# Volume – I

# Tender Notification for

# Supply of 2 MVA, 33/0.433 kV DTC Charging Station in BRPL

# CMC/BR/22-23/RB/PR/RJ/1032

# Due Date for Submission of Bids: 14.06.2022

**BSES RAJDHANI POWER LTD (BRPL)**
**BSES Bhawan, Nehru Place, New Delhi-110019**
**Corporate Identification Number: U74899DL2001PLC111527**
**Telephone Number: +91 11 3009 9999**
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**Website: www.bsesdelhi.com**

BSES
RAJDHANI POWER LIMITED

# Section – I

# REQUEST FOR QUOTATION

## Tender Notification: CMC/BR/22-23/RB/PR/RJ/1032

## Supply of 2 MVA ,33/0.433 kV DTC Charging Station in BRPL

RAJDHANI POWER LIMITED

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BSES
RAJDHANI POWER LIMITED

## SECTION – I: REQUEST FOR QUOTATION

### 1.0 Event Information

**1.01** BRPL invites sealed tenders for supply of Rate Contract for Supply of Motorized RMU along with FRTU in BRPL from the manufacturers. The bidder must qualify the technical requirements as specified in clause 2.0 stated below. The sealed envelopes shall be duly super scribed as — **"BID FOR Supply of 2 MVA ,33/0.433 kV DTC Charging Station in BRPL ,TENDER NOTICE CMC/BR/22-23/RB/PR/RJ/1032 DUE FOR SUBMISSION ON DT. 14.06.2022"**.

| Sl. No. | Item Description | Specification | Requirement | Estimated Cost |
|---|---|---|---|---|
| | | | Total Qty. | |
| **BRPL, DELHI** | | | | |
| 1 | **Rate Contract for Supply of of 2 MVA ,33/0.433 kV DTC Charging Station in BRPL** | SECTION V | 07 Nos | 8.00 Cr |

**Note: Quantity may vary to any extent of +/- 30% of above mentioned total quantity.**

**1.02** The schedule of specifications with detail terms & conditions can be obtained from address given below against demand draft/Pay Order of **Rs.1180/- with GST**-, drawn in favour of **BSES RAJDHANI POWER LTD**, payable at New Delhi. The sale of tender documents will be issued from **24.05.2022** onwards on all working days upto **14.06.2022**. The tender documents can also be downloaded from the website "**www.bsesdelhi.com**".

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 as stated above in a separate envelope with suitable superscription —"Cost of Bid Documents: Tender **Notice Ref: CMC/BR/22-23/RB/PR/RJ/1032"**.This envelope should accompany the Bid Documents.

**1.03** Offers will be received upto **1530 Hrs. on dt. 14.06.2022** as indicated earlier and will be opened at the address given below dt. **14.06.2022 at 1600 Hrs.** in the presence of authorized representatives of the bidders. The schedule of specifications with detail terms & conditions are enclosed. It is the sole responsibility of the bidder to ensure that the bid documents reach this office on or before the due date.

**HEAD OF THE DEPARTMENT, 1st FLOOR, 'C' BLOCK,**
**CONTRACTS & MATERIALS DEPARTMENT, BSES RAJDHANI POWER LTD,**
**BSES BHAWAN,**
**NEHRU PLACE, NEW DELHI-110019.**

**1.04** BRPL reserves the right to accept/ reject any or all Tenders without assigning any reason thereof and alter the quantity of materials mentioned in the Tender documents at the time of placing purchase orders. Tender will be summarily rejected if:

i) Earnest Money Deposit (EMD) @ 1% (One percent) of the Tender value i.e. **Rs. 8,00,000/-** is not deposited in shape of Bank Draft in favour of BSES RAJDHANI POWER LTD, payable at New Delhi or Bank Guarantee executed on favour of BSES RAJDHANI POWER LTD.

ii) The offer does not contain "FOR, NEW DELHI price indicating break-up towards all taxes & duties".

iii) Complete Technical details are not enclosed.

iv) Tender is received after due time due to any reason.

**1.05** BRPL reserves the right to reject any or all bids or cancel/ withdraw the invitation for bids without assigning any reason whatsoever and in such case no bidder/ intending bidder shall have any claim arising out of such action time of placing purchase orders.

**2.0 Qualification Criteria**:-

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

1) The bidder should have own manufacturing facility in India for PSS of similar rating or higher since last 3 years- manufacturing and factory incorporation certificate / Undertaking . The details of manufacturing units, locations and works from where supply against this tender shall be proposed to be furnished.

2) The bidder should have servicing , repairing, testing & refurbishment facility in INDIA with necessary spares and testing equipments for providing prompt after sales service for PSS -.Details of the set-up available shall be brought out in the offer, failing which the offer will be rejected. The bidder shall submit undertaking along with the bid confirming compliance to qualifying criteria for bidder.

3) The bidder should have manufacturing capacity of minimum 10 nos. PSS per month- Installed Capacity Certificate.

4) The Bidder should have supplied at least 50 Nos of PSS of 990/1000KVA (Dry/Oil DT) rating or higher in last 5 years from the date of bid opening to any utilities/SEB's/PSU's/reputed firm (wherein the end user shall be Utility/SEB's/PSU's).

5) Performance certificate for minimum 2 year satisfactory performance for PSS of 990/1000 kVA (Dry/Oil DT) or higher rating supplied in last 5 years from at least two utilities/ SEB/ PSUs / reputed firm wherin the end user shall be Utility/SEB's/PSU's
In case of bidder has a previous association with BRPL/BYPL for similar product and service,the performance feedeback for that bidder by BRPL/BYPL shall only be considered irrespective of performance certificate issued by any third organization.- Performance certificates.

6) Bidder should have Average Annual Sales Turnover of Rs 500 Crores or more in last three (3) Financial Years (i.e., FY 2018-19, 2019-20 & 2020-21).- Balance Sheet and Duly certified CA certificate to be submitted.

7) The Bidder must posses valid ISO 9001:2015 certification

8) Supplier must be the OEM and should be manufacturer of at least one major component out of two (11KV RMU, Transformer).- Manufacturing proof required

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

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

11) 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.- Relevant Statutory Documents Copy/Undertaking

## 3.0 Bidding and Award Process

Bidders are requested to submit their questions regarding the RFQ or the bidding process after review of this RFQ. BRPL response to the questions raised by various bidders will be distributed to all participating bidders through website.

### a. Time schedule of the bidding process

The bidders on this RFQ package should complete the following within the dates specified as under:

| S.No. | Steps | Activity description | Due date |
|---|---|---|---|
| 1 | Technical Queries | All Queries related to RFQ | On or before 05.06.2022 1500 Hrs. |

| | | | |
|---|---|---|---|
| 2 | Technical Offer | Documentary evidence in support of qualifying criteria. Technical Literature/ GTP/ Drawings/ Type test report, if any, etc., Testing facilities, any other relevant document, acceptance to commercial terms & conditions viz. delivery Schedule/ Period, Payment terms, PBG etc. Quality assurance plan, Deviation from the specification, list of plant & machinery and testing equipments Unpriced items. | 14.06.2022, 1530 Hrs |
| 3 | Commercial Offer | Prices for RMU and Break up regarding basic price and taxes. Delivery commitment | 14.06.2022, 1530 Hrs |
| 4 | Opening of technical bid | As per RFQ | 14.06.2022, 1600 Hrs |

This is a two part bid process. Bidders are to submit the bids (a) Technical Bid (b) Price Bid. Both these parts should be furnished in separate sealed covers superscribing with specification no., validity etc, with particulars as **Part-I "Technical Particulars & Commercial Terms & Conditions"** and **Part-II "Financial bid"** and these sealed envelopes should again be placed in another sealed cover which shall be submitted before the due date & time specified.

**Bidders are requested to submit the bid in one original plus one copy in duplicate.**

- **The Part-I (Technical Bid) -** Technical Bid should not contain any cost information whatsoever. In case of Bids where the qualification requirements, technical suitability and other requirements are found to be inadequate, Part-II "Financial Bid" will be returned unopened.

- **The Part-II (Financial Bid) -** Qualified bidders will be intimated after technical evaluation of all the bids is completed. The date and time of same shall be intimated in due course to the qualified bidders. 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.

## 4.0 Award Decision

Purchaser intends to award the business on a lowest bid basis, so suppliers are encouraged to bid competitively. The decision to place purchase order / letter of acceptance 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.

The purchaser reserves all the rights to award the contract to one or more bidders so as to meet the delivery requirement or nullify the award decision without any reason.

BSES reserves the right to split the tender quantity amongst techno commercially qualified bidders on account of delivery requirement in tender, quantity under procurement etc.

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

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

In the event of your bid being selected by purchaser (and / or its affiliates) and your 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 RFQ.

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

**Quantity Variation**: The purchaser reserves the rights to vary the quantity by **+/- 30%** of the tender quantity.

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

## 5.0 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. Bidders who violate the marketplace rules or engage in behavior that disrupts the fair execution of the marketplace restricts a bidder to length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

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

## 6.0 Supplier Confidentiality

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

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

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

## 7.0 Contact Information

All communication as regards this RFQ shall be made (i) in English, (ii) in writing and (iii) sent by mail, facsimile to:

| | Technical | Commercial |
|---|---|---|
| Contact Name | Mr. Abhinav Srivastava<br>Copy to Mr. Sheshadri Krishnapura | Ms Rachna Jain<br>Copy to Mr. Pankaj Goyal |
| Address | BSES RAJDHANI POWER LTD,<br>2nd Floor, B Block, Nehru Place, New Delhi – 110019 | C&M Deptt. 1st floor, D- Block, BSES Rajhdhani Power Limited, BSES Bhawan, Nehru Place, New Delhi -110019 |
| Email-ID | Abhinav R Srivastava@relianceada.com<br>sheshadri.krishnapura@relianceada.com | rachna.jain@relianceada.com<br>pankaj.goyal@relianceada.com |

# SECTION – II

# INSTRUCTION TO BIDDERS (ITB)

## Supply of 2 MVA, 33/0.433 kV DTC Charging Station in BRPL

## CMC/BR/22-23/RB/PR/RJ/1032

## A. GENERAL

**1.00** BSES Rajdhani power Ltd, hereinafter referred to as the Purchaser are desirous of implementing the various Systems Improvement/Repair & Maintenance works at their respective licensed area in Delhi. The Purchaser has now floated this tender for procurement of Substation as notified earlier in this bid document.

**2.00 SCOPE OF WORK**

The scope shall include Design, Manufacture, Testing at works conforming to the Technical Specifications enclosed along with Packing, Forwarding, Freight and Unloading and proper stacking at Purchaser's stores.

**3.00 DISCLAIMER**

3.01 This Document includes statements, which reflect various assumptions, which may or may not be correct. Each Bidder/ Bidding Consortium should 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.

3.02 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.

3.03 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.

3.04 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 Purchaser will in no case be responsible or liable for those costs.

## B BIDDING DOCUMENT

### 5.00 BIDDING DOCUMENTS

5.01 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:

**Volume –I**

| | | |
|---|---|---|
| a) | Request for Quotation (RFQ) | - Section – I |
| b) | Instructions to Bidders (ITB) | - Section – II |
| c) | General Conditions of Contract | - Section - III |
| d) | Quantity and delivery requirement | - Section –IV |
| e) | Technical Specifications (TS) | - Section –V |

**Volume – II**

| | | |
|---|---|---|
| a) | Bid Form | - Annexure – I |
| b) | Bid Format | - Annexure – II |
| c) | Price Schedule | - Annexure – III |
| d) | Commercial Terms & Conditions | - Annexure - IV |
| e) | No Deviation Sheet | - Annexure - V |
| f) | Qualification Criterion | - Annexure - VI |

5.02 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

6.01 At any time prior to the deadline for submission of Bids, the Purchaser 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.

6.02 The Amendment shall be part of the Bidding Documents, pursuant to Clause 5.01, and it will be notified in writing by Fax/e-mail to all the Bidders who have received the Bidding Documents and confirmed their participation to Bid, and will be binding on them.

6.03 In order to afford prospective Bidders reasonable time in which to take the Amendment into account in preparing their Bids, the Purchaser may, at its discretion, extend the deadline for the submission of Bids.

## C PREPARATION OF BIDS

### 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 an 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:

a) Bid Form ,Price & other Schedules (STRICTLY AS PER FORMAT)and Technical Data Sheets completed in accordance with Clause 9.0, 10.0, 11.0 and Technical Specification;

b) All the Bids must be accompanied with the required EMD as mentioned in the Section-I against each tender.

c) Power of Attorney or Authorization letter indicating that the person(s) signing the Bid have the authority to sign the Bid and thus that the Bid is binding upon the Bidder during the full period of its validity, in accordance with clause 12.0.

## 9.00 BID FORM

9.01 The Bidder shall complete an "Original" and another one "Copy" of the Bid Form and the appropriate Price & Other Schedules and Technical Data Sheets.

9.02 **EMD**

Pursuant to Clause 8.0(b) above, the bidder shall furnish, as part of its bid, a EMD amounting to 1% of the total bid value (FOR Destination) i.e. Rs. **8,00,000/-**. The EMD is required to protect the Purchaser against the risk of Bidder's conduct which would warrant the security's forfeiture.

The EMD shall be denominated in the currency of the bid, and shall be in the following form:

a) A bank guarantee issued by any scheduled bank strictly as per the form at enclosed and shall be valid for a period of thirty (30) days beyond the validity of the bid.

b) Bank Draft in favour of BSES RAJDHANI POWER LTD, payable at New Delhi.

Unsuccessful bidders' EMD will be discharged or returned as promptly as possible as but not later than thirty (30) days after the expiration of the period of bid validity.

The successful bidder's EMD will be discharged upon furnishing the performance security. The EMD may be forfeited:

a) If the Bidder:
i) Withdraws its bid during the period of bid validity specified by the Bidder in the Bid Form; or

b) in the case of a successful Bidder, if the Bidder fails:

i) to sign the Contract, or

ii) to furnish the required performance security.

## 10.00 BID PRICES

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

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. 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 quotation will be treated as non -responsive and rejected.

## 11.00 BID CURRENCIES

Prices shall be quoted in **Indian Rupees (INR) only**.

## 12.00 PERIOD OF VALIDITY OF BIDS

12.01 Bids shall remain valid for **120 days** post bid date.

12.02 Notwithstanding Clause12.01 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 by Fax/e-mail.

## 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 of Clause 22.03 & 22.04 regarding the rejection of Bids, 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 (as specified in Clause9.0),clearly marked "Original Bid", plus one copy must be received by the Purchaser at the date, time and place specified pursuant to Clauses15.0 and16.0. In the event of any discrepancy between the original and the copies, the original shall govern.

14.02 The original and copy 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.

## D SUBMISSION OF BIDS

### 15.0 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 superscribed with **—Technical & EMD**. The Financial bid shall be inside another sealed envelope with superscription — **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 superscribed with —**"Tender Notice No, Due date of submission, Tender opening date"**.

15.03 The Bidder has the option of sending the Bids in person. Bids submitted by Telex/ Telegram/ Fax will not be accepted. No request from any Bidder to the Purchaser to collect the proposals from Airlines/Cargo Agents etc shall be entertained by the Purchaser.

### 16.0 DEADLINE FOR SUBMISSION OF BIDS

16.01 The original Bid, together with the required copies, must be received by the Purchaser at the address specified not later than **1530 HRS on 04.02.2022**.

16.02 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents in accordance with Clause9.0, 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.

### 17.0 ONE BID PER BIDDER

Each Bidder shall submit only one Bid. 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 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.

## E. EVALUATION OF BID

### 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.

### 22.00 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.

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.

### 23.0 EVALUATION AND COMPARISON OF BIDS

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

23.02 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. 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:

(a) Supply Schedule
(b) 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 adjustment in price, which results from the above procedure, 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.

## F. AWARD OF CONTRACT

### 24.0 CONTACTING THE PURCHASER

24.01 From the time of Bid submission to the time of contract award, if any Bidder wishes to contact the Purchaser on any matter related to the Bid, it should do so in writing.

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.

### 25.0 THE PURCHASER ’S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

The Purchaser reserves the right to accept or reject any Bid and to annul the Bidding process and reject all Bids at anytime prior toward 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.

### 26.0 AWARD OF CONTRACT

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 other bidders in the tender, provided it is required for progress of project & provided he agrees to come to the lowest rate.

### 27.0 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.

## 28.0 LETTER OF INTENT/ NOTIFICATION OF AWARD

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

## 29.0 PERFORMANCE BANK GUARANTEE

The successful Bidder shall furnish the Performance Bank Guarantee for an amount of 10% (Ten percent) of the Contract Price in accordance with the format provided. The Performance Bond shall be valid for a period of twenty four months (24) from the date of the commissioning or thirty months (30) from the date of receipt of material (last consignment) at site/stores whichever is earlier plus 3 months towards claim period. Upon submission of the performance security, the EMD shall be released.

## 30.00 CORRUPT OR FRADULENT PRACTICES

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

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

i) "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

ii) "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Purchaser, 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.

(b) Will reject a proposal forward 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 General Conditions of Contract.

# SECTION – III

# GENERAL CONDITIONS OF CONTRACT (GCC)

# Supply of 2 MVA, 33/0.433 kV DTC Charging Station in BRPL

## CMC/BR/22-23/RB/PR/RJ/1032

## GENERAL TERMS AND CONDITIONS

### 1.0 General Instructions

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 BRPL 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" issued by the Purchaser.

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

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 supply, acceptance shall mean issue of necessary equipment / material takeover receipt after installation & commissioning and final acceptance.

**3.0 Contract Documents & Priority**

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

3.02 Priority: Should there be any discrepancy between any term hereof and any term of the Offer Sheet, the terms of these RFQ shall prevail.

**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 in Section – IV of this RFQ.

4.03 Quantity variation and additional requirement if any shall be communicated to successful bidder during project execution.

4.04 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.

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 needs to proceed with the work past a hold point only after clearance by purchaser or a witness waiver letter from BRPL.

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

5.04 On completion of manufacturing the items can be dispatched only after issue of shipping release by the Purchaser.

5.05 All testing and inspection shall be done without any extra cost.

5.06 Purchaser reserve the right to send any material out of the supply to any recognized laboratory for testing and the cost of testing shall be borne by the Purchaser. 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 bidders representative.

5.07 Bidder has to sign quality agreement before supply of the material.

## 6.0 Packing, Packing List & Marking

6.01 Packing: Supplier shall pack or shall cause to be packed all Commodities in boxes and containers and otherwise in such a manner as shall be reasonably suitable for shipment by road or rail to BRPL 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 and the extreme outside dimensions (length, width and eight) of each container or box. One copy of the packing list shall be enclosed in each package delivered. There shall

also be enclosed in one package a master packing list identifying each individual package, which is part of the shipment. On any packaging where it is not feasible to place the packing list inside the container, all pertinent information shall be stenciled on the outside and will thus constitute a packing list.

**7.01 Prices basis for supply of materials**

Bidders require quoting their prices on Landed Cost Basis and separate price for each item.
For Supply to BRPL Delhi the price shall be inclusive of packing, forwarding, GST and freights. The above supply prices shall also include unloading at site stores. Transit and storage insurance will be arranged by BRPL; however bidder to furnish required details in advance for arranging the same by BRPL.

**8.0 Variation in taxes, duties & levies:**

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

8.02 No other Taxes, Duties & Levies other than those specified above will be payable by BUYER except in case of new Levies, Taxes & Duties imposed by the Competent Authorities by way of fresh notification(s) subsequent to the issue of PURCHASE ORDER but within the stipulated delivery period.

8.03 Notwithstanding what is stated above, changes in Taxes, Duties & Levies shall apply only to that portion of PURCHASE ORDER not executed on the date of notification by Competent Authority. Further, changes in Taxes, Duties & Levies after due date of Delivery shall not affect PURCHASE ORDER Terms and Value.

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

**9.0 Taxes & Duties on raw materials & bought out components:**

9.01 Taxes & Duties on raw materials & bought out components are included in Order Value and are not subject to any escalation or variation for any reason whatsoever.

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

**10.0 Terms of payment and billing**

10.01 For Supply of Equipments:

- 100% payment shall be made within 45 days from the date of receipt of material at store/ site against submission of 10 % performance bank guarantee. (Refer 10.01)

10.02 Bidder to submit the following documents against dispatch of each consignment:

i) Consignee copy of LR

ii) Supplier detailed invoice showing commodity description, quantity, unit price, total price and basis of delivery.

iii) Original certificate issued by BRPL confirming receipt of material at site and acceptance of the same.

iv) Dispatch clearance / inspection report in original issued by the inspection authority

v) Packing List.

vi) Test Reports

vii) Guarantee Certificate.

viii) Insurance policy to be obtained by supplier

**11.0 Price Validity**

11.01 All bids submitted shall remain valid, firm and subject to unconditional acceptance by BRPL Delhi for 120 days post bid-date. For awarded suppliers, the prices shall remain valid and firm till contract completion.

**12.0 Performance Guarantee**

12.01 Supplier shall establish a performance bond in favor of BRPL in an amount not less than Ten percent (10%) of the total price of the Contract (the "Performance Bond"). The Performance Bond shall be valid for a period of twenty four months (24) from the date of the commissioning or thirty months (30) from the date of receipt of material (last consignment) at site/stores whichever is earlier plus 3 months towards claim period. It shall be in accordance with one of the following terms:

a) Depositing pay order /demand draft of the relevant amount directly with BRPL at the address listed above or as otherwise specified by BRPL, either of which shall constitute the Performance Bond hereunder; or

b) Bank guarantee from any nationalized bank in favour of BSES RAJDHANI POWER LTD (BRPL). The performance Bank guarantee shall be in the format as specified by BRPL.

**13.0 Forfeiture**

13.01 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 ICICI Bank at Mumbai, or to the relevant company/ correspondent bank referred to above, as the case may be, together with a

simple statement that supplier has failed to comply with any term or condition set forth in the Contract.

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

**14.0 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.

**15.0 Defects Liability Period**

15.01 The bidder to Guarantee the materials / items supplied against any defect of failure, which arise due to faulty materials, workmanship or design for the entire defects liability period. The Defect liability period shall be 60 months from the date of commissioning or 66 months from the date of delivery whichever is earlier. If during the defects liability period any materials / items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within 30 days from the date of receipt of intimation.

**16.0 Return, Replacement or Substitution.**

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

**17.0 Effective Date of Commencement of Contract:**

17.01 The date of the issue of the Letter of Acceptance shall be treated as the effective date of the commencement of Contract.

**18.0 Time – The Essence of Contract**

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

**19.0 The Laws and Jurisdiction of Contract:**

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

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

**20.0 Events of Default**

20.01 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.

**21.0 Consequences of Default.**

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

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

i) present for payment 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.

**22.0 Penalty for Delay**

22.01 If supply of items / equipments is delayed beyond the supply schedule as stipulated in purchase order then the Supplier shall be liable to pay to the Purchaser as penalty for delay, a sum of 1% (one percent) of the contract price for every week delay or part thereof for undelivered quantities.

22.02 The total amount of penalty for delay under the contract will be subject to a maximum of ten percent (10%) of the contract price for undelivered quantities.

22.03 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.

**23.0 Force Majeure**

23.01 General

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

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

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

iii) Such vent is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract.

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

23.02 Specific Events of Force Majeure subject to the provisions of above clause, Events of Force Majeure shall include only the following to the extent that they or their consequences satisfy the above requirements:

23.03 Mitigation of Events of Force Majeure Each Party shall:

i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure including recourse to alternate methods of satisfying its obligations under the Contract;

ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and

iii) Keep the other Party informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.

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

23.05 Termination for Certain Events of Force Majeure. If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 3 months, the Parties shall promptly discuss in good faith how to proceed with a view to reaching a solution on mutually agreed basis. If a solution on mutually agreed basis cannot be arrived at within a period of 30 days after the expiry of the period of three months, the Contract shall be terminated after the said period of 30 days and neither Party shall be liable to the other for any consequences arising on account of such termination.

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

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

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

**24.0 Transfer And Sub-Letting**

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

**25.0 Recoveries**

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

**26.0 Waiver**

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

**27.0 Indemnification**

27.01 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.

## SECTION – IV: QUANTITY AND DELIVERY REQUIREMENT

| Sl. No. | Item Description | Specification | Requirement | Delivery Schedule | Location |
|---|---|---|---|---|---|
| BRPL,DELHI | | | | | |
| 1 | Supply of 2 MVA, 33/0.433 kV DTC Charging Station in BRPL along with Supervision of ETC of Station | SECTION V | 07 Nos | 3-4 months from the date of Ordering | Stores BRPL Delhi |
| TOTAL | | | | | |

**Annexure –I**

**BID FORM**

**Rate Contract for Supply of DTC Charging Station in BRPL**

To
Head of the Department Contracts & Materials BSES Rajdhani Power Ltd BSES Bhawan, Nehru Place New Delhi– 110019
Sir,

We understand that BRPL is desirous of procuring "Rate Contract for Supply of DTC Charging Station in BRPL" in its licensed distribution network area in Delhi. Having examined the Bidding Documents for the above named works, we the undersigned, offer to deliver the goods in full conformity with the Drawings, Conditions of Contract and specifications for the sum of AS PER PRICE BID ENCLOSED 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.

If our Bid is accepted, we undertake to deliver the entire goods as per delivery schedule given by you from the date of award of purchase order/letter of intent.

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 General Conditions of Contract.

We agree to abide by this Bid for a period of 120 days from the date fixed for bid opening under clause 9.0 of GCC, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

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

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

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

There is provision for Resolution of Disputes under this Contract, in accordance with the Laws and Jurisdiction of Contract, Clause 19 of GCC .

Dated this.....day of.....20.....
Signature..... In the capacity of……
.....duly authorized to sign for and on behalf of (IN BLOCK CAPITALS)……

**Annexure -II**

**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] (hereinafter called the "Bidder") has submitted its bid dated [date of submission of bid] for the supply of [name and/or description of the goods] (hereafter 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 its Corporate Office at BSES Bhawan Nehru Place, New Delhi -110019, (herein after called —the "Purchaser") in the sum of_____ 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:

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

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

fails or refuses to execute the Contract Form ,if required; or
fails or refuses to furnish the performance security, In accordance with the Instructions to Bidders/GENERAL 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 conditions, specifying the occurred condition or conditions.

This guarantee will remain in force up to and including thirty (30) days after the period of bid validity, and any demand in respect thereof should reach the Bank not later than the above date.

(Signature of the bank)

Signature of the witness

**Annexure-III**

**PRICE FORMAT**

ENQUIRY NO & DATE: NIT: CMC/BR/22-23/RB/PR/RJ/1032

**PRICE SCHEDULE**

| ITEM DESCRIPTION | QTY AS PER RFQ | EX-WORKS RATE/ UNIT | CGST (%) | CGST AMOUNT | SGST (%) | SGST AMOUNT | IGST (%) | IGST AMOUNT | FREIGHT | LANDED RATE/ UNIT | TOTAL LANDED COST (INR) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SUPPLY OF 2 MVA, 33/0.433 kV DTC Charging Substation along with Supervision of ETC of Station | 07Nos | | | | | | | | | | |

Note: 1.Prices shall be Firm
2.The prices received without break up of ex works, Freight, GST are liable for rejection
3. Pls. Indicate the exact percentage of taxes in figures and words.
4. If there is a discrepancy between the unit price and the total price THE UNIT PRICE shall prevail.
5. Bidders are requested to attach the covering letter head alongwith the price bid indicating reference no and date.

Bidders seal & signature

**Annexure – IV**

Enquiry No. : CMC/BR/22-23/RB/PR/RJ/1032

## COMMERCIAL TERMS AND CONDITIONS

| S/NO | ITEM DESCIPTION | AS PER BRPL | CONFIRMATION OF BIDDER |
|---|---|---|---|
| 1 | Validity of prices | 120 days from date of offer | |
| 2 | Price basis | Firm, FOR Delhi store basis, Prices shall be inclusive of all taxes & duties, freight upto Delhi stores. Unloading at stores be in vendor's scope Transit insurance in BRPL scope | |
| 3 | Payment Terms | 100% payment within 45 days after receipt of material at stores | |
| 4 | Delivery schedule | As per our requirement | |
| 5 | Defect Liability Period | 60 months after commissioning or 66 months from the last date of supply after commissioning, whichever is earlier. | |
| 6 | Penalty for delay | 1% per week of delay of undelivered units or part thereof subject to maximum of 10% of total PO value of undelivered units | |
| 7 | Performance Bank Guarantee | 10% of total PO value for 24 months after commissioning or 30 months from date of supply, whichever is earlier plus 3 months towards claim period | |

**ANNEXURE - V**

ENQUIRY NO: CMC/BR/22-23/RB/PR/RJ/1032

**NO DEVIATION SHEET**

| SL NO | SL NO OF TECHNICAL SPECIFICATION | DEVIATION, IF ANY |
|---|---|---|
| | | |

**SIGNATURE & SEAL OF BIDDER**

**NAME OF BIDDER**

**CHECK LIST**

| Sl No | Item Description | YES/NO |
|---|---|---|
| 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 | TECHNICAL BID | YES/NO |
| 6 | ACCEPTANCE TO COMMERCILAL TERMS & CONDITIONS | YES/NO |
| 7 | FINANCIAL BIDS (IN SEALED ENVELOPE) | YES/NO |
| 8 | EMD IN PRESCRIBED FORMAT | YES/NO |
| 9 | DEMANT DRAFT OF RS 1180/- DRAWN IN FAVOUR OF | BSES RAJDHANI POWER LTD |
| 10 | POWER OF ATTORNEY/ AUTHORISATION LETTER FOR SIGNING THE BID | YES/NO |

BSES
RAJDHANI POWER LIMITED

**SECTION – V**

**TECHNICAL SPECIFICATIONS (TS)**

# Rate Contract for Supply 2 MVA, 33/0.433 kV DTC Charging Station

# CMC/BR/22-23/RB/PR/RJ/1032

# Specification for

# 2 MVA 33/0.433kV DTC CHARGING STATION

Specification no – **SP-DTCPT-00-R0**

| PREPARED BY | REVIEWED BY | APPROVED BY | REV | DATE |
| --- | --- | --- | --- | --- |
| JA/AM | Abhinav Srivastava | Gopal Nariya | 00 | 17.02.2022 |

## 1.0 Scope of supply

**The scope includes the following:**

**1.1** Survey, design, engineering, manufacture, shop testing, inspection, packing, dispatch, loading, unloading and storage at site, storage and construction insurance for 2 MVA 33/0.433 kV Compact Substation at Delhi Transport Corporation at different locations in New Delhi, BRPL.

**1.2** Assembly , erection ,structural , complete pre commissioning checks , testing and commissioning at site , obtaining statutory clearance & certification from state electrical inspector, Municipal Corporation department, Fire Officer, Horticulture department and handing over to owner after successful testing & Commissioning of 2 MVA 33/0.433 kV Compact at Delhi Transport Corporation at different locations in New Delhi, BRPL.

## 2.0 Codes & standards

a) Materials, equipment and methods used in the manufacture of Distribution Transformer shall conform to the latest edition of below mentioned standards.

b) Vendor shall possess valid BIS Certification.

## 3.0 IEC Standards

| | |
|---|---|
| IEC 60034 | Rotating Electrical Machines. (E.g. For Cooler Fan Motors.) |
| IEC 60071 | Co-ordination of Insulation. |
| IEC 60076 | Power transformers. |
| IEC 60156 | Method for Determination of the Electric Strength for Insulating Oils. |
| IEC 60044 | Current Transformers. |
| IEC 60214 | On Load Tap Changers |
| IEC 60296 | Specification for Unused Mineral Insulating Oils for Transformers and Switchgear. |
| IEC 60354 | Loading Guide for Oil-Immersed Power Transformers. |
| IEC 60445 | Basic& Safety principles for man-machine interface, marking and identification, Identification of Equipment Terminals and conductor terminals |
| IEC 60529 | Degrees of Protection Provided by Enclosures (IP Code). |
| IEC 60551 | Determination of Transformer and Reactor Sound Levels. |

| | |
|---|---|
| IEC 60606 | Application Guide for Power Transformers. |
| IEC 60616 | Terminal and Tapping Markings for Power Transformers. |
| IEC 60947 | Low-Voltage Switchgear and Control gear. |
| IEC 60947 | Bushing for alternating voltage above 1000V |

### 4.0 British Standard

| | |
|---|---|
| BS 148 | Determination of Transformer and Reactor Sound Levels. |
| BS 223 | Application Guide for Power Transformers. |
| BS 2562 | Terminal and Tapping Markings for Power Transformers. |

### 5.0 Indian Standards

| | |
|---|---|
| IS:335 | Insulating oil |
| IS:1271 | Thermal evaluation and classification of electrical insulation |
| IS:2099 | Bushing for Alternating voltage above 1000V |
| IS:2705 | Current Transformers |
| IS:3347 | Dimensions for Porcelain Transformer bushing |
| IS:3637 | Gas operated relays |
| IS:3639 | Fitting & Accessories for power transformers |
| IS:4201 | Application guide for CT's |
| IS:6600 | Guide for loading of oil immersed transformers |
| IS:8478 | Application guide for On-load tap changer |
| IS:8468 | On-load tap changer |
| IS:10028 | Code of practice for selection, installation & maintenance of transformers |
| IS:13947 | LV switchgear and Controlgear-Part1 |
| IS 2026 | Power Transformers |
| IS 1180 | Outdoor type oil immersed distribution transformer up to and including 2.0MVA,33kV |
| IS 5561 | Electrical Power Connectors |
| IS 5 | Colors for ready mix paints |
| IS 6272 | Industrial cooling fans |
| IS 325 | Three phase induction motors |

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| | Indian Electricity Rules |
| | Indian Electricity Act |
| | CBIP manual |

In the event of direct conflict between various order documents, the precedence of authority of documents shall be as follows -

I. Guaranteed Technical Particulars (GTP)

ii. This Specification

Iii Indian Standards / IEC standards

IV Approved Vendor Drawings

iv. Other documents

### 6.0 Major Design Criteria & Parameters of the Transformer

| Sr. No | Description | Data by purchaser |
|---|---|---|
| 3.1 | Voltage variation on supply side | + / - 10 % |
| 3.2 | Frequency variation on supply side | +/ - 5 % |
| 3.3 | Transient condition | - 20 % or + 10 % combined variation of voltage and frequency |
| 3.4 | Service Condition | Refer Annexure B |
| 3.5 | Insulation level | Class A |
| 3.6 | Location of equipment | Generally Outdoor but may be located indoor also with poor ventilation |
| 3.7 | Reference design ambient temperature | 50 deg C |
| 3.8 | Type | Oil immersed, core type, step down |
| 3.9 | Type of cooling | ONAN |
| 3.10 | Reference standard | IS 2026/IS 1180 |
| 3.11 | No. of phases | 3 |
| 3.12 | No. of windings per phase | 2 |
| 3.13 | Rated frequency ( Hz ) | 50 Hz |
| 3.14 | Highest system voltage HV side | 36 kV |
| 3.15 | Highest system voltage LV side | 460 volt |

| | | |
|---|---|---|
| 3.16 | Lightning Impulse withstand voltage , kV peak | |
| 3.16.1 | For nominal system voltage of 33 kV | 170 |
| 3.17 | Power Frequency Withstand Voltage kV rms | |
| 3.17.1 | For nominal system voltage of 33 kV | 70 |
| 3.17.2 | For nominal system voltage of 415 V | 3 |
| 3.18 | Clearances Phase to Phase , mm | |
| 3.18.1 | For nominal system voltage of 33 kV | 350 |
| 3.18.2 | For nominal system voltage of 415 V | 25 |
| 3.19 | Clearances Phase to Earth , mm | |
| 3.19.1 | For nominal system voltage of 33 kV | 320 |
| 3.19.2 | For nominal system voltage of 415 V | 25 |
| 3.20 | System Fault Level , HV side | 1500 MVA |
| 3.21 | System Fault Level , LV side | 35 MVA |
| 3.22 | System earthing | |
| 3.22.1 | HV | Solidly earthed |
| 3.22.2 | LV | Solidly earthed |
| 3.23 | Ratings | 2000 KVA |
| 3.24 | Percentage Impedance at 75 deg C | 6.25 % with IS tolerance |
| 3.25 | Max Total losses(No Load+ Load Losses at 75ºC) at 50% of the rated load , kW | |
| 3.25.1 | 2000 KVA | 5.05 |
| 3.26 | Max Total losses(No Load+ Load Losses at 75ºC) at 100% of the rated load , kW | |
| 3.26.2 | 2000 KVA | 15 |
| 3.27 | Phase CT Ratio , Amp | |
| 3.27.2 | 2000 KVA | 3000/5 |
| 3.28 | HV cable size for all sizes / Conductor size | |

| | | |
|---|---|---|
| 3.29 | Tinned Copper Busbar size on HV side for cable termination, mm x mm | 50x6 |
| 3.30 | LV cable size, 650 /1100 V grade , A2XY cable single core 1000 sqmm unarmoured (approx cable dia 40 mm) | Cable |
| 3.30.2 | 2500 KVA | 4 runs per phase + 3runs in Neutral |
| 3.31 | Tinned Copper Busbar size on LV side for cable termination, mm x mm | |
| 3.31.2 | 2500KVA | |
| 3.31.2.1 | Phase | 2 runs 100 x 12 |
| 3.31.2.2 | Neutral | 2 runs 100 x 12 |
| 3.32 | Maximum Overall Dimension Acceptable ( length x width x height), mm x mm x mm | |
| 3.32.2 | 2000 KVA | 2500 x 2500 x 2500 Maximum |
| 3.33 | Short Circuit withstand Capacity of the transformer | |
| 3.34 | Three phase dead short circuit at secondary terminal with rated voltage maintained on the other side | For 3 secs. |
| 3.35 | Single phase short circuit at secondary terminal with rated voltage maintained on other side | For 3 secs. |
| 3.36 | Overload Capability | As per IS 6600/IEC 60905 |
| 3.37 | Noise Level | 2000 KVA-60/61 Db respectively |
| 3.38 | Radio Influence Voltage | Maximum 250 microvolt |
| 3.39 | Harmonic suppression | Transformer to be designed for suppression of 3rd, 5th, 7th harmonic voltages and high frequency disturbances. |

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| 3.40 | Partial Discharge | Transformer to be free from partial discharge upto 120 % of rated voltage as the voltage is reduced from 150 % of rated voltage i.e. there shall be no significant rise above background level |
| 3.41 | Tappings | Off Circuit taps on HV winding , +5% to - 10% in steps of 2.5 % , change of taps by externally operated switch |
| 3.41.1 | Rotary tap switch operating voltage | 33 kV |
| 3.41.2 | Rotary tap switch current rating, Amp. | |
| 3.41.2.1 | 2000 KVA | 150 Amp |
| 3.42 | Loss capitalization formulae | As per CBIP manual (see note) |
| 3.43 | No load Loss capitalization figure | |
| 3.44 | Load loss capitalization figure | |

**Note : The bidder shall guaranteed No load losses & load loss individually without any positive tolerance , the bidder shall also guarantee losses at 50 % and 100 % load (at rated voltage & frequency & 75 deg. C ) and no positive tolerance shall be allowed on max. Total losses declared by bidder for 50 % & 100 % loading values. In the event of measured loss figures during testing exceeding the guaranteed loss figures of the successful bidder, penalty shall be applied at the rate of 1.25 times the figures mentioned Cl. 3.43 and 3.44 above.**

## 7.0 Construction & Design

| | | |
|---|---|---|
| 4.1 | Type | Double Copper wound, three phase, oil immersed, with ONAN cooling, with off circuit tap changer |
| 4.2 | Major Parts | |
| 4.2.1 | Tank | |
| 4.2.1.1 | Design | i) Completely sealed type with corrugated fins and without conservator<br>ii) Completely oil filled or N2 cushion at top filled with positive pressure. N2 shall be technical grade in accordance with IS:1747 |

| | | |
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| | | iii) With bolted / welded cover<br>iv) Type tested design |
| 4.2.1.2 | Plate / Corrugated fin / tank features | i) Adequate for meeting mechanical & electrical withstand requirements, as per applicable standard.<br>ii) The tank and its sealing (gaskets, o-rings, etc.) shall be of adequate strength to withstand positive and negative pressures built-up inside the tank while the transformer is in operation. The maximum pressure generated inside the tank shall be as per IS 1180(2014)<br>iii) Corrugated fins shall be built up of CRCA sheets of minimum 1.2mm thick.<br>iv) The corrugated tank wall shall ensure sufficient cooling of the transformer and compensate for the changes in the oil volume during operation.<br>v) The transformer shall be capable of giving continuous rated output, without exceeding the specified temperature rise.<br>vi) Internal clearance of tank shall be such that, it shall facilitate easy lifting of core with coils from the tank and HV & LV bushings mounted on Top cover.<br>vii) All joints of tank and fittings shall be oil tight. The tank design shall be such that the core and windings can be lifted freely with cover. The tank plate shall be of such strength that the complete transformers when filled with oil may be lifted bodily by means of lifting lugs.<br>viii) Tanks with corrugations & without conservator shall be tested for leakage at a pressure as per the applicable standard. |
| 4.2.1.3 | Material of Construction | Robust mild steel plate without pitting and low carbon content |
| 4.2.1.4 | Plate Thickness | Adequate for meeting the requirements of pressure and vacuum type tests as per IS |
| 4.2.1.5 | Welding features | i) All seams and joints shall be double welded<br>ii) All welding shall be stress relieved for sheet thickness greater than 35 mm<br>iii) All pipes, stiffeners, welded to the tank |

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|---|---|---|
| | | shall be welded externally |
| 4.2.1.6 | Tank features | i) Adequate space at bottom for collection of sediments<br>ii) Stiffeners provided for rigidity and designed to prevent accumulation of water<br>iii) No internal pockets in which gas/air can accumulate<br>iv) No external pocket in which water can lodge<br>v) Tank bottom with welded skid base<br>vi) Tank cover sloped to prevent retention of rain water<br>vii) Minimum disconnection of pipe work and accessories for cover lifting<br>viii) Tanks shall be of strength to prevent permanent deformation during lifting, jacking, transportation with oil filled.<br>ix) Tank to be designed for oil filling under vacuum<br>x) Tank cover fitted with lifting lug<br>xi) Tank cover bent at all the ends<br>xii) Minimum disconnection of pipe work and accessories for cover lifting |
| 4.2.1.7 | Inspection cover for bushing & Core / Wind | As per manufacturer standard |
| 4.2.1.8 | Fittings and accessories on main tank | See under fittings and accessories. |
| 4.2.2 | **Core** | |
| 4.2.2.1 | Material | High grade , non ageing, low loss, high permeability, grain oriented, cold rolled silicon steel lamination |
| 4.2.2.2 | Grade | Premium Grade minimum M3 or better |

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| 4.2.2.3 | Lamination thickness | 0.23 mm Max. |
| 4.2.2.4 | Design Flux Density at rated conditions at principal tap | As per Manufacturer design. |
| 4.2.2.5 | Maximum Flux Density at 12.5 % over excitation / over fluxing | 1.9 T |
| 4.2.2.6 | Core Design Features | i) Magnetic circuit designed to avoid short circuit paths within core or to the earthed clamping structures<br>ii) Magnetic circuit shall not produce flux components at right angles to the plane of lamination to avoid local heating<br>iii) Least possible air gap and rigid clamping for minimum core loss and noise generation<br>iv) Adequately braced to withstand bolted faults on secondary terminals without mechanical damage and damage/ displacement during transportation and positioning.<br>v) Percentage harmonic potential with the maximum flux density under any condition limited to avoid capacitor overloading in the system<br>vi) All steel sections used for supporting the core shall be thoroughly sand blasted after cutting , drilling, welding<br>vii) Provision of lifting lugs for core coil assembly<br>viii) Supporting framework designed not to obstruct complete drainage of oil from transformer |
| 4.2.3 | **Winding** | |
| 4.2.3.1 | Material | Electrolytic Copper |

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| 4.2.3.2 | Maximum Current Density allowed | 3 Amp per sq mm at all taps. |
| 4.2.3.3 | Winding Insulating material | Class A, non catalytic, inert to transformer oil, free from compounds liable to ooze out, shrink or collapse. |
| 4.2.3.4 | Winding Insulation | Uniform |
| 4.2.3.5 | Design features | i) Type of winding<br>LV: Spiral/Helical<br>HV: Crossover/Disc<br>ii) Stacks of winding to receive adequate shrinkage treatment<br>iii) Connections braced to withstand shock during transport, switching, short circuit, or other transients.<br>iv) Minimum out of balance force in the transformer winding at all voltage ratios.<br>v) Conductor width on edge exceeding six times its thickness<br>vi) Transposed at sufficient intervals.<br>vii) Coil assembly shall be suitably supported between adjacent sections by insulating spacers + barriers<br>viii) Winding leads rigidly supported , using guide tubes if practicable<br>ix) Winding structure and major insulation not to obstruct free flow of oil through ducts<br>x) Provision of taps as per clause 3.41 |
| 4.2.4 | **Transformer Oil** | |
| 4.2.4.1 | Type | Should be in accordance with specification as per Annex C of this document One sample of oil drawn from every lot of transformer offered for inspection should be tested from CPRI/ERDA for tests as listed BSES Standard |

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| | | QAP The cost of this testing should be included within the cost of transformer. The results shall be confirming to BSES specification Annex C<br>10% extra oil to be furnished in separate containers with each transformer |
| 4.2.5 | **Bushings and Terminations** | |
| 4.2.5.1 | Type of HV side bushing | Outdoor, Epoxy Resin cast, rated voltage and creepage as per 31mm/kV with voltage class of 12kV respectively<br>Bushing to be considered on top cover for optimization of size |
| 4.2.5.2 | Type of LV side bushing | Outdoor, Epoxy resin cast, rated voltage and creepage as per 31mm/kV with voltage class of 1.1 kV respectively<br>Bushing to be considered on top cover for optimization of size. Additional neutral bushing of porcelain outside on top of LT cable box with brass palm connector (as per IS 3347) shall be provided. Connection between the main neutral and additional neutral shall be provided**.** For extra neutral bushing, protection box shall be provided in order to prevent ingress of water |
| 4.2.5.2.1 | Essential provision for LV side line bushing | It shall be complete with copper palm complete with tinned copper busbar of size mentioned in clause no 3.31 |
| 4.2.5.2.2 | Essential provision for LV side neutral bushing | In case of neutral bushing the stem and busbar shall be integral without bolted, threaded, brazed joints. Busbar size shall be as per clause no 3.31. |
| 4.2.5.3 | Arcing Horns | Not required |
| 4.2.5.5 | Termination on HV side | 2 Runs of 3Cx400sqmm A2XFY 33kV (E) grade Cable |

| | | |
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| 4.2.5.6 | Termination of LV side bushing | By bimetallic terminal connectors suitable for LV Cable size of 650/1100VGrade, A2XY Cable single core 630sqmm(Approx dia 40mm) |
| 4.2.5.7 | Minimum creepage distance of all bushings and support insulators. | 31mm/KV |
| 4.2.5.8 | Protected creepage distance | At least 50 % of total creepage distance |
| 4.2.5.9 | Continuous Current rating | Minimum 20 % higher than the current corresponding to the minimum tap of the transformer |
| 4.2.5.10 | Rated thermal short time current | 25 times the rated current for 2 sec |
| 4.2.5.11 | Atmospheric protection for clamp and fitting of iron and steel | Hot dip galvanizing as per IS 2633 |
| 4.2.5.12 | Bushing terminal lugs in oil and air | Tinned copper |
| 4.2.5.13 | Sealing washers /Gasket ring | Nitrile cork rubber (RC70C)/ Expanded TEFLON (PTFE) as applicable. |
| 4.2.6 | **HV & LV cable box** | Required |
| 4.2.6.1 | Material of Construction | Sheet Steel min. 2.5 mm thick |
| 4.2.6.2 | Cable entry | At bottom through detachable gland plate with cable clamps of non magnetic material |
| 4.2.6.3 | Cable size for HV | 11 kV (E) grade , A2XFY 3C x 150 sqmm |
| 4.2.6.4 | Cable size for LV | LV cable size, 650 /1100 V grade, A2XY cable single core 630 sqmm unarmoured (approx cable dia 40 mm) |
| 4.2.6.5 | Cable size for LV Neutral | LV cable size, 650 /1100 V grade ,A2XY cable single core 630 sqmm unarmoured (approx cable dia 40 mm) |
| 4.2.6.6 | Detachable Gland Plate material for HV, LV, LV Neutral box | MS for HV cable box<br>Al for LV cable box. |

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| 4.2.6.7 | Gland plate thickness for HV, LV, LV Neutral box | 3 mm for HV side cable box<br>5 mm for LV cable box. |
| 4.2.6.8 | Cable gland for HV cables | Nickel plated brass double compression weatherproof cable gland |
| 4.2.6.9 | Cable lug for HV, LV, LV Neutral cables | Double hole Aluminium lugs |
| 4.2.6.10 | Essential parts | i) Flange type removable front cover with handles min two nos.<br>ii) Tinned Copper Busbar of adequate size for Purchaser's cable termination with busbar supports<br>iii) Earthing boss for the cable box<br>iv) Earthing link for the gasketted joints at two point for each joint<br>v) Earthing provision for cable Armour/ Screen<br>vi) Flanged type inspection cover on top for bushing inspection and maintenance with handle<br>vii) Drain plug<br>viii) Rainhood on gasketted vertical joint<br>ix) Danger / caution plate |
| 4.2.6.11 | Terminal Clearances | 700mm, Minimum |
| 4.2.6.12 | Termination height required for cable termination | 1000mm, Minimum |
| 4.2.7 | **Current Transformers** | |
| 4.2.7.1 | Provision | On all three phases on LV side |
| 4.2.7.2 | Mounting | On LV side bushings on all three phases with the help of fiber glass mounting plate affixed to main tank by nut bolt arrangement |
| 4.2.7.3 | Maintenance requirements | Replacement should be possible by removing fixing nut of mounting plate after removal of |

| | | |
|---|---|---|
| | | LT cable without disturbing LT bushing |
| 4.2.7.4 | Accuracy Class | 0.5 |
| 4.2.7.5 | Burden | 10VA |
| 4.2.7.6 | Type | Resin Cast Ring type suitable for outdoor use. |
| 4.2.7.7 | CT ratio | |
| | 2000KVA | 3000/5 |
| 4.2.7.8 | **CT terminal Box** | |
| 4.2.7.8.1 | Size | 650 mm height x 450 mm width x 275 mm depth. |
| 4.2.7.8.2 | Fixing of instrument / meters within box | On slotted channel 40 x 12 mm size, channel fixed on vertical slotted angle 40 x 40 mm size at two ends |
| 4.2.7.8.3 | No of horizontal channels to be provided | Four |
| 4.2.7.8.4 | Fixing of terminals within the box | On horizontal slotted channel with the help of C channel available with the terminals |
| 4.2.7.8.5 | Location | On tank wall |
| 4.2.7.8.6 | Box door design | Openable from outside with antitheft hinge, padlock facility, door fixed by stainless steel allen screw M6 size , door shall have canopy for rain protection |
| 4.2.7.8.7 | Terminal strip | Nylon 66 material, minimum 4 sq mm, screw type for control wiring and potential circuit. |
| 4.2.7.8.8 | Cables and wires | PVC insulated, extruded PVC inner sheathed, armoured, extruded PVC outer sheathed 1100 V grade control cable as per latest edition of IS 1554 part 1 minimum 2.5 sq mm for signals and 4 sq mm for CT with multi strand copper conductor |
| 4.2.7.8.9 | Cable Glands | Nickel plated brass double compression weatherproof cable gland |

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|---|---|---|
| 4.2.7.8.10 | Lugs on wires | Tinned copper pre insulated Pin, Ring, Fork type as applicable |
| 4.2.7.8.11 | Potential signal in CT box | i)Tapped from main LV busbar<br>ii)Neutral Link and Fuse to be provided by bidder for PT |
| 4.2.7.8.12 | Essential provision | Wiring diagram to be fixed on the back of door along with CT spec. on Aluminum engraved plate fixed by rivet. |
| 4.2.7.8.13 | Auxiliary Relay | 4 separate auxiliary relay with indicators (220V A.C) for tripping's to be provided for indicating type of fault i.e. Pressure, Oil leakage, OTI, MOG. |
| 4.2.8 | **Off Circuit tap Switch** | |
| 4.2.8.1 | Range /Step | Off circuit taps on HV winding, +5% to -10% in steps of 2.5%, change of taps by externally operated switch. |
| 4.2.8.2 | Type | Rotary type, 3 pole gang operated, draw out type |
| 4.2.8.3 | Operating Voltage | 33kV |
| 4.2.8.4 | Rated Current for tap Switch | 150 Amps |
| 4.2.8.5 | Operating Handle | External at suitable height to be operated from ground level. |
| 4.2.8.6 | Essential provision | Tap position indicator, direction changing facility, locking arrangement, and caution plate metallic fixed by rivet. |
| 4.2.9 | **Pressure Relief Device** | Required |
| 4.2.9.1 | Type | PRV |
| 4.2.9.2 | Provision on explosion vent | NA |
| 4.3 | **Hardware** | |
| 4.3.1 | External | Stainless Steel |
| 4.3.2 | Internal | Cadmium plated except special hardware for frame parts and core assembly as per |

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| | | manufacturer's design |
| 4.4 | **Gasket** | |
| 4.4.1 | For Transformer , surfaces interfacing with oil like inspection cover etc. | Nitrile cork rubber RC70C grade |
| 4.4.2 | For Cable boxes, Marshalling box, etc. | Neoprene rubber based/ cork nitrile |
| 4.5 | **Valves** | |
| 4.5.1 | Material of construction | Brass / gun metal |
| 4.5.2 | Type | Both end flanged gate valve / butterfly valve depending on application |
| 4.5.3 | Size | As per manufacturer's standard |
| 4.5.4 | Essential provision | Position indicator, locking rod, padlocking facility, valve guard, cover plate. |
| 4.6 | **Cable routing on Transformer** | Control cables for accessories on transformer tank shall be routed through perforated GI trays |
| 4.6.1 | Control cable specification | PVC insulated, extruded PVC inner sheathed, armoured, extruded PVC outer sheathed 1100 V grade control cable as per latest edition of IS 1554 part 1 minimum 2.5 sq mm for signals and 4 sq mm for CT with multi strand copper conductor |
| 4.6.2 | Specification of wires to be used inside marshalling box , OLTC drive mechanism | PVC insulated multi-strand flexible copper wires of minimum 2.5 sq mm size, 1100 V grade as per latest edition of relevant IS |
| 4.7 | **Terminal Blocks to be used by the vendor** | Nylon 66 material, minimum 4 sq mm, screw type for control wiring and potential circuit. |
| 4.7.1 | Essential provision for CT terminals | Sliding link type disconnecting terminal block screwdriver operated stud type with facility for CT terminal shorting material of housing melamine/ Nylon66 |

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| 4.8 | **Cable glands to be used by the vendor** | Nickel plated brass double compression weatherproof cable gland |
| 4.9 | **Cable lugs to be used by the vendor** | |
| 4.9.1 | For power cables | Long barrel medium duty Aluminum lug with knurling on inside surface. |
| 4.9.2 | For Control Cable | Tinned copper pre insulated Pin, Ring, Fork type as applicable |
| 4.10 | **Painting of transformer, Radiator, marshalling box for CT, cable boxes etc.** | |
| 4.10.1 | Surface preparation | By 7 tank pretreatment process or shot blasting method |
| 4.10.2 | Finish on internal surfaces of the transformer | Bright Yellow heat resistant and oil resistant paint two coats. Paint shall neither react nor dissolve in hot transformer insulating oil. |
| 4.10.3 | Finish on inner surface of the CT terminal box, HV/LV/LVN cable box | White Polyurethane paint anti condensation type two coats , minimum dry film thickness 80 microns |
| 4.10.4 | Finish on outer surface of the transformer, radiator, CT terminal box, HV/LV/LVN cable box | Battle ship Grey shade 632 Polyurethane paint two coats , minimum dry film thickness 80 microns |
| 4.10.5 | Frame parts | Battle ship grey shade 632 IS 5, 80 micron minimum insulating oil resistant paint. Paint shall neither react nor dissolve in hot transformer insulating oil. |
| **4.11** | **Winding Temperature scanner** | Required |
| 4.11.1 | No. of RTD inputs | Five (Three for windings, one for enclosure & one shall be spare) RTD for enclosure temperature monitoring shall be fixed at enclosure Top from inside to give max. |

| | | |
|---|---|---|
| | | Enclosure temp reading & shall be wired up to temp. Scanner to indicate the reading. |
| 4.11.2 | Location of winding RTD | At location of winding where maximum temperature is expected. |
| 4.11.3 | No of potential free trip contacts | Two |
| 4.11.4 | No of potential free Alarm contacts | Two |
| 4.11.5 | Auxiliary Supply | 240 V AC, 1 phase, 50 Hz. Tapped from LV side busbar through a MCB located inside box. |
| 4.11.6 | Winding Temperature Scanner terminal Box | Required |
| 4.11.7 | Size | As per manufacturers standard |
| 4.11.8 | Fixing of instrument within box | On side wall of enclosure |
| 4.11.9 | Fixing of terminals within the box | On C channel available with the terminals |
| 4.11.10 | Location | Within enclosure frame such that Marshalling Box & WTI on same side & free access to all LV side doors. |
| 4.11.11 | Terminal Strip | Nylon 66 material, minimum 4 sq mm, screw type for control wiring and potential circuit. |
| 4.11.12 | Cables & Wires | PVC insulated, extruded PVC inner sheathed, armoured, extruded PVC outer sheathed 1100 V grade control cable as per latest edition of IS 1554 part 1 minimum 2.5 sqmm for signals and 4 sqmm for CT with multistrand copper conductor & PVC insulated multistrand flexible copper wires of minimum 2.5 sqmm size, 1100 V grade as per latest edition of relevant IS |
| 4.11.13 | Cable Glands | Nickel plated brass double compression weatherproof cable gland |

| | | |
|---|---|---|
| 4.11.14 | Lugs on wires | Tinned copper preinsulated Pin, Ring, Fork type as applicable |
| 4.11.15 | Auxiliary supply in box | Tapped from main LV busbars, taken via MCB for isolation and protection of scanner, MCB to be fixed on DIN rail with clamps on two sides. |
| 4.11.16 | Essential provision | Wiring diagram to be fixed on the back of door along with brief details of scanner, HV side, LV side door limit switches to be wired up-to Terminal Block, Service socket to be provided with switch, fuse and link. |

**8.0 5.0 Fittings and Accessories on Transformer**

| | | |
|---|---|---|
| 5.1 | Rating and Diagram Plate | Required |
| 5.1.1 | Material | Anodized aluminum 16SWG |
| 5.1.2 | Background | SATIN SILVER |
| 5.1.3 | Letters, diagram & border | Black |
| 5.1.4 | Process | Etching |
| 5.1.5 | Rating and Diagram Plate details | Following details shall be provided on rating and diagram plate as a minimum<br>i) Type/kind of transformer with winding material<br>ii) Standard to which it is manufactured<br>iii) Manufacturer's name;<br>iv) Transformer serial number;<br>v) Month and year of manufacture<br>vi) Rated frequency in Hz<br>vii) Rated voltages in kV<br>viii) Number of phases<br>ix) Rated power in KVA<br>x) Type of cooling (ONAN)<br>xi) Rated currents in A<br>xii) Vector group connection symbol |

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| | | xiii) 1.2/50µs wave impulse voltage withstand level in kV<br>xiv) Power frequency withstand voltage in kV<br>xv) Impedance voltage at rated current and frequency in percentage at principal, minimum and maximum tap<br>xvi) Max. Total losses at 50 % rated load<br>xvii) Max. Total losses at 100 % rated load<br>xviii) Load loss at 50% & 100% rated load<br>xix) No-load loss at rated voltage and frequency<br>xx) Energy efficiency level.<br>xxi) Continuous ambient temperature at which ratings apply in deg C<br>xxii) Top oil and winding temperature rise at rated load in deg C;<br>xxiii) Winding connection diagram with taps and table of tapping voltage, current and power<br>xxiv) Transport weight of transformer<br>xxv) Weight of core and windings<br>xxvi) Weight of core<br>xxvii) Weight of winding<br>xxviii) Total weight<br>xxix) Volume of oil<br>xxx) Weight of oil<br>xxxi) Name of the purchaser<br>xxxii) PO no and date<br>xxxiii) Guarantee period |
| 5.2 | Terminal marking Plate for Bushing, anodized aluminium black lettering on satin silver background both inside cable boxes near termination and on cable box cover (all fixed by | Required |

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| | rivet) | |
| 5.3 | Company Monogram Plate fixed by rivet | Required |
| 5.4 | Lifting Lug to lift complete transformer with oil | Required |
| 5.5 | Lifting lug for top cover | Required |
| 5.6 | Lashing Lug | Required |
| 5.7 | Jacking Pad with Haulage hole to raise or lower complete transformer with oil | Required |
| 5.8 | Detachable Bidirectional flat roller Assembly | Required |
| 5.8.1 | Roller center to center distance | Required |
| 5.8.2 | Essential provision | Roller dia 150 mm min., roller to be fixed in such a way so that the lowermost part of the skid is above ground by at least 100 mm when the transformer is installed on roller. |
| 5.9 | Pockets for ordinary thermometer on tank cover with metallic identification plate fixed by rivet. | Required |
| 5.10 | Drain valve (gate valve) for the main tank with cork above ground by 150mm minimum with padlocking and valve guard with metallic identification plate fixed by rivet. | Required |
| 5.11 | Filter valve (gate valve) at top with padlocking and valve guard with metallic identification plate fixed by rivet. | Required |
| 5.12 | Air Release Plug on tank cover | Required |

| | | |
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| | with metallic identification plate fixed by rivet. | |
| | Oil level indicator with low level switch | Required |
| 5.13 | Earthing pad on tank for transformer earthing complete with non-ferrous nut, bolt, washers, spring washers etc. with metallic identification plate fixed by rivet | Required |
| 5.14 | Rainhood for vertical gasketted joints , in cable boxes | Required |
| 5.15 | Earthing bridge by copper strip jumpers on all gasketted joints at least two points for electrical continuity | Required |
| 5.16 | Skid base welded type with haulage hole | Required |
| 5.17 | Core , Frame to tank Earthing | Required |
| 5.18 | Danger plate made of Anodized aluminum with white letters on red background on Transformer, cable boxes (all fixed by rivet) | Required |
| 5.19 | Caution plate for Off Circuit tap changer fixed by rivet. | Required |
| 5.20 | Pressure Relief Device | Required |
| 5.21 | Gas-inlet valve of non-return type | Required (for transformers with nitrogen blanket above oil ) |
| 5.22 | User manual for Hermetically Sealed Transformers must be provided for review as a part of the technical proposal. The manual must be provided with, but not limited to, maintenance schedule, | Required |

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| | frequency & method of oil-sampling, procedures for oil-filling & oil-filtration, etc. | |
| 5.23 | Oil filling hole having(1-1/4" nominal size thread) with cover | Required |
| 5.24 | An extended pipe connection on upper end with welded cover. Pipe shall be suitably threaded over a sufficient length to enable use of refilling/siphon connection after removing the welded connection or any other similar arrangement capable of reuse. | Required |
| 5.25 | Nitrogen/Air filling device/pipe with welded cover capable of reuse | Required |
| 5.26 | Protection relay for internal parameters that is pressure, temperature, Oil level and gas detection(DMCR Relay)-auxillary relay | Required |
| 5.27 | WTI/OTI Scanner | Required |

**9.0 6.0 Approved make of components**

| | | |
|---|---|---|
| 6.1 | CT | Pragati / ECS / Kappa?Continental |
| 6.2 | Bushings | Baroda Bushing/CJI/JP |
| 6.3 | Tap Changer | Alwaye /Paragon |
| 6.4 | MOG | Sukrut/Atvus |
| 6.5 | Valves | Newman |
| 6.6 | CRGO | Nippon/JFE/Posco |
| 6.7 | Copper | Birla copper/Sterlite |
| 6.8 | Pre compressed Pressboard | Raman Board, Mysore/ Senapathy Whiteley |
| 6.9 | Laminated Wood | Permalli Wallance / Rochling Engineers |
| 6.10 | Oil | Apar/Savita/Raj Petro |
| 6.11 | Steel | TATA/Jindal/SAIL |
| 6.12 | Lugs/Glands | Jainson/Dowells/Comet |
| 6.13 | Radiators | CTR/Hi-TechRadiators/Tarang Engineers |
| 6.14 | Corrugated Tank | MPP/BSES approved make |
| 6.15 | WTI/OTI | Pecon/Precimeasure |

| | | |
|---|---|---|
| 6.16 | DMCR | IDEF |

Note – Any other make of component to be approved by purchaser

**10.0 7.0 Quality assurance**

| | | |
|---|---|---|
| 7.1 | Quality Assurance program | To be submitted before contract award. Program shall contain following<br>i) The structure of the organisation<br>ii) The duties and responsibilities assigned to staff ensuring quality of work.<br>iii) The bidder should have qualified technical & dedicated QA personnel at various stages of manufacture & testing.<br>iv) Factory inspection of bidder may be carried out to ascertain the quality system and process in place at manufacturing facility. The same is applicable to bidders not approved with BSES.<br>v) The system for purchasing, taking delivery and verification of materials<br>vi) The system for ensuring quality of workmanship<br>vii) The system for control of documentation<br>viii) The system for the retention of records<br>ix) The arrangements for the Supplier's internal auditing<br>x) A list of the administration and work procedures required to achieve and verify Contract's quality requirements. These procedures shall be made readily available to the Purchaser for inspection on request |
| 7.2 | Quality Plan | To be submitted by the successful bidder for approval. Plan shall contain following as a minimum<br>i) An outline of the proposed work and programme sequence<br>ii) The structure of the Supplier's organization for the contract<br>iii) The duties and responsibilities assigned to staff ensuring quality of work for the contract<br>iv) Inspection Hold and notification points |

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| | | mutually agreed.<br>v) Submission of engineering documents required by the specification<br>vi) The inspection of materials and components on receipt<br>vii) Reference to the Supplier's work procedures appropriate to each activity<br>viii) Inspection during fabrication/construction<br>ix) Final inspection and test<br>x) Successful bidder shall include submittal of Mills invoice, Bill of lading, Mill's test certificate for grade, physical tests, dimension, specific watt loss per kG for the core material to the purchaser for verification in the quality plan suitably |

**11.0 8.0 Progress Reporting**

| | | |
|---|---|---|
| 8.1 | Outline Document | To be submitted for purchaser approval for outline of production, inspection, testing, packing, dispatch, documentation programme |
| 8.2 | Detailed Progress report | To be submitted to Purchaser once a month containing<br>i) Progress on material procurement<br>ii) Progress on fabrication<br>iii) Progress on assembly<br>iv) Progress on internal stage inspection<br>v) Reason for any delay in total programme<br>vi) Details of test failures if any in manufacturing stages<br>vii) Progress on final box up<br>viii) Constraints<br>ix) Forward path |

**12.0 9.0 Submittals**

| | | |
|---|---|---|
| 9.1 | Submittals required with bid | i) Completed technical data schedule<br>ii) Descriptive literature giving full technical details of equipment offered;<br>iii) Outline dimension drawing for each major component, general arrangement drawing showing component layout and general schematic diagrams;<br>iv) Type test certificates, where available, and sample routine test reports;<br>v) Detailed reference list of customers already using equipment offered during the last 5 years |

| | | |
|---|---|---|
| | | with particular emphasis on units of similar design and rating;<br>vi) Details of manufacturer's quality assurance programme and ISO 9000 series or equivalent national certification;<br>vii) Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted;<br>viii) Recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements<br>ix) Transport / Shipping dimension and weights, space required for handling parts for maintenance<br>x) Write up on oil preservation system<br>xi) Write up on OLTC<br>xii) Quality Assurance Program |
| 9.2 | Submittals required after award for Approval (A), Reference (R), and subsequent distribution | i) Programme for production and testing (A)<br>ii) Guaranteed Technical Particulars (A)<br>iii) General description of the equipment and all components, including brochures (R)<br>iv) Calculations to substantiate choice of electrical, structural, mechanical component size/ratings (A)<br>v) Detailed loading drawing to enable the Purchaser to design and construct foundations for the transformer (R)<br>vi) Transport / shipping dimensions with weights, wheel base details, untanking height etc (R)<br>vii) Terminal arrangements and cable box details (A)<br>viii) Flow diagram of cooling system showing no of cooling banks (A)<br>ix) Drawings of major components like Bushing , CT etc (A)<br>x) PT fixing arrangement<br>xi) List of makes of all fittings and accessories |

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| | | (A)<br>xii) Statement drawing attention to all exposed points in the equipment at which contact with or in close proximity to other metals and stating clearly what protection is employed to prevent corrosion at each point (A)<br>xiii) Detailed installation and commissioning instructions<br>xiv) Quality Plan. |
| 9.3 | Submittals required at the final hold point prior to dispatch | i) Inspection and test reports carried out in manufacturer's works (A)<br>ii) Test certificates of all bought out items<br>iii) Operation and maintenance Instruction as well as trouble shooting charts/ manual |
| 9.4 | Drawing and document sizes | Standard size paper A1, A2, A3, A4 |
| 9.5 | No of drgs /Documents required at different stages | As per Annexure A Scope of Supply |

**13.0 10.0 Inspection & testing**

| | | |
|---|---|---|
| 10.1 | Inspection and Testing during manufacture | Only type tested equipment shall be acceptable |
| 10.1.1 | Tank | i) Check correct dimensions between wheels demonstrate turning of wheels through 90 deg and further dimensional check.<br>ii) Check for physical properties of materials for lifting lugs, jacking pads etc. All load bearing welds, including lifting lug welds shall be subjected to<br>Required load tests.<br>iii) Certification of all test results.<br>iv) Oil leakage test.<br>v) Vacuum and Pressure test on tank as type test as per IS |
| 10.1.2 | Core | i) Sample testing of core material for checking specific loss, bend properties, magnetization characteristics and thickness.<br>ii) Check on the quality of varnish if used on the stampings.<br>a) Measurement of thickness and hardness of varnish on stampings. |

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| | | b) Solvent resistance test to check that varnish does not react in hot oil.<br>c) Check overall quality of varnish by sampling to ensure uniform hipping colour, no bare spots. No ever burnt varnish layer and no bubbles on varnished surface.<br>iii) Check on the amount of burns.<br>iv) Bow check on stampings.<br>v) Check for the overlapping of stampings. Corners of the sheet are to be apart.<br>vi) Visual and dimensional check during assembly stage.<br>vii) Check on complete core for measurements of iron-loss and check for any hot spot by exciting the core so as to induce the designed value of flux density in the core.<br>viii) Check for inter laminar insulation between core sectors before and after pressing.<br>ix) Visual and dimensional checks for straightness and roundness of core, thickness of limbs and suitability of clamps.<br>x) High voltage test (2 KV for one minute) between core and clamps.<br>xi) Certification of all test results.<br>xii) One sample of CRGO to be sealed for testing at ERDA/CPRI. Tests to be conducted in accordance with annexure G |
| 10.1.3 | Insulating Materials | i) Sample check for physical properties of materials.<br>ii) Check for dielectric strength.<br>iii) Visual and dimensional checks.<br>iv) Check for the reaction of hot oil on insulating materials.<br>v) Certification of all test results. |
| 10.1.4 | Windings | i) Sample check on winding conductor for mechanical properties and electrical conductivity.<br>ii) Visual and dimensional check on conductor for scratches, dept. mark etc.<br>iii) Sample check on insulating paper for PE value, Bursting strength, Electric strength.<br>iv) Check for the reaction of hot oil on insulating paper. |

| | | |
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| | | v) Check for the bending of the insulating paper on conductor.<br>vi) Check and ensure that physical condition of all materials taken for winding is satisfactory and free of dust.<br>vii) Check for absence of short circuit between parallel strands.<br>viii) Check for Brazed joints wherever applicable.<br>ix) Measurement of voltage ratio to be carried out when core/ yoke is completely restocked and all connections are ready.<br>x) Certification of all test results. |
| 10.1.4.1 | Checks before drying process | i) Check conditions of insulation on the conductor and between the windings.<br>ii) Check insulation distance between high voltage connection distance between high voltage connection cables and earthed and other live parts.<br>iii) Check insulation distance between low voltage connection and earthed and other parts.<br>iv) Insulation test of core earthing.<br>v) Check for proper cleanliness<br>vi) Check tightness of coils i.e. no free movement.<br>vii) Certification of all test results. |
| 10.1.4.2 | Checks during drying process | i) Measurement and recording of temperature and drying time during vacuum treatment.<br>ii) Check for completeness of drying.<br>iii) Certification of all test results. |
| 10.1.5 | Oil | Oil testing to be done twice in accordance with the following[R9]:<br>1. As per IS 335:2018- Sample shall be drawn from oil storage tank before filling into transformer at CPRI/ERDA during stage inspection, which is one time per order<br>2. As per IS 1866:2017- Oil sample drawn after filling into transformer and after completion of acceptance test & Temp. rise test at CPRI/ERDA during stage/ final inspection, one |

| | | |
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| | | time per order In case of oil testing, if testing facility for any test is not available in CPRI and ERDA , those tests shall be waived off. |
| 10.1.6 | Test on fittings and accessories | As per manufacturer's standard |
| | Routine tests | The sequence of routine testing shall be as follows<br>i) Visual and dimension check for completely assembled transformer<br>ii) Measurements of voltage ratio<br>iii) Measurements of winding resistance at principal tap and two extreme taps.<br>iv) Vector Group and polarity test<br>v) Measurements of insulation resistance*<br>vi) Separate sources voltage withstand test.<br>vii) Measurement of iron losses and exciting current at rated frequency and 90%, 100% and 110% rated voltage.<br>viii) Induced voltage withstand test.<br>ix) Load losses measurement at 50 % & 100 % of load.<br>x) Impedance measurement of principal tap (HV and LV) of the transformer.<br>x) Routine test of tanks<br>xi) Induced voltage withstand test (to be repeated if type tests are conducted).<br>xii) Measurement of Iron loss (to be repeated if type test are conducted).<br>xiii) Measurement of capacitance and Tan Delta for transformer winding and Tan Delta for transformer oil (for all transformers).<br>xiv) Ratio of CT<br>xv) Oil leakage test on completely assembled transformer<br>xvi) Magnetic balance test<br>xvii) Power frequency voltage withstand test on all auxiliary circuits<br>xviii) Certification of all test results.<br>xix) Temperature Rise Test #<br>a) Insulation resistance measurement shall be carried out at 5kV for HV and 1kV for LV. Value of IR should not be less than 2000 Mohms . Polarization Index (PI = $IR_{10min}/IR_{1min}$) should not be less than 1.5 (If |

| | | |
|---|---|---|
| | | one minute IR value is above 5000 Mohms and it is not be possible to obtain an accurate 10 minutes reading, in such cases polarization index can be disregarded as a measure of winding condition.)<br><br>b) #Temperature rise test may be necessary to be carried one unit/lot. Purchaser's engineer, will at its discretion, select transformer for temp. rise test from any lot offered for inspection at manufacturer's works and witness the same for comparison with ERDA/CPRI type test results |
| 10.3 | Type Tests | In case of award of P.O., bidder need to conduct type tests and special test (clause No.:10.4(i)) from CPRI/ERDA lab (on one transformer of each rating and type) without any cost implication to<br>BRPL<br>i) Impulse withstand test on all three HV limbs of the transformers for chopped wave as per standard<br>ii) Temperature rise test as per IS 2026<br>iii) Dissolved gas analysis before and after Temperature Rise Test<br>iv) Air pressure test for sealed transformers<br>v) Pressure and Vacuum test on tank<br>Note –<br>In case bidder had earlier conducted and having valid type tests report on BRPL design/supplies, and report is more than 5 years old & less than 10 years old with no change in design, then bidder do not need to conduct the type test from CPRI/ERDA lab |
| 10.3.2 | Notification to bidders | The product offered must be of type tested quality and Incase type test report is more than 5 years old & less than 10 years old with no change in design, then also it is valid for participation. In case the product offered is never type tested the same (as per above list), to be conducted by bidder at his own cost at CPRI/ERDA lab. |

| | | |
|---|---|---|
| 10.4 | Special Tests | In case of award of PO bidder need to conduct the following tests on one transformer of each rating and type in inhouse NABL lab/CPRI/ERDA<br>i) Dynamic & Thermal (3 sec) Short Circuit Test as per IS 2026<br>ii) Measure of zero seq. impedance (Cl. 16.10 IS 2026 Part I).<br>iii) Measurement of acoustic noise level (Cl. 16.12 of IS 2026 Part I).<br>iv) Measurement of harmonic level on no load current.<br>v) Paint adhesion test.<br>vi) High voltage withstand test shall be performed on the auxiliary equipment and wiring after complete assembly. Cost of such tests, if extra, shall be quoted separately by the Bidder.<br>Special tests to be witnessed by BRPL representative. |
| 10.4.1 | Note for special test | In case the product offered is never tested for short circuit (Dynamic & Thermal), same to be conducted by bidder at his own cost at CPRI/ERDA lab.<br>In case the test report is more than 5 years old & less than 10 years old with no change in design, then bidder do not need to conduct the type test from CPRI/ERDA lab. |
| 10.5 | Customer Hold Point | i) GTP & Drawings approval<br>ii) Core Inspection(See Cl No 10.1.2)<br>Sample to be tested at CPRI/ERDA for each lot.<br>iii) Tank Pressure & vacuum Test<br>iv) Core & Coil Stage inspection of each lot to be offered for final testing. |

**14.0 11.0 Packing, Shipping, Handling and Storage**

| | | |
|---|---|---|
| 11.1 | Packing | |
| 11.1.1 | Packing protection | Against corrosion, dampness, heavy rains, breakage and vibration |
| 11.1.2 | Packing for accessories and spares | Robust wooden non returnable packing case with all the above protection |

| | | |
|---|---|---|
| 11.1.3 | Packing details | On each packing case details required as follows<br>i) Individual serial number;<br>ii) Purchaser's name;<br>iii) PO number;<br>iv) Destination;<br>v) Supplier's name;<br>vi) Name and address of supplier's agent<br>vii) Description and quantity<br>viii) Manufacturer's name<br>ix) Country of origin<br>x) Case measurements<br>xi) Gross and net weights in kilograms<br>xii) All necessary slinging and stacking instructions. |
| 11.2 | 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; and Furnish to the Purchaser 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 brought to the notice of the Purchaser |
| 11.3 | Handling and Storage | As per manufacturer's instruction |

**15.0 Deviations**

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, requirements of the Specification shall be met without exception.

**Annexure A Scope of supply**

**1.0 The scope of supply shall include following**

1.1 Design, manufacture, assembly, testing at stages of manufacture as per Cl. 10 of this specification, final testing at manufacturer works on completely assembled transformer before

dispatch, packing, transportation, delivery and submission of all documentation for the Distribution transformer with all accessories as below

| Sr. No | Description | Scope of Supply |
|---|---|---|
| 1.1.1 | Fully assembled transformer with all major parts like CT box, Fittings and accessories as per Clause 5.0 of this specification | YES |
| 1.1.2 | Off circuit tap changer as per this specification | YES |
| 1.1.3 | HV, LV, cable boxes | YES |
| 1.1.4 | Support steel material for support of cable boxes from ground | YES |
| 1.1.5 | Foundation Bolts for complete transformer | YES |
| 1.1.6 | Support structure to support of cable from the transformer tank | YES |
| 1.1.7 | Nickel Plated brass double compression glands for HV and LV, LVN cables (in case of termination by cable) | YES |
| 1.1.8 | Long barrel heavy [R3]duty Aluminum lugs for power cables (in case of termination by cable | YES |
| 1.1.9 | Nickel Plated brass double compression glands and tinned copper lugs for control cable termination in CT box for vendor's cables | YES |
| 1.1.10 | Cables and wires for transformer accessories and internal wiring of CT box | YES |
| 1.1.11 | Touch up paint, minimum 2 litres | YES |
| 1.1.12 | Extra Transformer oil 10 % in non returnable drums | YES |
| 1.1.13 | One spare complete set of gaskets | YES |
| 1.1.14 | Routine testing as per Cl. 10.2 of this specification | YES |
| 1.1.15 | Type testing as per Cl. 10.3 of this specification | YES |
| 1.1.16 | Special testing as per Cl. 10.4 of this specification | YES |
| 1.1.17 | Submission of Documentation as detailed below | YES |

## 2.0 Submission of documents

Submission of drawings, calculations, catalogues, manuals, test reports shall be as follows

| | Along with offer | For Approval after award of contract | Final after approval | Remarks |
|---|---|---|---|---|
| Drawings | 3 copies (Typical drgs) | 4 copies | 12 copies + 1 soft copy in CD | See Clause 9 for various drawings required |
| Calculations | 3 copies (Typical) | 4 copies | 6 copies + 1 soft copy in CD | See Clause 9 for details |
| Catalogues | 1 copy | | 12 copies + 1 soft copy in CD | |
| Instruction manual for the transformer | 1 copy | | 12 copies + 1 soft copy in CD | |
| Test Report | 2 copies (Type test and sample Routine Test ) | | 12 copies + 1 soft copy in CD | Type test and sample routine test reports |

**3.0 Delivery schedule**

3.1 Delivery period start date -

3.2 Delivery period end date -

3.3 Material dispatch clearance - after inspection by purchaser & written Dispatch clearances from purchaser

**Annexure B Service Conditions**

| | | |
| --- | --- | --- |
| 1.0.0 | Delhi Atmospheric conditions | |
| a) | Average grade atmosphere : | Heavily polluted, dry |
| | Maximum altitude above sea level | 1000 M |
| b) | Ambient Air temperature | Highest 50 deg C, Average 40 deg C |
| | Design ambient temperature | 50 deg C |
| c) | Relative Humidity | 90 % Max |
| d) | Seismic Zone | 4 |
| e) | Rainfall | 750 mm concentrated in four months |

## Annexure – C Technical Particulars of transformer Oil

Transformer oil shall be new and conform to the following requirements:

### 1.0 Codes & standards

Latest revision of following codes & standards with all amendments –

| | Standard no | Title |
|---|---|---|
| 1.1 | IS 335-2018 | New insulating oils |
| 1.3 | IS 1783 | Drums for oils |

### 2.0 Properties

The insulating material shall have following features –as per IS 335:2018

| Sr. No. | Item Description | Specification Requirement |
|---|---|---|
| A | Function | |
| 1 | Viscosity Max. | 15 $mm^2$ /s at $40^0$C |
| | | 1800 $mm^2$ /s at $0^0$C |
| 2 | Pour Point, Max | - $10^0$C |
| 3 | Water content, Max | 30 mg/Kg |
| 4 | Breakdown voltage | |
| | i) New unfiltered oil. Min. | 30 kV |
| | ii) After filtration Min. | 70 kV |
| 5 | Density Max. | 0.895 g/ml at $20^0$C |
| 6 | Dielectric dissipation factor (DDF) at 90 $^0$C, Max | 0.005 at 90 $^0$C, |
| 7 | Particle Content | Value to be provided by the vendor |
| B | Refining/Stability | |
| 1 | Appearance of oil | Clear, free from sediment and suspended matter |
| 2 | Acidity Max | 0.01 mg KOH/g |
| 3 | Interfacial tension at $27^0$C, Min | 40 mN/m |
| 4 | Total sulphur content | Value to be provided by the vendor |
| 5 | Corrosive sulphur | Not-corrosive |
| 6 | Potentially Corrosive sulphur | Not-corrosive |
| 7 | Dibenzyl Disulphide (DBDS) | Not detectable (<5 mg/kg) |
| 8 | Inhibitor | Not detectable (<0.01%) |
| 9 | Metal Passivator | Not detectable (<5 mg/kg) |
| 10 | Other additives | Type and concentration of additives to be provided |
| 11 | 2-furfural and related Compounds content | Not detectable (<0.05 mg/kg) for each individual compound |
| C | Performance | |
| 1 | Oxidation stability | |

| Sr. No. | Item Description | Specification Requirement |
|---|---|---|
| a) | Total acidity, Max | 1.2 mg KOH/g |
| b) | Sludge Max | 0.8% |
| c) | Dielectric dissipation factor (DDF) at 90 $^0$C, Max | 0.5 |
| 1 | Gassing Tendency | Value to be provided by the vendor |
| 2 | Electrostatic charging tendency (ECT) | Value to be provided by the vendor |
| D | Health, safety and Environment | |
| 1 | Flash point Min. | 135$^0$C, |
| 2 | Polycyclic Aromatics content (PCA) Max | 3% |
| 3 | Polychlorinated Biphenyls (PCB) content | Not detectable (<2 mg/Kg) |

**Annexure D Guaranteed Technical Particulars (Data by Seller)**

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 1.0 | General | | |
| 1.1 | Make | | |
| 1.2 | Type | Oil immersed, core type, step down located generally outdoor but may be located indoor also with poor ventilation. Bidder shall confirm full rating available in indoor location also | |
| 2.0 | Nominal Continuous Rating, KVA | | |
| 2.1 | HV winding | 2000 KVA | |
| 2.2 | LV winding | 2000 KVA | |
| 3.0 | Rated voltage ( kV ) | | |
| 3.1 | HV Winding | 33 kv | |
| 3.2 | LV Winding | 415 volt | |
| 4.0 | Rated current ( Amps ) | 2000 KVA | |
| 4.1 | HV Winding | | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 4.2 | LV Winding | | |
| 5.0 | Connections | | |
| 5.1 | HV Winding | Delta | |
| 5.2 | LV Winding | Star with neutral | |
| 5.3 | Vector Group reference | Dyn11 | |
| 6.0 | Impedance at principal tap rated current and frequency, ohm @75 deg C | | |
| 6.1 | Impedance | 6.25% with IS tolerance | |
| 6.2 | Reactance | | |
| 6.3 | Resistance | | |
| 6.4 | Impedance at lowest tap at rated current and frequency | | |
| 6.5 | Impedance at highest tap at rated current and frequency | | |
| 7.0 | Resistance of the winding at $75^0$ C in ohm | | |
| 7.1 | a) HV | | |
| 7.2 | b) LV | | |
| 8.0 | Zero sequence impedance in ohm | | |
| 8.1 | a) HV | | |
| 8.2 | b) LV | | |
| 9.0 | Guaranteed maximum Total losses at principal tap at 75°C, kW | | |
| 9.1 | 50 % of Load | 16.1Kw | |
| 9.2 | 100% of Load | 5.42Kw | |
| 9.3 | No Load Loss (Max) | | |
| 9.4 | Total $I^2R$ losses of windings @ 75 deg C, KW | | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 9.5 | Total stray loses @ 75 deg C, KW | | |
| 9.6 | Total Load losses (Max.), KW | | |
| 9.7 | No load loss at maximum permissible voltage and frequency (approx.),kW | | |
| 10.0 | Temperature rise over reference ambient of 40 $^0$C | | |
| 10.1 | Top oil by thermometer $^0$ C | 40 $^0$C | |
| 10.2 | Winding by resistance$^0$ C | 45 $^0$C | |
| 11.0 | Efficiency | | |
| 11.1 | Efficiency at 75$^0$C and unity power factor % | | |
| 11.1.1 | at 110% load | | |
| 11.1.2 | at 100% load | | |
| 11.1.3 | at 80% load | Not Less than 99.5% | |
| 11.1.4 | at 60% load | | |
| 11.1.5 | at 40% load | | |
| 11.1.6 | at 20% load | | |
| 11.2 | Efficiency at 75$^0$C and 0.8 power factor lag % | | |
| 11.2.1 | at 110% load | | |
| 11.2.2 | at 100% load | | |
| 11.2.3 | at 80% load | | |
| 11.2.4 | at 60% load | | |
| 11.2.5 | at 40% load | | |
| 11.2.6 | at 20% load | | |
| 11.3 | Maximum efficiency at 75$^0$C % | | |
| 11.4 | Load and power factor at which it occurs | | |
| 12.0 | Regulation (%) | | |
| 12.1 | Regulation at full load at 75$^0$ C | | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 12.1.1 | at unity power factor | | |
| 12.1.2 | at 0.8 power factor lagging | | |
| 12.2 | Regulation at 110% load at $75^0$ C | | |
| 12.2.1 | at unity power factor | | |
| 12.2.2 | at 0.8 power factor lagging | | |
| 13.0 | Tappings | | |
| 13.1 | Type | | |
| 13.2 | Capacity | | |
| 13.3 | Range-steps x % variation | | |
| 13.4 | Taps provided on HV winding (Yes / No) | | |
| 13.5 | Rated current of rotary switch | | |
| 14.0 | Cooling system | | |
| 14.1 | Type of cooling | ONAN | |
| 14.2 | No. of cooling unit Groups | | |
| 14.3 | Capacity of cooling units | | |
| 14.4 | Mounting of radiators | | |
| 14.5 | Number of Radiators | | |
| 14.8 | Total radiating surface , sqmm | | |
| 14.9 | Thickness of radiator tubes, mm | Minimum 1.2 mm | |
| 15.0 | Details of Tank | | |
| 15.1 | Material | Robust mild steel plate without pitting and low carbon content | |
| 15.2 | Thickness of sides mm | | |
| 15.3 | Thickness of bottom mm | | |
| 15.4 | Thickness of cover mm | | |
| 15.5 | Confirmation of Tank designed and tested for Vacuum, Pressure (Yes/ No) | | |
| 15.5.1 | Vacuum mm of Hg. / ($kN/m^2$) | As per IS | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 15.5.2 | Pressure mm of Hg. | | |
| 15.6 | Is the tank lid sloped? | Yes | |
| 15.7 | Inspection cover provided (Yes / No) | as per spec | |
| 15.8 | Location of inspection cover (Yes / No) | | |
| 15.9 | Min. dimensions of inspection cover ( provide list of all inspection cover with dimension), mm x mm | | |
| 16.0 | Core | | |
| 16.1 | Type: | Core | |
| 16.2 | Core material grade | Premium grade minimum M3 or better | |
| 16.3 | Core lamination thickness in mm | | |
| 16.4 | Insulation of lamination | With insulation coating on both sides | |
| 16.5 | Design flux density at rated condition at principal tap, Tesla | | |
| 16.6 | Maximum flux density at 12.5 % over excitation /over fluxing, Tesla | 1.9 Tesla Max allowed | |
| 16.7 | Equivalent cross section area $mm^2$ | | |
| 16.8 | Guaranteed No Load current at 100% rated voltage , Amps | | |
| 16.8.1 | HV | | |
| 16.8.2 | LV | | |
| 16.9 | Guaranteed No Load current At 110% rated voltage, Amps | | |
| 16.9.1 | HV | | |
| 16.9.2 | LV | | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 17.0 | Type of Winding | | |
| 17.1 | HV | Crossover/Disc | |
| 17.2 | LV | Spiral/Helical | |
| 17.3 | Conductor material | Electrolytic Copper | |
| 17.4 | Current density (HV/LV) | Maximum allowed 3.0 A per sq mm.at all taps | |
| 17.5 | Gauge/area of cross section of conductor | | |
| 17.5.1 | a) HV | | |
| 17.5.1 | b) LV | | |
| 17.6 | Insulating material | | |
| 17.6.1 | HV Turn | | |
| 17.6.2 | LV Turn | | |
| 17.6.3 | LV Core | | |
| 17.6.4 | HV - LV | | |
| 17.7 | Insulating material thickness, mm | | |
| 17.7.1 | HV Turn | | |
| 17.7.2 | LV Turn | - | |
| 17.7.3 | LV to Core | | |
| 17.7.4 | HV to LV | | |
| 18.0 | Minimum design clearance, mm | | |
| 18.1 | HV to earth in Air | | |
| 18.2 | HV to earth in oil | | |
| 18.3 | LV to earth in Air | | |
| 18.4 | LV to earth in oil | | |
| 18.5 | Between HV & LV in Air | | |
| 18.6 | Between HV & LV in oil | | |
| 18.7 | Top winding and yoke | | |
| 18.8 | Bottom winding and yoke | | |
| 19.0 | **Insulating oil** | | |
| 19.1 | Quantity of oil Ltrs | | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 19.1.1 | In the Transformer tank | | |
| 19.1.2 | In each radiator | | |
| 19.1.4 | Total quantity | | |
| 19.2 | 10% excess oil furnished? | To be furnished in separate containers with each transformer | |
| 19.3 | Type of Oil | As per cl 4.2.4 | |
| 20.0 | **Bushing / Support Insulator** | | |
| 20.1 | Make | - | |
| 20.2 | Type | | |
| 20.2.1 | HV side | As per the spec | |
| 20.2.2 | LV side | As per spec | |
| 20.3 | Reference Standard | | |
| 20.4 | Voltage class, kV | | |
| 20.4.1 | HV side Bushing/ Support Insulator | 36 kV | |
| 20.4.2 | LV side line and neutral bushing/ Support Insulator | 1.1 kV | |
| 20.5 | Creepage factor for all bushing / Support Insulator mm/KV | 31 mm / kV | |
| 20.6 | Rated thermal short time current | | |
| 20.6.1 | HV bushing | 25 times rated current for 2 secs. | |
| 20.6.2 | LV line and neutral bushing | 25 times rated current for 2 secs. | |
| 20.7 | Weight, Kg | | |
| 20.7.1 | HV bushing | | |
| 20.7.2 | LV line and neutral bushing | | |
| 20.8 | Free space required for bushing removal, mm | | |
| 20.8.1 | HV bushing | | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 20.8.2 | LV line and neutral bushing | | |
| 21.0 | **Terminal connections** | | |
| 21.1 | HV | Cable size as per Cl no 3.28 | |
| 21.2 | LV | Cable size as per Cl no 3.30 | |
| 21.3 | LV Neutral | Cable size as per Cl no 3.30 | |
| | | | |
| 22.0 | **HV cable box** | Required | |
| 22.1 | Suitable for cable type, size | Cable size as per Cl no 3.28 | |
| 22.2 | Termination height | 750 mm min. | |
| 22.3 | Gland plate dimension, mm x mm | | |
| 22.4 | Gland plate Material | MS | |
| 22.5 | Gland plate thickness | 3 mm min. | |
| 22.6 | Phase to phase clearance inside box,mm | 180 mm | |
| 22.7 | Phase to earth inside box,mm | 120 mm | |
| 23.0 | **LV Cable box** | Required | |
| 23.1 | Suitable for cable type , size | Cable size as per Cl no 3.30 | |
| 23.2 | Termination height | 1000 mm, min. | |
| 23.3 | Gland plate dimension, mmxmm | | |
| 23.4 | Gland plate material | Aluminum | |
| 23.5 | Gland plate thickness | . | |
| 23.6 | Phase to phase | 25 mm | |
| 23.7 | Phase to earth | 25 mm | |
| 24.0 | L.V neutral Cable termination arrangement | Separate cable box not required (LV-N to be provided in LV cable box.) | |
| 25.0 | Current Transformer on LV phases | | |
| 25.1 | Type | | |
| 25.2 | Make | | |
| 25.3 | Reference Standard | | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 25.4 | CT Ratio | | |
| 25.5 | Burden, VA | | |
| 25.6 | Class of Accuracy | | |
| 25.7 | CT terminal box size | | |
| 26.0 | Pressure release device | | |
| 26.1 | Minimum pressure the device is set to rupture | | |
| 26.1.1 | For Main Tank | | |
| 27.0 | Fittings Accessories Each Transformer furnished as per Clause No 5. (Bidder shall attach separate sheet giving details, make and bill of materials) | | |
| 27.1 | WTI/OTI Scanner details | | |
| 27.1.1 | Make | | |
| 27.1.2 | Model no. | | |
| 27.1.3 | Manual submitted | | |
| 27.2 | DMCR Relay details | | |
| 27.2.1 | Make | | |
| 27.2.2 | Model no. | | |
| 27.2.3 | Manual submitted | | |
| 28.0 | Painting: as per clause for the transformer, cable boxes, radiator, Marshalling box (Yes/No) | | |
| 29.0 | Max over all transformer dimensions | **As per Clause 3.32** | |
| 29.1 | Length, mm | | |
| 29.2 | Breadth, mm | | |
| 29.3 | Height, mm | | |
| 30.0 | Transformer Tank Dimensions | | |
| 30.1 | Length, mm | | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 30.2 | Breadth, mm | | |
| 30.3 | Height, mm | | |
| 31.0 | Weight data | | |
| 31.1 | Core, kG | | |
| 31.2 | Frame parts, kG | | |
| 31.3 | Core and frame, kG | | |
| 31.4 | Total Winding, kG | | |
| 31.5 | Core , Frame, Winding, kG | | |
| 31.6 | Tank, kG | | |
| 31.7 | Tank lid, kG | | |
| 31.8 | Empty conservator tank, kG | NA | |
| 31.9 | Each radiator empty, kG | NA | |
| 31.10 | Total weight of all radiators empty, kG | NA | |
| 31.11 | Weight of oil in Tank, kG | | |
| 31.12 | Weight of oil in Conservator, kG | NA | |
| 41.13 | Weight of oil in each Radiators, kG | NA | |
| 31.14 | Total weight of oil in Radiators, kG | NA | |
| 31.16 | Total Transport weight of the transformer, kG | | |
| 32.0 | Volume Data | | |
| 32.1 | Volume of oil in main tank, litres | | |
| 32.2 | Volume of oil between highest and lowest levels of main conservator, litres | NA | |
| 32.4 | Volume of oil in each radiator, litres | NA | |
| 32.5 | Total volume of oil in radiators, litres | NA | |
| 32.7 | Transformer total oil volume, litres | | |

| Sr. | Particulars | Specified / Required | Offered |
|---|---|---|---|
| 33.0 | Shipping Data | | |
| 33.1 | Weight of heaviest package, kG | | |
| 33.2 | Dimensions of the largest package (L x B x H) mm | | |
| 34.3 | Tests | | |
| 34.1 | All in process tests confirmed as per Cl. (Yes/ No) | | |
| 34.2 | All Type Tests confirmed as per Cl. (Yes / No) | | |
| 34.3 | All Routine Tests confirmed as per Cl. (Yes/ No) | | |
| 34.4 | All Special Tests confirmed as per Cl. (Yes/ No) | | |
| | | | |

**Annexure – E Recommended Spares (Data by Supplier)**

List of recommended spares as following –

| Sr No | Description of spare part | Unit | Quantity |
|---|---|---|---|
| | | | |
| 1 | | No | |
| 2 | | No | |
| 3 | | No | |
| 4 | | No | |
| 5 | | No | |
| 6 | | No | |

## Anexure G - CRGO & Testing Points

| In addition to the BSES specification following points to be verified during manufacturing/inspection. | |
|---|---|
| 1 | Transformer core shall be low loss, non-ageing, high permeability PRIME GRADE CRGO with M3 Grade or better with max thickness of 0.23mm and with max core loss of 0.8 **[R3]**W/Kg, perfectly insulated and clamped to minimize noise and vibrations. |
| 2 | Following stage inspections will be carried out by purchaser or by third party engineers appointed by BSES : |
| 2.1 | Verification & inspection of the mother coil at port & putting stamp & seal may be inspected by BSES. |
| 2.2 | Reconciliation of mother coil by checking stamp & seal at factory before slitting. One sample of CRGO to be sealed for testing at ERDA/CPRI. Following Tests shall be conducted on the sample**[R3]:**<br><br>1) Specific core loss measurement<br>2) Magnetic polarization<br>3) Magnetic permeability<br>4) Specific core loss measurement after accelerated ageing test<br>5) Surface insulation resistivity<br>6) Electrical resistivity measurement<br>7) Stacking factor<br>8) Ductility(Bend test)<br>9) Lamination thickness<br>10) Magnetization characteristics (B-H curve) |
| 2.3 | Bidder should have in house core cutting facility for proper monitoring & control on quality. In case it is done outside cutting shall be done in presence of BSES. |
| 2.4 | Following documents to be submitted during the stage inspection : |
| 2.4.1 | Invoice of supplier |
| 2.4.2 | Mills test certificates |
| 2.4.3 | Packing list |
| 2.4.4 | Bill of lading |
| 2.4.5 | Bill of entry certificates by customs |
| 2.4.6 | Core material shall be directly procured either from the BSES approved manufacturer or through their authorized service centre/distributor and not through any contractor. |
| 2.5 | Bidder should have hydraulic core lifting facility to avoid any jerk at the time of core building. |

| | |
|---|---|
| 2.6 | BSES may appoint recognized testing authority like CPRI /ERDA with their instruments & engineer's team and measure no load loss, load loss and percentage impedance of the transformer at supplier's works at our own cost. Bidder shall agree and give them full co-operation during their stay & testing at shop floor. The losses & impedance values so obtained will be considered as final. |
| 2.7 | Bidder should have in-house NABL accredited testing facility.<br>1. Prospective bidders whose NABL accreditation is in process, Team of BRPL (NABL certified Engineers) may visit prospective bidder's works and may give their inputs to take NABL accreditation {R4}<br>2. Based on bidder's status of NABL accreditation ongoing process, it may be qualified (by submission of undertaking that in defined time bidder shall get NABL accreditation certification) {R4} |

# SPECIFICATION FOR
# LTACB / SFU
## Specification no – GN101-03-SP-83-02

| PREPARED BY | REVIEWED BY | APPROVED BY | REV | DATE |
|---|---|---|---|---|
| JA/AM | Abhinav Srivastava | K.Sheshadri | 00 | 17.05.2022 |

# INDEX

**RECORD OF REVISION**

| Sr. No. | Revision No. | Cl. No. | Nature of Change | Approved By |
|---|---|---|---|---|
| 1 | R1 | 4.11.1 | Neutral bus bar CT protection | VP |
| 2 | R1 | 5.6 | Rated Ultimate breaking capacity at rated voltage | VP |
| 3 | R1 | 6.5.1 | Cable Termination for 3200A ACB | VP |
| 4 | R1 | 6.7.1 | Bus bar Size for 3200A ACB | VP |
| 5 | R2 | 5.9 | Rated making current Ampacity –Icm revised | KS/AT |
| 6 | R2 | 6.5.1 | 3200Amp ACB, number of O/G Cable description revised | KS/AT |
| 7 | R2 | 11.1 | Type test cl. revised | KS/AT |
| 8 | R2 | 11.2 | Special test cl. Added | KS/AT |
| 9 | R2 | 4.10 | Release and Tripping Mechanism | KS/AT |
| 10 | R2 | 5.12.2.1 | Short Circuit setting time delay | KS/AT |
| 11 | R2 | 5.12.4.1 | Earth fault setting time delay | KS/AT |

## SCOPE OF SUPPLY

This specification covers the design, engineering, manufacture, assembly and testing at manufacturer's works and supply of Manual LT ACB along with all hardware and accessories required for installation and operation.

## CODES & STANDARDS

| | | |
|---|---|---|
| 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/IEC 60947 | Specification for Low-voltage Switchgear and Controlgear - Part 2,3 & 4 : 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 Aluminum and aluminum alloys for electrical purposes |
| 2.10 | IS 3043 | Code of practice for Earthing |
| 2.11 | IS 5 | Colours for ready mixed paints and enamels |
| 2.12 | IEC 60529 | Degree of protection provided by enclosure (IP code) |

## SERVICE CONDITION

The material to be supplied against this specification shall be suitable for satisfactory operation under following climatic condition

| **3.1** | **Location** | **At various location in the Delhi** |
|---|---|---|
| 3.2 | System Configuration | 3 Phase 4 Wire with neutral solidly grounded |
| 3.3 | Supply Voltage | 415 volt +/- 10% |
| 3.4 | Supply frequency | 50Hz |
| 3.5 | Location | Outdoor |
| 3.6 | Maximum ambient temperature (ºC) | 50 |
| 3.7 | Minimum ambient temperature (ºC) | 0 |
| 3.8 | Maximum altitude above mean sea level (m) | 1000 |
| 3.9 | Relative Humidity (%) | 100 |
| 3.10 | Rainy month | June to October |
| 3.11 | Maximum Rainfall (mm) | 1450 |
| 3.12 | Wind Pressure (Kg/Sq.m) | 195 |

| | | |
|---|---|---|
| 3.13 | Seismic Zone | Zone IV as per IS : 1893 |
| | | |

**GENERAL FEATURS**

| | | |
|---|---|---|
| 4.1 | ACB mounting | Fixed type |
| 4.2 | Line-Load Reversibility | Required |
| 4.3 | Terminals | Suitable for connection with aluminium bus-bars with phase barriers & shrouds |
| 4.4 | Operating mechanism | Manual LT ACB - manual spring charging, stored energy type |
| 4.5 | Operation counter | 4 digit minimum, non-reversible |
| 4.6 | Operating handle | Required for manual spring charging |
| 4.7 | Local control | ON / OFF push buttons or lever with transparent shutter & locking facility |
| 4.8 | ACB auxiliary contacts | 2 NO + 2 NC minimum |
| 4.9 | ACB operating knob sealing | Possible in OFF condition |
| 4.10 | Release and Tripping Mechanism | Microprocessor based release should have LCD display for protection data, running load value & should have fault record facility min. 5 nos. |
| 4.11 | Protections Required | Overload, short-circuit, Instantaneous & earth fault |
| 4.11.1 | Neutral bus bar protection | CT Required [R1] |
| 4.12 | Fault indication on front panel | Required |
| 4.13 | Access to releases, coils & add on type replaceable parts to ACB | From front only |
| 4.14 | ACB indications | a. Separate ON / OFF / TRIP<br>b. Spring charge status |
| 4.15 | ACB ingress protection (without enclosure) | IP2X minimum |
| 4.16 | Pollution degree as per IS | 2 – nonconductive pollution |
| 4.17 | ACB temperature rise limits | As per table 2 & 3 of IS 13947-1 |
| 4.18 | Hardware | |
| 4.18.1 | Nuts and bolts materials | Hot Dip Galvanised |
| 4.18.2 | Washers and spring washers materials | Carbon steel |

**OPERATIONAL FEATURES**

| | | |
|---|---|---|
| 5.1 | Number of poles | Three pole |
| 5.2 | Rated Operational Voltage(V) | 415V |
| 5.2 | Rated Insulation Voltage (V) | 1000V |
| 5.4 | Rated Impulse Voltage | 8 kV for main circuit |
| 5.5 | Category of utilization | B |
| 5.6 | Rated Ultimate breaking capacity | Icu [R1] |

| | | |
|---|---|---|
| | at rated voltage | |
| 5.6.1 | Rating up to 4000A | 70 kA (minimum) |
| 5.7 | Rated Service breaking capacity at rated voltage Ics | Ics =100% Icu |
| 5.8 | Rated short term withstand current for 1 sec at rated voltage – Icw | Icw = 100% Icu |
| 5.9 | Rated making current ampacity – Icm | Icm = 210% Icu |
| 5.10 | Number of operating cycles at rated current (open + close)without changing arcing contact | As per IS / IEC up to 4000 A ACB |
| 5.11 | Number of mechanical operating cycles (open + close) | 20000 up to 2500A ACB<br>10000 above 2500A ACB |
| 5.12 | Tripping characteristic | With long time & short time characteristics |
| 5.12.1 | Overload setting | 40% -100% In, steps of 10%. |
| 5.12.1.1 | Overload setting time delay | 2.5 s to 40 s minimum three settings |
| 5.12.2 | Short Circuit Setting | 100% - 800% of In, steps of 10%. |
| 5.12.2.1 | Short Circuit setting time delay | 50ms - 400 ms in steps of 50ms |
| 5.12.3 | Instantaneous setting | 400% - 1500% of In & OFF |
| 5.12.4 | Earth fault setting | 10- 100 % of In, steps of 10% |
| 5.12.4.1 | Earth fault setting time delay | 50ms - 400 ms in steps of 50ms |
| 5.13 | Release requirement | self-powered, not tapped from neutral |
| 5.14 | Microprocessor release | Setting panel with locking arrangement |

**BUSBAR**

| | | |
|---|---|---|
| 6.1 | Material | High conductivity electrolytic grade aluminium |
| 6.2 | Bus bar size | a) Suitable for carrying rated continuous current. Current density should be 1A per sqmm.<br>b) Size of neutral busbar should be same as phase busbar.<br>c) Busbar shall be designed for maximum of 40 degrees temperature rise over ambient<br>d) Bus bars shall be colour coded with heat resistant sleeves for R,Y,B phases and black sleeves for neutral |
| 6.3 | Clearances | a) All live parts of the ACBs shall have adequate clearance between the phase to phase and phase to earth / body of enclosure as per the standard. All the clearance shall be more than the minimum standard laid down as per IS standard. |

| | | |
|---|---|---|
| 6.4 | Bus bar arrangement | a) All the busbars are to be extended on rear side incorporating proper arrangement for connecting LT XLPE/PVC cables<br>b) Busbar to be extended in such a way that adequate insulation is provided between the enclosure and busbar.<br>c) Inter phase barriers to be provided on both incoming and outgoing side busbar<br>d) Entry / exit of rear side busbar from the LT ACB shall have separate openings for I/C &O/G circuits. Separate opening shall be provided for each phases and shall be sealed with Bakelite/FRP/POLYCARBONATE covers |
| 6.5 | Cable termination | Arrangement shall be as shown in annexure-A. Appropriate working clearances have to be maintained and are subject to approval during detailed engineering stage. |
| 6.5.1 | 3200 A ACB as Incomer<br>400 A SFU as Outgoing | a) Incomer – 1nos. x 1C x 1000sqmm cable per phase.<br>b) Outgoing –7 nos. x 4C x 300sqmm cable per phase ( Refer attached SLD in Annexure .) |
| 6.6 | Earthing | Two number Earthing bolts of size M8 to be provided with suitable green colour earth logo |
| 6.7 | Incoming & Outgoing Bus bar Size | |
| 6.7.1 | 3200 A (Phase & Neutral) | 3 nos. X 120 X 10 mm **OR** 3 nos. X 100 X 12 mm [R1] |
| 6.7.2 | 400A (Phase & Neutral) | 1 no. X 50 X 10 mm |
| 6.8 | Cu & Al bus bar Connection | insulating paint as well as phase barrier shall be provided on Internal as well as external busbar |

**ACB ENCLOSURE**

| | | |
|---|---|---|
| 7.1 | Type | Enclosure shall be suitable for outdoor installation. All the welding shall be continuous type |
| 7.2 | Ingress Protection | IP55 supported by CPRI/ERDA test report. Change in enclosure design has to be validated by CPRI/ERDA |
| 7.3 | Enclosure Sheet material and thickness | a) Minimum 2.0 mm CRCA sheet for load bearing members<br>b) Minimum 2.0 mm CRCA sheet for doors and covers<br>c) No welds, rivets, hinges or bolts shall be visible from outside.<br>d) Make of CRCA sheet to be TATA/SAIL/JINDAL |

| | | |
|---|---|---|
| 7.4 | Canopy | Suitable canopy to be provided on the enclosure for preventing rain water accommodation. Canopy to be extended at both front and rear side. |
| 7.5 | Doors and covers | a) Door shall be opened vertically. Suitable bonnet type locking arrangement shall be provided to hold the door at open position.<br>b) Handle shall be provided to open the door.<br>c) The door shall be non-removable type and hinges shall be concealed type.<br>d) The front cover shall have a viewing window of required size for monitoring the close, open, trip and spring charge status of breaker from outside without opening the door. The viewing window shall be transparent, steel reinforced glass material which shall be fixed on the front cover by using neoprene gasket and suitable screws/rivets.<br>e) The door of the ACBs shall be lockable and shall be fitted with neoprene gaskets. |
| 7.6 | Door Hinges | Door Hinges shall be Anti-theft type |
| 7.8 | Mounting of the panel | ACB with enclosure shall be suitable for mounting on poles/plinth. The enclosure shall have proper mounting bucket. |
| 7.9 | Paint | |
| 7.9.1 | Surface Preparation | By 7 tanks Pre-treatment process or shot blasting method. |
| 7.9.2 | Colour shade of powder coating | Light orange 557 as per IS 5 |
| 7.9.3 | Paint thickness | 70 microns (minimum) |

## 8.0 400 Amp SWITCH FUSE UNIT ( SFU )

| S.No. | Description | Particulars |
| --- | --- | --- |
| 1. | Body Material | Polyamide or Better |
| 2 | Rated operational current | 400 Amp |
| 3 | Rated operational voltage( In) | 433V, 50Hz |
| 4 | Rated operational Current( In) | 400 Amp |
| 5 | Rated insulation voltage ( ui) | As per IS / IEC |
| 6 | Rated short time current ( Icw) | As per IS / IEC |
| 7 | Cable size | Up to 300 Sq.mm |
| 8 | Fuse Link | As per IS / IEC |
| 9 | Dimension | |
| 10 | Weight | As per IS / IEC |

**NAME PLATES & MARKINGS**

| | | |
|---|---|---|
| 9.1 | Panel nameplate | Nameplate shall be made of anodized Aluminium riveted on a side of the enclosure panel. It shall have a nameplate clearly indicating the following:<br>a) Customer Name - BSES Rajdhani Power Ltd<br>b) PO No. & date<br>c) Material code<br>d) Type of Panel<br>e) Current rating<br>f) Guarantee period |
| 9.2 | Danger plate | Danger plate shall be anodized Aluminium plate riveted to the enclosure or danger mar king can be screen printed on the front cover. |

**EQUIPMENT ID MARKING**

BSES Equipment ID shall be painted on two side of Enclosure (in Front & on side of Enclosure). Equipment id details & specification shall be provide you at the time of GTP approval

**APPROVED MAKE OF ACB**

| | | |
|---|---|---|
| 10.0 | ACB | L&T/Siemens/ABB/GE/Schneider/C&S/HPL/Havells |

**INSPECTION AND TESTING**

| | | |
|---|---|---|
| 11 | Type test on Breaker / LTACB / SFU<br>(Mandatory requirement for bid participation) | Equipment should be of type tested quality only, complete type tests certificates from CPRI/ERDA to be submitted at the time of bid submission as per relevant IS/IEC<br>List of type tests are as below—<br>1. Verification of overload release<br>2. Rated short-time withstand current<br>3. Rated service short circuit breaking capacity<br>4. Verification of operational capability<br>5. Verification of dielectric withstand<br>6. Verification of temperature rise<br>7. Verification of overload release<br>Type test reports shall be valid of the last 10 years subject to no change in relevant IS/IEC 60947<br>In case of change in IS/IEC , bidder need to submit fresh type test report from CPRI/ERDA as per latest relevant IS revision |
| 11.1 | Special test on ACB along with Enclosure to be witnessed by Purchaser after awarding of P.O | Following tests shall be conducted from CPRI/ERDA lab only-<br>a. Temperature rise test on one sample of each rating of ACB from the awarded P.O. as per relevant IS<br>b. Ingress Protection (IP-55) test on one sample of any one rating of ACB from the awarded P.O. as per |

| | | |
|---|---|---|
| | | relevant IS<br>Cost of the above tests shall be borne by the Bidders |
| 11.2 | Routine tests & Acceptance tests | • As per relevant Indian standard (IS)<br>• **The testing of LT ACB shall be done in presence of BRPL representative at vendor's work & test certificate shall be submitted to BRPL before dispatch** |

**PACKING, SHIPPING, HANDLING & SITE SUPPORT**

| | | |
|---|---|---|
| 12.1 | 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. |
| 12.2 | 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. |
| 12.3 | Packing Identification Label | On each packing case, following details are required: |
| 12.4 | Individual serial number | |
| 12.5 | Purchaser's name | |
| 12.6 | PO number (along with SAP item code, if any) & date | |
| 12.7 | Equipment Tag no. (if any) | |
| 12.8 | Destination | |
| 12.9 | Manufacturer / Supplier's name | |
| 12.10 | Address of Manufacturer / Supplier / it's agent | |
| 12.11 | Description | |
| 12.12 | Country of origin | |
| 12.13 | Month & year of Manufacturing | |
| 12.14 | Case measurements | |
| 12.15 | Gross and net weight | |
| 12.16 | All necessary slinging and stacking instructions | |
| 12.17 | Shipping | The seller shall be responsible for all transit damage due to improper packing. |
| 12.18 | Handling and Storage | Manufacturer instruction shall be followed. |
| 12.19 | Detail handling & storage instruction sheet / manual to be furnished before commencement of supply. | |

**DEVIATIONS**

| | | |
|---|---|---|
| 13.1 | 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. |

**DOCUMENTS SUBMISSION**

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

| | |
|---|---|
| 14.1 | List of major customers using the offered product from last 5 years specifying details like customer name, PO no. and PO date, year of supply and supply quantity |
| 14.2 | Completely filled compliance GTP sheet as per clause 16.0 of this specification |
| 14.3 | Complete product catalogue, Manual and calibration certificate of the equipment |
| 14.4 | Type test reports |
| 14.5 | Deviation Sheet (if any) |

**GTP OF ACB / MCCB / SFU**

| S. No. | Item descriptions | Specification Requirement | Data by Vendor |
|---|---|---|---|
| 1 | Manufacturer | Name | |
| 1.1 | | Address | |
| 1.2 | | Contact person | |
| 1.3 | | Contact/telephone no | |
| 1.4 | ACB / SFU Brand name | Manufacturer cataloguer reference | |
| 2 | ACB / SFU rated current at 50 deg. C | 400 SFU / LTACB 3200 A | |
| 3 | No of poles | Three | |
| 4 | Rated voltage | 415 V | |
| 5 | Rated insulation voltage | 1000V at 50 Hz | |
| 6 | Rated impulse withstand voltage | 8 kV for main and 4 kV auxiliary ckt. | |
| 7 | Category of utilization | B | |
| 8 | Rated ultimate breaking capacity at rated voltage | Icu | |
| 8.1 | Ratings up to 2000A | 50 kA minimum | |
| 8.2 | Rating 2500A above | 65 kA minimum | |
| 9 | Rated service breaking capacity Ics | Ics = 100% Icuat rated voltage | |
| 10 | Rated short time withstand current for1 sec. | Icw = 100% Icsat rated voltage | |
| 10.1 | Rated making current | Icm = 210% Icu | |
| 11 | Number of operating cycles at rated current (open +close) without changing arching contacts | up to 3200 A ACB / MCCB | |
| 12 | Number of mechanical operating cycles (open + close) | up to 3200 ACB / MCCB | |
| 13 | De-rating of ACB | 0% at 50Deg.C | |

| | | | |
|---|---|---|---|
| 14 | ACB clearance in air | As per table XIII of IS:13947-1 | YES /NO |
| 15 | ACB temperature rise limits | As per table 2 & 3 of IS:13947-1 | YES /NO |
| 16 | ACB mounting | Fixed or Draw-out | |
| 17 | ACB operating counter | Required | |
| 18 | Line load reversibility | Provided | YES /NO |
| 19 | ACB operation | ON / OFF pushbuttons | |
| 20 | Safety shutter and racking interlock | Required | |
| 21 | Terminal | Size in **mm*mm** | |
| 22 | Operating handle | Required | YES /NO |
| 23 | ACB position indicator | ON / OFF / Trip / Spring charged | YES /NO |
| 24 | ACB ingress protection | IP 2X minimum | YES /NO |
| 25 | Pollution degree as per IS | 2 minimum | YES /NO |
| 26 | Product Information as per clause 5 ofIS:13947, part – 1 | In addition name of the purchaser shall be marked on the front of the devices as BSES Delhi | |
| 27 | Release and Tripping Mechanism | Microprocessor based release should have LCD display for protection data, running load value & should have fault record facility min. 5 nos. | |
| 28 | Tripping characteristic requirement | | |
| 28 | Overload setting | 50 % to 100% In | |
| 28 | Time delay | 2.5s to 40s | |
| 29 | Short circuit setting | 200 % - 800 %In | |
| 29 | Time delay | 50 - 400 ms | |
| 30 | Instantaneous setting | 1000% In & off | |
| 31 | Earth fault setting | 10 - 50 % of In | |
| 31 | Time delay | 50 - 400 ms | |
| 32 | Release requirement | Self-powered, not tapped from neutral | |
| 32 | Minimum primary current | Required for operation release | |
| 33 | ACB opening time | in ms | |
| 34 | ACB closing time | in ms | |
| 35 | ACB dimension | L X B X H in mm | |
| 36 | ACB weight | in Kg | |

| | | | |
|---|---|---|---|
| 37 | ACB watt loss at rated current (W) | At rated voltage and current | |
| 38 | Copy of type test report | | YES /NO |
| 39 | Copy of ACB catalogue | | YES /NO |
| 40 | Deviation sheet | | YES /NO |

**GTP OF STEEL ENCLOSURE**

| S. No. | Description | Specification Requirement | Data by Vendor |
|---|---|---|---|
| 1 | General arrangement | | |
| 2 | Sheet steel thickness for frame door &cover | | |
| 3 | Make of CRCA | TATA/SAIL | |
| 4 | Powder Coating | 7 tank pre-treatment or short blasting method | |
| a | Color shade of powder | Light orange 557as per IS:5 | |
| b | Minimum thickness of coating | 70 microns | |
| 5 | Danger Plate | | |
| 6 | The enclosure shall be designed for system faults of35MVA | | |
| 7 | Size of electrolytic grade, extended Al. busbar (Ph & N) | | |
| 8 | All Al. bus-bar shall be insulated by heat shrinkable sleeves. The bus bar shall have proper R, Y, B phase colour sleeves and black for neutral | | |
| 9 | Thickness of Bakelite plate between xtended Al. bus and frame. | | |
| 10 | Thickness of phase barriers provided between individual phases at incoming &outgoing | | |
| 11 | Neutral Bus bar with CT protection | Req. | |
| 12 | Weight of ACB with | Kg | |

| | | | |
|---|---|---|---|
| | enclosure | | |
| 13 | Enclosure dimensions | LXWXH in mm | |
| 14 | Drawing of danger plate and name plate submitted. | Yes/No | |
| 15 | Type test report ofIP55 protection of enclosure submitted | Yes/No | |
| 16 | Type test report of class 10K submitted | Yes/No | |
| 17 | Reference IS/IEC standard | | |

# Technical Specification

# For

# 33 kV Motorized Ring Main Unit

Specification no – **SP-DTCPT-00-R0**

| PREPARED BY | REVIEWED BY | APPROVED BY | REV | DATE |
| --- | --- | --- | --- | --- |
| JA/AM | Abhinav Srivastava | K.Sheshadri | 00 | 22.02.2022 |

## Index

**Scope of work**

33kV MotorizedRMU with FRTU, Modem (4G, GSM), Battery, Battery charger and auxiliary transformer (for outdoor RMU only) shall be supplied as per the specification. All the accessories mentioned above shall be supplied along with RMU's as a composite unit. Inside the composite unit, battery and battery charger shall be inbuilt inside RMU compartment and FRTU, modem shall be inbuilt inside LV compartment. Refer Annexure-J for drawing. Make of all accessories shall be as per Annexure-I. Spares are also to be supplied by bidder along with RMU as per the list mentioned in Annexure-D.

**Codes & standards**

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

| S No. | Title |
| --- | --- |
| Indian Electricity Rules | With latest amendments |
| Indian electricity act | IE act 2003 |
| IS 3427 | A.C. Metal Enclosed Switchgear and Control gear for Rated Voltages Above 1 Kv |
| IS 9920 part 1,3 & 4 | High voltage switches above rated voltage 1kv |
| IS 13118 | General requirements of circuit breakers above rated voltage 1kv |
| IS 3231 | Electric Relays for Power System Protection |
| IS 2705 | Current Transformer**{R1}** |
| IS 3156 | Voltage Transformer**{R1}** |
| IEC 60059 | Preferred current ratings of high voltage switchgear |
| | |
| IEC 60298 | AC metal enclosed switchgear |
| | |
| IEC 60529 | Classification of degrees of protection provided by enclosures |
| IEC 60255 | Electrical relays |
| IEC 62271 | HV Switchgear and Control gear |
| IEC 62271 – 103 | HV Switchgear and Control gear - Switches for rated voltages above 1 kV up to and including 52 kV |

| | |
|---|---|
| IEC 62271 – 1 | HV Switchgear and Control gear – Common Specifications |
| IEC 62271 – 201 | HV Switchgear and Control gear - AC insulation-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 Kv |
| IEC 60044 | Instrument Transformers – Current Transformers |
| IEC 62271 – 102 | HV Switchgear and Control gear – Alternating Current Disconnector and Earthing Switches |

Note:

In the event of direct conflict between various order documents, the precedence of authority of documents shall be as follows -

i. Guaranteed Technical Particulars (GTP)
ii. Specification including applicable codes & standards
iii. Approved Vendor Drawings
iv. Deviation sheet

**Electrical Distribution System Data**

| | | |
|---|---|---|
| 3.1 | Supply | 3 phase AC, 3 wire |
| 3.2 | Voltage | 33000volt ±10% |
| 3.3 | Frequency | 50 Hz ± 5% |
| 3.4 | System neutral | Earthed at upstream 11kV source |

**11 kV RMU System layout**

| | | |
|---|---|---|
| 4.1 | RMU Configuration | As per scheme given in Annexure E & type as per Purchase requisition |
| 4.2 | Extensibility | Right hand side |
| 4.3 | Load break switch, Circuit breaker & earth switch in RMU panel | All shall be non draw out type, fixed position |
| 4.4.1 | Insulation medium for panel | SF6 gas or Dry air in sealed metallic tank |
| 4.4.2 | Breakers | SF6 gas or Vacuum type (with disconnector & earth switch) |
| 4.4.3 | load break switches | SF6 gas or Vacuum type (With Earth Switch) |

| | | |
|---|---|---|
| 4.5 | Arc interruption chamber for breaker | i) Separate for each breaker<br>ii) Arc interruption chamber of breakers shall be separate from the main insulated tank. |
| 4.6 | Maximum dimensions for a 3 way panel (1 CB + 2 LBS), without FRTU Panel | |
| 4.6.1 | Width (measured from front) | Mm ( As per manufacturer design ) |
| 4.6.2 | Depth | Mm ( As per manufacturer design ) |
| 4.6.3 | Height | Mm (( As per manufacturer design ) |
| 4.7 | FRTU | FRTU shall be provided integrated with RMU in the LV compartment completely wired along with Dual SIM auto change over Modem suitable for communicating with 4G, GSM network of any service provider and also have facility to communicate with available Optical fiber network. Vendor shall demonstrate the data communication of FRTU and modem with MCC/Existing SCADA for approval of owner in the Pre Order technical evaluation stage. FRTU shall be EMI free and EMC compatible.<br>For detailed specification of FRTU, I/O requirements **, refer our enclosed standard specification of FRTU** |
| 4.8 | Modem | As per Modem Specifications **given in Annexure G** |

**RMU panel construction**

| | | |
|---|---|---|
| 5.1 | Panel type | CRCA/GI Metal enclosed, framed, Compartmentalized panel construction. CRCA thickness shall be 2 to 2.5 mm subject to type test report from CPRI/ERDA**.{R1}. Sheet thickness below 2 mm in any part of RMU shall not be accepted** |
| 5.2 | Service Location | Indoor, non air conditioned environment / Outdoor with continuous ambient temperature of 50 deg C and shall be suitable for external climatic condition Resistant to water ultraviolet radiation (Canopy for outdoor application) |
| 5.3 | Mounting | Free Standing |
| 5.4 | Overall Enclosure Protection | IP4X minimum, vermin proof<br>IP 54 (For outdoor duty) |
| 5.5 | Doors | Front access with anti theft hinge arrangement, Minimum three hinges. Hinges arrangement shall ensure that door cannot be removed. |
| 5.6 | Covers | Bolted (stainless steel) for rear access, with handles. Support for handle shall be provided atsuitable place on RMU body.<br>All the accessible bolts / screws shall be vandal proof. One |

| | | |
|---|---|---|
| | | set of required Special tools per RMU (if any) shall be in the scope of supply. All kind of nuts and bolts must be stainless steel |
| 5.7 | Construction | (Stainless steel tank. 3.0 mm thickness shall be based on validated type tests for 31kA 1sec IAC test and 31.5kA, 3sec short ckt tests.) |
| 5.8 | Base frame | 1. Base frame shall be made with 75mm ISMC/ISA channel<br>2. for both Indoor and Outdoor type RMU. Proper Bolted fixing arrangement shall be provided for erection on RCC foundation. Also, base frame shall be painted with 2 coats of anti rust red oxide and 2 coats of bitumen paint shall be provided. {R9}Adjustable HDPE clits as cable supporting clamps for each power cable (to suit the cable size from 150 to 400 sq mm PILC / XLPE cable. Exact size shall be provided during drawing approval stage.), also cleat shall be adjustable vertically. |
| 5.9 | Lifting lugs | Four numbers |
| 5.10 | Cable Entry | 1. Bottom<br>2. 3mm metallic, removable type & split type in two parts, with 1no. 90 mm diameter knocks out punch/hole in the centre. Hole arrangement shall be done up to 33Kv, 3cx400 sqmm cable. (For double cable boxes, Un-drilled gland plate to be supplied. Approval should be taken for the same during drawing submission) |
| 5.12 | Cable type & size | 3CX400sq mm Aluminum conductor XLPE/ PILC with armor & PVC outer sheath |
| 5.13 | Terminals for 33 kV cable termination | Suitable for Ring Type Bimetallic lug along with reducer/adapter check nuts/bolts for different type lugs sizes as per annexure F |
| 5.13.1 | Right angled boots | Single piece cold shrink type<br>(Minimum 20mm spacing between boots preferred) |
| 5.13.2 | Brass Nut bolt | Shall be suitable for all kind of lugs of cable size 33Kv, 3cx400 sqmm (Reducer to be provided to fit the nuts/bolts for all kind of lugs with all the bushing and all kind of nuts/bolt shall be the part of supply) |
| 5.13.3 | Bimetallic washers | Required (Not applicable for silver quoted bushing) |
| 5.13.4 | Termination type | suitable for heat shrinkable type |
| 5.13.5 | Termination height | For Indoor / Outdoor : Min. height from top of the gland plate to bushing center shall be as per IS / IEC standards |
| 5.14 | Bus bar | Copper with sleeve (Sizing Calculation to be submitted in support of its Guaranteed S.C. rating / Capability) {R1} |

| | | |
|---|---|---|
| 5.14.1 | Bus bar continuous rated current | 630amp ( at designed 40 deg.C ambient) |
| 5.14.2 | Bus bar short time withstand capacity | 26.3 KA for 3 sec |
| 5.14.3 | Bus bar support insulator material | SMC / DMC resin |
| 5.14.4 | Maximum temperature rise abovereference ambient 40 deg C | In line with Table 3 of IEC62271-1 |
| 5.15 | Earth bus bar | Tinned Copper flat sized for rated fault duty for 3 sec |
| 5.16 | Earth bus internal connection to all Noncurrent carrying metal parts | By 2.5sq mm copper flexible wire, Earthconnection point maximum 1 meter awayfrom cable test facility |
| 5.17 | Earth bus external connection to owners earth | Studs on both sides with holes for M10 bolt +hardware to readily receive purchaser earthconnection |
| 5.18 | Cooling arrangement | By natural air without fan |
| 5.19 | Panel internal wiring | Multi strand flexible color coded PVC insulated Cu wire 1 sq mm (SCADA) / 2.5 sq mm (for CT's) 1100 volt grade (AC-black, DC – grey, Earth – green) with ferrules at both ends. |
| 5.20 | Hardware (Nut, bolts & handle) | Stainless steel (Except termination nut-bolts which are Brass ) |
| 5.21 | Gasket | Neoprene rubber |
| 5.22 | Marshalling terminal blocks | 1 Sq mm, Nylon 66 material, Disconnecting type terminal blocks shall be provided. 20% spare in each row of TB. |
| 5.23 | Panel cover fixing bolts | Allen head 6mm with hexagonal slot<br>Seals shall be provided between the Panel and removable covers to avoid theft. The seals shall be opened/broken by using specific equipment. |
| 5.24 | Padlock facility | Required for all earth switches & all handles |
| 5.25 | Bushings for future extensions of RMU | LHS extensible. Should be duly insulated & covered withmetallic covers in unused condition, In addition a removable boot cover shall be provided on the extensible bushings. |
| 5.26 | Explosion vents | To ensure operator's safety, design should ensure that gases / flames generated during flash over / blast in any of the compartment, must not come out from the front of RMU |

| | | |
|---|---|---|
| | | as well shall not go to adjacent cable compartment. AFLR Internal arc test report (for Cable compartment & other compartments) must be submitted to support above, along with RMU GA drawing indicating these vents. There shall not be any type of holes, gaps etc on the walls of cable termination compartment. |
| 5.27 | SF6 Gas Annual Loss | < 0.1% of total mass. Pressure of SF6 gas shall be above the operating limit throughout the life of the equipment. |
| 5.28 | VPIS | VPIS shall be provided with terminals facility for phasing purpose.VPIS sensor shall be installed on screened bushing<br>NO/NC Contact shall be provided with VPIS for taking the Live line indication status to remote SCADA through FRTU. **{R1}** |
| 5.29 | Push Buttons | On/Off PBS shall be shrouded / covered to prevent accidental operation. |
| 5.30 | Internal Arc Classification | Shall comply to the requirements of IEC 62271-200, Accessibility type AFLR.Operators of equipment shall be protected against the effects of an arcing fault inany of the MV compartment at all times , including while carrying out themaintenance works on other compartments |

**Load break switch (LBS) / Isolator**

| | | |
|---|---|---|
| 6.1 | Type | Three poles operated simultaneously by a commonshaft |
| 6.2 | Arc interruption indielectric medium | SF6 or Vacuum |
| 6.3 | Operation | 3 position operation |
| 6.3.1 | Operating mechanism forclose / open | Motorized LBS Each motor shall be provided with separate MCB or Local-Remote switch. |
| 6.3.2 | Manual operation | Possible without removal of motor |
| 6.4.1 | Addition / removal of motor | Without overhaul of operating mechanism |
| 6.4.3 | Motor rated voltage | 24V DC |
| 6.5.1 | Battery type & size | 1. Li-ionbattery(LIB)<br>2. Battery provided in enclosure shall be rated for 10 close & 10 open operations of LBS / CB + 2 hrs back up for SCADA FRTU load (10watt).® |
| 6.5.2 | Battery charger rating | Two chargers of rating 10A each with parallel connection |
| 6.5.3 | Battery charger configuration | With auto changeover between two chargers using10Amp diodes |
| 6.5.4 | MCBs at charger input &output supply | Required 2nos for AC Incoming supply. All the MCBsshall be easily accessible for operation, with properlabeling. |

| | | |
|---|---|---|
| 6.5.5 | Charger temperature rise at heatsink at full load for 2 hours | Maximum 55 deg C above ambient of 40 deg C |
| 6.5.6 | DC power supply for FRTU | 24v DC +/- 1 volt thru 2 Amp MCB |
| 6.5.7 | Battery charger cooling method | Natural without any fans |
| 6.5.8 | Individual LBS DC Control | Required with MCB |
| 6.6.1 | Continuous rating of LBS | 630 Amp at design 40 deg C ambient |
| 6.6.2 | Short time withstand capacity | 31.5 KA for 3 sec |
| 6.7 | Fault making capacity | 50 kA peak |
| 6.8 | Minimum number of operations at rated current (as per IEC 62271-102) | Mechanical Endurance – Class M1( 1000 operations)<br>Electrical Endurance – Class E3 (100 operations**)** |
| 6.9 | Minimum number of operations at rated fault current (as per IEC 62271-102 ) | Class E3 (Min 10 operations) |
| 6.10 | Fault passage indicator (FPI) (Earth fault and over current protection type) | To be provided on each and every LBS for RMU.FPI shall be earth fault and over current protection type and shall be suitable for remote load monitoring at SCADA for LBS**{R1}** |
| 6.10. 1 | Earth Fault and over current Indicator | CBCT – Split open type suitable for mounting without disconnection of cable for EF.<br>Phase sensor – 3 Nos. for short ckt. purpose with mounting arrangement |
| 6.10.2 | Connection of CT sensors with FPI | Cable connection of FPI with CBCT/phase CTs shall be of pre moulded type on the CBCT side. Cable shall be 2.5 sq.mm cu cable |
| 6.10.3 | Fault Passage Indicator (Earth fault and over current protection type) | Digital type and shall operate as the current exceeds the set value. Flash indication for identifying faults with red LED with one flash for every one sec. Test & rest button 1 NO + 1 NC potential free contact for remote indication FPI power supply unit shall use lithium battery with minimum life of 1000 blinking hours , so that FPI shall continue to function even after main feeder has tripped. FPI shall be powered by 24V DC in all motorized RMUs and shall be suitable for remote load monitoring at SCADA for LBS**{R1}** |

| | | |
|---|---|---|
| 6.10.4 | Data by Purchaser | |
| 6.10.4.1 | System Fault Level | |
| 6.10.4.2 | Type of Grounding | Solidly Grounded |
| 6.10.4.3 | Fault clearing time | 100ms |
| 6.10.4.4 | Cable Type | PILC / XLPE to 400 sq.mm |
| **6.10.4.5** | **Earth Fault Indicator** | |
| 6.10.4.5.1 | Sensing Current | 50 to 400A |
| 6.10.4.5.2 | Sensing Time | 30 to 100 ms in steps of 10ms. |
| 6.10.4.5.3 | Reset Time | 0.5 -1-2-3-4 hr |
| 6.10.4.5.4 | Resetting Facility | a) Self rest after reset time<br>b) Self rest after restoration of voltage<br>c) Manual<br>d) Remote resetting |
| 6.10.4.5.5 | Contact Rating | 1A at 230 V |
| 6.10.4.5.6 | Degree of Protection | IP 54 |
| 6.10.4.5.7 | Mounting Arrangement | Surface or Flush Mounting |
| 6.10.4.5.8 | Ambient Temperature | -20 to 55 Deg C |
| **6.10.5.5** | **Short Ckt indicator** | |
| 6.10.5.5.1 | Sensing Current | 200 to 120 0 A |
| 6.10.5.5.2 | Sensing Time | 30 to 100 ms in steps of 10 ms |
| 6.10.5.5.3 | Reset time | 0.5-1-2-3-4 hr |

**Circuit breaker (CB)**

| | | |
|---|---|---|
| 7.1.1 | Type | Three pole, operated simultaneously by a common shaft |
| 7.1.3 | Circuit breaker - CB | For controlling cable feeder, manual and remote operation. Remote trip operation by SCADA |
| 7.2 | Arc interruption in dielectric medium | Vacuum Bottle |
| 7.3.1 | NA | NA |
| 7.3.2 | Operating mechanism - CB | Manual and Motorized spring charged stored energy type, remote electrical close / open operation possible. |
| 7.3.3 | Addition / removal of motor | Without overhaul of operating mechanism |
| 7.3.4 | Motor rated voltage | 24V DC |
| 7.4 | Emergency trip / open push button | On panel front with Protective flap to prevent any accidental tripping of breaker. |
| 7.5.1 | Continuous rating at design 40deg C ambient | 630amp |
| 7.5.2 | Short time withstand | 26.3 KA for 3 sec |

| | | |
|---|---|---|
| | capacity | |
| 7.6 | Minimum number of operations at rated current (as per IEC 62271-100) | Mechanical Endurance – Class M1( 2000 operations)<br>Electrical Endurance – Class E2 |
| 7.7 | Fault making capacity | 50 KA peak |
| 7.8 | Fault breaking capacity | 21 KA Minimum |
| 7.9 | Maximum number of operations at rated Fault current *(as per IEC 62271-100*) | Electrical Endurance – Class E2 . To be guaranteed by manufacturer with authorized lab test reports |
| 7.10 | Breaker status auxiliary contact | 2NO + 2NC wired to terminal block |
| 7.11 | Current transformer | 1. 75-400 / 1 amp for TCB/ FCB. {R9}<br>2. Considering three core cable terminations, mounting flexibility shall be provided for CT's (in horizontal & vertical direction both). Additionally, CAUTION marking (by sticker/ paint) shall be provided to avoid CT's installation above the screen of cable. (I.e. earth potential point.)<br>3. Position of CTs inside compartment shall be adjustable in vertical and horizontal direction |
| 7.12 | CT accuracy class | 5P10 minimum |
| 7.13 | Protection relay | **Relay features.** |
| | Technology and Functionality | Numerical, microprocessor based with provision for multifunction protection, control, metering and monitoring |
| | Mounting | Flush Mounting, IP5X |
| | Architecture | Hardware and software architecture shall be modular and dis-connectable to adapt the protection and control unit to the required level of complexity as per the application. |
| | 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. |
| | SCADA Interface port | (a) RS485 for IEC 103 communication.<br>(b) Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatibility. Through this port relays shall be connected to Ethernet switches. |
| | Communication Protocol | IEC103 (Data Type 9) and Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatibility. Through these ports relays shall be connected to switches. Communication protocol shall be selectable at site. |
| | Processing Indications | SCADA functions in monitoring direction 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. |
| | 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. |
| | PC Interface port | Front port (preferably serial) for configuration/data download using PC. |
| | GOOSE messaging | Relays shall communicate all status signals, commands and events on GOOSE messaging. Interlocks if any shall also be on GOOSE Messaging and wiring for that shall be in vendor’s scope. |
| | 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. |
| | 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. |
| | Event and Fault records | (c) 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.<br>(d) Relay shall store records for last 100 events (minimum)<br>(e) Relay shall store records for last 10 faults (minimum).<br>(f) It should be possible to download records locally to PC and to remote SCADA. |
| | Measurement | Relays shall be capable of transmitting current, voltage, power, fault type and other measured parameters to SCADA. |
| | Self diagnosis | Relay shall be able to detect internal failures and same shall be transmitted to SCADA as a soft signal. A watchdog relay with changeover contact shall provide information about the failure for annunciation. |
| | Time synchronization | All relays shall be capable of being synchronized with the system clock through SCADA, PC and GPS. |
| | Operation Indicators | (a) LEDs with push button for resetting.<br>(b) Resetting of LEDs shall be possible from SCADA |
| | Test Facility | Inbuilt |
| | Relay 1 | Combined Line differential and distance protection |

| | | |
|---|---|---|
| | | Dedicated port for communication with remote end relay through optical fibre. This port should be in addition to PC interface and SCADA interface ports. |
| | | Software based CT ratio correction |
| | User Configurable 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.<br>(b) Relay-2 should have minimum of 32 DIs and 16 DOs Exclusively for SCADA interfacing. DIs and DOs fortripping and interlocking shall be additional as perscheme requirement. If DIs and DOs for tripping andinterlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should beavailable as spare in each panel for future use. |
| | | **Relay -2** Self powered, Microprocessor based Numerical relay (with LCD display), IDMT over current and earth fault protection with high set element, manual reset type Relay mounting flush to panel front<br>Display shall be powered with 24V DCor 230V AC for all motorized RMU<br>RS-485 Port to be provided on the Relay for remote communication of the parameters to the SCADA through FRTU over MODBUS Protocol. Necessary internal wiring also shall be done between Relay and FRTU.<br>Licensed software shall be provided for Relay communication with Laptop along with necessary cables for interconnection between Laptop and Relay (Based on requirement).<br>Appropriate wiring to be done to connect all the relays to the FRTU. **{R1}** |
| 7.14 | Relay auxiliary contacts for remote indication | Potential free contact 1NO + 1NC wired to terminal block<br>RS-485 Port to be provided on the Relay for remote communication of the parameters to the SCADA through FRTU over MODBUS Protocol. Necessary internal wiring also shall be done between Relay and FRTU.<br>Licensed software shall be provided for Relay communication with Laptop along with necessary cables for interconnection between Laptop and Relay (Based on requirement)..<br>Appropriate wiring to be done to connect all the relays to the FRTU. **{R1}** |
| 7.15 | Shunt trip 230v AC (for WTI, OTI trip & door limit switch of Dry type transformer) & for remote trip from SCADA. | To be wired to terminal blocks (If the functional requirement is achieved by the Protection relay, then shunt trip is not required. |

| | | |
|---|---|---|
| 7.16 | Breaking Timing | 40 to 60 ms**{R1}** |

**Earth switch (ES)**

| | | |
|---|---|---|
| 8.1 | Type | Three Pole, operated simultaneously by a common shaft, for each Circuit breaker & Load break switch. |
| 8.2 | Switching in dielectric medium | Dry Air in sealed medium or SF6 gas |
| 8.3 | Operating mechanism for close,open and Earth | Manual |
| 8.4 | Fault making capacity | 50 kA |
| 8.5 | Auxiliary contacts | 5NO+5NC wired to terminal block |
| *8.6* | Disconnect switch (if provided in serieswith vacuum bottle) | Desirable to be located on purchaser cableconnection side of vacuum bottle |
| 8.7 | Minimum number of operations at no load (as per IEC 62271-102) | Mechanical Endurance – Class M0( 1000 operations) |
| *8.8* | Making capacity endurance of earth switch (as per IEC 62271-102 ) | Class E2 (Min 5 operations) |

**Requirements of sealed housing live parts**

| | | |
|---|---|---|
| 9.1 | Enclosure/Tank | Stainless steel enclosure suitable for IP67. Non ferrite&Non magnetic grade stainless of minimum 3.0 mm thickness.Stainless steel enclosure welding shall be roboticwelding type. |
| 9.2 | SF6 gas pressure low alarm | To be given along with NO and NC Contracts |
| 9.3 | Provision for SF6 gas filling | To be given (For 'sealed for life' design of RMU, this is not applicable) |
| 9.4 | Provision for SF6 gas pressure indication | Manometer with integrated pressure density switch and temperature compensation required. |
| 9.5 | Arc interruption method for SF6 breaker / Load break switch | Puffer type / rotating arc type |
| 9.6 | Potential free contacts for SF6 gas pressure low | 1NO +1NC |

**Operational interlocks**

| | | |
|---|---|---|
| 10.1.1 | Interlock type | Mechanical. All interlocks shall be preferably guarded by flap , so as to prevent insertion of handle for wrong operation |
| 10.1.2 | Load break switch & respective earth switch | Only one in 'close' condition at a time |
| 10.1.3 | Circuit breaker & respective earth switch | Only one in 'close' condition at a time |
| 10.2 | Prevent the removal of respective cable covers if load break switch or circuit breaker is 'ON' | Electrical / Mechanical |
| 10.3 | Prevent the closure of load break switch or circuit breaker if respective cable cover is open | Electrical / Mechanical |
| | NA | NA |
| 10.4 | Cable test plug for LBS/CB accessible only if Earth switch connected to earth | Mechanical |
| | | |
| 10.5 | Prevent motorized operation of LBS / CB during manual operation | Electrical / Mechanical<br>Electrical signal shall cut-off completely during manual operation. If LBS fail to operate, the supply to motor shall be disconnected after certain time period to prevent burning of motor due to continuous supply. |
| 10.6 | Prevent motorized operation of more than one LBS / CB at a time | Necessary feature (Electrical) |

**Indication & signals (for SCADA / Local)**

| | | |
|---|---|---|
| 11.1 | Operation counter on front / Inside the RMU LT chamber | To be provided for each LBS & Circuit breaker, with minimum four digits & non re-setable type |
| 11.2 | Cable charge status indication for all LBS & CB | Capacitor type voltage indicators with LED on all the phases (Shall be clearly visible in day light) |
| 11.3 | Spring charge status indication | On front for breaker |

| | | |
|---|---|---|
| 11.4 | Earth switch closed indication (For Each LBS) | On front |
| 11.5 | Load break switch ON/OFF indication | Green for OFF / Red for ON |
| 11.6 | Circuit breaker On/OFF indication | Green for OFF / Red for ON |
| 11.7 | Circuit breaker protection relay operated on fault | Flag |
| 11.8 | Fault passage indication | Flag |
| 11.9 | Status signals to SCADA-to be wired to marshalling terminal block | 2NO + 2NC |
| 11.9.1 | LBS close / open | potential free contacts |
| 11.9.2 | LBS & CB Earth Switch close /open | potential free contacts |
| 11.9.3 | Battery charger Fail | potential free contacts |
| 11.9.4 | CB close / open | potential free contacts |
| 11.9.5 | Auto trip | potential free contacts |
| 11.9.6 | FPI operated | potential free contacts |
| 11.9.7 | SF6 gas pressure low | potential free contacts |
| 11.9.8 | Local/Remote Switch | Required |
| 11.9.9 | Spring Charge Status | Potential free contacts |
| 11.9.10 | Ready to Close Signal to control centre to indicate all interlocks are OK | Potential free contacts |
| 11.9.11 | Battery Health Monitoring Unit | Required |
| 11.9.12 | Auxiliary Circuit Healthy | Potential free contacts |
| 11.9.13 | Breaker Panel Disconnector Close/Open | Potential Free contacts |
| 11.9.14 | FRTU Door open | Potential Free Contacts |
| 11.9.15 | Interlock Card Operation fail | Potential Free Contacts |
| 11.9.16 | Command Acknowledgement | Potential free Contacts |
| 11.10.1 | Commands from SCADA- to be wired to marshalling terminal block | LBS close / open |
| 11.10.2 | | CB close / open |
| 11.10.3 | | FPI Reset |

| | | |
|---|---|---|
| 11.10.4 | RS 485 MODBUS output of Protection relay | Required |
| 11.10.5 | Interlock Card Remote Reset | Required |

**Mimic diagram, labels & finish**

| | | |
|---|---|---|
| 12.1 | Mimic | 1. Mimic diagram (Shall not be accepted with Stickers)<br>2. On panel front with description of function & direction of operation of handles/buttons |
| | Operating Instructions | Operating instruction chart and Do's & Don'ts in English/Hindi / local language to be displayed on left / front side of panel enclosure on anodized Al Sheet 16SWG, duly affixed on panel. Sticker shall be provided for termination process along with required torque, feeder label. |
| 12.2 | Name plate on panel front | Fixing by rivet only |
| 12.2..1 | Material | Anodized aluminum 16SWG / SS |
| 12.2.2 | Background | SATIN SILVER |
| 12.2.3 | Letters, diagram & border | Black |
| 12.2.4 | Process | Etching |
| 12.2.5 | Name plate details | Month & year of manufacture, equipment type, input & output rating, purchaser name & order number, guarantee period, Model no, SLD |
| 12.3 | Labels for meters & indications | The label shall be riveted and not pasted on the panel compartment door. Preferable the labels shall be engraved on the plate.**{R1}** |
| 12.4 | Danger plate on front & rear side | Anodized aluminum 16 SWG with white letters on red background |
| 12.5 | Painting surface preparation | Chemical 10 tank process |
| 12.6 | Painting external finish | Powder coated epoxy polyester base grade A, shade -RAL 7032, uniform thickness 60 micron minimum |
| 12.7 | Painting internal finish | Powder coated epoxy polyester base grade A, shade -white, uniform thickness 60 micron minimum |

**Quality assurance**

| | | |
|---|---|---|
| 13.1 | Vendor quality plan | To be submitted for purchaser approval |

| | | |
|---|---|---|
| 13.2 | Inspection points in quality plan | To be mutually identified & agreed |
| 13.3 | Quality – Process Audits | BRPL shall carryout vendor process audits. |
| 13.4 | Field quality plan | Bidder to submit field quality plan along with the bid |
| 13.5 | Spare part list | Bidder to submit detailed spare part list along with the bid |
| 13.6 | Maintenance manual | Bidder to submit maintenance manual along with the bid |
| 13.7 | Approved sub vendor /make List | Please refer Annexure-I. Any deviation from make without written approval of BRPL shall not accept at any stage of contract. |

**Inspection & testing**

| | | |
|---|---|---|
| 14.1 | Type test | 1. Equipment of type tested quality only, including internal arc test (AFLR)on various compartments like cable chamber, SF6 gas tank etc.<br>2. Type test certificate along with AFLR internal test report from CPRI/ERDA/Any other reputed independent international Lab equivalent or better than CPRI/ERDA to be submitted along with offer for scrutiny. Type test more than 5 years old will not be acceptable. In case type test is more than 5 years old, bidder shall conduct type test from CPRI/ERDA/Any other reputed independent international Lab equivalent or better than CPRI/ERDAas per standard without any cost implication to BRPL. In this regards if BRPL want to witness the test , all the expenses of BRPL inspector shall be borne by bidder.<br>3. Bidder to submit following test report for DC charger.<br>a) temperature rise test<br>b) voltage regulation test |
| 14.2 | Routine test | As per relevant Indian standard |
| 14.3 | Acceptance test | To be performed in presence of purchaser at manufacturer works. BRPL may carry out integration of the FRTU/Modem and BRPL SCADA during Inspection stage. OEM to carry out the configuration of both Modem and FRTU in this case to establish connection between FRTU and SCADA.SIM shall be provided by BRPL |
| | | 1. Physical inspection & BOM, wiring check |
| | | 2. Insulation resistance test (Before & after HV test) |
| | | 3. HV test for one minute, |
| | | 4. Operation & interlock check |
| | | 5. Measurement of resistance of main circuit |
| | | 6. Voltage Indication check |

| | | |
|---|---|---|
| | | 7. Functional testing of Fault passage Indicator for Alarm |
| | | 8. Primary current injection test for each circuit breaker feeder with relay |
| | | 9. Breaker closing & opening time measurement |
| | | 10. Temperature rise test |
| | | 11. Functional test of FRTU |
| | | 12. Motor Operation |
| | | 13. Partial Discharge |
| | | 14. Raw material docs verification |

## 1.0 Shipping, Handling and Site support

| | | |
|---|---|---|
| 15.1 | Packing Protection | Against corrosion, dampness, heavy rains, breakage and vibration |
| 15.2 | Packing for accessories and spares | Robust wooden non returnable packing case with all the above protection & identification Label |
| 15.3 | Packing Identification Label (Anodized Aluminum Plate) | On each packing case, following details are required: |
| | | i. Individual serial number |
| | | ii. Purchaser's name |
| | | iii. PO number (along with SAP item code, if any) & date |
| | | iv. Equipment Tag no. (if any) |
| | | v. Destination |
| | | vi. Manufacturer / Supplier's name |
| | | vii. Address of Manufacturer / Supplier / it's agent |
| | | viii. Description (Configuration of RMU; e.g. 1CB + 2 ISO, Motorized / Non Motorized, Extensible / Non Extensible) and Quantity must be prominently displayed at least 3 sides of packing box & on top. |

| | | |
|---|---|---|
| | | ix. Country of origin |
| | | x. Month & year of Manufacturing |
| | | xi. Case measurements |
| | | xii. Gross and net weights in kilograms |
| | | xiii. All necessary slinging and stacking instructions |
| 15.4 | Shipping | The seller shall be responsible for all transit damage. |
| 15.5 | Handling and Storage | 1. Manufacturer instruction shall be followed.<br>2. Detail handling & storage instruction sheet / manual to be furnished before commencement of supply. |

**Deviations**

| | |
|---|---|
| 16.1 | a) Deviations from this specification shall be listed separately by bidder clause wise (as mentioned in Annexure-K) along with optional offer and has to submit the list along with bid./quotation. BRPL will review the deviations and if BRPL is agreed with the deviation, seller has to take written confirmation from BRPL on deviation during tender evaluation.<br>b) In the absence of any separate list of deviations from the bidder with bid as well as written confirmation from BRPL on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.<br>c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BRPL 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. |

**Drawings/Documents and Software Submission**

| | | |
|---|---|---|
| 17.1 | To be submitted along with bid | The seller has to submit following: |
| 17.1.1 | GA / cross sectional drawing of product showing all the views / sections | |
| 17.1.2 | Detailed reference list of customers using the offered product during the last 5 years with similar design and rating | |
| 17.1.3 | Completely filled GTP | |
| 17.1.4 | Manufacturer's quality assurance plan and certification for quality standards | |
| 17.1.5 | Type test reports for the type, size & rating of product / equipment offered | |
| 17.1.6 | Complete product catalogue and Manual. | |
| 17.1 | Recommended spare parts and consumable items for five years of operation and spare parts catalogue with price list | |
| 17.2 | All documents as per clause 13 of this specification | |
| 17.3 | After award of contract, Seller has to submit following drawings for buyer's Approval (A) / Reference (R) | |
| 17.3.1 | Program for production and testing (A) | |

| | | |
|---|---|---|
| 17.3.2 | Guaranteed Technical Particulars (A) | |
| 17.3.3 | GA drawing along with civil foundation details. | |
| 17.3.4 | Schematic and wiring drawings for all components | |
| 17.3.5 | Terminal arrangement & cable box details including gland plate arrangement etc | |
| 17.3.6 | Bill of material | |
| 17.3.7 | Detailed loading drawing to enable the buyer to design and construct foundations | |
| 17.3.8 | Transport / Shipping dimensions with weights, wheel base details, un tanking height | |
| 17.3.9 | Detailed installation and commissioning instructions | |
| 17.3.10 | quality plan | |
| 17.4 | Submittals required prior to dispatch | |
| | -Inspection and test reports, carried out in manufacturer's works | |
| | -Test certificates of all bought out items | |
| | -Operation and maintenance Instruction as well as trouble shooting charts/ manuals | |
| 17.5 | Drawing and document sizes | Standard size paper A3, A4 |
| 17.6 | Number of Documents required at different stages shall be per Annexure-A | |
| 17.7 | 1. As Built Drawings. (One set of As Built drawing to be provided with each RMU during dispatch. As Built drawing shall be provided to BRPL in soft copy)<br>2. IO termination chart shall be provided along with the schematic drawing for approval. IO Termination chart shall be provided on the inside of FRTU Compartment door.<br>3. The FRTU and modem Configuration file for every FRTU shall be shared with BRPL after successful on-site integration with SCADA.<br>4. FRTU and modem licensed software to be provided to BRPL. Any future software upgrades and support to be provided to BRPL without any cost implication till warranty period.<br>5. FRTU and modem features brochure and tutorial for configuration to be provided to BRPL for reference during configuration for their engineers | |
| Note : | Duly signed & stamped copies of the drawings / documentation are required to be submitted to BRPL for approval along with deviation sheet. | |

**18.0 Equipment ID**

- A Slot shall be provided on the Compartment door at a clearly readable height from the base level of FRTU compartment. This slot shall be provided with a Fibre card which shall be accessible from inside only but shall be visible outside. Equipment ID shall be painted/printed on the Fibre Cardand

- Equipment ID shall be painted on any appropriate face of RMU at a clearly readable height from the base level. Front recommended type face for the signage is True type or Post script

- Font Size: All painting should be in UPPERCASE. Recommended height of 50 mm with spacing between alphabets of 3 mm.
- Total No's of Character: 18
- Height of Font: 50 mm
- Height of Base: 100 mm
- Spacing between alphabets: : 3 mm
- Paint: Base coat – Dense Yellow. Letters – Black Quick Drying paint 2 coats.
- Equipment ID shall be separately provided by BRPL
- Equipment IDprinting shall complete at factory by seller on each and every motorized RMU before dispatch.

## 19.0 BATTERY HEALTH MONITORING UNIT

I. BHMU will have Autoand Manual test facility. In Auto Mode it ensures battery automatic discharge at preset set period with 100W discharge resistor along with suitable algorithm to check the healthiness based on rate of discharge.

II. In manual Mode PB provided for battery testing.

III. Provision for Bypass mode pof BHMU also required.

IV. Output contacts :230V/24V DC -5A

a. Battery Fail: 1 CO b.Test In process

V. Indications:

b. BHMU healthy b. Battery Fail c. Battery Low d.Test On.

VI. Make :as per annexure- I

**Annexure A Scope of supply**

**1.2 The scope of supply shall include following**

1.3 Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation the 33kv Ring Main Unit (RMU).

1.4 33kV RMU shall be as per scheme enclosed as Annexure E.

1.5 FRTU along with necessary software's as per detailed specification in Annexure H

1.6 Supply of Modem (Dual SIM, Auto Change Over, 4G, and GSM) for FRTU communication with Control Centre as per specification in Annexure G. SIM card shall be provided by BRPL.

1.7 Battery, Battery Charger and BHMU

1.8 Configuration of 33kV RMU shall be as per Purchase Requisition.

1.9 Testing & Commissioning of all motorized RMUs at site before charging is included in the scope of vendor including all operational checks, LV wiring checks, battery / charger checks, VPI , FPI, self powered relay, FRTU and SCADA integration. Vendor shall depute the service team with 1 day prior notice from owner.

1.10 FRTU customization, parameterization along with integration of FRTU with Control Centre has to be carried out at all sites by vendor engineer.

1.11 Guarantee Period for RMU along with FRTU & Modem: 66 months from the date of supply or 60months from date of commissioning, whichever is earlier.

1.12 Service Performance Requirements During Guarantee Period:

a) RMU including battery charger: Complaint to be attended on urgent basis and to be resolved within24hrs, 1day from intimation. Necessary spares may be maintained by vendor service team at Delhi.

b) FRTU:After reporting of FRTU modules compliant / failure, within 24 hours FRTU modules shall be replaced by vendor at site. Spare cards / modules shall be maintained by the vendor at Delhi during the guarantee period.

c) Modem: After reporting of Modem compliant / failure, within 24 hours Modem to be rectified / replaced by vendor at site. Spare modems if required shall be maintained by the vendor at Delhi during the guarantee period.

1.13 Each RMU shall be supplied with 2 sets of Operating Handle.

1.14 All the accessories mentioned above shall be supplied along with RMU's as a composite unit. Inside the composite unit, battery and battery charger shall be inbuilt inside RMU compartment and FRTU, modem shall be inbuilt inside LV compartment. Refer Annexure-J for drawing.

1.15 Supplier scope includes training of BRPL team – 4 batches (each batch with 4-6 engineers or team member as per BRPL requirement.) for minimum 3 days each at factory as well as at BRPL site for erection, testing commissioning and maintenance trouble shooting mechanism of Motorized RMU including Automation part. This shall be carried out 1 week from date of 1st shipment/ dispatch. Supplier shall also provide training for Self Powered relay & FRTU at respective manufacturer' factory as well as at BRPL site for minimum 3 days for BRPL team – 4 batches (each batch with 4-6 engineers or team member as per BRPL requirement.) ..This is applicable for each and every P.O. of Motorized RMU's.

1.16 Unit price for Conversion kit should be offered separately for converting the RMU from single cable termination design to double cable termination design, at site.

1.17 BOQ as following –

| Sr No | Purchaser Equipment Tag No / SAP code | RMU standard configuration Type | Unit | Quantity |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |

## 2.0 Submission of documents

| | | | |
|---|---|---|---|
| | Along with offer | For Approval after award of contract | Final after approval |

| | | | |
|---|---|---|---|
| Documents as given in clause no 17 of specification | 3 copies + 1 soft copy on CD | 4 copies + 1soft copy on CD | 6 copies + 1 soft copy on CD for all type of documents |

**3.0 Delivery schedule**

| | | | |
|---|---|---|---|
| 3.1 | Delivery period start date | - | from date of purchase order |
| 3.2 | Delivery period end date | - | as agreed with supplier |
| 3.3 | Material dispatch clearance | - | after inspection by purchaser |

**Annexure B Technical particulars (Data by purchaser)**

| Sr No | Description | Data by purchaser |
|---|---|---|
| 1. | Reference design ambient temperature | *40 deg C* |
| 2. | Maximum ambient temperature | 50 deg c for Delhi |
| 3. | Relative humidity | e.g. 85% for Delhi |
| 4. | Seismic zone | e.g. 4 for Delhi |
| 5. | Extensibility of RMU on both side is required - | Yes |
| 6 | Minimum ambient temperature | 0 deg C |

**Annexure C Guaranteed Technical Particulars (Data by Supplier)**

Bidder shall furnish the GTP format with all details against each clause.
Bidder shall not change the format of GTP or clause description.
Deviation sheets shall be submitted separately along with company seal and sign. Deviation mentioned in submitted GTP or any other documents except deviation sheet shall not be considered as a deviation.

| Sr. No. | Description | Data to be filled by Manufacturer |
|---|---|---|
| 1 | 33 kV RMU ( as per scope of supply annexure A) | Separate GTP to be filled for each type of RMU |
| 2 | Equipment make | |
| | Equipment type / brand name | |
| 3 | Conformance to design standards as per specification clause no 2.0 – | Yes/No |

| | | |
|---|---|---|
| 4 | Conformance to specification clause no 3.0 to 17.0 – | Yes/No |
| 5 | If NO for pt 3 or pt 4 above, Submission of deviation sheet for each specification clause no – | Yes/No |
| 6 | Panel overall dimensions in mm | |
| | Width (measured from front) | |
| | Depth | |
| | Height | |
| 7 | Panel weight in kg | |
| 8 | Panel extensible on RHS sides | Yes |
| 9 | Panel enclosure protection offered | |
| 10 | Panel tested for internal arc (Cable & other compartments) –Yes / No | |
| 11 | Heat generated by the panel in Kw | |
| 12 | Insulation level for complete panel | |
| 12.1 | Impulse withstand (kV peak) -170kvp min | |
| 12.2 | Power frequency withstand (kV rms) – 70kV min | |
| 13 | Bus bar | |
| 13.1 | Material & grade | |
| 13.2 | Bus bar cross section area in sq mm | |
| 13.3 | Bus bar rated current in amp<br>i) at designed 40 deg.C ambient<br>ii) at 50 deg.C ambient | |
| 13.4 | Max temperature rise above reference ambient of 40 deg C | |
| 13.5 | Short time current withstand capacity for 3 seconds (in KA) | |
| 13.6 | Bus bar clearances in mm P-P / P-E | |
| 13.7 | Bus bar with insulation sleeve / barriers | |
| 13.8 | Bus bar support insulator type | |

| | | |
|---|---|---|
| 13.9 | Bus bar support insulator voltage class | |
| 13.10 | Bus bar support insulator minimum creepage distance / mm | |
| 13.11 | Earth bus bar material | |
| 13.12 | Earth bus bar size | |
| **14** | **Circuit breaker type – SF6 or VCB** | |
| 14.1 | Rated voltage & frequency | |
| 14.2 | Rated current in amp | |
| 14.3 | Rated breaking current – KA rms symmetrical | |
| 14.4 | Short time withstand capacity in KA for 3 sec | |
| 14.5 | Rated making current - KA peak | |
| 14.6 | Breaker total opening time at rated breaking capacity (in milliseconds) | |
| 14.7 | Number of breaks per pole | |
| 14.8 | Total length of contact travel in mm | |
| 14.9 | No of circuit breaker operation cycles (close & open) guaranteed at rated current, Electrical endurance class | 25% rated current - |
| | | 50% rated current - |
| | | 75% rated current - |
| | | 100% rated current - |
| 14.10 | No of breaker opening operations guaranteed at rated fault current, Electrical Endurance Class | |
| 14.11 | No of breaker mechanical operation cycles (close & open) guaranteed at zero current , Mechanical endurance class | |
| 14.12 | Contact material | |
| 14.13 | Operating mechanism – trip free | |
| | Manual Spring charge type | |
| | | |

| | | |
|---|---|---|
| 14.14.1 | Spring charging motor rating– Watt | |
| 14.14.2 | Spring charging motor rated Dc voltage | |
| 14.14.3 | Closing coil wattage & rated DC voltage | |
| 14.14.4 | Trip coil wattage & rated DC voltage | |
| 14.15 | Transformer CT class, ratio &Vk | |
| **15** | **Load break switch type – SF6 or VCB** | |
| 15.1 | Rated voltage & frequency | |
| 15.2 | Rated current in amp | |
| 15.3 | Load break switch total opening time at rated current (in milliseconds) | |
| 15.4 | Number of breaks per pole | |
| 15.5 | Total length of contact travel in mm | |
| 15.7 | No of LBS close & open operation cycles guaranteed at | 25% rated current - |
| | | 50% rated current - |
| | | 75% rated current - |
| | | 100% rated current - |
| 15.8 | No of LBS making operations guaranteed at rated fault current, Electrical endurance class | |
| 15.9 | No of LBS close & open operations guaranteed at zero current, Mechanical endurance class | |
| 15.10 | Contact material | |
| 15.11 | Operating mechanism type | |
| 15.12 | Operating motor voltage with acceptable % variation | |
| 15.13 | Minimum permissible SF6 gas pressure (For SF6 type RMU only) | |
| 15.14 | Capacitor type cable voltage indication provided? | Yes / No |
| 15.15 | Operation counter provided | Yes/ No |
| 15.16 | Motor Details Parameter | |

| | | |
|---|---|---|
| 16.1 | Disconnect switch continuous rating (Amp) | |
| 16.2 | Disconnect switch Short time withstand rating -20kA for 3 sec minimum | Yes / No |
| 16.3 | One LBS open operation possible in the event of loss of SF6 gas | Yes/No |
| **16.4** | **DC charger rating in amps – min 10 Amp Dual** | Yes |
| a | MCB rating at 230v AC input of charger | Amp |
| b | MCB rating at 24v DC output of charger | Amp |
| c | Charger heat sink temperature rise (max 55 deg C above ambient 40 deg C) | |
| d | Voltage variation in 24v Dc output for FRTU | (Max +/-1 V) |
| e | Charger with natural cooling (no cooling fans) | Yes/No |
| f | Charger tested for input supply voltage regulation test (input variation 150v-250v, output Dc voltage variation +/- 1 volt max) | Yes/No |
| g | Charger temperature rise test certificate submitted | Yes/No |
| 16.5 | DC battery rating in Ah – 20Ah standard | Yes/No |
| 16.6 | DC charger changeover – Diode rating 10A min | Yes/No |
| 17.1 | Cable termination –<br>Height of power terminal from gland plate | Mm |
| 17.2 | Torque required for tightening terminal lug | |
| 18 | Mimic diagram, labels & finish as per cl no 12 | Yes / No |
| 19 | Submission of RMU / component | Yes/No |

| | | |
|---|---|---|
| | catalogue | |
| 20 | Unit price for Conversion kit offered separately for converting the RMU from single cable termination design to double cable termination design | Yes / No |
| 21 | Earth Switch | |
| 21.1 | Minimum number of operations at no load- Mechanical Endurance class | |
| 21.2 | Making capacity endurance of earth switch – Electrical endurance class | |
| 22 | Self Powered Relay – Make / Model | As per Annexure-I |
| 22.1 | CT Input | |
| 22.2 | IDMT Setting Range 4 element – Over Current & Earth fault & steps | As per BRPL requirement |
| 22.3 | Operating Time | Over Current – IDMT Instantaneous |
| 22.4 | Pick up Current | |
| 22.5 | Resetting Current | |
| 22.6 | Relay Burden | |
| 22.7 | Time Accuracy | |
| 22.8 | Tripping Coil O/P – type & duration | |
| 22.9 | Fault Current Display | |
| 22.10 | No of Fault Current Latching with time stamping | |
| 22.11 | Display Facility / Type | |
| 22.12 | Operational Indicators | |
| 22.13 | Potential Free Output Contacts | |
| 22.14 | Thermal Withstand Capacity of Relay | |
| 23 | Fault Passage Indicator (shall be for both earth fault and over current protection) | |
| 23.1 | CBCT | |
| a | Type | |
| b | Mounting Arrangement | |

| | | |
|---|---|---|
| c | CT to indicator connection | |
| d | ID of sensor | |
| e | Make | As per Annexure-I |
| 23.2 | Phase CT – LBS | |
| A | Type | |
| B | Mounting Arrangement | |
| C | CT to indicator connection | |
| D | ID of sensor | |
| 23.2 | Earth Fault Indicator make | As per Annexure-I |
| a | Sensing Current<br>(i) Earth Fault<br>(ii) Short Ckt Indicator | |
| b | Sensing Time<br>(i) Earth Fault<br>(ii) Short Ckt Indicator | |
| c | Indication | |
| d | Reset Time<br>(i) Earth Fault<br>(ii) Short Ckt Indicator | |
| e | Resetting Facility | |
| f | Output Contact | |
| g | Contact Rating | |
| h | Aux Power Supply | |
| i | Degree of Protection | |
| j | Mounting Arrangement | |
| k | Ambient Temperature | |
| l | Make | As per Annexure-I |
| 24 | Current Transformer- Make | As per Annexure-I |
| 24.1 | Ratio | |
| 24.2 | Burden | |
| 24.3 | Accuracy Class | |
| 25 | Voltage Presence Indicator- Make / Model | As per Annexure-I |

| | | |
|---|---|---|
| 26 | FRTU | |
| 26.1 | Make & Model No | As per Annexure-I |
| 26.2 | No of DI Modules | |
| 26.2.1 | Type I – 1CB + 2ISO | |
| 26.2.2 | Type 2 – 2CB + 2ISO | |
| 26.3 | No of DO Modules | |
| 26.3.1 | Type I – 1CB + 2ISO | |
| 26.3.2 | Type 2 – 2CB + 2ISO | |
| 26.4 | No of AI Modules | |
| 26.4.1 | Type 1/ Type 2 | |
| 26.5 | Make of Protocol converter | As per Annexure-I |
| 26.6 | Modem | Make -As per Annexure-I |
| | Type – 4G, GSM, Dual SIM Auto Change Over Facility<br>Speed – 800/1900 MHZ | Yes / No<br>Yes / No |
| 26.7 | Interposing Relay with freewheeling diode | |
| | Make | As per Annexure-I |
| | Rating | |
| | Model No | |
| 26.8 | Terminal Blocks, Disconnecting type fuses make | As per Annexure-I |

Bidder / Vendor seal / signature ----------

| | |
|---|---|
| Name of the bidder | |
| Address of bidder | |
| Name of contact person | |
| Telephone no & email id | |

**Annexure-D Recommended spares**

List of recommended and mandatory sparesare as following

Mandatory spares are the part of supply along with RMU.

| Sr No | Description of spare part | Unit | Quantity |
| --- | --- | --- | --- |
| 1 | Battery Charger set for RMU – Dual | No | 10 |
| 2 | FPI (over current and earth fault) | No | 10 |
| 3 | VPIS | No | 10 |
| 4 | Manometer with pressure indicator switch | No | 10 |
| 5 | Motor Kit for LBS and Circuit Breaker | No | 10 |
| 6 | Self Powered Relay (communicable) | No | 10 |
| 7 | Aux Relays | No | 10 no.s of each type |
| 8 | Aux Switches | No | 10 nos. of each type |
| 9 | Modem (4G, Dual SIM, Auto change Over) | No | 5 |
| 10 | CPU with Power Supply Card,I/O Adapter Board, rack etc | No | 5 |
| 11 | DO Card – 8 DO | No | 5 |
| 12 | DI Card -16DI | No | 5 |
| | Mandatory Spares | | |
| 1 | High Gain Antenna | No | 5 |
| 2 | FRTU | No | 1 no. of each type |
| 3 | HRC Fuses for Aux Transformer | No | 20 |
| 4 | Single Phase Aux Transformer | No | 1 |

Note-Any additional spares, if required shall be separately listed by bidder and same shall be taken approval from BRPL during bid evaluation.

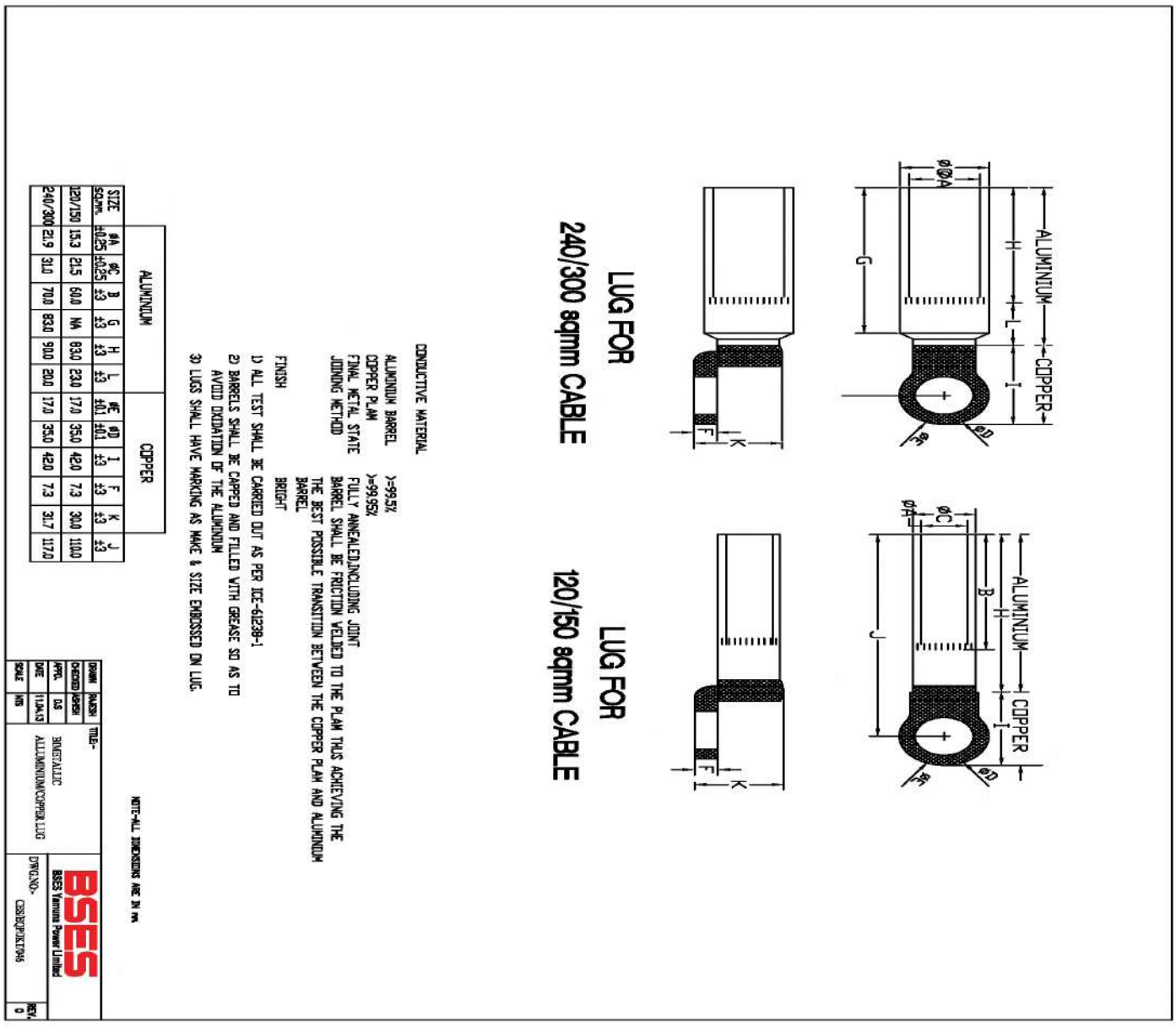
a) 33kv RMU shall have circuit breakers (CB) with Load break switches(LBS) as per configuration defined inPurchase Requisition.

b) Motor drive for LBS or CB is shown by letter ‘M’.

d) 33 kv RMU shall be suitable for extension onRHS for addition of LBS, CB.

e) Fault passage indicator (FPI) including associated CT & connecting cable is shown byletter ‘F’.

## Annexure F Drawing of Bimetallic Ring Type Lug




| SIZE sqmm. | ØA ±0.25 | ØC ±0.25 | B ±3 | G ±3 | H ±3 | L ±3 | ØE ±0.1 | ØD ±0.1 | I ±3 | F ±3 | K ±3 | J ±3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ALUMINIUM | | | | | | COPPER | | | | | |
| 120/150 | 153 | 215 | 500 | NA | 830 | 230 | 170 | 350 | 420 | 73 | 300 | 1100 |
| 240/300 | 219 | 310 | 700 | 830 | 900 | 200 | 170 | 350 | 420 | 73 | 317 | 1170 |

**Annexure G Specification for Modem**

| | |
|---|---|
| Modem | : 4G GSM (800/1900 MHZ), (Dual SIM auto change over-optional.) Modem should be able to send a power failure signal in case when battery/battery charger fails before shutting down. |
| Make- | As per Annexure-I |
| RUIM Interface | : External RUIM 3.0V |
| SMS | : Supports Text |
| Data | : Data circuit Asynchronous and non transparent Up to 153.6 kbps Autobaud rate (2400, 4800, 9600, 19200, 38400, 57600 bps) Fixbaud rate (300, 600, 1200, 9600, 115200 bps) |
| AT Commands Interface | : RS-232 port for supporting AT commands, PPP Protocol |
| Communication Interface | : Remote management features like telnet & remotely download facility. |
| LED Indications | : Power ON, Network |
| Connectors / Switches | : RS-232 Serial, RUIM Card Holder, DC power connector,SMA Antenna connector, Make shall be As per Annexure-I |
| Power Supply | : 6 – 30V DC (with reverse current protection) |
| Enclosure | : Aluminium Extrusion |
| Mounting | : DIN Rail Mounting |
| Temperature | : Operating (-10 to 65 Degree Centigrade) |
| Antenna | : : 12 dB High gain multi directional antenna with 15Mtr wire to be provided . Provision for taking antenna wire outside to be provided.Adequate accessories for mounting Antenna at appropriate Sub-station location (Roof/wall) for trouble free operation such as wall mounting bracket, roof mounting bracket etc. |
| Accessories | : a) 1 Meter cable for connecting to external DC power source (5V – 30V) b) Standard RS232 serial data cable(1 Meter) |
| SIM Capability | : The Modem shall be provided with GSM 4G compatible. Dual SIM Capability along with auto change over facility between the two SIM may be provided as a optional. |

**Annexure G(1)**

**SERVICING AND WARRANTY REQUIREMENT- EQUIPMENT SUPPLY (33 KV RING MAIN UNIT)**

**INDEX**

## 1. Purpose

This document is prepared to specify the servicing requirement and Warranty / Guarantee handling procedure in case of difficulty that arises in the supplied equipment within the useful service life of the equipment being procured by BRPL Rajdhani Power Limited.

## 2. Applicability

It is applicable to any equipment supplied directly or indirectly for installation / use in BRPL Rajdhani Power Limited.

## 3. Priority

This document which include service, warranty / guarantees management / handling procedures shall be considered a final in case of any contradiction with other contractual document.

## 4. Liability

i) Supplier shall be liable to arrange OEM qualified service engineers as and when required by BRPL Rajdhani Power Limited to attend defects, trouble shooting to restore equipment health to ensure 100 % capacity availability.

ii) OEM shall be liable to provide essential spares at reasonable price for entire lifespan of the equipment.

iii) Service call shall be attended within reasonable time frame as mentioned in this document.

iv) Service cannot be denied by supplier/OEM till completion of useful life of the equipment.

v) The commercial liability shall be restricted to supply/service contract provision.

It will be liability of manufacturer /vendor tie up with accessories / component manufacturer to full fill requirement stipulated this document.

## 5.Warranty Requirements

i) The equipment failed / malfunctioned within stipulated warranty period shall be attended free of cost for the reasons not attributed to BRPL Rajdhani Power Limited.

ii) The cost incurred for service, spares, transportation, consumable and manpower / labour shall be borne by supplier.

iii) OEM is bound to send service engineer to site on request for troubleshooting promptly.

iv) There is no cap on number of visit or spare replacement required to repair / trouble soot the problem in the equipment during warranty period.

v) Each break down / problem reported shall be analysed scientifically to establish the root cause of breakdown.

vi) In case it is established that any component or accessories is not performing satisfactorily or causing repeated failure due to poor performance, manufacturing mistakes, design mistakes or not suitable to our environment condition applicable to NCR region, the OEM shall be liable to rectify or replace the same in all equipment supplied to BRPL irrespective of warranty period.

vii) In case if RMU supplier is not OEM of the equipment / accessories, the supplier will be liable to tie up with OEM to provide service / spares to meet warranty / servicing requirement stipulated in this documents.

viii) Irrespective of onsite or workshop repairing, it will be responsibility of OEM to maintain work quality to ensure no compromise on performance and useful life of the equipment.

## 6. Process requirements

6.1 Complain Registration.

i) Supplier to provide communication details for complaint registration in O&M Manual, on website as well as shall be printed on the equipment. In case of changes, same shall be communicated to BRPL.

ii) BRPL will register complain through a e-mail / telephonic call to the call centre / service centre

6.2 Confirmation and Service time Schedule.

i) All timing will be counted from date of call registration by BRPL till restoration of equipment health at respective site in operation condition satisfactory of BRPL engineer.

ii) Service call confirmation & service engineer visit schedule shall be provided within two hour for working hour call (09:00AM to 06:00PM, Monday to Saturday) and before 10 AM next working day for off working hour calls.

iii) Emergency trouble shooting calls - within 12 Hrs including spare arrangements.

iv) Normal trouble shooting call - within 48 Hrs.

v) On site repairing / component replacement - within 7 days.

vi) OEM workshop repairing - within 30 days including returning to BRPL stores.

vii) Replacement of complete RMU - within 45 days.

viii) The service engineer shall intimate necessary requirement to attend call along with confirmations

6.3 Site visit & Investigation.

i) The OEM shall depute qualified and experienced engineer to carryout trouble shoot as well as testing and collecting necessary data / details essential for root cause analysis.

ii) The service engineer shall collect preliminary details to understand and estimate the spare requirement, shutdown time requirement from our respective area engineer whose details will be provided along with service call.

iii) The necessary tools shall be carried by service engineer attending calls.

iv) Service engineer to get call attendance certificate from respective area BRPL engineers.

v) Service engineer to intimate necessary precaution required to prevent repetition of problem to respective area BRPL engineer as well as CES Team.

vi) Detailed technical report (root cause analysis) to be submitted to CES Team for records and analysis against each call.

6.4 Recommendation.

i) Shall be based on scientific study / test results only.

ii) Shall cover root cause analysis for failure.

iii) Shall cover spares / component list for repairing.

iv) Shall cover time requirement.

v) Shall cover site preparation / condition requirement.

vi) Other critical measures essential for quality work.

6.5 On Site Repairing.

i) All site repairing shall be under supervision of OEM engineer and shall meet all OEM recommendation to ensure quality of work.

ii) All spares arrangement shall be carried out well in advance to minimize outage time. The list must be shared with CES team

iii) Necessary repairing process to be intimated to CES team in advance. It shall include in process & final quality and performance checks / test.

iv) The repairing process shall be certified by OEM design / quality expert.

v) Detailed time schedule and spares arrangement details shall be submitted to CES team for necessary planning.

vi) The repairing work shall be witness by BRPL CES engineer, who may insist in process / performance checks / test in addition to above if felt essential.

vii) If BRPL engineer observed any quality problem / skill problem, may insist for repairing at OEM facility.

**6.6 Repairing at OEM facility.**

Following requirement shall be fulfilled during OEM workshop repairing work: -

i) During site inspection, if service engineer felt necessary to send equipment to OEM facility, the same shall be organized by OEM.

ii) In case if BRPL felt that site repairing is not up to the required quality or felt necessary to analyze cause of failure, the same shall be organized by OEM.

iii) Equipment unpacking, testing and opening for analysis inspection shall be carried out in presence of BRPL engineer. It shall be intimated to BRPL at least 3 days in advance for necessary travel arrangement.

iv) If cause of failure observed due to design mistake / manufacturing mistakes, the same shall be rectified in all other similar design equipment without any cost to BRPL.

v) OEM to intimate the final testing for inspection. BRPL may depute engineer or third party representative to carryout inspection / testing before dispatch.

vi) Dispatch shall be carried out only after BRPL clearance.

vii) Necessary lifting, shifting, loading / unloading & transportation arrangement shall be in the scope of OEM / supplier.

viii) A document required essential for lifting and shifting of equipment will be intimated at least two days in advance.

**6.6 Witness / Inspection stages.**

Even though OEM is liable for overall quality of work, BRPL may witness / Inspection following activity:-

i) On site inspection, repairing/replacement work.

ii) Testing / inspection equipments / any accessories / component to establish the cause of failure.

iii) Opening of equipment for internal part inspection.

iv) Final testing/inspection before despatch.

v) Testing / checking of the evidence causing failure / problem.

Note: It will be responsibility of OEM / Supplier to establish with facts, figure, photographs, and evidence to prove that cause of failure not attributed to design.

**7 .0 Documents / records / report submission**

The following be recorded and provided to BRPL by OEM against each call / repairing / rectification works for BRPL clearance and future reference:-

i) Root cause analysis report.

ii) All test report.

iii) Minutes of meeting.

iv) Spares / accessories test report / calibration certificates.

v) Proof of expenditure for cost incurred to BRPL.

vi) Copy of transportation documents.

vii) All technical details of parts / accessories being replaced.

**8.0 Qualification requirements for service engineers**

i) All work must be carried out by only qualified, experience engineer certified by OEM. BRPL may request qualification and experience details if felt necessary.

**9.0 Safety.**

i) All necessary personal protective equipments requirement for the personal and labour will be in the scope of OEM / supplier.

ii) It will be liability of OEM / Supplier to meet the necessary safety norms , standards, rules & regulation .

iii) BRPL may audit the same during on site work.

**10.0 Communications.**

For better coordination, single channel communication must be followed. BRPL and OEM / Supplied to communicate to each other their team for communication time to time in case of any changes.

At present, all warranty related communication is to be done with CES team.

**11.0 Changes / revision management.**

Necessary approval of O&M analytic cell is essential for changes in this document.
In case if any stack holders do not agree or wish to amend its content may send request to BRPL O&M analytic cell for approval. The request will be in effect only on consideration and authorized release of revision in document by O&M analytic cell.

# Specification for

# FRTU

**ANNEXURE-H:FRTU DETAILS**

## Index

**Record of Revision**

| Sl. No. | Clause no. | Descriptions | Revised No | Old Revision |
| --- | --- | --- | --- | --- |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Feeder Remote Terminal Units**

This specification encompasses the requirements for Feeder Remote Terminal Units (FRTU's) for acquisition of real time status and control functions associated with selected 11 kV Ring Main Units (for sites where 11 kV/415 V distribution transformers or capacitors are installed). Make of FRTU shall be As per Annexure-I.

**1.1.0 FRTU Architecture**

The FRTU's shall have an architecture that supports convenient installation, maintenance and expansion features. Their configuration shall include a central processing module, I/O module, time / date facilities, data storage capacity etc.

**Central Processing Module**

The central processing module (CPM) shall handle all protocol emulation, perform data acquisition, and execute control requests. It shall accept commands from the master station, perform address recognition, assemble response messages in accordance with the received command messages, and transmit these messages to the SCADA/DMS master station. The CPM shall also provide interfaces for a time standard and a test set.

The CPM shall have user configurable routines / procedures to carry out connection establishment, link failure detections and reconnection after failures for dialup connectivity. The parameters viz: user name & password, baud rate, no. of retries after link failure shall be user configurable.

The CPM shall manage communications between all other functional modules of the FRTU and shall determine the integrity of the FRTU. The processor shall provide diagnostic information in the message structure that the SCADA/DMS shall monitor. A flag shall be set if the FRTU performs a restart for any reason including power failure.

The CPM shall be programmable in a high level language like C. BRPL shall be able to program the FRTU and manage the FRTU database from the FRTU test set and download parameters and configuration data from the SCADA/DMS system.

**I/O Module**

Each I/O module shall be capable of interfacing with digital inputs, control output points and combinations of point types. I/O modules shall be replaceable without reprogramming, redefinition of configuration parameters or rewiring.
A control disable switch shall be provided within each I/O module. When the switch is in the control position, the SCADA/DMS or test set shall have control of the digital control outputs. When the switch is in the disable position, the digital control outputs shall be disabled. A status input contact shall be available to monitor the position of this switch. The switch position shall be reported to the SCADA/DMS system. The required number of points shall be the responsibility of the Contractor.

**FRTU Time and Date Facility**

The FRTU shall have an internal clock for data collection coordination and time tagging. This shall include support for feeder fault detection. The FRTU internal clock time shall be maintained within hundred (100) millisecond of the same time reference used by the respective SCADA/DMS. The FRTU synchronization shall be accomplished by the communication protocol.

**Functional Requirements**

The FRTU's shall include all hardware, software, and firmware necessary to meet the Input/Output(I/O) point requirements including input and output cards and output relays.

**Input / Output Point Types**

The FRTU's shall include facilities for handling status input and control output points.
Requirements for each type of I/O point are described in the following sub-sections.

**Status Inputs**

The Contractor shall supply the necessary sensing voltage, current limiting, input isolation, and bounce filtering for all status inputs. The debouncetime period for each status input shall be

individually configurable. The input circuit of the status input modules shall be optically isolated from the external signal. In addition, each input circuit shall include an LED indicator next to the circuit terminations to show the status of the associated input contact.

The state of each status point shall be reported to the SCADA/DMS on a contention basis. That is, a status point shall not be reported unless the point state has changed from the last scan. The FRTU shall also report the state of selected status points upon receipt of a demand scan request from the SCADA/DMS.

The FRTU's shall include the following types of status input points:

1) Single Contact, Two-State Status: For single contact, two-state status points, a single contact shall represent both states of the monitored device. One position of the contact shall indicate an alarm or failure condition, while the opposite state of the contact shall indicate the normal condition.

2) Double Contact, Two-State Status: For double contact, two-state status input points; separate contacts shall be provided for representing each state of the monitored device. One contact shall indicate an OPEN condition of the monitored device. The other shall indicate a CLOSED condition. The contacts shall be treated as a complimentary pair. Conflicting contact positions (e.g., either indicates CLOSED or OPEN) shall be labeled INVALID.

**Control Outputs**

The FRTU's shall include on/off device control points to support control actions initiated from the SCADA/DMS master stations. The FRTU's shall perform on/off control actions using complimentary pairs of contact outputs. One contact output shall perform the ON control action, and a second output contact shall perform the OFF control action. The FRTU's shall be designed such that only one output in a complimentary pair can be activated at a time. For single point indications FRTU shall also support single command output.

To support the above capabilities, the FRTU's shall include momentary control outputs as required by the feeder device being controlled. Each momentary control output shall provide a contact closure (pulse) that shall have programmable pulse duration. The pulse duration shall be adjustable on an individual point basis from 0.1 to 60 seconds in increments of 0.01 seconds.

FRTU control outputs shall be equipped with high power relays with free-wheeling diodes that are integral to the FRTU so that external auxiliary control relays are not required. The associated high and low control power shall be obtained from the dc power supply in the switch. The voltage rating

of the control output contacts shall be 24 V DC. All control outputs shall be capable of driving a load of eight (8) amps at the primary control voltage with provision for an additional NO contact for DI status of Command Execute Acknowledgement wired up to terminal blocks. External auxiliary control relays are not preferred, but may be applied if integral relays do not satisfy the above ratings. These relays shall be supplied by the Contractor.

All control points shall follow a Select - Check back – Before - Operate (SCBO) procedure for control operation. The SCBO procedure shall be equivalent to the following:

1. The point selection command is received from the SCADA/DMS master station.
2. The FRTU checks that no other point is selected.
3. The FRTU selects the addressed point and transmits a selection confirmation to the SCADA/DMS.
4. The FRTU starts the command receipt timer and checks that only the required point remains selected and no other points become selected.
5. The operate command is received from the SCADA/DMS.
6. The FRTU verifies the operate command and energizes the selected control point relay for a predetermined time.

Point selection shall be canceled automatically following the completion of the control action, and re-selection of the point shall be required for subsequent control actions.

**Input / Output Point Counts**

The FRTU's shall be equipped to handle the I/O point requirements as per each FRTU types described in Sr.No. 1.9 of index.

All I/O channels provided (used as well as additional / spares) irrespective of immediate application shall be wired from FRTU I/O card along with interposing relays for DOs to the associated terminal strips in the cabinet with proper segregation and identification of Digital inputs and Digital outputs.

It shall be possible to expand the FRTU capacity by an additional twenty percent (50%) of the initially delivered (including spares) I/O points by providing space for adding cards and terminations at future date.

**Analog Inputs**

FRTU shall be able to capture Analog values from current & voltage transducers and communicate the Analog Measured Information (AMI) to control centre through communication media in the intervals of 10 minutes.

Unipolar and bipolar analog measurements shall be collected by the AI cards. Input to the cards shall be programmable for various mA and V input ranges.

**Programmable Logic Control (PLC)**

The FRTU shall be provided with a PLC Module. The PLC module shall have access to the controlling process via its process interface imaged in the FRTU process DB actualized by the internal communication. That allows to use nearly all process information from direct connected process signals as well as from process data points received via serial communication line. Control information for actuators to the process will be handled in the same way from the PLC to the physical output signals etc. The overall transaction time for a PLC task is therefore to be given by the PLC cycle time plus the update time between the process actuators and sensors and the PLC's FRTU process DB.I

Programming of the PLC program is to be done by a specific PLC programming tool. The integration of the PLC task and the link between the IO interfaces of the PLC to the real process signals is to be supported by FRTU Configuration Utility together with the PLC programming tool.

More than one PLC task shall be active. The FRTU shall allow to have more than one PLC module in the FRTU running.

**FRTU Data Communications**

The communication between the FRTU's and BCC/MCC shall be through all 4G GSM cellular network using Wireless VPN. Alternatively FRTU's shall also communicate with BCC/MCC wherever all 4G GSM cellular communication/Opticalfiber network is available. The FRTU's shall support communications using the IEC 608705-104 and Modbus set of protocols. Contractor shall provide Interoperability document specifying all the sets of parameters / functions implemented by its device. The message security defined in the protocol should be fully implemented, and if needed later, a convenient means of changing the communication protocol in the field should be provided.

The FRTU's shall have three (3) number serial ports, one port used for communication with slave device and one port for communication with BCC and MCC, and one RS485 port for Modbus

communication with IEDs. The FRTU shall also have one Ethernet port for diagnostic and communication with MCC / BCC in addition to the serial ports. Each of the serial ports shall be individually selectable in RS-232 or RS485 mode and for operation from 9,600 to 38,400 bps. FRTU's shall support communication with redundant masters installed at both BCC and MCC ie. 4 masters. The FRTU shall support IEC 61131-3 PLC programming for incorporation of peer to peer communication & achieve Self Healing Grid (SHG) automation logic.

#### 1.2.8Wifi Connectivity for local access

An inbuilt wifi communication modem shall be offered in FRTU for local access via hand held devices (Tablet / smart phone / etc..). It shall be secured by means of

- Activation/deactivation from the SCADA
- SSID visibility configurable
- Passphrase
- Automatic disconnection by timeout

### 1.2.9 Cyber Security

In order to secure all controls and data acquisition, the FRTU shall be designed to be compliant with NERC and IEC62351-5 requirements. The FRTU shall support secure access based on RBAC, with the possibility to configure the roles.

Local and remote access connection shall be secured for maintenance (locally and remotely)

### FRTU Enclosures

FRTU enclosure shall be provided integrated with the RMU as a single composite unit. A separate compartment for the FRTU shall be provided with protection class in accordance with RMU IP class. The enclosure shall be fabricated using 2-2.5 mm thick CRCA/GIsheet and powder coated using 10 tank process. The shade shall be same as the RMU. No access to the FRTU Compartment shall be given from the RMU back side. All the equipments housed in FRTU Compartment shall be accessible from front. The FRTU enclosure back side shall be bolted with SS Bolts.

3 Nos keys for the FRTU Compartment shall be provided along with the RMU.**{R1}**

The dimensions shall be suitable to accommodate FRTU CPM and I/O modules, power supply accessories, terminal blocks, communication modem with power adaptor, Ethernet switch for FO

connection and ease of intra-panel wiring/termination and maintenance thereafter. Suitably sized PVC perforated channels to be used for routing intra-panel wiring.

The front access door shall be hinged on cabinet with a common lock & key arrangement.

Removable type gland plates shall be provided at bottom of enclosure with 8-12 nos. knock out holes suitable for CBW01 gland for control cable entry. Provision of entry shall be kept for extending GSM modem antenna outside the enclosure. Alternately BRPL shall also have an option to mount communication switch connecting to optical fiber network.

Suitable ventilation, if necessary forced ventilation, and louver with dust filters shall be provided to maintain operating temperature under permissible limits of electronic components.

Contractor shall indicate gross weight of FRTU in GA drawing.

Alternately Fiber Reinforced Plastic (FRP) enclosure with suitable thickness and dimension may also be quoted.

**FRTU Power Supply**

Power supply for FRTU shall be on 24V DC system which would be made wired from Battery Charger system to FRTU cabinet.

The main DC circuits shall be protected by incoming circuit breakers. Each circuit shall be tapped through single pole MCBs so as to provide an individual DC feed to each of the I/O modules, modems and protocol converters. Contractor shall provide maximum power consumption data of each of the type of FRTU.

Type 3 Pluggable Surge Protection Device in accordance with IEC 61643 with KEMA & UL approval must be installed at the incoming power supply of FRTU. DIN Rail Mounted Suitable Surge Protection must be installed on all communication lines (Ethernet/RS 485)

**FRTU Test Systems**

The Contractor shall supply FRTU test systems for performing the functions listed below. Portable computers shall be used for this purpose. The FRTU test system shall comply with the following requirements:

1 Each test system shall support all maintenance aspects: verifying proper operation, troubleshooting, reconfiguring, and setting operational parameters for the FRTU's.

2 The test systems shall support all functional capabilities of the FRTU's, including functions which are not explicitly required in these Technical Specifications and functions which may not be included in the delivered FRTU's.

3 It shall be possible to use a test system locally at the site of the FRTU under test, and also remotely wherever access can be obtained to the communication channel of the FRTU.

4 All the required data rates shall be easily selectable.

5 It shall be possible to use the test systems to monitor communications between the respective SCADA/DMS and the FRTU's by selecting specific data streams, or portions of such data streams, both to and from FRTU. The data shall be displayed in a form that is easy for the user to interpret.

6 It shall be possible to connect the test system directly to the FRTU and to use the test system to perform all necessary FRTU management and expansion functions, monitor all stored data, monitor FRTU inputs, exercise FRTU outputs, and diagnose and troubleshoot the FRTU. It shall also be possible to use the test system as a local user interface at the FRTU location.

7 No programming skills shall be required to use the field test system. Interactive procedures relying mostly on pull down menus shall be used. The user shall not be required to type in commands, and shall be prompted when data entry is needed.

8 The test system shall be ruggedly constructed and suitable for field work and transportation in trucks. All cables, connectors, equipment, and documentation associated with their operation shall be included and stored either within the test system package or in suitable separate containers.

The test systems shall operate on internal battery and 220 V. AC, 50 Hz

**Software / Firmware**

The term software is used in this Technical Specification to mean software or software implemented through firmware. All software shall be implemented according to the Contractor's latest established design and coding standards. Complete and comprehensive documentation shall be provided for all software. Contractor may consider providing windows based software as it is preferred for its user friendliness. All the related software and related communication ports shall be provided to BRPL by OEM with latest version till warranty period without any cost implications to BRPL.

**General**

A real-time non-proprietary operating system that is capable of managing the FRTU applications shall be provided.

This software shall provide automatic restart of the FRTU upon power restoration, memory parity errors, hardware failures, and manual request. The software shall initialize the FRTU and begin execution of the FRTU functions without intervention by the SCADA/DMS master station. All restarts shall be reported to the SCADA/DMS.

The software shall be prepared in a high level language and shall be documented in detail. No separate licensing charges or agreements shall attach to the FRTU software or its underlying operating system.

In order to easily support the system under continuously changing site conditions all protocol, configuration, and application data must be contained in easily programmable non-volatile memory such as Flash EPROM.

The FRTU design shall be independent of any communication protocol that would impose restrictions on the flexibility or functionality of the FRTU. Protocol changes shall be accomplished by software/firmware changes only.

ALL FRTU cards to be coated with conformal coating for protection against weather related deterioration.

FRTU to have capability of reporting to four distinct IP addresses of same or different domains.

**Diagnostic Software**

Software shall be provided to continuously monitor operation of the FRTU and report FRTU hardware errors to the SCADA/DMS. The software shall check for memory, processor, and input/output errors and failures. It is desirable that internal diagnostics be sufficiently detailed to detect malfunctions to the level of the smallest replaceable component.

The FRTU shall facilitate isolation and correction of all failures and shall include features that promote rapid fault isolation and component replacement. All functional module nodes shall be designed with integrated on-line diagnostic functions. The results of these diagnostics shall be reported to the central processing module. The central module shall store this information and report it to the SCADA/DMS as permitted by the protocol. FRTU shall be able to access from remote (BCC/MCC) for down loading configuration.

**FRTU Testing**

## 1.7.1 Type Tests

The FRTU controller shall be KEMA /CPRI/ERDACertified and in accordance with IEC 255-4, 255-5, 255-6, 801-2, and 801-3 to demonstrate that the FRTU's comply with the ratings stated in these standards. As a minimum, certificates for the following type tests shall be furnished:

1. Dielectric test
2. Impulse voltage withstand test
3. High frequency disturbance test
4. Thermal requirement test
5. Mechanical requirement test
6. Limiting dynamic value test
7. Contact performance test
8. Electromagnetic radiation susceptibility test
9. Electrostatic discharge susceptibility test
10. EMI free & EMC Compatible

## 1.7.2 Routine Tests

The FRTU's shall pass the Manufacturer's standard routine tests in accordance with the referenced standards.

In addition to the tests described in the IEC standards, the routine tests and test report of the FRTU's shall include the following:

1. Visual tests to confirm that construction and sizing requirements have been met.
2. Rigorous testing of each input and output function of the FRTU's. This shall include the fault detection and the disturbance data storage functions as well as the operation and performance of the FRTU time and date facilities.
3. Verification of the use of the FRTU test equipment for maintenance and testing.
4. Verification of the ability to download parameters and configuration data from the SCADA/DMS master station.
5. Verification that FRTU software and firmware support FRTU sizing and expansion requirements.
6. Verification of successful communications (i.e. protocols) at all the required data rates.

7. Testing for secure operation, including verification that: a) Communication errors are detected. b) SCBO procedures are properly performed for control outputs. c) No erroneous control operation occurs and no incorrect data is generated when power is turned on or off or when operating on low battery voltage.

**FRTU Spares:**

Bidder shall supplyspares for 5 years trouble free operations as per the spares list given in this tech spec.

**FRTU Types:**

FRTU's are categorized as type 1 to 7 in this specification, according to their DI/ DO/AI Channel requirements as indicated in the annexure –1. FRTU shall be modular construction type.

**High Gain Antenna**

Scope :

: 12 dB High gain multi directional antenna with 15Mtr wire to be provided . Provision for taking antenna wire outside to be provided.Adequate accessories for mounting Antenna at appropriate Sub-station location (Roof/wall) for trouble free operation such as wall mounting bracket, roof mounting bracket etc.

**Annexure –1: Guaranteed Technical Particulars**

| FRTU Types | Digital Input Channels | Digital Output Channels | Analogue Channels |
|---|---|---|---|
| 1 | 24 | 8 | 6 |
| 2 | 32 | 16 | 6 |
| 3 | 48 | 24 | 6 |
| 4 | 64 | 32 | 6 |
| 5 | 80 | 40 | 6 |
| 6 | 96 | 48 | 6 |
| 7 | 112 | 32 | 6 |

(Vendors shall furnish the General Technical Particulars along with their offer. Any kind of

deviation along with offer shall be listed and submitted separately clause wise as per the deviation format given in this specification for approval of BRPL. Deviation shall not be considered which mentioned in any other submitted bid documents)

| Sr. No. | Description | Buyer's Requirement | Vendors Data |
|---|---|---|---|
| 1 | Vendors Name | | |
| 2 | Guarantee period | 5 yrs. | |
| 3 | Make of FRTU base module | As per Annexure-I | |
| | | | |
| 4 | No. of DI modules | | |
| | Type 2 | 2 x 16 | |
| | | | |
| 5 | No. of DO modules | | |
| | Type 2 | 2 x 8 | |
| | | | |
| 6 | No. of AI modules | | |
| | Type 1 to 2 | 1x 6 | |
| | | | |
| 7 | Dimensions &Weight of FRTU | | |
| | Type 2 | Vendor shall Provide | |
| | | | |
| 8 | Make of protocol converter | As per Annexure-I | |
| | | | |
| 9 | Interposing relay with freewheeling diode | | |
| | Make | As per Annexure-I | |
| | Capacity | >8 A | |
| | Model | CR-P with 2C/O contacts / Eqv | |
| 10 | AC & DC MCB | As per Annexure-I | |
| 11 | Terminal Blocks | As per Annexure-I | |
| 12 | Disconnecting type fuses make | As per Annexure-I | |
| 13 | Enclosure | | |
| | Sheet steel thickness | As per type test design | |
| | Painting process | 10 tank and powder coating | |
| | Construction of steel according to IEC 529 , index of protection | IP52 | |
| | Shade | RAL-7035 | |
| | Louvers with filters | 2 Nos | |

**Annexure – 2: IO List{R1}**

| Signals List for Motorized RMU | | | | | | |
|---|---|---|---|---|---|---|
| | Equipments | Signals | DI for 3Way | | DI for 4Way | |
| **Digital Inputs** | Isolator | Isolator ON | DI1, DI2 | 2 | DI1, DI2 | 2 |
| | | Isolator OFF | DI3, DI4 | 2 | DI3, DI4 | 2 |
| | | Earth Status | DI5, DI6 | 2 | DI5, DI6 | 2 |
| | | FPI operated | DI7, DI8 | 2 | DI7, DI8 | 2 |
| | | Local/Remote | DI9, DI10 | 2 | DI9, DI10 | 2 |
| | | VPIS Status | DI11, DI12 | 2 | DI11, DI12 | 2 |
| | Circuit Breaker | CB ON | DI13 | 1 | DI13, DI14 | 2 |
| | | CB OFF | DI14 | 1 | DI15, DI16 | 2 |
| | | Disconnector Open | DI15 | 1 | DI17, DI18 | 2 |
| | | Disconnector Close | DI16 | 1 | DI19, DI20 | 2 |
| | | Earth Status | DI17 | 1 | DI21, DI22 | 2 |
| | | Ready to Close Signal to control centre to indicate all interlocks are OK (including spring charge and trip ckt healthy) | DI18 | 1 | DI23, DI24 | 2 |
| | | Auto Trip | DI19 | 1 | DI25, DI26 | 2 |
| | | Local/Remote | DI20 | 1 | DI27, DI28 | 2 |
| | | SF6 Low | DI21 | 1 | DI29 | 1 |
| | | VPIS Status | DI22 | 1 | DI30, DI31 | 2 |
| | Common Signals | Battery Charger-1 Fail | DI23 | 1 | DI32 | 1 |
| | | Battery Charger-2 Fail | DI24 | 1 | DI33 | 1 |
| | | Command Acknowledgement | DI25 | 1 | DI34 | 1 |
| | | Battery Health Monitoring Unit/Battery in Trouble | DI26 | 1 | DI35 | 1 |
| | | FRTU Door Open | DI27 | 1 | DI36 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Interlock Card operation Fail | --- | 0 | --- | 0 |
| | | Auxiliary Circuit Healthy (Control Ckt healthy) | DI28 | 1 | DI37 | 1 |
| | | MOG Alarm from field | DI29 | 1 | DI38, DI39 | 2 |
| | | WTI Alarm from field | DI30 | 1 | DI40, DI41 | 2 |
| | APFC | APFC Incomer MCCB Trip | DI31 | 1 | DI42, DI43 | 2 |
| | | APFC Fan MCCB Trip+Other common alarm | DI32 | 1 | DI44, DI45 | 2 |
| | | | total | 32 | total | 45 |
| | **Spare DI** | | | **8** | | **3** |

## Signals List for Motorized RMU

| | Signals | DO for 3 way | | DO for 4Way | |
|---|---|---|---|---|---|
| **Digital Outputs** | Isolator ON | DO1, DO2 | 2 | DO1, DO2 | 2 |
| | Isolator OFF | DO3, DO4 | 2 | DO3, DO4 | 2 |
| | FPI Reset | DO5, DO6 | 2 | DO5, DO6 | 2 |
| | CB ON | DO7 | 1 | DO7, DO8 | 2 |
| | CB OFF | DO8 | 1 | DO9, DO10 | 2 |
| | | | | | |
| | Inteerlock card remote reset | DO9 | 1 | DO11 | 1 |
| | Modem interlock card remote reset | DO10 | 1 | DO12 | 1 |
| | Modem Remote Reboot | DO11 | 1 | DO13 | 1 |
| | FRTU Remote Reboot | DO12 | 1 | DO14 | 1 |
| | Auto Trip Reset | DO13 | 1 | DO15 | 1 |
| | | total | **13** | total | **15** |
| Spare DO | | DO14-DO16 | 3 | DO16 | 1 |

| | | |
|---|---|---|
| **Analog Inputs** | LT Palm Temp | AI1 |
| | Oil Temp of Trf. | AI2 |
| | | |

| | | |
|---|---|---|
| | Oil Level | AI3 |
| | **Spare** | AI4 to AI8 |

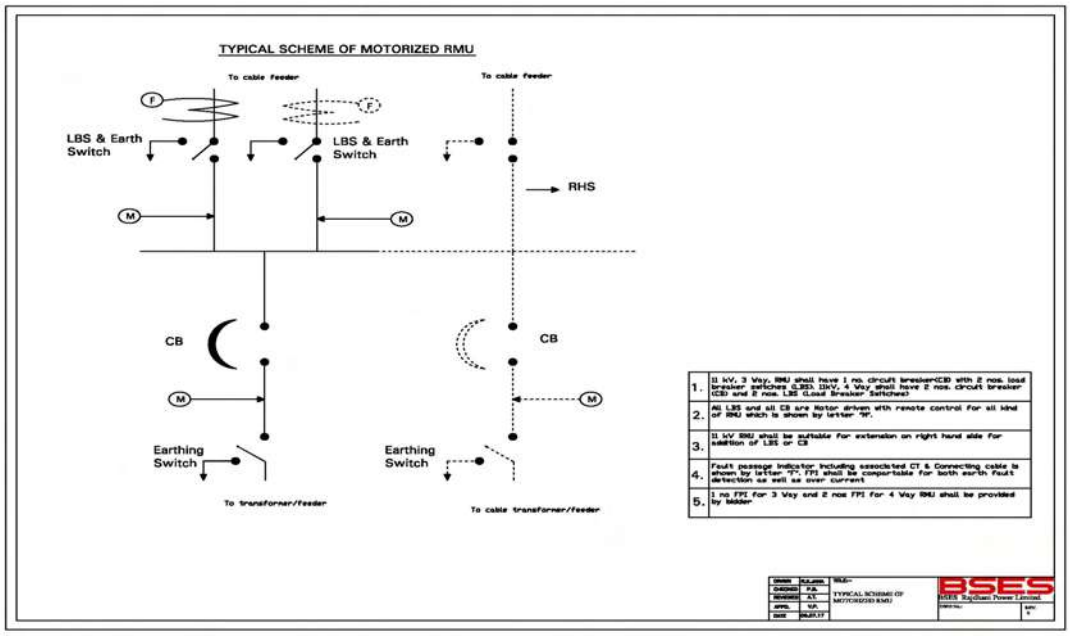
| | | |
|---|---|---|
| **Serial Port** | DT Energy Meter Data | SP1 |
| | Relay of RMU (Both relays to be connected to FRTU in case of 4 Way RMU) | SP2 |

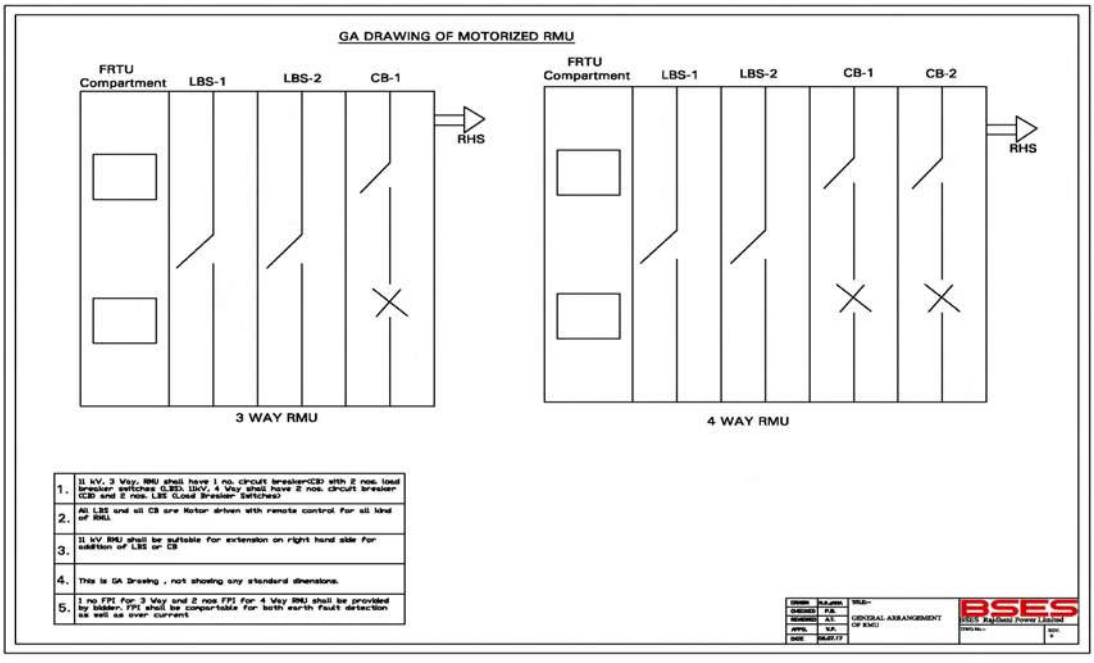
**Annexure-I : Make List**

| **Make List of RMU's Accessories** | | |
|---|---|---|
| Sl. No. | Descriptions | Make |
| 1 | **Relay (Self Power+ External DC Supply+ Communicable){R1}** | Ashida (ADR241S-761), |
| 2 | **CT and Aux PT{R1}** | Narayan Power Tech (NPT)/Gilbert Maxwell, Pragati,Nortex |
| 3 | FRTU | Schneider - HUA/HUBI<br>ABB - RTU520<br>CG - USP-020i<br>Wago (Model-750)<br>Phoenix (ILC 171 ETH 2TX) |
| 4 | Interposing relay with freewheeling diode | ABB/Tyco/OEN |

| | | |
|---|---|---|
| 5 | FPI(Both for Earth fault and Over current protection) | EMG/Schneider/SIEMENS/C&S |
| 6 | CBCT (Both for Earth fault and Over current protection) | EMG/Schneider/SIEMENS/C&S |
| 7 | Boot | 3M/Raychem/K.D.Joshi |
| 8 | **Modem (GSM 4G+) {R1}** | Nomus |
| 9 | Battery | GOGATE/Allan |
| 10 | Battery Charger (2 nos. For each RMU with free wheelingdiode ) | GOGATE/Allan |
| 11 | Wire | Polycab/Havells/Finolex/KEI |
| 12 | AC & DC MCB | SIEMENS/Havells/C&S/ Schneider |
| 13 | Disconnecting type fuses | Connectwell/Wago/Phoenix/Elmex |
| 14 | TB (disconnecting type) | Connectwell/Wago/Phoenix/Elmex |
| 15 | Protocol converter | ABB/Tyco/OEN |
| 16 | DC power connector | Wago/Havells/Connectwell |
| 20 | **Vacuum Interrupter{R1}** | CG/ ABB/Schneider/SIEMENS/Any other type tested (CPRI/ERDA)make |
| 21 | Battery Health Monitoring Unit | GOGATE/Allan |

Annexure-J: Composite RMU Drawing




Annexure-K: Deviation Sheet Format

**(To be filled in by Vendor with submission of Offer)**

We hereby confirm compliance of our product / system with BRPL Technical Specifications / GTP / BOQ / QAP / Approved Drawings, if any (strike off whichever not applicable) – in all respects / subject to the following Deviations listed below till closing of contract.

| Sl. No. | Document Name | Clause No. | Deviation | Reason | Merit to BRPL |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Special Requirement:**

| Sl. No | Descriptions |
|---|---|
| 1 | Animated video for ETC guide of RMU shall be submitted to BRPL before delivery of first lot |
| 2 | Relay Protection setting (min 10%) |
| 3 | All the communicable accessories shall have Latch contact |
| 4 | NO/NC contact for manometer shall be provided |
| 5 | --Bidders shall have additional RMU readily available of each type to replace under warranty faulty RMU in case it is repairable at OEM factory<br>--In case of under warranty failure and if the faulty RMU is repairable only at OEM factory, bidder has to replace the faulty RMU during lifting with new/ operatable same type of RMU within the time period mentioned in the tech spec warranty clauses.<br>--BRPL shall not issue any RMU from their assests for replacement activity. In case of delay, penalty shall be imposed as per this corrigendum sl no 9<br>--After Warranty period completion (5 years), these clause shall not be applicable to OEM |
| 6 | Sample RMU |
| 6.1 | 1 sample RMU of each type shall be manufactured as per BRPL specification after award of PO. BRPL will do the routine testing and inspection of the sample RMU and if found satisfactory as per BRPL specification, BRPL will give clearance/ approval for bulk manufacturing |
| 6.2 | During inspection of the sample RMU, BRPL may ask the vendor to modify/ change the design as per BRPL requirement including the make of accessories mentioned in the specification. OEM is liable to modify the design irrespective of the offer submitted during tender stage.However, BRPL will not ask for the requirement beyond the technical specification. |
| 6.3 | The lead time required to arrange the accessories/ to modify the design required as per BRPL requirement shall be in the account of bidder. |

| Sl. No | Descriptions |
|---|---|
| 6.4 | BRPL is not liable to bear any extra cost out of the PO for the approval of sample RMU and the bulk quantity afterwards. |
| 6.5 | The sample may be used in BRPL network based on fulfilment of technical requirement and BRPL approval.Else fesh RMUs as per the approved sample shall be supplied in line with PO quantity. |
| 6.6 | During bulk manufacturing and PO execution, BRPL may ask necessary changes to be done (if required). Bidder is liable to provide the required changes as per the BRPL requirement irrespective of the offer / design given during tendering stage without any cost implication to BRPL. However, BRPL will not ask any changes out of BRPL Technical specification |
| 7 | Warranty clause's terms & conditions mentioned in the technical specification Annexure- G(1), Clause no-6.2 shall be strictly followed by the OEM, in the event of violation of warranty clauses, BRPL is liable to impose penalty with1% of RMU unit rate per day basis (Unit rate shall be considered as per the PO) |
| 8 | Submission of Type test report (not more than 5 years from the date of tender opening date) of internal arc for 1 sec (AFLR 20kA for 1 sec) from CPRI/ERDA is mandatory with 3 way RMU |
| 9 | Complete Civil foundation Drawing along with sectional view (RCC casting shall be followed) and BBS shall be submitted by bidders along with drawing |
| 10 | Submission of 3nos as built drawing to BRPL before dispatch of first lot of material is mandatory. Also one set of as built drawing shall send with each unit of supplied RMU. Proper holding arrangement to be provided to place as built drawing inside the RMU. |
| 11 | Test bushing feature-The bushing of RMU must have the feature of "Test Bushing". |
| 12 | Broken conductor feature in relay-The relay must have the feature of detecting change in impedance (negative phase sequence over current) |
| 13 | **Aux-PT for Outdoor RMU Only**<br><br>1. Cast Resin, Single Phase Auxiliary Power transformer to be provided. Turns ratio – 11kV to 230V<br>2. 230V AC supply to be provided to RMU battery charger for power supply<br>3. Minimum VA Burden – 500VA<br>4. HRC Fuses to be provided on HT and MCB to be provided on LT Side of the Aux. Transformer<br>5. Aux Transformer to be placed on LHS of RMU<br>6. Resin material type shall be cycloaliphatic<br>7. CPRI/ERDA type test report shall be submitted for review and same shall not be older than 5 years. In case of type test report is more than 5 years old, type test shall be conducted form CPRI/ERDA without any cost implications to BRPL. |

| Sl. No | Descriptions |
| --- | --- |
| | 8. GA drawing for auxiliary voltage transformer arrangement along with schematic diagram, ratings and fuse details to be submitted for approval |

**Inspection**

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 5 Star for Abroad) shall be in scope of Vendor. The Factory visits will be held at OEM Factory & Etc.

# 33/0.433 KV Compact Substation

## ANNEXURE - A