating:		

6.04.01	Volt		
6.04.02	Watt		
6.04.03	Series Resistance		
6.05.00	10 % Extra lamps furnished?		
6.06.00	Size of lens		
7.00.00	**SEMAPHORE INDICATORS**		
7.01.00	Make		
7.02.00	Type		
7.03.00	Diameter of the Disc		
7.04.00	Operating voltage		
7.05.00	Burden (Watt DC)		
7.06.00	Whether latch in type or supply Failure type		
8.00.00	**INDICATING INSTRUMENT**	**Ammeter**	**Voltmeter**
8.01.00	Make		
8.02.00	Type		
8.03.00	Reference Standard		
8.04.00	Type of Movement		
8.05.00	Accuracy Class		
8.06.00	Scale in Degrees		
8.07.00	VA Burden		
9.00.00	**MULTIFUNCTION METER**		
9.01.00	Make		
9.02.00	Type		
9.03.00	Reference Standard		
9.04.00	Furnished in Draw out Case or not		
9.05.00	Type of Register		
9.06.00	Accuracy Class		
9.07.00	VA Burden		
9.07.01	Current Coil		
9.07.02	Voltage Coil		
10.00.00	**ANNUNCIATOR**		
10.01.00	Make		
10.02.00	Type		
10..03.00	Reference Standard		
10.04.00	No. of Annunciator groups furnished?		
10.05.00	No. of Windows per group		
10.06.00	Overall Dimension of a group (mm)		
10.07.00	Detailed Write-up on Scheme furnished?		
11.00.00	**TRANCDUCERS**		
11.01.00	Whether provided as per specification		
11.02.00	Make		
11.03.00	Type		
11.04.00	Output		
11.05.00	Accuracy		
11.06.00	Response Time		
11.07.00	Power Supply		
11.08.00	Isolation		
11.09.00	Catalogue furnished		

Schedules & Annexure **Schedule C2**

12.00.00	RELAYS	Make	Type
12.01.00	Relays furnished in draw out cases with built in test facilitates?		
12.02.00	Line Protection Panel		
12.03.00	Transformer Panel		
12.04.00	Bus coupler Panel		
12.05.00	Miscellaneous Auxiliary Relays		
12.06.00	Auxiliary Relay, Voltage Operated with		
	4 pair of contacts		
	8 pair of contacts		
12.07.00	Auxiliary Relay, Current Operated with		
	4 pair of contacts		
12.08.00	Catalogue of all relays submitted with bid		

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C3

BATTERY CHARGER

Sr. No.	Description	Data to be filled by manufacturer
1	Manufacturer equipment type	
2	Conformance to design standards as per specification Yes / No	
3	Conformance to design features as per specification Yes / No	
4	Submitted to deviation sheet for each specification clause no - Yes / No	
5	Panel dimension in mm (length x depth x height)	
6	Panel weight in kg	
7	Panel enclosure protection offered	
8	Voltage regulation as per specification (value to be specified)	
9	Boost charging DC current adjustment range (Value to be specified)	
10	Amount of Ripple in DC in % - output with battery - without battery	
11	Charger efficiency offered	
12	Max temperature rise above ambient	
13	Power factor at rated load	
14	Rectifier bridge as per specification	
15	Heat generated by the panel in Kw	
16	AC MCCB - Make , rating	
17	DC MCCB - Make , rating	
18	Rectifier transformer - Make , rating	
19	Semiconductor rectifier - Make , rating	
20	DC conductor - Make , rating	
21.1	DCDB integral part of charger or separate?	
21.2	MCB for DC distribution boards - Make, rating	
22	Conformance to metering & indication as per specification	
23	Conformance to make of component as per specification	
24	Conformance to mimic diagram, labels & finish as per specification	
25	Submission of component catalogue - Yes / No	
26	DC charger nominal output current - (battery trickle charge + DC load)	
27	DC charger boost charge current	

28	DC battery	
29	DC battery duty cycle	

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C4

Li Ion BATTERY

S.NO.	Description	BRPL Requirement	Data to be filled by Manufacturer
1	Battery (as per scope of supply) – Yes / No	Yes	
2	Manufacturing battery type	Li-Ion	
3	Conformance to design standards as per specification clause no. 2.0 – Yes / No	Yes	
4	Conformance to design feature as per specification clause no. 5&6 – Yes / No	Yes	
5	Submitted of deviation sheet for each specification clause no - Yes / No	Furnish each deviation if yes	
6	Battery GA drawing submitted - Yes / No	Required	
6.1	Battery selection / sizing calculation submitted – Yes / No	Required	
7	Battery rating offered in Ahr	Refer specs	
7.1	Rating at temperature 45 deg C	Refer specs	
8	Battery bank dimensions in mm (length x depth x height)	As required	
9	Battery Module weight in kg	As required	
10	Battery nominal voltage	220V for 220VDC	
11	Total battery bank CC-CV charging required in volts	As per clause no 6.1	
12	Heat generated by battery at rated full load (in Kw)	Less than 0.025kW/module	
13	Manufacturer of Li-Ion Battery Cells and Modules	Yes	
14	Manufacturer of Battery management system (BMS)	Yes	
15	Availability of Service team in India	Yes	
16	Built In Battery Management System	Yes	

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C7

LT POWER CABLES

For each size / rating separate GTP need to be furnished.			
S.No.	**Description**	**Buyer's requirement**	**Seller's Data**
1	Make	……	
2	Type (AS PER IS)	A2XFY (Multicore)	
3	Voltage Grade (KV)	1.1	
4	Maximum conductor temperature		
A	Continuous (^{0} C)	90 ^{0}C	
B	Short time (^{0} C)	250 ^{0}C	
5	Conductor		
A	Size (mm^2)	4CX300,4CX50, 4CX25, 4CX10 & 2CX10 Sqmm	
B	No. of wire in each conductors Nos.	As per Manufacturer standard	
C	Dia of wires in each conductors before compaction (mm)	As per Manufacturer standard	
D	Shape of conductor	As per specification	
E	Diameter over conductor (mm)	……	
F	Maximum conductor resistance at 20^0 C (ohm / km)	As per table 2 of IS -7098 Part -1	
6	Insulation		
A	Nominal thickness (mm)	As per table 3 of IS -7098 Part -1	
B	Minimum thickness (mm)	……	
C	Diameter over insulation (mm) Approx	……	
7	Inner Sheath		
A	Minimum thickness	As per table 5 of IS -7098 Part -1	
B	Approx dia over sheath (mm) Approx	……	
8	Galvanized steel Armour	As per table 6 of IS -7098 Part -1	
A	Number of strips	As per manufacturer Std.	
B	Size (Thickness X width) in mm	0.8 x 4	
C	Dia of wire for 2CX10sqmm	1.4mm Min	
D	Dia over Armour -Approx	……	
9	Outer Sheath	As per table 8 of IS -7098 Part -1	
A	Thickness (Minimum)		
B	Colour	Yellow	
C	Weather proof paint (applicable for 2c x 10 sqmm and 4c x 10 sqmm only)	……	
10	Approx. overall dia (mm)	……	
11	End Cap	Required	
12	Continuous current rating for standard I.S. condition laid Direct		

	a. In ground 30 ^{0}C Amps	……	
	a. In duct 30 ^{0}C Amps	……	
	a. In air 40 ^{0}C Amps	……	
13	Short circuit current for 1 sec of conductor (KAmp)	……	
14	Electrical Parameters at Maximum operating temperature		
A	Resistance (Ohm / Km) (AC Resistance)	……	
B	Resistance AT 50 C/s (Ohm / Km)	……	
C	Impedance (Ohm / Km)	……	
D	Capacitance (Micro farad /Km)	……	
15	Recommended minimum bending radius	…… X O/D	
16	De-rating factor for following Ambient Temperature in	Ground /Air	
	a. At 30 ^{O}C		
	a. At 35 ^{O}C		
	a. At 40 ^{O}C		
	a. At 45 ^{O}C		
	a. At 50 ^{O}C		
17	Group factor for following Nos. of cables laid	Touching Trefoil	
A	3 Nos.		
B	4 Nos.		
C	5 Nos.		
D	6 Nos.		
18	Process of cross linking of polyethylene	Dry cure	

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C8

CONTROL CABLES

Sr.	Description	Buyer's requirement	Seller's Data
	Purchase Req. No.	….	
	Guarantee Period: 5 Years	60/66 Months	
1.0	Make	….	
2.0	Type (AS PER IS 1554 part -1)	YWY	
3.0	Voltage Grade (KV)	1.1	
4.0	Maximum Conductor temperature		
A	Continuous (° C)	70°C	
B	Short time (° C)	160°C	
5.0	Conductor		
A	Size (mm2)	2.5 / 4 sq mm	
B	No. of wires in each conductor Nos.	As per Manufacturer standard	
C	Dia. of wires in each conductor before compaction (mm)	As per Manufacturer standard	
D	Shape of Conductor	As per Cl.2.1.1 of specification	
E	Diameter over conductor mm	….	
F	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
6.0	Insulation	As per Table 1 of IS:5831 – 1984	
A	Nominal thickness (mm)	As per Cl.2.1.2 of specification & Table 2 of IS 1554(Part-1)	
B	Minimum thickness (mm)		
C	Core Identification	Color of all the cores shall be different	
D	Diameter over Insulation (mm) Approx.	….	

7.0	Inner Sheath	As per Table 2 of IS:5831 – 1984	
A	Minimum thickness (mm)	As per Table 4 of IS 1554(Part-1)	
B	Approx. dia. Over sheath (mm)- Apprx.	….	
8.0	Galvanized Steel Armour	As per Cl 2.1.5 of specification	
A	Number of armour wire	As per Manufacturer Std.	
B	hal Dia of Round Wire	As per Table 5 of IS 1554(Part-1)	
C	Dia. over Armour – Approx.	….	
D	Lay Ratio	….	
E	Confirm minimum 90% coverage (submit calculation)		
9.0	Outer Sheath (FRLS)	As per Table 2 of IS:5831 – 1984	
A	Thickness (Minimum)	As per Table 7 of IS 1554(Part-1)	
B	Color	Black	
10.0	Approx. overall dia. (mm)	….	
11.0	Drum Length & tolerance	As per Spec.Cl. 6.0.0	
12.0	End Cap	Required	
13.0	Drums provide with MS Spindle plate & Nut bolts arrangement	Required	
14.0	Net Weight of cable (Kg/Km.) – Approx.	….	

15.0	Continuous current rating for standard I.S. condition laid Direct		
	a) In ground 30° C Amps	….	
	b) In duct 30° C Amps	….	
	c) In Air 40° C Amps	….	
16.0	Short circuit current for 1 sec of conductor. (KAmp)	….	
17.0	Electrical Parameters at Maximum Operating temperature:		
A	Resistance (Ohm/Km) (AC Resistance)	….	
B	Reactance at 50 C/s (Ohm/Km)	….	
C	Impedance (Ohm/Km)	….	
D	Capacitance (Micro farad / KM)	….	
18.0	Recommended minimum bending radius	…. x O/D	
19.0	FRLS Properties		
	i) Oxygen Index		
	ii) Temperature Index		
	iii) Max Acid Gas Generation		
	iv) Light Transmission / Smoke Density		

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C9

ILLUMINATION SYSTEM

1	**General**			
+1.01	Make			
*1.02	Applicable Standards			
*1.03	Degree of protection			
2	**Lighting Panel /Feeder Pillarm Box (LP/ELP/DLP/FPB/EPB/LDB/ELDB/ Construction Features)**			
2.01	Make			
2.02	Rated Value (V)			
*2.03	Busbar continuous current rating (A)			
*2.04	Busbar material and cross section	1	2	3
3	**Minimum current breakers :**			
+3.01	Service			
3.02	Make			
+3.03	Type			
*3.04	No. of poles			
*3.05	Rated continuous current (A)			
*3.06	Short time current rating (Ka)			
*3.07	Related Voltage (V)			
*3.08	Breaking Current (Ka)			
4	**Load Breaking Switches**			
4.01	Service			
+4.02	Make			
+4.03	Type			
*4.04	No. of poles			
*4.05	Related Voltage (V)			
*4.06	Rated continuous current (A)			
*4.07	Rated making current (Ka peak)			
*4.08	Rated breaking current (Ka)			
*4.09	Rated short time one (1) second current (Ka)			
*4.10	Rated dynamic current (kApeak)			
5	**Fuses**			
5.01	Service			
+5.02	Make			
*5.03	Type			
*5.04	Standard applicable			
*5.05	Related Voltage (V)			
*5.06	Rated current (A)			
*5.07	Fusing factor			

*5.08	Category of duty			
*5.09	Rupturing capacity (prospective current) (Ka)			
6	**Earth Leakage current Breaker**			
+6.01	Make			
+6.02	Type			
*6.03	No. of poles			
*6.04	Rated continuous current (A)			
6.05	Short time current rating (Ka)			
6.06	Rated Tripping current			
7	**Lighting Fixtures**	Type A	B	C
+7.01	Manufacturer			
+7.02	Type			
7.03	Description of different types			
*7.04	Type and wattage of lamp			
*7.05	Rated life of the lamp			
*7.06	Applicable standards			
	Note:- In case luminaries other than the ones specified in specification are offered, all the deviations shall be listed out otherwise these shall be considered as being fully in line with luminaries specified.			
8	**Receptacles with Switches**	1	2	3
+8.01	Make			
+8.02	Type			
+8.03	Related Voltage (V)			
*8.04	Rated current (A)			
8.05	Technical brochures (Attach brochures and state brochure Nos.)			
9	**Cables / Wire**	1	2	3
9.01	Service			
+9.02	Make			
+9.03	Type			
*9.04	Voltage Grade (V)			
*9.05	Conductor Material			
*9.06	Size of conductors (mm^2)			
*9.07	Current rating of conductors (A)			
9.08	Applicable Standards			
10	**Conduits and Accessories**			
10.01	Make			
10.02	Type			
10.03	Material			
10.04	Applicable Standards			
11	**Lamp and Luminaries**	Incandescent Lamps	Fluorescent Tubes	HPSV Lamps
11.01	Make			

11.02	Type			
*11.03	Lumen output throughout life (Lumen)			
*11.04	Derating factor due to temperature			
*11.05	Derating factor due to aging			
12	**Lighting Poles / Towers**			
12.01	Manufacturer			
12.02	Applicable Standards			
12.03	Material and Painting			
12.04	Height			

Notes :

1. Single asterisk (*) marked particulars are guaranteed.
2. Other particulars are bonafide and may vary slightly upon completion of detailed design.
3. Particulars against items marked * and + shall be furnished with the Bid.

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C10

AC DISTRIBUTION BOARDS

S.No	Description	Buyers Requirement	Sellers Data
1	**Panel Construction**		
1.1	Enclosure Type	Free standing, indoor, Fully compartmentalized, Metal clad, Vermin Proof	
1.2	Enclosure degree of protection	IP 5X	
1.3	Enclosure Material	CRCA steel	
1.4	Load bearing members	Minimum 2.5 mm thick	
1.5	Doors and covers	Minimum 2.0 mm thick	
1.6	Gland Plate (detachable type)	3.0mm MS detachable type or Aluminum 5.0mm for single core cables	
1.7	Separate compartment for	Bus bar, circuit breaker, incoming cable, outgoing cable PT, LV instruments.	
1.8	Breaker compartment door	Separate with lockable handle	
1.9	Fixing arrangement i. Doors ii. Covers iii. Gasket	 Concealed hinged Bolted with SS bolts Neoprene	
1.10	Panel Base Frame	Steel base frame as per manufacturer's standard.	
1.11	Handle	Removable bolted covers for cable chamber and busbar chamber shall be provided with "C" type handles	
1.12	Space Heater	Required	
1.13	Panel extension possibility	Required	
2	**MCCB**		
2.1	Mounting	Flush Mounted	
2.2	Rated Operational Voltage(V)	415 volt	
2.3	Ultimate breaking Capacity		
2.3.1	630A MCCB	As per requirement	
2.3.2	100A MCCB	As per requirement	
2.4	Rated Service breaking capacity at rated voltage Ics	Ics =100% Icu	
2.5	Rotary handle	Required	
2.6	Interlocking arrangement	Between Incomer MCCBs	
2.7	Trip time	As per requirement	
2.8	Test Certificates	Should have test certificates for breaking capacities from independent test authorities	

		CPRI / ERDA or equivalent	
3	**MCB**		
3.1	Rated Operational Voltage(V)	415 VAC 50 Hz	
3.2	Protection relay/Release	Magnetic thermal release for over current and short circuit protection	
3.3	Breaking capacity	Shall not be less than 10 KA at 415 VAC	
3.4	Mounting	Din mounted	
3.5	MCB classification	As required	
3.6	ISI Marked	The complete range shall be ISI marked	

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C12

GROUNDING & LIGHTNING PROTECTION SYSTEM

S.No.	Description	Unit	Data by vendor
1	**Earth mat**		
a	Material		
b	Size of conductor		
c	Fault withstand current & duration		
2	**Equipment Earthing**		
a	Material		
b	Size of conductor		
3	**Earth Electrode**		
a	Material		
b	Size		
c	Length		
4	**Lightning Protection System**		
a	Material and size of horizontal air termination		
b	Material and size of vertical air termination		
c	Material and size of down conductor		
d	Size of test link		
e	Material of enclosure for test link		
f	Material and size of earth electrode		

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C13

CABLE ACCESSORIES

1	Cable Accessories	
1.01	Makes	
1.02	Termination kits	
1.03	Straight through joint kits	
1.04	Cable glands	
1.05	Cable lugs	
1.06	Termination blocks	
1.07	Types	
1.08	Termination kits	
1.09	Straight through joints	
1.1	Cable glands	
1.11	Cable lugs	
1.12	Terminal blocks	

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C14

CABLE TRAYS, ACCESSORIES AND TRAY SUPPORT, CONDUITS, PIPES AND DUCTS

1	**General**	
a	Name of the Contractor	
b	Name of sub contractors, if any	
c	Applicable standards	
2	**Cable Trays and Fittings**	
a	Cable Trays and Fittings	
i.	Make	
ii.	Type	
iii.	Material	
	1. Thickness (mm)	
	2. Thickness of galvanization (microns)	
	3. Zinc coating per sq meter (gms)	
3	**Conduits , Fitting and Accessories**	
a	Pipes with fitting	
i.	Make	
ii.	Type	
iii.	Material	
	1. Thickness (mm)	
	2. Thickness of galvanization (microns)	
b	Flexible conduits with fittings and accessories	
i.	Make	
ii.	Type	
iii.	Material	
	1. Thickness (mm)	
	2. Thickness of galvanization (microns)	

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – C15

GAS INSULATED SWITCHGEAR

Proposed Technical data 33k V Gas insulated switchgear

S.No	Description	Units	DATA SPECIFIED BY PURCHASER	DATA PROVIDED BY BIDDER
	PARAMETERS			
1	Voltage	kV	33	
2	Phases	-	3	
3	Frequency	Hz	50	
4	Short Time Rating for 3 Sec	kA	31.5 / 26.3	
5	Voltage Class	kV	36	
6	Insulation level (PF rms / Impulse peak)	kVrms / kVpeak	70/170	
7	Internal arc test			
8	Rated current and duration	kA, sec		
9	Classification			
	ENCLOSURE TYPE		IP65 / IP4X	
1	Rear Doors		Manufacturers Standard	
2	Indoor / Outdoor		Indoor	
3	Arc Resistant		Yes	
4	Tamperproof Category		Yes	
5	Dust resistant (gasketed)		Yes	
	PANEL CONSTRUCTION			
1	Gas pressure – busbar compartment		Bar / MPa	
2	Normal gas pressure		Bar / MPa	
3	Permitted range of Gas pressure for safe operation		Bar / MPa	
4	Alarm level		Bar / MPa	
5	Gas pressure for operation of PRD		Bar / MPa	
6	Withstand gas pressure of enclosure		Bar / MPa	
7	Number of aux.contacts /stages provided for the gas density meter			
8	Gas pressure – breaker compartment		Bar / MPa	
9	Normal gas pressure		Bar / MPa	

10	Permitted range of Gas pressure for safe operation		Bar / MPa	
11	Alarm level		Bar / MPa	
12	Gas pressure for operation of PRD		Bar / MPa	
13	Withstand gas pressure of enclosure		Bar / MPa	
14	Number of aux. contacts /stages provided for the gas density meter			
15	Material and thickness of gas enclosure			
16	Total no. of Gas compartments per panel		No.	
17	Number of Gas Density meters provided per panel		No.	
18	Rating of Isolator (A)		Same as CB rating	
19	Rating of earthing switch(A)		Same as CB rating	
20	Guaranteed Gas leakage Rate		< 0.5 %	
21	Rodent damage protection		Yes	
22	Ground and test device		Yes	
23	Equipment Labeling		Anodized aluminium	
24	Lift truck		If required	
25	Testing facility			
25.1	For Cable		Required	
25.2	For CT		Required	
25.3	For PT		Required	
	BUS INFORMATION			
1	Material		Copper	
2	Bus Joint Plating		Manufacturers Standard	
3	Rated Continuous Current	A rms	2000A	
4	Short time Withstand Current	A rms	31.5kA/ 26.3kA for 3 Sec	
	BUS SUPPORTS AND INSULATION			
1	Manufacturer's Standard & Type		Manufacturers Standard	
2	Material		Manufacturers	

			Standard	
	POWER CABLE ACCOMMODATION			
1	Power Cable entry		Bottom	
2	Terminal lug type		Socket & Plug for SF6	
3	Qty of power cables per phase per compartment		As per Specification	
4	Make of termination			
	CIRCUIT BREAKER INFORMATION			
1	Manufacturer / Model No.			
2	Type (SF6/Vacuum)		Manufacturers Standard	
3	Rated Short-Circuit Current	kA	31.5 kA /26.3kA	
4	Short circuit-Current Withstand Time	sec	3	
5	Rated Maximum Voltage	kV rms	36	
6	Rated Voltage Range Factor, K		1.1	
7	Power Frequency Withstand Voltage	kV rms	70	
8	Lightning Impulse Withstand Voltage	kV crest	170	
9	Rated Continuous Current	A rms	As per single line drawing.	
10	Rated Transient Recovery Voltage Time to Peak (T2)	microsec	Manufacturers Standard	
11	Switching duty/capability			
A	Power Transformers (oil filled)	Capacity		
B	Cables	Length		
C	Over head lines	Length		
12	Rated Interrupting Time	ms	60	
13	Time for Opening Operation	cycles	3	
14	Time for Closing Operation	cycles	4	
15	Closing and latching capability (peak)	kA	Manufacturers Standard	
16	Control Power Voltage Range, Trip Coil	V dc	50VDC	
17	Control Power Voltage	V dc	50VDC	

	Range, Closing Coil			
18	Auxiliary Contacts Total	qty	12	
19	Min. Auxiliary Contacts for Customer use	qty	6	
20	Auxiliary Contact voltage rating	V dc	50VDC	
21	Auxiliary Contact current rating	Amps		
22	Stored Energy System Minimum Voltage	V dc		
23	Stored Energy Spring Charging Motor Current	Amps		
24	Stored Energy Spring Charging Motor Inrush	Amps		
25	Stored Energy Time to Fully Recharge Spring:	seconds		
26	Rated Operating duty cycle		O – 0.3Sec – CO -3min -CO	
27	Rated out of phase switching capability to IEC 56			
28	Operating Power Consumption			
29	Trip Coil	Watt		
30	Closing Coil	Watt		
31	Operating Motor	Watt		
32	Number of trip coils	Nos.	2	
33	Quantity of Gas in CB			
34	Mass			
35	Volume at Normal Pressure	CuM		
36	Interrupting Gas Pressure Maximum / Normal/Minimum	Bar (Absolute)		
37	Number of Close / Open Operation possible without re-charging	No.		
38	Number of operations possible before interrupter maintenance required			
39	At rated S.C. current	Nos		
40	At full load current	Nos		
41	At no load	Nos		
42	Method used to relieve internal overpressure due to short circuit (Bursting			

	disc / relief valve / none. Etc.)			
43	Operating pressure of pressure relief device			
	PROTECTIVE RELAYS			
1	Manufacturer		By Seller	
2	Model no. of each relay			
3	Relay functions		As per specification	
4	Relay Communication		IEC 601850	
	INDICATING METERS			
1	Ammeter			
A	Make			
B	Type		Digital	
C	Auxiliary supply		As per specification	
5	Voltmeter			
A	Make			
B	Type		Digital	
C	Auxiliary supply		As per specification	
	CONTROL WIRING			
A	Type		XLPE	
B	Control wire Size minimum:		2.5sqmm	
C	Voltage Rating:		1.1kV	
D	FRLS type		Yes	
	CURRENT TRANSFORMERS			
1	(Details to be furnished for each type of CT)			
2	Manufacturer/Model Number:		As per SLD	
3	Accuracy Class		As per SLD	
4	Ratio		As per SLD	
5	Burden		As per SLD	
6	Knee point voltage		As per SLD	
7	Rct		As per SLD	
8	Excitation current		As per SLD	
	VOLTAGE TRANSFORMERS			

1	Manufacturer			
2	Model Number			
3	Accuracy		As per SLD	
4	Primary Fuse		Required	
5	Secondary Fuse/min-breaker:		Required	
6	Burden		As per SLD	
7	Disconnecting switch for VT		Required	
	PANEL ACCESSORIES			
1	Indications		LED type	
A	Control switches			
B	Make			
C	Type			
D	Rating			
2	L/R switch			
A	Make			
B	Type			
C	Rating			
3	CT & PT Terminal blocks			
A	Make			
B	Type			
C	Rating			
D	Size			
4	Terminal blocks			
A	Make			
B	Type			
C	Rating			
D	Size			
5	**HEAT LOSS**			
A	Bus Losses		Watts	
B	Heat loss at rated breaker Current 2000A		W/bkr	
C	Heat loss of space heater per vertical section		W/vrtl	
	INSTALLATION INFORMATION			
1	Mass of heaviest piece to be shipped as a unit			
2	Largest section to be shipped a unit -Length:			
3	Largest section to be shipped a unit -Width:			

4	Largest section to be shipped a unit -Height:			
5	Total Mass of assembly to be shipped			
6	Total assembly (breaker lineup only) -Length			
7	Total assembly (breaker lineup only) -Width			
8	Total assembly (breaker lineup only) -Height			
9	Transition section (breaker line-up only) -Mass			
10	Transition section (breaker line-up only) -Length			
11	Transition section (breaker line-up only) -Width			
12	Transition section (breaker line-up only) -Height			
13	Total Number of shipping sections per line up:			
	PANEL DIMENSIONS			
1	Incomer (Width x Depth x Height)			
2	Bus-coupler (Width x Depth x Height)			
3	Outgoing (Width x Depth x Height)			
4	Overall length of Complete board			
	CONTROL AND AUXILIARY SUPPLY			
1	Buyer Control power supply (Volts)		50V ,+15% & -15%V DC	
2	Buyer control power supply short circuit level		30 kA	
3	Buyer AC power supply (Volts)		240 V + 10%	
4	Buyer AC power supply short circuit rating (kA)		50 kA	
	PAINTING / FINISHING			
1	Manufacturer's Standard		Manufacturer’s	

			Paint Spec doc. No.	
2	Colour		RAL7032	
	TYPE TEST			
1	Type tests made on identical designs of equipment to those offered (Report no. / date / testing agency detail to be mentioned here and report to submit)			

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – E1

TECHNICAL DEVIATIONS FROM THE SPECIFICATION

(This shall form part of Technical Bid)

All the technical deviation from the tender specification shall be listed out by the Bidder, para by para in this schedule. Deviation taken in covering letter, standard terms and/or body of the Bid but not listed herein will make the Bid liable for rejection as 'Irresponsive'

S.No.	Section/Sub-Section	Part	Para	Deviation	Justification
1	2	3	4	5	6

Certified that above are the only technical deviations from the tender Specification

Name of Firm : _____

Signature of Bidder : _____

Designation : _____

Date : _____

Seal of Company

SCHEDULE – E2

COMMERCIAL DEVIATIONS FROM THE SPECIFICATION

(This shall form part of Technical Bid)

All the commercial deviation from the tender specification shall be listed out by the Bidder, para by para in this schedule. Deviation taken in covering letter, standard terms and/or body of the Bid but not listed herein will make the Bid liable for rejection as 'Irresponsive'.

S.No.	Section/Sub-Section	Part	Para	Deviation	Justification
1	2	3	4	5	6

Certified that above are the only technical deviations from the tender Specification

Name of Firm : _____

Signature of Bidder : _____

Designation : _____

Date : _____

Seal of Company

SCHEDULE – F

LIST OF DRAWINGS ENCLOSED WITH BID

(This shall form part of Technical Bid)

S.No.	Drawing No	Title
1	2	3

Name of Firm : _____

Signature of Bidder : _____

Designation : _____

Date : _____

Seal of Company

SCHEDULE – G

SCHEDULE OF TEST

(This shall form part of Technical Bid)

Tests as per the relevant Indian Standard except as modified and/or as additionally called for in the tender specification shall be performed. Detailed list of the type test certificates enclosed for the various equipments offered shall be listed in the schedule.

S.No.	Type of test	Equipment	Description
1	2	3	4

1.0 TYPE TESTS

2.0 TESTS
– DURING MANUFACTURE

3.0 ROUTINE TESTS
– ON COMPLETION OF MANUFACTURE

Name of Firm : _____

Signature of Bidder : _____

Designation : _____

Date : _____

Seal of Company

SCHEDULE – H

LIST OF INSTRUMENTS, TESTING EQUIPMENTS, TOOLS AND TACKLES FOR ERECTION AND MAINTANANCE

(This shall form part of Technical Bid)

S.No.	Description	Capacity	Quantity	Delivery
(1)	(2)	(3)	(4)	(5)

1.0 INSTRUMENTS, TESTING EQUIPMENT, TOLLS & TACKLES FOR ERECTION
(To be taken back by the Bidder after completion of job)

2.0 INSTRUMENTS, TESTING EQUIPMENT, TOOLS & TACKLES FOR MAINTENANCE
(To be taken back by the Bidder after completion of job)

3.0 SPECIAL INSTRUMENTS, TSTING EQUIPMENT, TOOLS & TACKLES FOR ERECTION
(To be taken back by the Bidder after completion of job)

4.0 SPECIAL INSTRUMENTS, TSTING EQUIPMENT, TOOLS & TACKLES FOR MAINTENANCE
(To be taken back by the Bidder after completion of job)

Name of Firm : _____

Signature of Bidder : _____

Designation : _____

Date : _____

Seal of Company

SCHEDULE – I
LIST OF INSTALLATIONS

S.No.	Purchaser	Project	PF Ref.	Brief Description	Value	Target Commissioning	Commissioned	Performance	Person to whom reference may be made	Remarks
1	2	3	4	5	6	7	8	9	10	11

Bidders Name : _____
Signature : _____
Name : _____
Seal of Company Designation : _____
Date : _____

SCHEDULE – J

DELIVERY TERMS AND CONDITIONS

1	Quoted for all the items & in the manner as called for in Specification	*Yes/No
1.1	If not, furnish details of deviations	
2	Price FOR site delivery basis	
2.1	Freight:	
	1 Applicable rate	* Not included/included
2.2	Transit Insurance including forty five(45) days storage	
	1 Applicable rate	* Not included/included
2.3	Excise duty	
	1 Applicable rate	* Not included/included
2.4	Sales tax	
	1 Applicable rate	* Not included/included
2.5	Are quoted price firm	*Yes/No
3	Delivery from LOI	
3.1	Supply	
3.2	Erection	
3.3	Testing & commissioning	
3.4	Whether penalty clause acceptable	*Yes/No
4	Validity	
5	Terms of payment	
5.1	As per tender specification	*Yes/No
5.2	If not, give details	
6	Guarantee period	
6.1	Is it as per the tender specification	*Yes/No
6.2	If not, state alternative guarantee period acceptable	
7	Earnest money furnished	*Yes/No
8	Agreeable to furnish security deposit as per the tender specification	*Yes/No
8.1		*Yes/No
9	Agreeable to furnish performance Bank as per the tender specification	*Yes/No
10	Correspondence, drawings, test certificates, instruction manuals, BAR/PERT charts progress reports etc. shall be furnished in number of copies as per distribution schedule attached to the tender specification	*Yes
11	Agreeable to approval of above documents in our (4) weeks from date of receipt as per tender specification	Yes
12	Agreeable to commercial as well as technical terms & conditions of the tender specification, unless listed deviations are accepted	Yes
13	Commencing & completion of submission of drawings from LOI	

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – K

SCHEDULE OF RECOMMENDED SPARES

Bidder shall offer the prices for spares for destination, rate of taxes & duties to be considered shall be indicated.

S.No.	Description	Quantity	Unit Price	Total Price
1	2	3	4	5

Bidders Name : _____

Signature : _____

Name : _____

Designation : _____

Seal of Company Date : _____

SCHEDULE – L

DECLARATION

(This shall form part of Technical Bid)

I, _____ certify that all the typed data & information pertaining to the subject tender specification are correct & are true representation of the equipment covered by our formal Bid No_____dated_____.

I hereby, certify that I am duly authorized representative of the Bidder whose name appears above my signature.

Bidders Name : _____

Authorized Representative Signature : _____

Authorized Representative Name (Typed) : _____

Authorized Representative Designation : _____

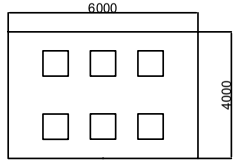
Seal of Company

Date : _____

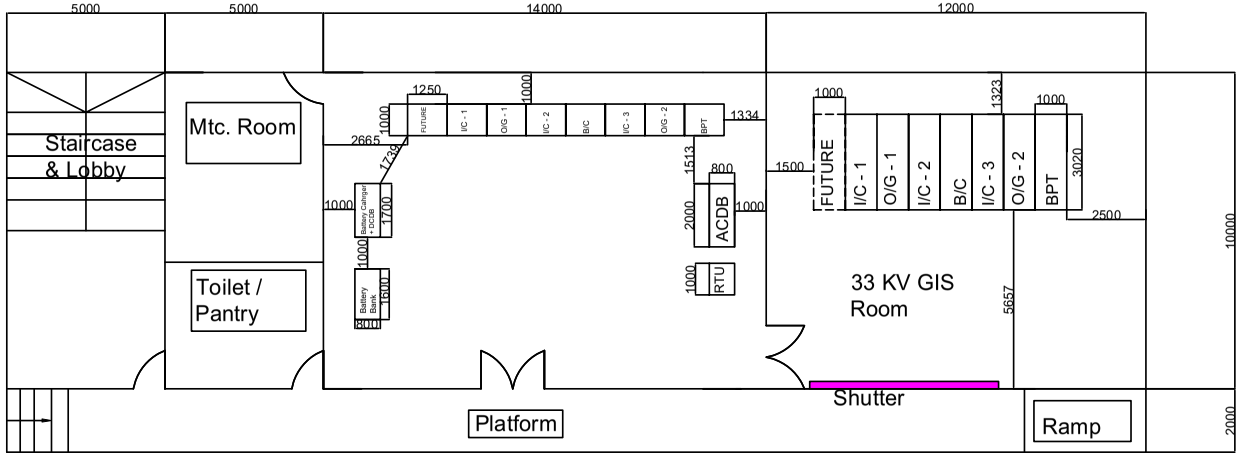
Bidder's Intent : The bidder hereby agrees to fully comply with the requirements & intents of the subject tender specification for the price(s) indicated

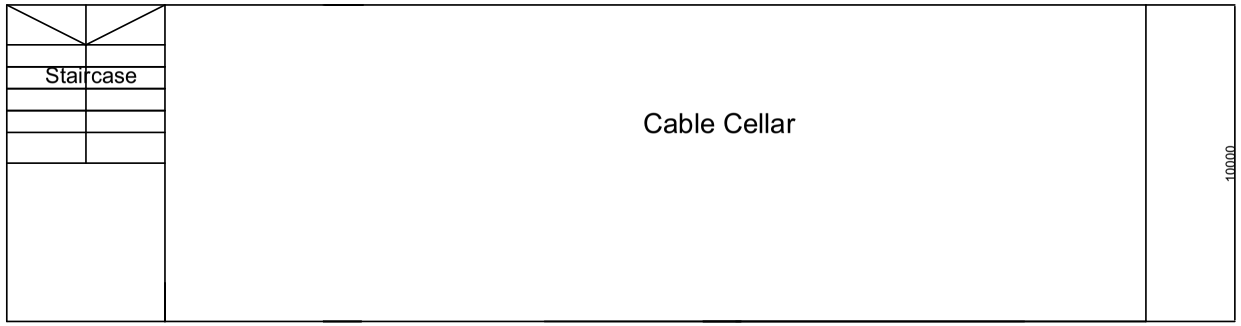
Authorized Representative Signature : _____

DJB STP OKHLA



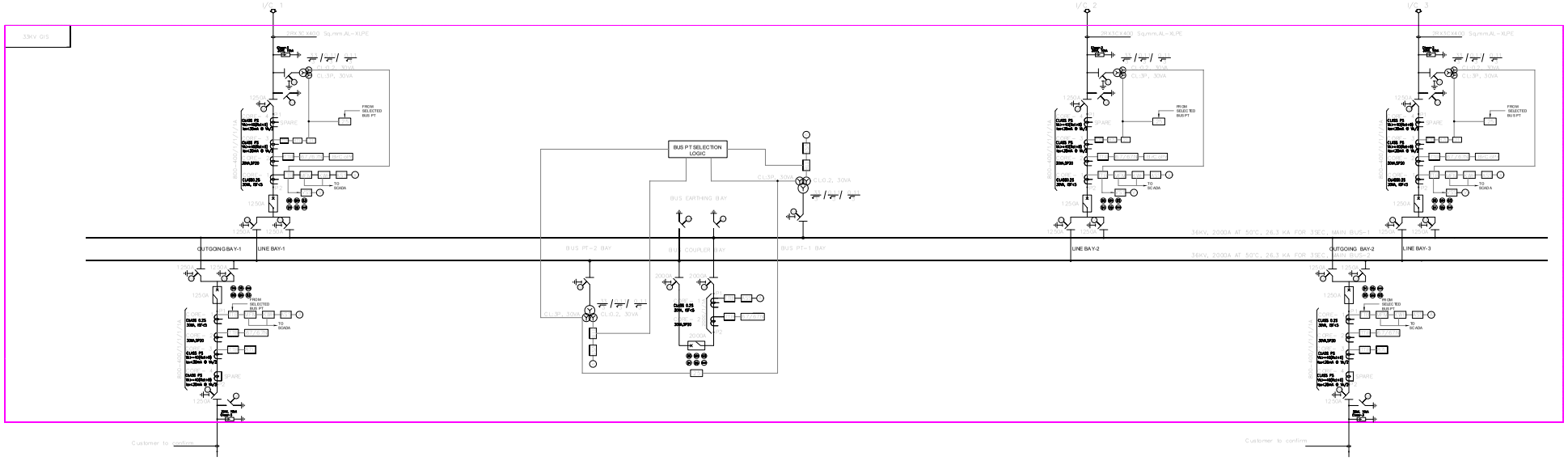
33 KV Cable Structure





Notes :-

1. Control Room Consists CRP,ACDB, DCDB, Li-ion battery bank, Battery Charger, SCADA RTU.
2. Cable Cellar shall be planed below the ground floor.
3. Layout is tentative & subject to modify during detailed engineering.
4. Complete 33KV swithing substation shall be Airconditioned except cable cellar, staircase,toilet/pantry.
5. Requisite minimum clearance of building shall be provided by Customer.
6. ROW for 33KV Cables -6 Nos. shall be provided by Customer. The same shall be finalized after site feasibility.
7. BRPL authorized construction team and O&M personnel shall be allowed 24x7 entry to the said proposed site.
8. 6M wide access shall be available infront of the substation, whenever it is required for any transportation of material or testing facility vehicle.
9. Minimum 2 nos. LT Power supply shall be made available by the customer for running of 33kV switching substation.
10. BRPL use land shall be handed over by the customer to BRPL's land estate deptt. as per prevailing norms.



LEGEND

- POWER CIRCUIT
- CONTROL CIRCUIT
- BUSBAR
- LIGHTNING ARRESTOR
- 3 POSITION MOTORISED ISOLATOR WITH EARTH
- POTENTIAL TRANSFORMER
- MOTORISED EARTH SWITCH
- CURRENT TRANSFORMER
- SF6 CIRCUIT BREAKER
- POWER TRANSFORMER
- FUSE
- DRAWOUT TYPE VACCUM CIRCUIT BREAKER
- UNDER VOLTAGE PROTECTION
- OVER VOLTAGE PROTECTION
- MULTIFUNCTION METER
- POWER QUALITY ANALYSER
- ENERGY METER
- AMMETER SELECTOR SWITCH
- AMMETER
- VOLTAGE SELECTOR SWITCH
- VOLTMETER
- TEST TERMINAL BLOCK
- LINE DIFFERENTIAL PROTECTION
- DISTANCE PROTECTION
- SYNC-CHECK RELAY
- RESTRICTED EARTH FAULT
- TAP POSITION & RAISE/LOW ON OLTC
- DIFFERENT SWITCHES ON POWER TRANSFORMER - HV WTI, LV WTI, OTI, Main Tank OSR, SPR, PRV, Buchholz, MOG, OLTC OSR Inp, OLTC Out of Step/Stuck Up/Motor Inp
- NEUTRAL DISPLACEMENT PROTECTION
- DIRECTIONAL OVERCURRENT & EARTH FAULT
- OVERCURRENT & EARTH FAULT
- BROKEN CONDUCTOR PROTECTION
- SF6 ABNORMAL PRESSURE PRTECTION
- LOCAL BREAKER BACKUP PROTECTION
- LOCK OUT RELAY
- ANTIPUMPING RELAYN
- BREAKER CONTACT MULTIPLIER
- TRIP CIRCUIT SUPERVISION RELAY

Note:

1. This drawing is tentative and for tendor pupose only.
2. Refer tender specification for further details.

BSES Rajdhani Power Limited

BSES Rajdhani Power Limited
BSES BHAWAN
Nehru Place, New Delhi - 110019

DRAWN	SK	TITLE:-			
CHECKED	BG/US	SLD OF 33KV SWITCHING S/STN. AT DJB STP OKHLA			
APPD.	AS				
DATE	05.07.22	DWG No.:-	SHEET	REV.	VER.
SCALE	NTS	BRPL-DJB STP-DEE-B-0000	1 OF 1	00	02

ANNEXURE-II Soil Bearing Capacity Report

Soil Bearing Capacity				
S. No.	Foundation Type	Net Safe Bearing Capacity (Kn/Sqm)		
1	Isolated/ Combined Footing	1.5 m 90-102	3.0 m & above 105-115	Raft 160-168