

Tender Notification for

**DESIGN, ENGINEERING, CIVIL WORKS,
SUPPLY, ERECTION, TESTING, &
COMMISSIONING OF NEW 33/11KV INDOOR
SUBSTATION ALONG WITH ALLIED
EQUIPMENTS AND WORKS ON TURNKEY BASIS
AT GANGARAM HOSPITAL, NEW DELHI FOR
BYPL, DELHI (INDIA)**

NIT NO CMC/BY/19-20/RB/SV/009

Due Date for Submission: 23.05.2019, 14:30 HRS

**BSES YAMUNA POWER LIMITED (BYPL)
SHAKTI KIRAN BUILDING, KARKARDOOMA,
DELHI-110032
CIN: U40109DL2001PLC111525
TEL: 011 3999 7111
WEBSITE: www.bsesdelhi.com
GSTIN: 07AABCC8569N1Z0**

SECTION – I: REQUEST FOR QUOTATION

1.00 Event Information

- 1.01 BSES Yamuna Power Ltd (hereinafter referred to as “BYPL”) invites sealed tenders in 2 envelopes for DESIGN, ENGINEERING, CIVIL WORKS, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 33/11KV INDOOR SUBSTATION ALONG WITH ALLIED EQUIPMENTS AND WORKS ON TURNKEY BASIS AT GANGARAM HOSPITAL, NEW DELHI FOR BYPL, DELHI (INDIA). The bidder must qualify the requirements as specified in clause 2.0 stated below. All envelopes shall be duly superscribed as — **“DESIGN, ENGINEERING, CIVIL WORKS, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 33/11KV INDOOR SUBSTATION ALONG WITH ALLIED EQUIPMENTS AND WORKS ON TURNKEY BASIS AT GANGARAM HOSPITAL, NEW DELHI FOR BYPL, DELHI (INDIA)”** “NIT NO CMC/BY/19-20/RB/SV/009 DUE ON 23.05.2019, 14:30 HRS”

Sl. No.	Description	Estimated Cost (₹)	Cost of EMD (₹)	Qty.	Delivery & Installation at
1	Survey, design, engineering, manufacture, shop testing, inspection, packing, dispatch, loading, unloading and storage at site, transit/storage and construction insurance, assembly, erection, civil, structural, architectural work, complete pre-commissioning checks, testing & commissioning at site, obtaining statutory clearance & certification from State Electrical Inspector, and handing over to the Owner after satisfactory commissioning of new 33/11kv Indoor Substation along with allied equipments and works on Turnkey basis conforming to Technical Specification & SOW	2.88 Crore	5.76 Lakh	AS PER BOQ (Bidder is requested to verify the same before bidding by visiting the site)	GANGARAM GRID, NEW DELHI FOR BYPL, DELHI (INDIA)

- 1.02 The schedule of specifications with detail terms & conditions can be obtained from address given below against submission of non-refundable demand draft of **Rs. 1,180/-** drawn in favour of BSES Yamuna Power Ltd, payable at Delhi. The tender papers will be issued on all working days upto **23.05.2019, 17:00 P.M.** The tender documents & detail terms and conditions can also be downloaded from the website www.bsesselhi.com --> **BSES YAMUNA POWER LTD** --> **Tender** --> **Open Tenders**

In case tender papers are downloaded from the above website, then the bidder has to enclose a demand draft covering the cost of bid documents.

- 1.03 Offers will be received upto **23.05.2019, 14:30 PM.** at the address given below. Part A of the Bid shall be opened on **23.05.2019, 16:30 PM.** Part B of the Bid will be opened

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

**Head of Department
Contracts & Materials Deptt.
BSES Yamuna Power Ltd
3rd Floor, A Block
Shaktikiran Building, Karkardooma
Delhi 110032**

1.03 Bid will be summarily rejected if:

- (i) Earnest Money Deposit (EMD) of requisite value & validity.
- (ii) Tender fee of requisite value.
- (iii) The offer does not contain "FOR NEW DELHI" prices indicating break-up towards all taxes & duties.
- (iv) Complete Technical details are not enclosed.
- (v) Tender is received after due date and time.

2.00 **Qualification Criteria**

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

- a) The bidder should be a manufacture of 33KV Indoor Switchgear.
- b) The bidder should have infrastructure in India for providing service & spare support to BYPL. The relevant documents including details of manufacturing units, locations and works from where supply & spares against this tender shall be proposed to be furnished.
- c) The bidder should have established project management, field quality assurance system & safety organization designed to achieve high level of reliability at various stages of field services required for successful erection, testing & commissioning. The bidder should have successfully designed, supplied, installed & commissioned minimum two 33KV Indoor Grid substations or higher rating projects in last 5 years. Details of these projects including customer name, PO number (with date), date of completion and rating (Capacity/Voltage etc) shall be provided.
- d) Performance certificate for 1 (One) year satisfactory performance from at least 2 executed projects of 33KV Indoor Grid substations or higher voltage rating should be submitted.
- e) Bidder shall procure equipment's from the approved vendor list of BYPL for individual items (attached in Scope of work - SP-SWGH-151-R0). The bidder is supposed to have agreement with manufacturer/service provider to provide support to BYPL for any service & spares related issues for time stipulated in the specification or service life of the equipments. The bidder must submit the undertaking for the same.
- f) The bidder must have adequate Financial Stability and status to meet the financial obligation pursuant to the scope of work and shall have average annual turnover of minimum Rs 200 Crores during last three (3) Financial Years preceding the date of opening of bid, duly certified CA certificate to be submitted.
- g) The bidder should possess valid Electrical Contractor License issued by competent statutory agency to undertake work in NCT Delhi. In case bidder is not having this license, Bidder to give the undertaking that it will be obtained by

them before the start of the work at site or suitable sub-contractor having the valid license shall be engaged for works at site where copy of valid license shall be submitted to BYPL before the start of the work.

- h) An undertaking (self certificate) that the bidder has not been blacklisted/debarred by any central/state government institution including electricity boards.
- i) The bidder should have registered under GST ACT and shall submit PAN, EPF and 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 statutory compliances as per the applicable laws/rules etc before the start of the work.

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

3.00 Bidding and Award Process

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

3.01 BID SUBMISSION

The bidders are required to submit the bids in 2(two) parts and submitted in **1 original + Duplicate** to the following address:

**Head of Department
Contracts & Material Deptt.
BSES Yamuna Power Ltd
3rd Floor, A Block
Shaktikiran Building, Karkardooma
Delhi 110032**

PART A :: TECHNICAL **BID** comprising of following

- EMD in prescribed format
- Non-refundable demand draft for Rs 1180/- in case the forms are downloaded from website
- Details of constitution of the company (Proprietary/Limited/etc along with the details)
- Memorandum of Association of the company
- Documentary evidence in support of qualifying criteria i.e, Copies of the following for last 3 years i) Balance sheet ii) Annual profit & loss statement iii) Annual turn over, iv) Capacity, v) CA certificate etc
- Copies of following i) Orders ii) Execution/Performance Certificates, & other documents to support the QC as per Clause 2.0
- Technical Literature/ GTP/Type test report etc
- Organization Chart/Qualified Manpower available
- Testing Facilities
- Original Tender documents duly stamped & signed on each page as token of acceptance

- Acceptance to Commercial Terms and Conditions viz. Delivery schedule/period, Payment terms, BG, Power-of-Attorney etc

PART B :: FINANCIAL **BID** comprising of

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

3.02 TIME SCHEDULE

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

S.No.	Steps	Due date
1	Last Date of Sale of Bid Documents	22.05.2019, 17:00 HRS
2	Last Date of Queries, if any	13.05.2019, 15:30 HRS
3	Pre-Bid Meeting	13.05.2019, 15:30 HRS
4	Last Date of Receipt of Bid Documents	23.05.2019, 14:30 HRS
5	Date & Time of Opening of PART A - Technical and Commercial Bid	23.05.2019, 16:30 HRS

NOTE: In case last date of submission of bids & date of opening of bids is declared as holiday in BYPL office, the last date of submission will be following working day at the same time.

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

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

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

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

REVERSE AUCTION CLAUSE :: Purchaser reserves the right to use reverse auction as optional tool through SAP – SRM as an integral part of the entire tendering process. All the bidders who are techno-commercially qualified on the basis of tender requirements shall participate in reverse auction.

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

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

4.00 Award Decision

4.01 Purchaser intends to award the business on a lowest bid basis, so suppliers are encouraged to submit the bid competitively. The decision to place purchase

order/LOI solely depends on purchaser on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that Purchaser may deem relevant.

- 4.02 The purchaser reserves all the rights to award the contract to bidder so as to meet the delivery requirement or nullify the award decision without any reason.
- 4.03 In the event of your bid being selected by purchaser (and / or its affiliates) and you subsequent DEFAULT on your bid; you will be required to pay purchaser (and / or its affiliates) an amount equal to the difference in your bid and the next lowest bid on the quantity declared in NIT/RFQ.
- 4.04 In case any bidder is found unsatisfactory during the Project execution, the award will be cancelled and BYPL reserves the right to award other bidders who are found fit.
- 4.05 Bidders are requested to quote their lowest No-Regret prices since BYPL would not prefer to negotiate the price further.

5.00 **Market Integrity**

We have a fair and competitive marketplace. The rules for bidders are outlined in the Terms & Conditions. Bidders must agree to these rules prior to participating. In addition to other remedies available, we reserves the right to exclude a bidder from participating in future markets due to the bidder's violation of any of the rules or obligations contained in the Terms & Condition. 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/NIT.

6.00 **Supplier Confidentiality**

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

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

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

7.0 **Contact Information**

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

	Technical	Commercial
Contact Person	Mr Ashwani Aggarwal Copy to : Mr. Rakesh Bansal	Mr Rakesh Bansal & Rajesh Srivastava
Address	BSES Yamuna Power Ltd , 3 rd floor, B Block, Shaktikiran Building, Karkardooma, Delhi 110032	C&M Deptt. 3 rd Floor , A-Block, BSES Yamuna Power Ltd Shaktikiran Building, Karkardooma, Delhi 110032
E-Mail ID	ashwani.aggarwal@relianceada.com	rakesh.bansal@relianceada.com rajesh.r.srivastava@relianceada.com

SECTION – II: INSTRUCTION TO BIDDERS

A. GENERAL

1.00 BSES Yamuna 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 material notified earlier in this bid document.

2.00 SCOPE OF WORK

2.01 The scope shall include design, engineering, civil works, supply, erection, testing, & commissioning of new 33/11kv Indoor Switchgear along with allied equipments and works on turnkey basis at gangaram grid substation, new delhi for bypl, delhi (india)

3.0 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 arising 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 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 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:

(a) Request for Quotation (RFQ) - Section - I

- (b) Instructions to Bidders (ITB) - Section - II
- (c) Terms & Conditions of SUPPLY (T&C) - Section -III
- (d) Price Format - Supply - Section IV
- (e) Summary T&C - Supply - Section V
- (f) Bid Form - Section VI
- (g) Acceptance Form RA - Section VII
- (h) EMD BG Format - Section VIII
- (i) Terms & Conditions of SERVICES (T&C) - Section -IX
- (j) Price Format – ETC - Section -X
- (k) GRAND SUMMARY OF THE QUOTED PRICE- Section -XI
- (l) Vendor Code of Conduct - Section -XII
- (m) Appendix
- (n) Technical Specifications (TS) - Section -XIII

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.

6.0 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 web site www.bsedelhi.com and the same 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. The same shall be published as a corrigendum in website www.bsedelhi.com

6.04 Purchaser shall reserve the rights to following:
a) extend due date of submission,
b) modify tender document in part/whole,
c) cancel the entire tender

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

C. PREPARATION OF BIDS

7.0 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.

8.0 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 Technical Specification.
- (b) All the Bids must be accompanied with the required EMD as mentioned in the Section-I against each tender.
- (c) Tender documents duly stamped and signed on each page by authorized signatory.

8.0 BID FORM

- 8.01 The Bidder shall submit one "Original", "Copy- 1", of the Bid Form, Supporting Documents & Technical Data Sheets duly filled in as per attached specification/BOM etc enclosed.

9.0 EMD

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

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

- (a) Bank Guarantee drawn in favour of BSES Yamuna Power Ltd, payable at Delhi.
- (b) EMD shall be valid for One Hundred Fifty (150) days after due date of submission drawn in favour of BSES Yamuna Power Ltd

The EMD may be forfeited in case of:

- (a) the Bidder withdraws its bid during the period of specified bid validity
- or
- (b) the case of a successful Bidder, if the Bidder does not
 - (i) accept the Purchase Order, or
 - (ii) furnish the required contract performance BG.

10.0 BID PRICES

- 10.01 Bidders shall quote for the entire Scope of Supply/Work with a break-up of prices for individual items and Taxes & Duties. The total Bid Price shall also cover all the Supplier's obligations mentioned in or reasonably to be inferred from the Bidding Documents in respect of Design, Supply, Transportation to site, all in accordance with the requirement of Bidding Documents. The Bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total Price with taxes, duties & freight upto destination.
- 10.02 The prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during execution of the supply work, breakup of price constituents, should be there.
- 10.03 Prices quoted by the Bidder shall be "**Firm**" and not subject to any price adjustment during the performance of the Contract. **A Bid submitted with an adjustable price/ Price Variation Clause will be treated as non-responsive and rejected.**

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

11.0 BID CURRENCIES

11.01 Prices shall be quoted in Indian Rupees Only.

12.0 PERIOD OF VALIDITY OF BIDS

12.01 Bids shall remain valid for 150 days from the due date of submission of the Bid.

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

13.0 ALTERNATIVE BIDS

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

14.0 FORMAT AND SIGNING OF BID

14.01 The original Bid Form and accompanying documents, clearly marked "Original Bid" plus copy1, must be received by the Purchaser at the date, time and place specified pursuant to Clauses 15.0 and 16.0. In the event of any discrepancy between the original and the copies, the original shall govern.

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

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

15.0 SEALING AND MARKING OF BIDS

15.01 Bid submission: One original, & copy1 (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 price bid shall be inside another sealed envelope with superscribed "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, & copy1. The envelopes should be superscribed with —"Tender Notice No. & Due date of opening".

15.03 The Bidder has the option of sending the Bids in person. Bids submitted by Email/Telex/Telegram /Fax will be rejected. No request from any Bidder to the Purchaser

to collect the proposals from Courier/Airlines/Cargo Agents etc shall be entertained by the Purchaser.

16.0 DEADLINE FOR SUBMISSION OF BIDS

- 16.01 The original Bid, together with the required copies, must be received by the Purchaser at the address specified earlier.
- 16.02 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will there after be subject to the deadline as extended.

17.0 ONE BID PER BIDDER

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

18.0 LATE BIDS

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

19.0 MODIFICATIONS AND WITHDRAWAL OF BIDS

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

E. EVALUATION OF BID

20.0 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.

21.0 CLARIFICATION OF BIDS

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

22.0 PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS

- 22.01 Purchaser will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order. Purchaser may ask for submission of original documents in order to verify the documents submitted in support of qualification criteria.
- 22.02 Arithmetical errors will be rectified on the following basis. If there is a discrepancy

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

- 22.03 Prior to the detailed evaluation, Purchaser will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.
- 22.04 Bid determined as not substantially responsive will be rejected by the Purchaser and/or the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non -conformity.

23.0 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 & qualifying 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) Delivery Schedule
 - (b) Conformance to Qualifying Criteria
 - (c) Deviations from Bidding Documents

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

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

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

F. AWARD OF CONTRACT

24.0 CONTACTING THE PURCHASER

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

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

25.0 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 to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Purchaser's action.

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

Though the contract is for Turnkey in nature, the Purchaser intends to issue 2 (two) separate Purchase/Works Orders viz.

- a) Purchase Order for Supply Portion.
- b) Work Order for Installation, Testing & Commissioning.
- c) Work Order for Civil Works.

All individual contracts will contain cross fall breach clause (i.e., a breach of one will constitute breach of the others)

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 with in 7 days of issue of the letter of intent /Notification of Award by Purchaser. The date of LOI/LOA shall be treated as Start date of Project.

29.0 CONTRACT PERFORMANCE BANK GAURANTEEE

Within 15 days of the receipt of Notification of Award/ Letter of Intent/PO from the Purchaser, the successful Bidder shall furnish Contract Performance Bank Guarantee towards faithful performance of Contract for an amount of 10% (Ten percent) of the Contract Price. The Performance Bond shall be valid upto completion period/handing over, whichever is earlier plus 3 months claim period. Upon submission of the performance security, the EMD shall be released. 03 (three) nos. separate CPBG's shall be submitted against Supply, ETC & Civil Contract.

30.0 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 for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question ;
 - (c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a contract.
- 30.02 Furthermore, Bidders shall be aware of the provision stated in the Terms and Conditions of Contract.

31.0 COMPLETION PERIOD (PROJECT)

- 31.01 05 months from the date of issuance of LOI/PO's.

SPECIAL TERMS AND CONDITIONS OF CONTRACT

- 1.01** Bidders are requested to visit the site to understand the scope of work, site conditions and requirements prior to Bidding. Hence, no price/time escalation shall be admissible on these accounts.
- 1.02** As this is the Turnkey Project, so additional cost will not be paid to successful bidders even if the size and quantity of cables or other minor material mentioned in BOM changed as per the site requirements.
- 1.03** Statutory variation will be allowed for direct supplies only wherever breakup of Taxes & Duties are available in Price Bid.
- 1.04** Bidder has to submit the technical parameters with details of Spares for each rating with catalogue, reference codes etc.
- 1.05** Bidder has to submit the item wise price bifurcation in bid. Unprice copy must be attached with the Part A. Reverse Auction will be carried out on Lump sum Basis/Total Landed Cost i.e. Supply + ETC + Civil Works.
- 1.06** Successful bidder has to compliance the statutory compliance.
- 1.07** In case of any major deviation, deletion or addition which bidder may feel is relevant to this project & for its safe operation and completion of works; Bidder may clearly highlight and communicate the same to the purchaser with his bid.
- 1.08** Necessary Statutory Clearances & any other authority for energizing the substation shall be in the scope of this tender. However, any statutory fees shall be borne by BYPL on production of documentary evidence.
- 1.09** Problem Troubleshooting & Restoration In Warranty Period For A Particular Equipment:
a) Service Engineer Availability to Attend, Identify & Restore Defects (Minor) Of Grid Equipments under Guarantee Period within 48 Working Hours (Exclusion of Material Support Cases)
b) Spare Material Delivery For Restoration Of Grid Equipment (Major Defect) Under Guarantee Period Within Two Weeks. Seller must keep Requisite Inventory of Critical Switchgear Spares & Other Equipment's Covered in Guarantee Period to Restore Equipment within Two Weeks.
c) In Case Of Complete Replacement of Equipment, Complete Equipment to Be Replaced Within a Period Of 4 Weeks.
- 1.10** **PROJECT INFORMATION & COMPLETION**
The contractor shall be fully responsible to complete the project in time. It is desired that the total project should complete in 180 days from the date of LOI or purchase order whichever is earlier. The detail completion schedule shall be prepared by vendor and shall be submitted at the time of detailed engineering for approval. Vendor has to submit the progress report fortnightly in the format attached with this tender/as asked by the Purchaser.
- 1.11** **PROJECT IMPLEMENTATION & EXECUTION CONTROL**
The bidders are requested to submit the following along with the bid, about the project implementation & execution methodology.
a) Write up/overview of project Plan
b) Implementation Methodology
The successful Bidder shall be required to prepare detailed Network(s) and project implementation plans & programmes and finalize the same with the Employer as per requirement specified in Technical Specifications, which shall form a part of the Contract.

SECTION III

GENERAL TERMS AND CONDITIONS – SUPPLY

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 BSES Yamuna Power Limited, on whose behalf this bid enquiry is issued by its authorized representative / officers.
- 2.02 "Bidder" shall mean the firm who quotes against this bid enquiry issued by the Purchaser. "Supplier" or "Supplier" shall mean the successful Bidder and/or Bidders whose bid has been accepted by the Purchaser and on whom the "Letter of Acceptance" is placed by the Purchaser and shall include his heirs, legal representatives, successors and permitted assigns wherever the context so admits.
- 2.03 "Supply" shall mean the Scope of Contract as described.
- 2.04 "Specification" shall mean collectively all the terms and stipulations contained in those portions of this bid document known as RFQ, Commercial Terms & Condition, Instructions to Bidders, Technical Specifications and the Amendments, Revisions, Deletions or Additions, as may be made by the Purchaser from time to time.
- 2.05 "Letter of Acceptance" shall mean the official notice issued by the Purchaser notifying the Supplier that his proposal has been accepted and it shall include amendments thereto, if any, issued by the Purchaser. The "Letter of Acceptance" issued by the Purchaser shall be binding on the "Supplier" The date of Letter of Acceptance shall be taken as the effective date of the commencement of contract.
- 2.06 "Month" shall mean the calendar month and "Day" shall mean the calendar day.

- 2.07 "Codes and Standards" shall mean all the applicable codes and standards as indicated in the Specification.
- 2.08 "Offer Sheet" shall mean Bidder's firm offer submitted to BYPL in accordance with the specification.
- 2.09 "Contract" shall mean the "Letter of Acceptance/Purchase Order" issued by the Purchaser.
- 2.10 "Contract Price" shall mean the price referred to in the "Letter of Acceptance/Purchase Order".
- 2.11 "Contract Period" shall mean the period during which the "Contract" shall be executed as agreed between the Supplier and the Purchaser in the Contract inclusive of extended contract period for reason beyond the control of the Supplier and/or Purchaser due to force majeure.
- 2.12 "Acceptance" shall mean and deemed to include one or more of the following as will be stipulated in the specification:
- The written acceptance of material by the inspector at suppliers works to ship the materials.
 - Acceptance of material at Purchaser site stores after its receipt and due inspection/ testing and release of material acceptance voucher.
 - 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.

4.0 Scope of Supply -General

- 4.01 The "Scope of Supply" shall be on the basis of Bidder's responsibility, completely covering the obligations, responsibility and supplies provided in this Bid enquiry whether implicit or explicit.
- 4.02 Bidder shall have to quote for the Bill of quantities as listed elsewhere.
- 4.03 All relevant drawings, data and instruction manuals.

5.0 Quality Assurance and Inspection

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

- 5.02** Witness and Hold points are critical steps in manufacturing, inspection and testing where the supplier is obliged to notify the Purchaser in advance so that it may be witnessed by the Purchaser. Final inspection is a mandatory hold point. The supplier to proceed with the work past a hold point only after clearance by purchaser or a witness waiver letter from BYPL.
- 5.03** The performance of waiver of QA activity by Purchaser at any stage of manufacturing does not relieve the supplier of any obligation to perform in accordance with and meet all the requirements of the procurement documents and also all the codes & reference documents mentioned in the procurement document nor shall it preclude subsequent rejection by the purchaser.
- 5.04** On completion of manufacturing the items can only be dispatched after receipt of dispatch instructions issued by the Purchaser.
- 5.05** All in-house testing and inspection shall be done with out any extra cost. The in-house inspection shall be carried out in presence of BSES/BSES authorized third party inspection agency. Cost of Futile/abortive visit(s) shall be debited from the invoices
- 5.06** Purchaser reserves the right to send any material being supplied to any recognized laboratory for testing, wherever necessary and the cost of testing shall be borne by the Bidder. In case the material is found not in order with the technical requirement / specification, the charges along with any other penalty which may be levied is to be borne by the bidder. To avoid any complaint the supplier is advised to send his representative to the stores to see that the material sent for testing is being sealed in the presence of bidder's representative.

6.0 Packing, Packing List & Marking

- 6.01 Packing:** Supplier shall pack or shall cause to be packed all Commodities in crates/boxes/drums/containers/cartons and otherwise in such a manner as shall be reasonably suitable for shipment by road or rail to BYPL, Delhi/New Delhi stores/site without undue risk of damage in transit.
- 6.02 Packing List:** The contents of each package shall be itemized on a detailed list showing the exact weight, extreme outside dimensions (length, width & weight) of each container/box/drum/carton, Item SAP Code, PO No & date. One copy of the packing list shall be enclosed in each package delivered.

7.01 Price basis for supply of materials

- a) Bidder to quote their prices on Landed Cost Basis and separate price for each items. FIRM prices for supply to BYPL Delhi/New Delhi stores inclusive of packing, forwarding, loading at manufacturer's premises, payment of GST, Freight, Custom Duty, any other local charges. Octroi is presently not applicable in Delhi and however if applicable shall be reimbursed at actual.
- b) The above supply prices shall also include unloading at BYPL Delhi/New Delhi stores/site.

8.0 Terms of payment and billing – SUPPLY

- a) 5% of the total supply contract price shall be paid as initial interest free advance on fulfillment against 1) acceptance of LOI/PO, 2) submission of BG of equivalent amount valid upto completion period/handing over, whichever is earlier plus 3 months claim period and 3) Submission of Contract Performance Bank Guarantee of 10% of the contract price valid upto completion period/handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably. The advance shall be adjusted against R/Bills.

- b) 10% of the total supply contract price shall be paid as interest free advance against submission of BG of equivalent amount valid upto completion period/handing over, whichever is earlier plus 3 months claim period, approval of drawings under Category-1 of major drawings (shall be mutually agreed at the time of award), Quality Plans, Pert Chart, Network Diagram, Field Quality Plan, posting of project Manager and commencement of the first mile stone of the work mutually agreed. In case of delay, the BG shall be extended suitably. The advance shall be adjusted against R/Bills.
 - c) 60% prorata of supply value shall be payable against R/A bills for supply of equipment and material within 30 days against receipt & acceptance of material at site and submission of following documents against dispatch of each consignment at our Vendor Support Cell (VSC) duly certified by BYPL Project-in-charge:
 - I. Consignee copy of LR.
 - II. Detailed invoice showing commodity description, qty, unit & total price.
 - III. Original certificate issued by BYPL confirming receipt of material at site & acceptance.
 - IV. Dispatch clearance & inspection report issued by the inspection authority.
 - V. Packing List, Test Reports.
 - VI. Guarantee Certificate.
 - VII. Performance Bank Guarantee equivalent to 10% of Supply value of the Contract valid upto Defect Liability period plus 3 months Claim period.
 - d) 10% prorata on account of supply value of the actual executed value after completion of installation/erection of equipment duly certified by BYPL Project-in-charge.
 - e) Balance 15% on account of supply value of the actual executed value shall be paid in 30 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BYPL Engineer-in-Charge specified in the tender and on submission of performance Bank Guarantee of 10% amount, in our format valid up to a defect liability period for 36 months from the date of handing over of the scheme including submission of Electrical Inspector Clearance Certificate, Compliance of final punch point, No Demand Certificate, Letter of Indemnity by the supplier (The format of No Demand Certificate and Letter of Indemnity are attached as Annexure) and after reconciliation & adjustments of payments, if any towards quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job.
- 8.02 Purchaser has the right to recover tax loss, interest and penalty suffered due to any non-compliance of tax laws by the Vendor. In the event, Purchaser is not able to avail any tax credit due to any short coming on the part of the Vendor (which otherwise should have been available to Purchaser in the normal course), then the Vendor at his own cost and effort will get the short coming rectified. If for any reason the same is not possible, then the Vendor will make 'good' the loss suffered by Purchaser due to the tax credit it lost . In such event, any amount paid to the Vendors shall be first attributable to the tax (GST) charged in the invoice and the balance shall be considered towards the 'value' of supply of goods/ services.
- 8.03 Purchaser shall deduct "Tax Deducted at Source" wherever applicable and at the rate prescribed under the GST Laws or any other Indian law and remit the same to the Government. Necessary TDS certificates as per law shall be issued by the purchase to the vendor.

8.04 Any liability arising out of dispute on the tax rate, classification under HSN, calculation and payment of tax to the Government will be to the Vendor's account.

8.05 Where the supply of Goods are liable to GST under reverse charge mechanism, then the supplier should clearly mention the category under which it has been registered and also that "the liability of payment of GST is on the Recipient of Supply".

9.0 Price Validity

9.01 All bids submitted shall remain valid, firm and subject to unconditional acceptance by BYPL Delhi for 150 days from the due date of submission. For awarded suppliers/contractors, the prices shall remain valid and firm till contract completion.

10.0 Performance Guarantee

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

11.0 Forfeiture

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

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

12.0 Release

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

13.0 Warranty/Defects Liability Period

13.01 The bidder to guarantee the materials/items supplied against any defect of failure, which arise due to faulty materials, workmanship or design for the entire defects liability period. The Defect liability period shall be 36 months from the date of handing over of entire Installation. 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.

14.0 Return, Replacement or Substitution

14.01 BYPL shall give Supplier notice of any defective Commodity promptly after becoming aware thereof. BYPL may in its discretion elect to return defective Commodities to Supplier for replacement, free of charge to BYPL, or may reject such Commodities and

purchase the same or similar Commodities from any third party. In the latter case BYPL 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. BYPL may set off such costs against any amounts payable by BYPL to Supplier. Supplier shall reimburse BYPL for the amount, if any, by which the price of a substitute Commodity exceeds the price for such Commodity as quoted in the Bid.

15.0 Effective Date of Commencement of Contract

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

16.0 Time – The Essence of Contract

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

17.0 The Laws and Jurisdiction of Contract

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

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

18.0 Events of Default

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

- (a) Supplier fails or refuses to pay any amounts due under the Contract;
- (b) Supplier fails or refuses to deliver Commodities conforming to this RFQ/specifications, or fails to deliver Commodities within the period specified in P.O. or any extension thereof
- (c) Supplier becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or the Supplier's creditors file any petition relating to bankruptcy of Supplier;
- (d) Supplier otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Supplier of notice of such failure from BYPL.

19.0 Consequences of Default

- (a) If an Event of Default shall occur and be continuing, BYPL may forthwith terminate the Contract by written notice.
- (b) In the event of an Event of Default, BYPL 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 BYPL may incur as a result of Supplier's default.

20.0 Liquidated Damages

20.01 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 basic (ex-works) price of the contract for every week delay or part thereof delay until the actual date of completion.

20.02 The total amount for delay under the contract will be subject to a maximum of Ten percent (10%) of the basic (ex-works) price.

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

21.0 Statutory variation in Taxes and Duties

21.1 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, in case of reduction in taxes, duties and levies, the benefits of the same shall be passed on to BUYER.

21.2 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.

21.3 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.

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

21.5 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.

21.6 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.

22.0 Force Majeure

22.01 General

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

- (i) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected party's ability to perform its obligations under this Contract and to mitigate the consequences thereof.
- (ii) For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.
- (iii) Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract.
- (iv) Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken in order to comply with above clause.

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

- (i) The following events and circumstances:
 - a) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters.
 - b) Explosions or fires
- (ii) War declared by the Government of India, provided that the ports at Mumbai are declared as a war zone.
- (iii) Dangers of navigation, perils of the sea.

22.03 Notice of Events of Force Majeure If a force majeure event prevents a party from performing any obligations under the Contract in part or in full, that party shall:

- i) Immediately notify the other party in writing of the force majeure events within 7(seven) working days of the occurrence of the force majeure event
- ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event.
- iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable
- iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis.
- v) Provide prompt notice of the resumption of full performance or obligation to the other party.

22.04 Mitigation of Events of Force Majeure Each Party shall:

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

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

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

22.07 The Purchaser may terminate the contract after giving 15 (Fifteen) days notice if any of following occurs:

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

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

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

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

23.0 Transfer and Sub-Letting

23.01 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.

24.0 Recoveries

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

25.0 Waiver

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

26.0 Indemnification

26.01 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.

27.01 DOCUMENTATION

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

27.0 Limitation of Liability

Except as provided otherwise in the Contract and except for willful misconduct or gross negligence, neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contract or any other indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract. The total liability of the Contractor to the Purchaser under the Contract shall not exceed the Contract Value. Except that this Clause shall not limit the liability of the Contractor:

- (a) Under any other provisions of the Contract which expressly impose a greater liability,
- (b) In cases of fraud, willful misconduct or illegal or unlawful acts, or
- (c) In cases of acts or omissions of the Contractor which are contrary to the most elementary rules of diligence which a conscientious Contractor would have followed in similar circumstances.

28.0 Liability of Contractors

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

the Purchaser for the following:

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

29.0 Intellectual Property Rights and Royalties

- 29.1 The Contractor shall indemnify the Purchaser and the Purchaser's Representative from and against all claims and proceedings on account of infringement (or alleged infringement) of any patent rights, registered designs, copyright, design, trademark, trade name, know-how or other intellectual property rights (hereinafter collectively referred to as "**Intellectual Property Rights**") in respect of the Works, Contractor's Equipment, machines, Works method, Plant, Materials, or anything whatsoever required for the execution of the Works and from and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. In the event of infringement of any Intellectual Property Rights of any third party as a result of the execution of the Works (or any part thereof) by the Contractor, the Contractor shall rectify, modify or replace, at its own cost, the Works, Plant or Materials or anything whatsoever required for the Works so that infringement ceases to exist or, in the alternative, the Contractor shall procure necessary rights/ licenses from the affected third party so that there is no infringement of Intellectual Property Rights.
- 29.2 The Contractor shall be promptly notified of any claim made against the Purchaser. The Contractor shall, at its cost, conduct negotiations for the settlement of such claim, and any litigation or arbitration that may arise from it. The Purchaser or the Purchaser's Representative shall not make any admission which might be prejudicial to the Contractor, unless the Contractor has failed to take over the conduct of the negotiations, litigation or arbitration within a reasonable time after having been so requested. In the event of Contractor failing to act at the Purchaser's Representative's notice, the Purchaser shall be at full liberty to deduct any such amount of pending claim from any amount due to the Contractor under the Contract or any other contract and the balance portion of claim shall be treated as debt due from the Contractor.
- 29.3 All Intellectual Property Rights in respect of any Plant, Materials, Drawings and Designs, plans, documents, specifications, data, materials, know how, charts, information, etc.,

provided to the Contractor by the Purchaser pursuant to this Contract for the execution of the Works, belongs to and shall continue to belong to the Purchaser and the Contractor shall not have any rights in the same other than the limited right for its use for the purpose of execution of the Works.

- 29.4 Intellectual Property Rights in respect of any Plant, Materials, Drawings and Designs, plans, calculations, drawings, documents, know-how and information relating to the Works which are proprietary to the Contractor and/ or its third party licensors ("**Contractor's IPR**") shall continue to vest with the Contractor and/ or its third party licensors and the Contractor shall grant and/ or procure from its third party licensors, at its own cost, a worldwide, perpetual, royalty free, non-exclusive license (along with the right to sub-license) to use and reproduce such Contractor's IPR for the use, operation, maintenance and repair of the Works.
- 29.5 If any patent, trademark, trade name, registered design or software is developed by the Contractor or its Subcontractor specifically for the execution of the Works, then all Intellectual Property Rights in respect of such design, trademark, trade name or software shall be the absolute property of the Purchaser and shall not be utilized or retained by the Contractor (or its Subcontractors) for any purpose other than with the prior written consent of the Purchaser.
- 29.6 If the Contractor uses proprietary software (whether customized or off the shelf) for the purpose of storing or utilizing records in relation to the Works, the Contractor shall obtain at its own expense, the grant of a worldwide, royalty-free, perpetual licence or sublicense (including the right to sublicense) to use such software, in favour of the Purchaser provided that the use of such software under the licence or the sublicense may be restricted to use any such software only for the design, construction, reconstruction, manufacture, installation, completion, reinstatement, extension, repair and operation of the Works or any part thereof.
- 29.7 If any software is used by the Contractor for the execution of the Works over which the Contractor or a third party holds pre-existing title or other rights, the Contractor shall obtain for the Purchaser, a worldwide, royalty free, perpetual license for the right to use and apply that software (together with any modifications, improvements and developments thereof).

30.01 Commissioning Spares

- 30.01 Commissioning Spares shall be deemed to be included in the quoted prices.

31.0 Tax Indemnity Clause:

- 31.1** Vendor (along with its affiliates in India or overseas including any agent/ third party contractor or any other person appointed by such affiliates for the purpose of this agreement) agrees that it will be solely responsible for performing all compliances and making payments of all taxes (direct tax or indirect tax including but not limited to income-tax, transfer pricing, value added tax, SGST, CGST, IGST, UTGST, GST Compensation Cess custom duty, excise duty, Research and Development Cess, etc.), cesses, interest, penalties or any other tax/ duty/ amount/ charge/ liability arising either out of laws/ regulations applicable in India and overseas or because of a demand/ recovery initiated by any revenue authority under laws/ regulations applicable in India or overseas.
- 31.2** In case any tax liability (including but not limited to income-tax, transfer pricing, value added tax, SGST, CGST, IGST, UTGST, GST Compensation Cess custom duty, excise duty, Research and Development Cess, etc.), cesses, interest, penalties or any other tax/ duty/ amount/ charge/ liability becomes payable by Purchaser due to failure of the Vendor, or any of its affiliates in India or overseas including any agent/ third party

contractor or any other person appointed by such affiliates for the purpose of this agreement, to comply with the relevant laws/ regulations applicable in India or overseas, Vendor undertakes to indemnify Purchaser for an amount equal to amount payable by Purchaser.

31.3 Further, Vendor undertakes to keep Purchaser indemnified at all times against and from all other actions, proceedings, claims, loss, damage, costs and expenses which may be brought against Purchaser or suffered or incurred by Purchaser and which shall have arisen either directly or indirectly out of or in connection with failure of The Vendor, or any of its affiliates in India or overseas including any agent/ third party contractor or any other person appointed by such affiliates for the purpose of this agreement, to comply with relevant obligations/ compliance under any law/ regulations applicable in India and overseas.

31.4 The parties agree to follow the following process in case any communication of demand, arising out non-compliance by Vendor (along with its affiliates in India or overseas including any agent/ third party contractor or any other person appointed by such affiliates for the purpose of this agreement), is received by Purchaser :

31.4.1 On Purchaser receiving any communication from a competent authority demanding tax liability (including but not limited to income-tax, transfer pricing, value added tax, SGST, CGST, IGST, UTGST, GST Compensation Cess custom duty, excise duty, Research and Development Cess, etc.), cesses, interest, penalties or any other tax/ duty/ amount/ charge/ liability, Purchaser shall, within 5 common working days from the date of receipt of such communication (save where the period to respond to the relevant authority is less than five days, in which case, as soon as reasonably possible) inform Vendor in writing of such communication.

31.4.2 Pursuant to receiving communication from Purchaser, Vendor shall suggest to accept the communication and pay the demand amount to the competent authority. In such an event, Vendor shall reimburse such amount paid to Purchaser within 5 working days from the date of payment by Purchaser to the competent authority.

31.4.3 If Vendor advises in writing and Purchaser agrees to dispute the demand, then Purchaser shall dispute the matter with competent authority as per due process prescribed under the regulations and Purchaser shall not pay the Tax Demand. In such scenario, cost of litigation including but not limited to Counsel cost, filing fees, other related charges, should be reimbursed by Vendor to Purchaser. Additionally, If any coercive steps of recovery are initiated by the department, then Purchaser would pay such amount (including by way of adjustment of refunds due to it) and the same would be reimbursed by Vendor within 5 working days from date of such recovery from Purchaser. Purchaser will take all necessary steps to avoid such recovery measures.

31.4.4 On determination of the demand through an Order issued by a Tribunal or any other similar Authority, by whatever name called, under any law applicable in India or overseas, if the demand or any part thereof becomes payable and is paid by Purchaser, then Vendor undertakes to reimburse such amount to Purchaser within 10 days from the date of payment. Alternatively, if on determination of the demand through an Order, no amount is payable by Purchaser then any refund arising to Purchaser due to such an Order shall be passed on to Vendor within 10 days from the date of receipt of refund.

32.0 TRANSIT INSURANCE:

32.1 Transit Insurance shall be arranged by the Bidder.

32.2 **DAMAGE / LOSS OF CARGO IN TRANSIT:** Vendor shall be solely responsible for coordinating with the concerned insurance company for procuring insurance for material and/or Goods, processing claim lodgment and settlement. Notwithstanding the insurance cover, in case of loss / damage to material and/or Goods, in any manner and for any cause whatsoever, Vendor shall cause the damaged cargo to be replaced and delivered

to the Purchaser with new material and/or Goods within 30 days of such loss / damage. The Vendor shall be solely responsible for all expenses in relation to the replacement and delivery in such circumstances.

33.0 Acceptance:

33.1 Vendor confirms to have gone through the Policy of BYPL on legal and ethical code required to be followed by vendors encapsulated in the "Vendor Code of Conduct" displayed on the official website of BYPL (www.bsesdelhi.com) also, which shall be treated as a part of the contract/PO/WO.

Vendor undertakes that he shall adhere to the Vendor code of Conduct and also agrees that any violation of the Vendor Code of Conduct shall be treated as breach of the contract/PO/WO.

In event of any such breach, irrespective of whether it causes any loss/damage, Purchaser (BYPL) shall have the right to recover loss/damage from Vendor.

The Contractor/Vendor hereby indemnifies and agrees to keep indemnified the Purchaser (BYPL) against any claim/litigation arising out of any violation of Vendor Code of Conduct by the Contractor/Vendor or its officers, agents & representatives etc.

33.2 Acceptance of the CONTRACT implies and includes acceptance of all terms and conditions enumerated in the CONTRACT in the technical specification and drawings made available to Contractor consisting of general conditions, detailed scope of work, detailed technical specification, detailed equipment drawing and complete scope of work.

33.3 Contractor and Company contractual obligation are strictly limited to the terms set out in the CONTRACT. No amendments to the concluded CONTRACT shall be binding unless agreed to in writing for such amendment by both the parties

SECTION IV

PRICE FORMAT – SUPPLY (A) (Items shown are indicative, Kindly refer BOQ, attached as Annexure)

DESCRIPTION OF GOODS	HSN CODE	QTY	UoM	UNIT RATE	UNIT FREIGHT	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST)		UNIT LANDED COST (₹)	TOTAL LANDED COST (₹)
						%	AMT		
Items as per BOQ i.e. shall be utilized to furnish price break-up.									
GRAND TOTAL LANDED COST									
In words									

NOTE:

- 1) Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser’s country.
- 2) The bidder shall, at its own, handle all imported equipment’s and handle all formalities for custom clearances, port charges, etc if any.
- 3) Item-wise breakup of Recommended Spares for 5 years to be indicated as below.
- 4) All Tools & Tackles, Consumables and Commissioning Spares required to complete the work shall be included in the quoted rates.
- 5) Any other items not mentioned above but are required for successful completion of the substation shall be deemed to be included in the above quoted rates.

SECTION V

SUMMARY COMMERCIAL TERMS AND CONDITIONS – SUPPLY

SI No	ITEM DESCRIPTION	AS PER BYPL	BIDDER'S CONFIRMATION
1	Validity	150 days from the due date of submission	
2	Price basis	a) Firm, FOR Delhi store basis. Prices shall be inclusive of all taxes & duties, freight upto Delhi stores. b) Unloading at site stores - in vendor's scope c) Transit insurance in Bidders scope	
3	Payment terms	As per Clause 8.0 of Part I, Page 18	
4	Completion time	05 months from date of LOI/PO	
5	Defect Liability period	36 months from the date of Handing over of entire Installation.	
6	Liquidated damages	1% of basic price for every week delay subject to maximum of 10% of basic PO value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid upto completion period/handing over	
8	Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid upto Defect Liability Period plus 3 months towards claim period	

Bidder should furnish the below details for future communication:-

General Information

Full Name of the Company:

Postal Address:

GSTIN:

For Technical Clarification(s)

Name:

Designation:

E-Mail:

Mobile No.:

Telephone No.:

For Commercial Clarification(s)/ Reverse Auction

Name:

Designation:

E-Mail:

Mobile No.:

Telephone No.:

SECTION VI

BID FORM

To

Head of Department
Contracts & Material Deptt.
BSES Yamuna Power Ltd
Shaktikiran Building, Karkardooma,
Delhi 110032

Sir,

1 We understand that BYPL is desirous of procuring..... for its licensed distribution network area in Delhi

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

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

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

5 We agree to abide by this Bid for a period of 150 days from the due date of bid submission and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

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

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

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

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

Dated this..... day of..... 20.....

Signature..... In the capacity of

.....duly authorized to sign for and on behalf of

(IN BLOCK CAPITALS)

SECTION VII

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed and stamped by the bidder)

BSES Yamuna Power Ltd (hereinafter referred to as “BYPL”) intends to use the reverse auction through SAP-SRM tool as an integral part of the entire tendering process. All the bidders who are found as techno commercial qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

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

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

Signature & seal of the Bidder

SECTION VIII

FORMAT FOR EMD BANK GUARANTEE

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

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

KNOW ALL PEOPLE by these presents that WE [name of bank] at [*Branch Name and address*],having our registered office at[*address of the registered office of the bank*](herein after called the "Bank"),are bound unto BSES Yamuna Power Ltd., with it's Corporate Office at Shaktikiran Building, Karkardooma, Delhi -110032, (herein after called —the "Purchaser")in the sum of Rs..... (Rupees..... only) for which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these presents.

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

THE CONDITIONS of this obligation are:

- 1 If the Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Bid Form ; or
2. If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity:
 - (a) fails or refuses to execute the Contract Form ,if required; or
 - (b) fails or refuses to furnish the performance security, In accordance with the Instructions to Bidders/ Terms and Conditions;

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

This guarantee will remain in force up to and including One Fifty (150) days after the due date of submission bid, and any demand in respect thereof should reach the Bank not later than the above date.

(Stamp & signature of the bank)

Signature of the witness

LITIGATION HISTORY

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

CURRENT CONTRACT COMMITMENTS/ WORK IN PROGRESS

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

FINANCIAL DATA

(Duly Certified by Chartered Accountant)

	Actual in previous 5 financial years				
	FY 15-16	FY 14-15	FY 13-14	FY 12-13	FY 11-12
Total assets					
Current assets					
Total Liability					
Current Liability					
Profit before taxes					
Profit after taxes					

CHECK LIST

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

SECTION IX

GENERAL TERMS & CONDITIONS - SERVICES

1. DEFINITIONS and INTERPRETATION

The following terms shall have the following meanings:

1.1 "Company/Employer": means BSES Yamuna Power Ltd, a company incorporated under the Companies Act 1956 and having its office at BSES Yamuna Power Limited having its office at Shaktikiran Building, Karkardooma, Delhi -110032, which expression shall include its authorized representatives, agents, successors and assigns.

1.2 "Contractor": shall mean the successful Tenderer / vendor to whom the contract has been awarded

1.3 "Rate": The unit rates for the work to be carried out at site shall be as per finalized unit rates through tender. The finalized rates shall be firm for the entire duration of work to be carried out by the Contractor under the work order and are not subject to escalation for any reason whatsoever.

1.4. CONTRACT SPECIFICATION: The terms "CONTRACT Specification" shall mean the Technical specification of the work as agreed by you and description of work as detailed in Annexure-I enclosed herewith and all such particulars mentioned directly/referred to or implied as such in the contract.

1.5 SITE: The terms "Site" shall mean the working location in BYPL area. Under this tender, working location shall be as mentioned elsewhere.

1.6 ENGINEER IN CHARGE: "Engineer In-charge" means the Company's authorized representative for the purpose of carrying out the work.

1.7 PRIORITY OF CONTRACT DOCUMENTS:

The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the same shall be explained and adjusted by the Employer, who shall thereupon issue to the Contractor, instructions thereon. In such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

- 1.1. SAP Work Order duly acknowledged by Contractor
- 1.2. Price Schedule
- 1.3. Special Condition of Contract
- 1.4. Technical specification and Tender Drawing
- 1.5. Erection Conditions of Contract
- 1.6. General Conditions to the Contract

2. EXAMINATION OF SITE AND LOCAL CONDITIONS:

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

3. LANGUAGE AND MEASUREMENT:

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

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

4. SCOPE OF WORK:

The scope of work shall be as per SOW at Site, New Delhi". Schedule of work shall be as mentioned in the Bill of quantity attached herewith.

Free Issue Material as required for the completion of work under the scope of the Contract shall be issued free of cost by the Employer / Owner from its stores. Transportation from store to the work area shall be in scope of the Contractor.

The Contractor shall requisition the free issue materials in the prescribed format(s) to the Employer and Employer shall arrange to issue the same on Free of Cost basis.

The Contractor shall take proper care of the materials supplied to the Contractor and protect the same from weathering and any other damages. Any material rendered unserviceable or damaged while in Contractor's custody shall be replaced by the Contractor at his cost as determined by the Engineer.

The Contractor shall have to furnish an Indemnity Bond (Annexure attached) for the materials supplied free of cost by the Employer / Owner. Further, he shall be responsible for the safe custody of materials till the materials are utilized, fabricated, erected and accounted for in all respect in the Project.

After completion of work of above grid, contractor has to obtain the Electrical Inspectorate's Clearance from the Electrical Inspector of Delhi Govt. However the Electrical Inspectors clearance fees shall be paid by the company.

Engineer In-Charge shall arrange any permission like Road cutting clearance etc. from the Delhi Civic authorities like MCD,DDA, PWD and DJB. However, the contractor shall make follow up with local authorities and other connected persons that may be required to carry out the job under this work order.

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

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

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

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

The Contractor will make his own arrangement for electricity and water requirement from Local sources for construction requirements.

The Contractor will be required to make his own arrangement for distribution of water/power on the site by erecting temporary lines. All such work shall be carried out according to local regulation. The temporary lines will be removed forthwith after the completion of work. If there is hindrance caused to the other work done to the alignment of these lines, the contractor will re-route and remove the temporary lines at his own cost

Under no circumstances the delay in work shall be attributed to non-availability or inadequate power and / water supply.

5. SITE MOBILIZATION:

5.1 Contractor shall commence the work as per the plan.

5.2 Contractor shall submit deployment plan for the T&P and Man power required for the project. If the Contractor is not able to deploy the required T&P, manpower & construction materials, Employer, at its sole discretion, may opt to arrange the same on behalf of Contractor and an amount of cost plus 20% shall be deducted from any amount due or becoming due to the Contractor.

5.3 Quality Assurance Plan: Contractor to submit QAP / FQP for the complete scope within 02 weeks of issue of order for Employers / Owners Approval. Works to be executed as per approved QAP.

5.5 Schedule of work to be performed shall be as per implementation schedule (to be finalized during kick-off meeting).

The Network so finalised shall also be used for the purpose of contract execution, monitoring progress of work, payments and operation of all other terms and conditions of the Contract strictly.

The Schedules shall be reviewed periodically with the Employer / Owner to ensure that the completion dates for different milestones will be met and to institute all corrective steps such as mobilising additional resources in terms of labour, materials, equipment, tools and plant, night work etc. at no extra cost to the Employer / Owner to achieve any accelerated progress at any time to the extent required to adhere to the completion dates. The Employer / Owner reserves the right to revise the work schedule at his discretion in order to ensure completion date and to suit the project requirements and such alterations shall not entitle the Contractor to any extra payment.

6. RATES:

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

Rate for all the extra items shall be mutually negotiated and fixed on the basis of cost of materials, consumables, labour and T&P expenses plus overhead expenses and profit upto maximum 10%.

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

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

7. TAXES AND DUTIES:

Prices are inclusive of all taxes and duties including labour cess and GST as applicable. However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS). The total order value shall remain **FIRM** and shall only be adjusted on account of any variations in Statutory Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period.

8. BILL SUBMISSION PROCEDURE:

All bills shall be submitted to the Engineer In charge / Package Engineer for certification. Bills shall be complete in all respect including ESI / HR compliance, Quality compliance, HSE compliance, Store compliance, Finance compliance etc. An established procedure is followed at site. Incomplete bills / invoices will not be considered for processing payments.

9. POWER TO WITHHOLD PAYMENT BY EMPLOYER:

9.1 Employer shall have power to withhold payment of RA Bill in full or in parts for the reason of non compliance of major contract terms and conditions such as quality of work, progress of work etc as per the discretion of Engineer In Charge.

9.2 Such withholding of payment neither relieve the contractor to execute the work with due diligence and speed, nor entitle contractor to claim any interest, loss of anticipated profit, etc there on.

9.3 All the compliances to be done by the Contractor before next RA bill and hold amount to be released. In case contractor is not able to do the compliance before next RA bill such hold amount shall be released as and when such compliances are fulfilled to the satisfaction of Employer.

9.4 If the work is not performed in strict accordance with the contract ,or if the work of any other contract between the contractor herein and the Employer is not performed in strict accordance with its terms ,or if the Employer has a claim against the contractor herein for any other reason whatsoever ,or if any claim ,just or unjust (including claims for wrongful death and for injuries to person property), which arises out of the performance of work is made against the Employer, the Employer shall have the right to withhold out of any payment, final or otherwise, such sums as the Employer may deem ample to protect it against delays or loss or to assure the payment of such claims.

9.5 Deduction of Defective Work as Alternative to Requiring Corrections: If the Employer deems it inexpedient to require the Contractor to Correct Work damaged or not done in accordance with the Contract, an equitable deduction from the Contract Price shall be made by agreement between the Contractor and Employer. In the event of failure of said parties to reach an agreement, the amount to be so deducted shall be settled in accordance with the procedure hereinafter provided for the settlement of disputes. Until such settlement, the Employer may withhold such sum as it deems just and reasonable from monies, if any, due the Contractor.

10. TERMS OF PAYMENT

Payment shall be made to you as under:

- (i) 5% of the total services contract price shall be paid as initial interest free advance on fulfillment against 1) acceptance of LOI/PO, 2) submission of BG of equivalent amount valid upto completion period/handing over, whichever is earlier plus 3 months claim period and 3) Submission of Contract Performance Bank Guarantee of 10% of the contract price valid upto completion period/handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably. The advance shall be adjusted against R/Bills.
- (ii) 80% prorata of total services value shall be payable against R/A bills payable within 30 days after completion duly certified by Engineer in charge.
- (iii) Balance 15% on account of total services value of the actual executed value shall be paid in 30 days after completion of successful acceptance testing, commissioning and handing

over of complete systems duly certified by BYPL Engineer-in-Charge specified in the tender and on submission of performance Bank Guarantee of 10% amount, in our format valid up to a defect liability period for 36 months from the date of handing over of the scheme including submission of Electrical Inspector Clearance Certificate, Compliance of final punch point, No Demand Certificate, Letter of Indemnity by the supplier (The format of No Demand Certificate and Letter of Indemnity are attached as Annexure) and after reconciliation & adjustments of payments, if any towards quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job.

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

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

8. DEFECT LIABILITY PERIOD:

Work executed shall be guaranteed against any defect or failure which may arise due to faulty materials, design or workmanship for a period of 36 months from the date of handing over of the entire installation.

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

9. COMPLETION PERIOD:

You are required to mobilize your manpower and Tools & Tackles and furnish a list of equipments to be used for erection and commence the execution activity as per instructions of Engineer In-charge. The entire erection work should be completed within project completion of 05 months from the date of issue of LOI/WO. The detailed schedule and milestone completion dates would be as per the contract schedules given from time to time by Engineer In-charge at site. You shall submit a weekly progress report to Engineer In charge.

10. CLEANLINESS:

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

11. COMMISSIONING & ACCEPTANCE TEST:

After completion of the work, the Contractor shall conduct trial run/ operation in the presence of Engineer In charge. During such trial run the system shall be operated under the supervision of the Contractor. If any rectification/modification required during this period the Contractor shall do all necessary measures.

On satisfactory completion of above, the system shall be deemed to have energized and placed in commercial operation. The Engineer In Charge will issue an acceptance certificate.

12. WORK COMPLETION CERTIFICATION. HANDING OVER:

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

Contractor shall remain in close contact with Engineer In-Charge at site to report the general findings of the fieldwork during the initial as well as later stage of the work at site.

13. RECONCILIATION:

Reconciliation of free issue material, BOQ items shall be done on monthly basis and same shall form part of the running bills. The contractor shall maintain an accurate and exhaustive record detailing out the list of all items received by him for the purpose of erection and keep such record open for the inspection of the company. All measurement of works shall be done in The Joint Measurement Book, jointly signed by Engineer In Charge / Package Owner and contractor's representative. Copy of measurement sheet shall form part of both running bill and final bill.

The contractor shall be solely responsible for any shortage or damage of materials issued to them handling of and / or in storage and erection at site and cost of the same will be recovered from the contractor as certified by Engineer In-Charge.

14. PUNCH LIST AND OUTSTANDING WORK:

14.1 The Contractor shall, in conjunction with the Employer / Owner, prepare and update on a continuing basis during the period between completion of structure and final completion, punch lists (based on the preliminary punch list) of outstanding items requiring completion or rectification.

14.2 The Contractor shall rectify or complete to the standards specified in the Contract and in accordance with the schedule stated in the punch list any outstanding items of work or plant noted as requiring rectification or as incomplete. In the event that the Contractor fails to commence and / or diligently proceed with the execution of any such outstanding items of work in accordance with such schedule, the Employer / owner may arrange for the outstanding work to be done and reasonable cost thereof shall be certified by the Employer / Owner and deducted from the contract price or paid by the Contractor to the Employer / Owner.

14.3 The parties may in any event agree that any outstanding items of work shall be carried out by the Employer / Owner or shall otherwise be deleted from the punch list referred to above, subject to the agreement of any appropriate sum to be paid or allowed by the Contractor to the Employer / Owner in respect of such outstanding item.

14.4 Rectification / Correction and Replacement of faulty / defective / damaged work
The Employer may reject defective or unsatisfactory work or materials. The Contractor shall proceed immediately with the correction of rejected, defective, or unsatisfactory workmanship or materials and shall have all objectionable materials and defective work removed from the site (or any place used for storing materials for use on the work) and replaced.

15. REMEDY FOR CONTRACTOR'S DEFAULT:

In case the quality of works performed by the Contractor is found to be not meeting the requirements of the contract, then the Employer / Owner shall have the right to demolish such work and get it re-executed at the risk and cost of the contractor. In case the contractor is not able to perform as per the time schedule and other requirements of the contract, then, the Employer / Owner, upon giving a notice of 7 (seven) days to the contractor, can get the works rectified/completed by some other agency, at the risk and cost of the contractor.

16. DEMobilIZATION:

16.1 Prior to Handing over, the contractor shall remove all the belonging from the site.

16.2 Debris, Rubbish etc. so as to take all practical measures to prevent damage to the site or any other property on or near the site or work area. As soon as reasonably practicable, but in any event prior to handing over, the contractor shall remove or dispose of in accordance with applicable laws all such rubbish, debris, etc. and all contractor's Equipment, supplies, materials and wastes brought or produced by the contractor on the site or the work area.

16.3 Labour and Hutments: Labour and work men engaged by the contractor for the works along with their hutments, sheds and dwellings, notwithstanding the foregoing, the contractor shall be responsible for the removal of all its temporary structures built at site.

17. CONTRACT CLOSURE:

As per Annexure - Contract closure document

18. CODES AND STANDARD:

All required codes and standard detailed in the specifications are to be adhered to. The plant equipment material and works shall be completely furnished in all the respects in accordance with the technical specification as per the acceptable codes & standards.

20. PENALTY AND LIQUIDATED DAMAGES:

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

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

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

20.3 The Liquidated Damages shall not in any way relieve the Contractor from any of its obligations to complete the Work or from any other obligations and liabilities of the Contractor under the Contract.

20.4 Notwithstanding the above, in the event the Contractor fails to complete the package as per the schedule; and delays the Employer 'Handing Over' of the plant / Structure / unit(s) up to a period for which the Liquidated Damages for time delay becomes more than 5% of the Contract Price, then the Employer at his sole discretion, shall be entitled to treat the failure as an act of default by the Contractor and same shall entitle the Employer to terminate the Contract and get the work done by some other agency, at the Risk & Cost of Contractor.

20.5 Employer shall issue notice to Contractor in writing before recommending any risk & cost to contractor. The Contractor shall immediately provide an action plan to make good of any balance Work/deficient Work within seven (07) days of receiving such notice. Any non response by the Contractor to the Risk and Cost proposal of the Employer or failure to provide an action plan shall be deemed as acceptance of the Risk and Cost proposal by the Contractor.

20.6 The Liquidated Damages for delay will be recovered at the sole discretion of the Employer from the Contract Price or from other securities/ BG's available with the Employer or jointly.

20.7 Time is essence of the Contract. After issuance of the Work order, the Contractual network / L2 network will be finalized and approved by the Employer.

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

21. MITIGATION OF CONSEQUENCES OF DELAY:

In all cases where such an event for delay has occurred, the Contractor shall advise the Employer / Owner of -

21.1 "The extent of the actual and contemplated delay and its anticipated effect upon the date of "Handing-Over".

21.2 "The Contractor's plans to take steps to overcome or minimize the actual or anticipated delay and

21.3 The Contractor's plans to adopt any methods suggested by the Employer / Owner to overcome or minimize the delay, and shall use all reasonable endeavors to take such steps and/or adopt such methods.

22. SAFETY CODE:

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

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

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

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

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

23. STATUTORY OBLIGATIONS:

The Contractor shall take all steps as may be necessary to comply with various Acts, Rules, including but not limited to The Child Labour (Prohibition & Regulation) Act, 1986, The Contract Labour (Regulation & Abolition) Act, 1970. The Employees Pension scheme, The Employees Provident Funds and miscellaneous provisions Act, 1952, The Employees state Insurance Act, 1948, The Equal Remuneration Act, The Industrial Dispute Act, 1947, The Maternity Benefit Act, 1961, The Minimum Wages Act, 1948, The payment of Bonus Act, 1965, The Payment of Gratuity Act, 1972, The Payment of wages Act, 1936, The Shops & Establishment Act, The Workmen's Compensation Act, 1923, Building and Other Construction Workers (Employment and Regulations) Act 1996, Building and Other Construction Workers (Cess) Act 1996, The Employers Liability Act, 1938, Indian Electricity Act, 2003 and Indian Electricity Rules, VAT and GST etc., and all other applicable laws as amended and rules framed there under including any statutory approval required from the Central/State Govt. Ministry of Labour. Broadly, the compliance shall be as detailed below, but not limited to:

- a) An Electrical license.
- b) PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.
- c) All employees to have a temporary or permanent ESI Card as per ESI Act.
- d) ESI Registration No.
- e) Sales Tax registration number, if applicable.
- f) PAN No.
- g) Work Contract Tax Registration Number/ VAT Registration.
- h) Labour License under Contract Labour Act (R & A) Act 1970.
- i) Delhi Building and other Construction Worker (Regulation of Employment and Conditions of Services) Rules, 2002(B.O.C.W.)

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

The Contractor must follow:

- a) Third party Insurance Policy before start of work.
- b) To follow Minimum Wages Act prevailing in the state.
- c) The Salary/wages to all deployed manpower is to be distributed through ECS only into the bank accounts of all individuals and not later than 7th of succeeding month. In case of unavoidable circumstances the payment may be made through crossed cheques in the name of the individual and information of all such cases need to be submitted to HR(CMC).
- d) To maintain Wage- cum - Attendance Register.
- e) To maintain First Aid Box at Site.
- f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.
- g) Workman Compensation Policy. {If applicable}.
- h) Labour license before start of work. {If applicable}.

Before commencing the work it would be mandatory for the Contractor to furnish the Company the permanent PF code no and ESI of the employees.

24. WORKMAN COMPENSATION:

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

The contractor shall keep the company indemnified at all times, against all claims of compensation under the provision of Workmen Compensation Act 1923 and as amended from time to time or any compensation payable under any other law for the time being workman engaged by the contractor/sub-contractor/sub-agent in carrying out the job involved under this work order and against costs and expenses, if any, incurred by the company in connection therewith and without prejudice to make any recovery.

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

25. STAFF AND WORKMAN:

(I) It shall be responsibility of contractor:

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

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

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

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

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

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

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

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

26. INSURANCE:

Before commencing the execution of the work the Contractor shall take at his own cost Transit Insurance policy, Third party insurance and suitable insurance policy for his own men and material. Please note that these insurance policies shall be taken in consultation with the Employer, where Employer is to be named as Co-insured and a copy of the insurance policy shall have to be furnished to Employer within 30 days of the date of order. For all the insurance policies (whether taken by the Employer or Contractor), the Contractor shall be responsible for settlement of claims with the underwriters without any liability on the Employer / Employer and will arrange replacements / rectification expeditiously without waiting for settlement of insurance claim, at contractor's own cost and this shall arrange the comprehensive Insurance policy for workmen's compensation, General liability Insurance, Automobile insurance, Third party insurance for damage of any movable and immovable properties and lives. This shall not entitle the Contractor for any extension of time.

Third Party Risk and Public Liability Insurance –

The Contractor, at his own cost, shall take necessary insurance to indemnify third party risk arising out of the work to be done by him. The contractor shall also take out the following Public Liability and Property Damage Liability Insurance Cover for the entire period of contract as given below.

A Public Liability and Property Damage Liability Insurance Covering All Operations the contract

Limits for bodily injury or death up to and including Rs. 200000/- for one person and Rs. 500000/- for each accident.

Limits for property damage up to and including Rs. 500000/- for each accident.

B Automobile Liability Insurance

On all self –propelled vehicles used in connection with this contract, whether owned, non-owned or hired by the contractor, limits of insurance shall be as follows:

For Public Liability up to and including Rs. 200000/- for one person and Rs. 500000/- for each accident.

For property damage up to and including Rs. 200000/- for each accident.

Insurance for contractor's personnel

The contractor shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the contractor or any other of the Contractor's personnel.

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

27. SECURITY/WATCH & WARD:

All security rules and safety rules enforced at site by company shall be strictly observed.

28. ENVIRONMENTAL, HEALTH & SAFETY PLAN:

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

- a) Comply with all of the elements of the EHS Plan and any regulations applicable to the work.
- b) Comply with the procedures provided in the interests of Environment, Health and Safety.
- c) Ensure that all of their employees designated to work are properly trained and competent.
- d) Ensure that all plant and equipment they bring on to site has been inspected and serviced in accordance with legal requirement and manufacturer's or suppliers' instructions.
- e) Make arrangements to ensure that all employees designated to work on or visit the site present themselves for site induction prior to commencement of work.
- f) Provide details of any hazardous substances to be brought onsite.
- g) Ensure that a responsible person accompanies any of their visitors to site.

All contractor's staff are accountable for the following:

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

29. TEST CERTIFICATE & QUALITY ASSURANCE:

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

30. SUB-CONTRACTING / SUBLETTING:

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

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

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

31. INDEMNITY:

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

- a) Any breach non-observance or non-performance by contractor or its employees or agents of any of the provisions of this Work Order.
- b) Any act or omission of contractor or its employees or agents.
- c) Any negligence or breach of duty on the part of contractor, its employees or agents including any wrongful use by it or them of any property or goods belonging to or by COMPANY.

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

32. EVENTS OF DEFAULTS:

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

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

In the event COMPANY terminates this work order, in whole or in part, on the occurrence of any event of default, COMPANY reserves the right to engage any other subcontractor or agency to complete the work or any part thereof, and in addition to any other right COMPANY may have under this work order or in law including without limitation the right to penalize for delay under clause 15.0 of this work order, the contractor shall be liable to COMPANY for any additional costs that may be incurred by COMPANY for the execution of the Work.

33. RISK & COST:

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

34. ARBITRATION:

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

35. FORCE MAJEURE:

27.1 General:

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

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

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

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

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

27.2 Specific Events of Force Majeure:

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

- (i) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters, and
- (ii) Explosions or fires
- (iii) Declaration of the Site as war zone

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

27.3 Notice of Events of Force Majeure:

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

- (i) Immediately notify the other party in writing of the force majeure events within 2 working days of the occurrence of the force majeure event
- (ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event
- (iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable
- (iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis.
- (v) Provide prompt notice of the resumption of full performance or obligation to the other party.

27.4 Mitigation of events of force majeure:

The Contractor shall:

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

27.5 Burden of proof:

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

27.6 Terminations for certain events of force majeure:

If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 1 (one) month during the Term of the Contract the Contract shall be terminated at the discretion of the Company and neither Party shall be liable to the other for any consequences arising on account of such termination.

36. SECRECY CLAUSE:

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

This technical information, drawing and other related documents shall be returned to the Company with all approved copies and duplicates including drawing/plans as are prepared by the Bidder during the executions of this work order, if any, immediately after they have been used for agreed purpose.

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

37. TERMINATION:

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

38. QUALITY:

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

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

39. PROGRESS REPORT INCLUDING PHOTOGRAPH:

39.1 During the various stages of erection and commissioning of the critical equipments in the pursuance of the Contract, the Contractor shall at its own cost submit periodic progress reports as may be reasonably required by the Employer (Format Attached as per Annexure-) with such materials as charts, networks, photographs, test certificates, etc. Such progress reports shall be in the form and size as may be required by the Employer and shall be submitted in adequate number of copies to be notified by the Employer

39.2 The quantitative progress report of the works by reference to the project schedule in sufficient detail should permit the Employer to assess performance, plan witness dates and evaluate forecasts, including reports on key Sub-contracts (as applicable). Within 10 days of the submission of each such report and at such other times as the Employer may reasonably request, the Contractor and the Employer shall meet to discuss progress. Contractor has to submit daily manpower, T&P, & work done report. Weekly MIS is required to be submitted by Contractor, at the end of each weekday (On Every Monday). Each monthly progress report shall be submitted not later than the 3rd day of the month following that in respect of which it is made, but may report on actual progress only up to the 25th day of the month and anticipated progress thereafter. Monthly progress reports shall include the following section

39.2.1 Executive summary

39.2.2 Description of the work and services performed and erection / commissioning activities completed during the preceding month

39.2.3 Necessary photographs of erection and commissioning activities which shall be taken when and where indicated by the Employer. Photographs shall be approximately 100 x 125 mm in size including a margin of 5 mm side for fixing. Adequate numbers of photographs shall be submitted indicating various stages of erection / commissioning. Each photograph shall contain the date, the name of the Contractor and the title of the view taken

39.2.4 Updated project schedule showing progress to the end of the month (as percentages completed of the Contractor's activities broken down into significant elements of the works), and the current schedule of activities and the targets for the next month including catch up plan, if required.

39.2.5 Identification of areas with foreseeable problems which in the opinion of the Contractor may affect the project schedule

39.2.6 Such other information and supporting documentation as the Employer may require satisfying himself about the timely erection and commissioning of equipment as per Contract.

39.2.7 The Employer shall advise the Contractor about the number of copies of progress reports and, where relevant, photographs to be submitted each month together with the names and addresses of persons to whom they are to be sent. Employer will also advise the Contractor regarding the format of the Monthly Progress report as per Annexure – VII.

39.2.8 The Contractor shall submit to the Engineer-in-Charge on a daily basis details of Contractor's and subcontractors' personnel (classified by trade), equipment and construction materials on Site; progress of Work under the Contract; and safety issues.

39.3 Monthly/Fortnightly Progress Report - Format

39.3.1 Project Overview

39.3.2 Executive Summary

- i. Performance Highlights during the period
- ii. Issues needing Attention

39.3.3 Schedule Analysis

- i. Progress Curves: Attach – Engineering progress curve, procurement progress curve, Erection & commissioning curve and overall progress curve Schedule Analysis
- ii. Brief write up on major gains and shortfall in each schedule.
- iii. One page summary schedule indicating target and forecast delivery dates of major equipment.
- iv. Overview of critical inputs to be provided by Contractor to Employer and vice versa.

39.3.4 Critical areas/ issues needing attention

Bring out any critical issue that needs attention/action of project team including Contractor, Employer & its Consultants. Suggest action required from concerned on the critical issues and impact of the decision on project schedule & cost (if any). Bring out specifically the previous agreed date for issue of deliverable/delivery of equipment or a decision on the issue.

39.3.5 Recovery Plan:

Bring out the areas that are delayed by over 2 weeks from the schedule or current requirement. Provide action taken for recovery of schedule and meet the delivery dates.

39.3.6 Engineering Progress

- i. Major highlights during the month.
- ii. Goals for next month
- iii. Updated project schedule – 12 weeks rolling plan. Target Vs Actual/ Forecast
- iv. Detailed schedule analysis
- v. Critical areas and action taken recovery plan.
- vi. List of inputs required from Contractor to Employer and vice versa – Plan Vs Actual.
- vii. Plan for next month

39.3.7 Procurement Schedule

- i. Major highlights during the month
- ii. Updated detailed manufacturing and delivery schedule. 12 weeks rolling plan. Target Vs Actual/ Forecast
- iii. Detailed delivery report – Indicate list of all material supplied and plan for next 3 months as annexure.
- iv. Critical areas, Impact of delays, action taken and recovery plan

- v. List of purchase orders placed, with vendor name, order no., and date
 - vi. Transport & logistics Plan
 - vii. QA & Inspection plan
 - viii. Plan for next month
- 39.3.7 Erection & Commissioning Schedule
- i. Major highlights during the month
 - ii. Updated detailed erection schedule. 12 weeks rolling plan. Target Vs Actual/ Forecast
 - iii. Resource mobilization plan Vs Actual, Constraints
 - iv. Critical areas, Constraints, Impact of delays, action taken and recovery plan
 - v. QA & Inspection plan
 - vi. Plan for next month

39.3.8 Financial Summary

Invoice raised, Payments received

39.3.9 Fortnightly Progress Report

The fortnightly progress report shall consist of executive summary, critical areas and updated project schedule.

Vendor shall submit the progress report latest by 3rd day of every month.

39.4 Meetings At Site

- i. Meetings shall be convened weekly or at other intervals as deemed necessary by the Engineer-in-Charge during the period of Work under the Contract and such meetings shall be held on Site during the period of Site work. The meetings shall be attended by the Senior Representatives of both Employer and the Contractor.
- ii. The meetings shall ascertain Work progress, safety issues, any problems related to manpower, equipment or Site conditions, and provide early notice of any potential claims for Contract variations. Meetings shall be minutes by the Employer Representative / Engineer-in-Charge. Copies of the minutes shall be supplied to attendees and a standard list of addressees and the Employer.

40. REVIEW MEETING:

The contractor has to attend weekly review meeting at site level and bi-monthly review meeting at corporate level. MIS and Resources planning shall be prepared and monitored showing progress and quantity completion along with S-curve.

41. ACCEPTANCE:

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

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

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

SECTION X

PRICE FORMAT – (E/T/C) (Items shown are indicative, Kindly refer BOQ, attached as Annexure)

DESCRIPTION OF SERVICES	SAC CODE	QTY	UoM	UNIT RATE	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST)		UNIT LANDED COST (₹)	TOTAL LANDED COST (₹)
					%	AMT		
Items as per BOQ i.e. shall be utilized to furnish price break-up.								
GRAND TOTAL LANDED COST								
In words								

NOTE:

- 1) Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser’s country.
- 2) Any other items not mentioned above but are required for successful completion of the substation shall be deemed to be included in the above quoted rates.

PRICE FORMAT – CIVIL WORKS (Items shown are indicative. Kindly refer BOQ attached as Annexure)

DESCRIPTION OF SERVICES	SAC CODE	QTY	UoM	UNIT RATE	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST)		UNIT LANDED COST (₹)	TOTAL LANDED COST (₹)
					%	AMT		
Items as per BOQ i.e. shall be utilized to furnish price break-up.								
GRAND TOTAL LANDED COST								
In words								

NOTE:

1. Kindly refer the relevant layout drawing of existing foundations in Annexure of tender document. Site visit is advisable prior to submission of quotation.

SECTION XI

GRAND SUMMARY OF THE QUOTED PRICE

DESCRIPTION	Total price for supply F.O.R site incl all duties, taxes	Total for Erection, Testing & Comm incl all Taxes	Total for Civil Works incl all Taxes	Grand Total (₹)
Survey, design, engineering, manufacture, shop testing, inspection, packing, dispatch, loading, unloading and storage at site, transit/storage and construction insurance, assembly, erection, civil, structural, architectural work, complete pre-commissioning checks, testing & commissioning at site, obtaining statutory clearance & certification from State Electrical Inspector, and handing over to the Owner after satisfactory commissioning of new 33/11kv Indoor switchgear along with allied equipments and works on Turnkey basis conforming to Technical Specification & SOW				
In words				

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

Date:

Bidders Name:

Place:

Bidders Address:

Signature:

Printed Name:

Designation:

Common Seal:

SECTION XII

VENDOR CODE OF CONDUCT

Purchaser is committed to conducting its business in an ethical, legal and socially responsible manner. To encourage compliance with all legal requirements and ethical business practices, Purchaser has established this Vendor Code of Conduct (the "Code") for Purchaser's Vendors. For the purposes of this document, "Vendor" means any company, corporation or other entity that sells, or seeks to sell goods or services, to Purchaser, including the Vendor's employees, agents and other representatives.

Fundamental to adopting the Code is the understanding that a business, in all of its activities, must operate in full compliance with the laws, rules and regulations of the countries in which it operates. This Code encourages Vendors to go beyond legal compliance, drawing upon internationally recognized standards, in order to advance social and environmental responsibility.

I. Labour and Human Rights

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

- . Fair Treatment - Vendors must be committed to a workplace free of harassment. Vendors shall not threaten workers with or subject them to harsh or inhumane treatment, including sexual harassment, sexual abuse, corporal punishment, mental coercion, physical coercion, verbal abuse or unreasonable restrictions on entering or exiting company provided facilities.

- . Antidiscrimination - Vendors shall not discriminate against any worker based on race, colour, age, gender, sexual orientation, ethnicity, disability, religion, political affiliation, union membership, national origin, or marital status in hiring and employment practices such as applications for employment, promotions, rewards, access to training, job assignments, wages, benefits, discipline, and termination. Vendors shall not require a pregnancy test or discriminate against pregnant workers except where required by applicable laws or regulations or prudent for workplace safety. In addition, Vendors shall not require workers or potential workers to undergo medical tests that could be used in a discriminatory way except where required by applicable law or regulation or prudent for workplace safety.

- . Freely Chosen Employment - Forced, bonded or indentured labour or involuntary prison labour is not to be used. All work will be voluntary, and workers should be free to leave upon reasonable notice. Workers shall not be required to hand over government-issued identification, passports or work permits as a condition of employment.

- . Prevention of Under Age Labor - Child labor is strictly prohibited. Vendors shall not employ children. The minimum age for employment or work shall be 15 years of age, the minimum age for employment in that country, or the age for completing compulsory education in that country, whichever is higher. This Code does not prohibit participation in legitimate workplace apprenticeship programs that are consistent with Article 6 of ILO Minimum Age Convention No. 138 or light work consistent with Article 7 of ILO Minimum Age Convention No. 138.

- . Juvenile Labor - Vendors may employ juveniles who are older than the applicable legal minimum age for employment but are younger than 18 years of age, provided they do not perform work likely to jeopardize their health, safety, or morals, consistent with ILO Minimum Age Convention No. 138.

- . Minimum Wages - Compensation paid to workers shall comply with all applicable wage laws, including those relating to minimum wages, overtime hours and legally mandated benefits. Any Disciplinary wage deductions are to conform to local law. The basis on which workers are being paid is to be clearly conveyed to them in a timely manner.

- . Working Hours - Studies of good manufacturing practices clearly link worker strain to reduced productivity, increased turnover and increased injury and illness. Work weeks are not to exceed

maximum set by local law. Further, a work week should not be more than 60 hours per week, including overtime, except in emergency or unusual situations. Workers should be allowed at least one day off per seven-day week.

. Freedom of Association - Open communication and direct engagement between workers and management are the most effective ways to resolve workplace and compensation issues. Vendors are to respect the rights of workers to associate freely and to communicate openly with management regarding working conditions without fear of reprisal, intimidation or harassment. Workers' rights to join labour unions seek representation and or join worker's councils in accordance with local laws should be acknowledged.

II. Health and Safety

Vendors must recognize that in addition to minimizing the incidence of work-related injury and illness, a safe and healthy work environment enhances the quality of products and services, consistency of production and worker retention and morale. Vendors must also recognize that ongoing worker input and education is essential to identifying and solving health and safety issues in the workplace.

The health and safety standards are:

. Occupational Injury and Illness - Procedures and systems are to be in place to prevent, manage, track and report occupational injury and illness, including provisions to: a) encourage worker reporting; b) classify and record injury and illness cases; c) provide necessary medical treatment; d) investigate cases and implement corrective actions to eliminate their causes; and e) facilitate return of workers to work.

. Emergency Preparedness - Emergency situations and events are to be identified and assessed, and their impact minimized by implementing emergency plans and response procedures, including: emergency reporting, employee notification and evacuation procedures, worker training and drills, appropriate fire detection and suppression equipment, adequate exit facilities and recovery plans.

. Occupational Safety - Worker exposure to potential safety hazards (e.g., electrical and other energy sources, fire, vehicles, and fall hazards) are to be controlled through proper design engineering and administrative controls, preventative maintenance and safe work procedures (including lockout/tagout), and ongoing safety training. Where hazards cannot be adequately controlled by these means, workers are to be provided with appropriate, well-maintained, personal protective equipment. Workers shall not be disciplined for raising safety concerns.

. Machine Safeguarding - Production and other machinery is to be evaluated for safety hazards. Physical guards, interlocks and barriers are to be provided and properly maintained where machinery presents an injury hazard to workers.

.Industrial Hygiene - Worker exposure to chemical, biological and physical agents is to be identified, evaluated, and controlled. Engineering or administrative controls must be used to control overexposures. When hazards cannot be adequately controlled by such means, worker health is to be protected by appropriate personal protective equipment programs.

.Sanitation, Food, and Housing - Workers are to be provided with ready access to clean toilet, **facilities** potable water and sanitary food preparation, storage, and eating facilities. Worker dormitories provided by the Participant or a labour agent are to be maintained clean and safe, and provided by the Participant or a labour egress, hot water for bathing and showering, and adequate heat and ventilation and reasonable personal space along with reasonable entry and exit privileges.

. Physically Demanding Work - Worker exposure to the hazards of physically demanding tasks, including manual material handling and heavy or repetitive lifting, prolonged standing and highly repetitive or forceful assembly tasks is to be identified, evaluated and controlled.

III. Environmental

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

The environmental standards are:

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

IV. Ethics

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

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

V. Management System

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

The management system should contain the following elements:

- . Company Commitment - Corporate social and environmental responsibility statements affirming Vendor's commitment to compliance and continual improvement.
- . Management Accountability and Responsibility - Clearly identified company representative[s] responsible for ensuring implementation and periodic review of the status of the management systems.
- . Legal and Customer Requirements - Identification, monitoring and understanding of applicable laws, regulations and customer requirements.
- . Risk Assessment and Risk Management - Process to identify the environmental, health and safety and labour practice risks associated with Vendor's operations. Determination of the relative significance for each risk and implementation of appropriate procedural and physical controls to ensure regulatory compliance to control the identified risks.
- . Performance Objectives with Implementation Plan and Measures - Areas to be included in a risk assessment for health and safety are warehouse and storage facilities, plant/facilities support equipment, laboratories and test areas, sanitation facilities (bathrooms), kitchen/cafeteria and worker housing /dormitories. Written standards, performance objectives, and targets and implementation plans including a periodic assessment of Vendor's performance against those objectives.
- . Training - Programs for training managers and workers to implement Vendor's policies, procedures and improvement objectives.
- . Communication - Process for communicating clear and accurate information about Vendor's performance, practices and expectations to workers, Vendors and customers.
- . Worker Feedback and Participation - Ongoing processes to assess employees' understanding of and obtain feedback on practices and conditions covered by this Code and to foster continuous improvement.
- . Audits and Assessments - Periodic self-evaluations to ensure conformity to legal and regulatory requirements, the content of the Code and customer contractual requirements related to social and environmental responsibility.
- . Corrective Action Process - Process for timely correction of deficiencies identified by internal or external assessments, inspections, investigations and reviews.
- . Documentation and Records - Creation of documents and records to ensure regulatory compliance and conformity to company requirements along with appropriate confidentiality to protect privacy.

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

Annexure-Contract closure document:

After completion of works, as per scope and specification of contract, process for contract closure will be initiated.

Following are major activities to be carried out for contract closure.

- i. Completion of Works and issuance of Work Certificate by Employer.
- ii. Closure Of Punch Points.
- iii. Finalization of Measurements with certification from Engineer In Charge / Engineering.
- iv. Joint Final Material reconciliation of Free Issue material (FIM) between contractor and Employer
- v. Joint finalization of delay analysis & LD value if applicable between contractor and Employer.
- vi. No Demand Certificate from Contractor
- vii. Indemnity Bond from Contractor
- viii. Contract Payment Register with accounts duly reconciled between Contractor and Employer.

Annexure – FORMAT OF ADVANCE BANK GUARANTEE
(To be executed on a Non-Judicial Stamp Paper of appropriate value)

This Guarantee made at _____ this [____] day of [____] 20XX

1. WHEREAS M/s. _____ (*Pl specify the name of the Company*), a Company within the meaning of the Companies Act, 1956 having its Registered Office at _____ hereinafter referred to as the “ Purchaser”, (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).

2. AND WHEREAS the Purchaser has entered into a *contract for _____ (Please specify the nature of contract here) vide Contract No. _____ dated _____* (hereinafter referred to as the “Contract”) with M/s. _____, (hereinafter referred to as “the Supplier”, which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include its successors and assigns) for providing of the Goods and/or services on the terms and conditions as more particularly detailed therein.

3. AND WHEREAS in conformity with the provisions of clause _____ of *Special conditions of Contract/GTC*, the Supplier has agreed to furnish a Bank Guarantee for an amount equivalent to the Advance Payment of Rs. extended by the Purchaser to the Supplier for the faithful execution of the Contract.

4. AND WHEREAS the Supplier has agreed to provide the Purchaser and the Purchaser has agreed to accept the Advance Bank Guarantee for _____ percent (____%) of the total Contract Value from [_____] (*pl. specify the name of Bank*) having its head/registered office at [_____] through its branch in _____ (*pl. specify the name of Branch through which B.G is issued*) hereinafter referred to as “the Bank”, (which expression shall unless it be repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns).

5. NOW THEREFORE, in consideration inter alia of the Purchaser granting the Suppliers the Contract, the Bank hereby unconditionally and irrevocably guarantees and undertakes, on a written demand, to immediately pay to the Purchaser any amount so demanded (by way of one or more claims) not exceeding in the aggregate [Rs.]..... (*in words*) without any demur, reservation, contest or protest and/or without reference to the Supplier and without the Purchaser needing to provide or show to the Bank ,grounds or reasons or give any justification for such demand for the sum/s demanded.

6. The decision of the Purchaser as to whether the Supplier has fulfilled its obligation or not towards set-off of Advance Payment extended by the Purchaser to the Supplier shall be final and binding on the Bank and the Supplier. The Bank acknowledges that any such demand by the Purchaser of the amounts payable by the Bank to the Purchaser shall be final, binding and conclusive evidence in respect of the amounts payable by the Supplier to the Purchaser. Any such demand made by the Purchaser on the Bank shall be conclusive and binding, notwithstanding any difference between the Purchaser and the Supplier or any dispute raised, invoked, threatened or pending before any court, tribunal, arbitrator or any other authority.

7. The Bank also agrees that the Purchaser at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor without proceeding against the Supplier notwithstanding any other security or other guarantee that the Purchaser may have in relation to the Supplier's liabilities.

8. The Bank hereby waives the necessity for the Purchaser first demanding the aforesaid amounts or any part thereof from the Supplier before making payment to the Purchaser and further also waives any right the Bank may have of first requiring the Purchaser to use its legal remedies against the Supplier, before presenting any written demand to the Bank for payment under this Guarantee.

9. The Bank's obligations under this Guarantee shall not be reduced by reason of any partial performance of the Contract. The Bank's obligations shall not be reduced by any failure by the Purchaser to timely pay or perform any of its obligations under the Contract.

10. The Bank further unconditionally and unequivocally agrees with the Purchaser that the Purchaser shall be at liberty, without the Bank's consent and without affecting in any manner its rights and the Bank's obligation under this Guarantee, from time to time, to:

- i. vary and/or modify any of the terms and conditions of the Contract;
- ii. forebear or enforce any of the rights exercisable by the Purchaser against the Supplier under the terms and conditions of the Contract; or and the Bank shall not be relieved from its liability by reason of any such act or omission on the part of the Purchaser or any indulgence shown by the Purchaser to the Supplier or any other reason whatsoever which under the law relating to sureties would, but for this provision, have the effect of relieving the Bank of its obligations under this Guarantee.

11. This Guarantee shall not be discharged by any change in the constitution or composition of the Supplier, and this Guarantee shall not be affected or discharged by the liquidation, winding-up, bankruptcy, reorganisation, dissolution or insolvency of the Supplier or any of them or any other circumstances whatsoever.

12. This Guarantee shall be in addition to and not in substitution or in derogation of any other security held by the Purchaser to secure the obligations of the Supplier under the Contract.

13. NOTWITHSTANDING anything herein above contained, the liability of the BANK under this Guarantee shall be restricted to _____ (*insert an amount equal to ___ percent (___%) of the Contract Value*) and this Guarantee shall be valid and enforceable and expire on _____ (*pl. specify date*) or unless a suit or action to enforce a claim under this Guarantee is filed against the Bank on or before the date of expiry.

14. On termination of this Guarantee, all rights under the said Guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities hereunder.

15. The Bank undertakes not to revoke this Guarantee during its validity except with the prior written consent of the Purchaser and agrees that any change in the constitution of the Bank or the Supplier shall not discharge our liability hereunder.

16. Purchaser may assign this Guarantee to any Person or body whether natural, incorporated or otherwise under intimation to the Bank. The Bank shall be discharged of its obligations hereunder by performance in accordance with the terms hereof to such assignee without verifying the validity / legality / enforceability of the assignment.

17. This Guarantee shall be governed by the laws of India. Any suit, action, or other proceeding arising out of, connected with, or related to this Guarantee or the subject matter hereof shall be subject to the exclusive jurisdiction of the courts of _____ (*pl. specify the city*), India.

Dated this day of 20XX at

(Signature)

.....

(Name)

.....

(Designation with Bank Stamp)

Attorney as per

Power of Attorney No.....

Date.....

Annexure – FORMAT OF PERFORMANCE BANK GUARANTEE
(To be executed on a Non-Judicial Stamp Paper of appropriate value)

This Guarantee made at _____ this [____] day of [____] 20XX

1. WHEREAS M/s. _____ (*Pl specify the name of the Company*), a Company within the meaning of the Companies Act, 1956 having its Registered Office at _____ hereinafter referred to as the “Purchaser”, (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).

2. AND WHEREAS the Purchaser has entered into a contract for _____ (*Please specify the nature of contract here*) vide Contract No. _____ dated _____ (hereinafter referred to as the “Contract”) with M/s. _____, (hereinafter referred to as “the Supplier”, which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include their successors and assigns) for providing Goods and/or services on the terms and conditions as more particularly detailed therein.

3. AND WHEREAS as per clause ____ of *Special conditions of Contract/GTC*, the Supplier is obliged to provide to the Purchaser an unconditional bank guarantee for an amount equivalent to _____ percent (____%) of the total Contract Value for the timely completion and faithful and successful execution of the Contract from [_____] *pl. specify the name of Bank*) having its head/registered office at [_____] through its branch in _____ (*pl. specify the name of Branch through which B.G is issued*) hereinafter referred to as “the Bank”, (which expression shall unless it be repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns).

4. NOW THEREFORE, in consideration inter alia of the Purchaser granting the Suppliers the Contract, the Bank hereby unconditionally and irrevocably guarantees and undertakes, on a written demand, to immediately pay to the Purchaser any amount so demanded (by way of one or more claims) not exceeding in the aggregate [Rs.].....(*in words*) without any demur, reservation, contest or protest and/or without reference to the Supplier and without the Purchaser needing to provide or show to the Bank ,grounds or reasons or give any justification for such demand for the sum/s demanded.

5. The decision of the Purchaser to invoke this Guarantee and as to whether the Supplier has not performed its obligations under the Contract shall be binding on the Bank. The Bank acknowledges that any such demand by the Purchaser of the amounts payable by the Bank to the Purchaser shall be final, binding and conclusive evidence in respect of the amounts payable by the Supplier to the Purchaser. Any such demand made by the Purchaser on the Bank shall be conclusive and binding, notwithstanding any difference between the Purchaser and the Supplier or any dispute raised, invoked, threatened or pending before any court, tribunal, arbitrator or any other authority.

6. The Bank also agrees that the Purchaser at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor without proceeding against the Supplier notwithstanding any other security or other guarantee that the Purchaser may have in relation to the Supplier's liabilities.

7. The Bank hereby waives the necessity for the Purchaser first demanding the aforesaid amounts or any part thereof from the Supplier before making payment to the Purchaser and further also waives any right the Bank may have of first requiring the Purchaser to use its legal remedies against the Supplier, before presenting any written demand to the Bank for payment under this Guarantee.

8. The Bank's obligations under this Guarantee shall not be reduced by reason of any partial performance of the Contract. The Bank's obligations shall not be reduced by any failure by the Purchaser to timely pay or perform any of its obligations under the Contract.

9. The Bank further unconditionally and unequivocally agrees with the Purchaser that the Purchaser shall be at liberty, without the Bank's consent and without affecting in any manner its rights and the Bank's obligation under this Guarantee, from time to time, to:

- (i) vary and/or modify any of the terms and conditions of the Contract;
- (ii) Forebear or enforce any of the rights exercisable by the Purchaser against the Supplier under the terms and conditions of the Contract; or
- (iii) Extend and/or postpone the time for performance of the obligations of the Supplier under the Contract;

and the Bank shall not be relieved from its liability by reason of any such act or omission on the part of the Purchaser or any indulgence shown by the Purchaser to the Supplier or any other reason whatsoever which under the law relating to sureties would, but for this provision, have the effect of relieving the Bank of its obligations under this Guarantee.

10. This Guarantee shall be a continuing bank guarantee and shall not be discharged by any change in the constitution or composition of the Supplier, and this Guarantee shall not be affected or discharged by the liquidation, winding-up, bankruptcy, reorganisation, dissolution or insolvency of the Supplier or any of them or any other circumstances whatsoever.

11. This Guarantee shall be in addition to and not in substitution or in derogation of any other security held by the Purchaser to secure the performance of the obligations of the Supplier under the Contract.

12. NOTWITHSTANDING anything herein above contained, the liability of the BANK under this Guarantee shall be restricted to _____ (*insert an amount equal to ___ percent (___%) of the Contract Value*) and this Guarantee shall be valid and enforceable and expire on _____ (*pl. specify date*) or unless a suit or action to enforce a claim under this Guarantee is filed against the Bank on or before the date of expiry.

13. On termination of this Guarantee, all rights under the said Guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities hereunder.

14. The Bank undertakes not to revoke this Guarantee during its validity except with the prior written consent of the Purchaser and agrees that any change in the constitution of the Bank or the Supplier shall not discharge its liability hereunder.

15. Purchaser may assign this Guarantee to any Person or body whether natural, incorporated or otherwise under intimation to the Bank. The Bank shall be discharged of its obligations hereunder by performance in accordance with the terms hereof to such assignee without verifying the validity / legality / enforceability of the assignment.

16. This Guarantee shall be governed by the laws of India. Any suit, action, or other proceeding arising out of, connected with, or related to this Guarantee or the subject matter hereof shall be subject to the exclusive jurisdiction of the courts of _____ (*pl. specify the city*), India.

Dated this day of 20XX at

(Signature)

.....

(Name)

.....

(Designation with Bank Stamp)



Attorney as per
Power of Attorney No.....
Date.....

Beneficiary's bank detail with IFSC Code:

1. Name of the Bank: Axis Bank Limited
2. Branch Name & Full Address: C-58, Basement & Ground Floor, Preet Vihar, Main Vikas Marg, New Delhi 110092
3. Branch Code: 055
4. Bank Account No: 911020005246567
5. IFSC Code: UTIB0000055

Annexure – FORMAT OF WARRANTY/GUARANTEE CERTIFICATE-SUPPLY

BSES YAMUNA POWER LIMITED, Shaktikiran Building, Karkardooma, Delhi -110032.

Ref. Purchase Order No. :

Dear Sir,

We hereby confirm that the.....dispatched to BSES YAMUNA POWER LTD vide invoice no..... DT.....is exactly of the same nature and description as per above mentioned Purchase Order.

We further confirm that we will replace/repair our.....free of cost If found any manufacturing defect during.....months from the date of dispatch of material or.....months from the data of commissioning whichever is earlier.

Vendors Name & Signature

Annexure – WARRANTY / DEFECT LIABILITY PERIOD –SERVICE

Performance requirements of the works completed is as per detailed specifications and standards specified and to be adhered to strictly. In-case of deficiency, the same is to be rectified / redone to meet the specifications by the contractor within stipulated schedule or any extension thereof. The Contractor shall be liable to rectify all defects except those arising out of normal wear and tear, in the works done by the Contractor under this contract, or from any act or omission of the contractors for a period of 36 months will depend on individual contract period package to package from the date of Handing over the works to the Employer / Owner.

Annexure – NO DEMAND CERTIFICATE FORMAT

NO DEMAND CERTIFICATE BY CONTRACTOR
(To be issued on letterhead of Contractor)

To ,

BSES YAMUNA POWER LIMITED,
Shaktikiran Building, Karkardooma,
Delhi -110032.

Name of the Project:

Contract No.:

Date of Contract:

Name of the Contractor:

We,

_____ M/s
(Contractor) do

hereby acknowledge and confirm that we have claimed Rs. _____
(Rs. _____)

towards full and final settlement of our claims from BSES Yamuna Power Limited, in respect of the aforesaid WO/PO/Contract No.: #####. Dated. ####. including all amendments, if any, to the said Contract, to our entire satisfaction and we further confirm that we have no claim whatsoever pending with BSES Yamuna Power Limited under or in respect of the said Contract.

Notwithstanding any protest, note or objection recorded or raised by us in any correspondence, documents, measurement books and / or final bills etc.

- (a) we confirm that BSES Yamuna Power Limited stands fully discharged of all its obligations,
- (b) we shall make no claim of any nature on BSES Yamuna Power Limited or any of its affiliates or personnel, and
- (c) we waive all our rights to lodge any claim or protest in future, in respect of the said Contract.

We have paid in full all applicable duties, levies, taxes and statutory and other amounts payable by us in connection with the above-mentioned Contract and amounts payable to or in relation to third parties engaged by us including our contractors, suppliers, employees and labour. No payment in this regard is pending or unpaid and we have no (and shall have no) claim against BSES Yamuna Power Limited in this regard.

No refund has been received/ is envisaged to be received or reasonably believed to be receivable on account of taxes, duties or any other payment made by us in respect of the Contract. In case any refund corresponding to any amount paid or reimbursed by BSES Yamuna Power Limited is received in the future, the same will be passed on to BSES Yamuna Power Limited promptly and without any demand from them in this regard.

We are issuing this "NO DEMAND CERTIFICATE" in favor of BSES Yamuna Power Limited with full knowledge of its contents and with our free consent without any influence, misrepresentation, coercion etc.

Date:
Place:

Signature:
Name:
Designation:
(Company Seal)

Annexure – FORMAT FOR LETTER OF INDEMNITY

Format for Letter of Indemnity

(Notes: Preferably shall be obtained on Stamp paper of appropriate value as applicable at the place of execution, if not, then at least on the letterhead of the Contractor)

Place: _____

Date: _____

To,

BSES Yamuna Power Limited, Shaktikiran Building, Karkardooma, Delhi -110032.

Dear Sirs,

WO/PO/Contract No. _____ Dated ___/___/___

For _____

Settlement of Dues

In consideration of your awarding the subject Work Order/Purchase Order/Contract to us and in further consideration of your having agreed to pay our final bill towards settlement of the dues in respect of the subject Work Order/Purchase Order/Contract, inter alia, on our assurances and representations that :

(a) We have paid in full all amounts payable by us including but not limited to duties, levies, taxes, cess, octroi, royalties, statutory payments, amounts payable to or in relation to third parties engaged by us including our contractors, suppliers, employees and labour, and

(b) we have fully complied with all requirements under applicable laws in connection with the subject Purchase Order/Work Order/Contract,

We _____,

unconditionally and irrevocably agree and undertake, to pay and/or settle entirely at our own cost and indemnify, defend and hold harmless you, your affiliates and your/your affiliates' personnel, directors and representatives, (hereinafter collectively referred to as "Indemnified Parties") from and against any and all liabilities, judgments, damages, losses, claims, costs and expenses, claimed, suffered or incurred or, likely to be claimed, suffered or incurred at any time by or against the Indemnified Parties or any of them as a result of, or arising out of, or in any way related to any failure or delay in payment of any of the amounts or compliances by us as aforesaid for any reason whatsoever.

Any notice(s) or communication(s) by you shall be sufficient proof that the Indemnified Parties have suffered or incurred loss, damages, liabilities etc. as aforesaid and we shall upon receipt of such notice(s) or communication(s) immediately, without any delay or demur or contest, make payment to you of the entire amount demanded under the said notice(s) or communication(s).

This letter of indemnity shall be in addition to and not in derogation of any other indemnity/guarantee and/or security which we may have executed in your favor or your rights and entitlements under the contract.

This letter shall be governed by and construed and interpreted to accordance with the laws of India, and shall be subject to the exclusive jurisdiction of the courts of law at Mumbai.

Yours faithfully,

For M/s _____

Authorized Signatory

ANNEXURE - SCHEDULE OF DEVIATIONS

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

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

SL NO	Clause No.	Details of deviation with justifications

SCOPE OF WORK

FOR

GANGARAM HOSPITAL

Department	Prepared By	Reviewed By	Approved By	Rev	
CES	AH	GS	AA		0
P&E	-	MR	PB	Date	15 Apr 2019
					Page 1 of 10

INDEX

f1.0	INTENT.....	3
2.0	SITE DETAILS.....	3
3.0	BIDDER'S SCOPE	3
4.0	APPROVED MAKE LIST	9
5.0	TENTATIVE GROUND FLOOR LAYOUT	10

SCOPE OF WORK FOR GANGARAM HOSPITAL**1.0 INTENT**

- This document defines the scope for turnkey execution of 33 kV Air Insulated Switchgear with Associated equipment.
- This document shall be read in conjunction with all technical documents enclosed in the tender.
- In event of any contradiction between the tender documents, the most stringent one shall govern.

2.0 SITE DETAILS

- Gangaram hospital is situated at Rajinder Nagar, Delhi 110060.
- For providing power supply to Gangaram Hospital, a substation building is proposed in Gangaram Hospital Arena which shall consist of Ground floor and First floor.
- Ground floor shall have arrangement of 33 kV Switchgear and Associated equipment.
- This tender deals with turnkey work at ground floor of substation building as per clause "Scope of supply" and "Scope of work"
- Bidder shall depute its representative at site to assess the condition of existing infrastructure in detail prior to submission of bid.
- It should be noted that Substation Building work shall be done by Gangaram Hospital.

3.0 BIDDER'S SCOPE

- Bidder's Scope includes design, engineering, manufacture, shop testing, inspection, packing, dispatch, supply, loading, unloading, storage at site, assembly, erection, civil, complete pre-commissioning checks, testing & commissioning at site, obtaining statutory clearance & certification from Electrical Inspector and handing over of equipment covered under scope of this document to BSES Yamuna Power Ltd.
- Details are given in subsequent sections. It shall be noted that project execution shall ensure uninterrupted operation of grid.

3.1 DESIGN & ENGINEERING

- Detailed design and engineering of complete project as per tender requirements shall be in bidder's scope. General guidelines for design are given below

3.1.1 CODES AND STANDARDS

- The bidder shall comply with latest Indian/International standard and CEA regulations. Refer respective equipment specification for applicable standards.

3.1.2 SERVICE CONDITIONS

3.1.2.1	Average grade atmosphere	Heavily polluted, Dry
3.1.2.2	Maximum altitude above sea level	1000M
3.1.2.3	Ambient air temperature	Highest 50Deg C,Average 40Deg C
3.1.2.4	Minimum ambient air temperature	0 Deg C
3.1.2.5	Relative Humidity	100%
3.1.2.6	Rainfall	750mm concentrated in four months

SCOPE OF WORK FOR GANGARAM HOSPITAL

3.1.2.7	Seismic Condition	Zone IV
3.1.2.8	Max. Relative Humidity	100%

3.1.3 SYSTEM PARAMETERS

3.1.3.1	Nominal Voltage kV	33	11
3.1.3.2	Rated voltage kV	36	12
3.1.3.3	Power Frequency (kV rms) with stand voltage	70	28
3.1.3.4	Basic Insulation Level KVp	170	75
3.1.3.5	Rated Frequency Hz	50 +/- 5 %	50 +/- 5 %
3.1.3.6	System Neutral Earthing	Solidly Grounded	Solidly Grounded

3.2 SCOPE OF SUPPLY

S No.	Items	Remarks	UOM	Qty	Specification No.
3.2.1	33 kV AIS with Single Bus Bar Arrangement as per SLD Attached	Meter, CT, PT Compartment must have provision of sealing at atleast two points in all panels			SP-HTSWG-01-R3
3.2.1.1	Incomer Feeder with Line PT	Line Differential Protection Relay shall be supplied as Relay 1 (Main protection) of incomer feeder for Both Receiving and Sending End	Nos	2	
3.2.1.2	Outgoing Panel (For Installation at KCC Consumer Premises) with Line PT		Nos	2	
3.2.1.3	Bus Coupler		Nos	1	
3.2.1.4	Bus Riser With Bus PT		Nos	1	
3.2.1.5	Bus PT		Nos	1	
3.2.2	Earthing truck for bus-bar side earthing		Nos	1	
3.2.3	Earthing truck for cable side earthing		Nos	1	
3.2.4	Fire Resistant Coating	a) On all cable specified in "Scope of Supply" b) Fire rating-4 hours	LOT	1	
3.2.5	Cable Sealing System	For all cables entering and exiting the Building	LOT	1	
3.2.6	Clamps, Connectors & Accessories		LOT	1	
3.2.7	AC Distribution Board		Nos	1	SP-ACDB-113-R0
3.2.8	SMPS Based Battery Charger		Nos	1	SP-SMPSBC-153-R0

SCOPE OF WORK FOR GANGARAM HOSPITAL

S No.	Items	Remarks	UOM	Qty	Specification No.
3.2.9	DC Distribution Board		Nos	1	SP-DCDB-129-R0
3.2.10	220 VDC Li Ion Battery Bank		Nos	1	SP-TSLBB-137-R0
3.2.11	Control Cables with proper ferruling and tagging along with glands and lugs	For items specified in "Scope of Supply" including interlocks	LOT	1	SP-EWLP-01-R1
3.2.12	LT Power Cable	a) For items specified in "Scope of Supply" b) It Also Includes extension of LT power for Secondary source of ACDB	LOT	1	SP-LTPC-63-R0
3.2.13	Insulated Floor Coating	For Switchgear Room, Battery Bank Room, ACDB, DCDB Room	LOT	1	SP- INNFLR-103-R0
3.2.14	Earthing	a) Connecting Equipment to Existing Earthing mesh by 50X10 GI Strip b) Earthing shall be done at two points for each equipment	LOT	1	
3.2.15	Cable Trays including Bends		LOT	1	
3.2.16	Fire protection system	Shock Treatment chart, First Aid Box, Safety hand Gloves, Portable Earthing stick, Fire Extinguisher	LOT	1	
3.2.17	Material for Civil Works		LOT	1	
3.2.18	RTU and Associated SCADA Works		LOT	1	As per Attached Document "Technical specification for SCADA RTU/ DCU & network automation based on IEC 61850 protocol"
3.2.19	Painting of Feeder names (SCADA code, Asset Code, etc)	As per Engineer Incharge Guidance	LOT	1	
3.2.20	Licensed programming software and communication cord for offered numerical relays		No	1	
3.2.21	Special Tools	Corresponding to Items specified in "Scope of Supply" for ease of Operation and	LOT	1	

SCOPE OF WORK FOR GANGARAM HOSPITAL

S No.	Items	Remarks	UOM	Qty	Specification No.
		Maintenance			
3.2.22	A-Type ladder (3 feet height) to be supplied.(For viewing and operating Relays)	Material of Ladder shall be FRP	No	1	
3.2.23	Recommended/Mandatory Spares as per Specification		LOT	1	
3.2.24	SLD of Grid	a) Engraved in SS Plate b) Size-A1	No	1	
3.2.25	Emergency Exit Floor Marking	For Ground floor of Substation Building	LOT	1	

3.3 SCOPE OF WORK

- Broad scope of work is specified below. Refer respective equipment/work specifications for detailed scope of work.

S. No	Items	Remarks	UOM	Qty
3.3.1	Erection, Testing and Commissioning	For Items Specified in "Scope of Supply"	LOT	1
3.3.2	Retrofitting Work of Differential Relay at both receiving and sending end	a) Erection, testing and commissioning b) Panel cutting of switchgear for erection purpose c) Control cable works	LOT	1
3.3.3	Civil Work	For Items Specified in "Scope of Supply"	LOT	1
3.3.4	Training on O&M of 33 KV AIS	One day classroom training at BYPL Training Centre and one day onsite training. Training shall be provided by Domain experts only	Days	2
3.3.5	Training on application, programming, testing and commissioning of Numerical Relays	One day classroom training at BYPL Training Centre and one day onsite training. Training shall be provided by Domain experts only	Days	2

3.4 SCOPE DEMARCATION

S. No	Head	BYPL	Bidder's Scope	Remarks
3.4.1	Testing Equipments	x	✓	

SCOPE OF WORK FOR GANGARAM HOSPITAL

S. No	Head	BYPL	Bidder's Scope	Remarks
3.4.2	Lighting Arrangement	x	✓	
3.4.3	Construction Power and Construction Water	x	✓	
3.4.4	Safety and Security of Manpower(Labor, Engineers, Supervisors etc)	x	✓	
3.4.5	Various Tools and Tackles related to Job	x	✓	
3.4.6	Loading, Unloading and Transportation of Material	x	✓	It includes transportation of dismantled equipment to BYPL store in stacked manner.
3.4.7	Cleanliness around work premises	x	✓	
3.4.8	Document/Drawing Submission	x	✓	
3.4.9	Document/Drawing Approval	✓	x	
3.4.10	Security and Safety of material until handover	x	✓	
3.4.11	Various Machines e.g. Crane, Hydra, JCB etc to complete the Job	x	✓	
3.4.12	Maintenance of Equipments Until Handover to Engineer Incharge and EHV O&M	x	✓	
3.4.13	Electrical Inspector Clearance	x	✓	Only statutory fees will be borne by BYPL
3.4.14	Permit issuing agency for Works inside BYPL Premises	✓	x	
3.4.15	Permit requesting Agency	x	✓	Permit Should be applied to Engineer In charge prior to start of work. Isolation & permit of only one Feeder at a time, shall be given at a time, during final hook up. All necessary preparation works to be made, in order to minimize the Shutdown Time.
3.4.16	Temporary office near work premises	x	✓	After handing over the equipments, contractor has to evacuate the premises within one week otherwise deemed fit action will be taken
3.4.17	Temporary store near work premises	x	✓	

SCOPE OF WORK FOR GANGARAM HOSPITAL

S. No	Head	BYPL	Bidder's Scope	Remarks
3.4.18	Yard aesthetics at work place should be maintained at the time and after the completion of Work	x	✓	Disposal of Scrap/Debris etc from site and complete cleaning of working area till handover
3.4.19	Any damages done to the existing system, shall be repaired/ rectified/ replaced	x	✓	
3.4.20	Clearance certificate	x	✓	Clearance Certificate shall be taken from BYPL Departments (Quality, Safety, Protection, O&M, SCADA, EHV, Civil, etc) before Final Charging of the Systems. Any Site Observations/ Punch points, observed during execution, shall be attended.
3.4.21	Various compliances pertaining to Job	x	✓	IE rules, CEA Regulation 2010

3.5 DOCUMENTATION

- Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A3/A4 sheet in box file with separators for each section. PDF shall also be provided of all documents via USB i.e. USB must be the part of Bid.
- Language of the documents shall be English only. Deficient/ improper document/ drawing submission shall be liable for rejection.
- Following drawing/document are required for all equipment specified in "Scope of Supply" (Refer equipment specification for details)

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
3.5.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
3.5.2	Deviation Sheet with Clause reference	Required			
3.5.3	Design Calculation		Required		
3.5.4	Drawings		Required		
3.5.5	Manufacturer's quality assurance plan		Required		
3.5.6	GTP		Required		
3.5.7	Inspection Reports			Required	
3.5.8	As manufacturing Drawings			Required	

SCOPE OF WORK FOR GANGARAM HOSPITAL

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
3.5.9	Operation and Maintenance Manual			Required	
3.5.10	As built Drawings				Required

- Note – Any drawing not included in the above table but necessary for detailed engineering shall be deemed to be included in bidder’s scope

4.0 APPROVED MAKE LIST

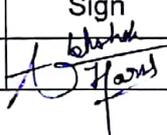
- Following table contains Approved Make List. Although, any make other than specified in table shall be subject to BSES Yamuna Power Limited Approval.

S. No	Equipment	MAKE
4.1	33 kV AIS	ABB/Siemens/Schneider
4.2	Control cable	Universal/KEI/GEMSCAB/Polycab/Torrent/Sterlite
4.3	Numerical relays	ABB (R series), Siemens (Siprotec series) and Schneider / Alstom (Micom Series)
4.4	Cable sealing system	Roxtec, MCT Brattberg
4.5	Fire retardant coating for cables	3M/Demech/Stanvac
4.6	Floor coating	3M/Demech/Stanvac

TECHNICAL SPECIFICATION

FOR

HT INDOOR SWITCHGEAR (33 & 11KV)

Prepared by		Reviewed by		Approved by		Rev	03
Name	Sign	Name	Sign	Name	Sign	Date	25 Sep 2018
AH		GS		AA		Page	1 of 72

INDEX

1.0	RECORD OF REVISION.....	3
2.0	SCOPE OF SUPPLY	3
3.0	CODES & STANDARDS	3
4.0	PANEL CONSTRUCTION	4
5.0	CIRCUIT BREAKER	6
6.0	FUNCTIONAL REQUIREMENTS.....	7
7.0	SURGE SUPPRESSOR.....	9
8.0	CURRENT TRANSFORMER.....	9
9.0	POTENTIAL TRANSFORMER.....	9
10.0	FEEDER AND BUS EARTHING	10
11.0	EQUIPMENT EARTHING	10
12.0	METERS.....	11
13.0	INDICATION, ALARMS & ANNUNCIATION	11
14.0	SELECTOR SWITCHES & PUSH BUTTONS	13
15.0	INTERNAL WIRING.....	13
16.0	TERMINAL BLOCKS.....	14
17.0	RELAYS.....	15
18.0	SPACE HEATERS.....	24
19.0	SOCKETS, SWITCHES & ILLUMINATION LAMPS.....	24
20.0	NAMEPLATES AND MARKING	25
21.0	SURFACE TREATMENT & PAINTING.....	26
22.0	APPROVED MAKES OF COMPONENTS	26
23.0	INSPECTION , TESTING & QUALITY ASSURANCE	27
24.0	DRAWINGS & DATA SUBMISSION MATRIX.....	28
25.0	PACKING	30
26.0	SHIPPING	31
27.0	HANDLING AND STORAGE.....	31
28.0	PROGRESS REPORTING.....	31
29.0	DEVIATION	32
30.0	ACCESSORIES & TOOLS	32
	ANNEXURE – A - SCOPE OF SUPPLY	33
	ANNEXURE – B – TRANSFORMER MONITORING CUM AVR RELAY	33
	ANNEXURE – C - TECHNICAL PARTICULARS (DATA BY PURCHASER).....	36
	ANNEXURE – D - GUARANTEED TECHNICAL PARTICULARS (DATA BY BIDDER)40	
	ANNEXURE – E – SPARES REQUIREMENT	60
	ANNEXURE- F -SLD(F-1 to F-12).....	61

1.0 RECORD OF REVISION

S. No	Item/ Clause No	Change/ Addition	Reason of Change/Addition
1.1	4.17	Space for APFC Relay	APFC shall be supplied by Auto Switched Capacitor Bank Supplier but cutout for the same has to be provided by 11kV Switchgear Panel Vendor
1.2	12.2	Multifunction Meter	Ammeter has been removed and Multifunction Meter has been included for SCADA integration of all parameters
1.3	16.8	Spare Terminal Block in Capacitor Bank Panel	For APFC Control cables
1.4	17.1.5	SCADA interface port requirement revised	For integration with SCADA on IEC 61850 based on site requirement
1.5	17.6.1	Neutral Unbalance protection by RVT	As Auto Switched Capacitor banks are used, Only one RVT is enough in comparison with three NCTs
1.6	20.1.3	Panel Rating plate requirement revised	All CT, PT and breaker details included in Panel Rating plate for ready reference.
1.7	24.0	Drawing and Data Submission	To streamline drawing/document submission

2.0 SCOPE OF SUPPLY

- a. This specification covers the design, manufacture, testing, supply, erection & commissioning of 33kV and 11kV, Air Insulated, metal-enclosed and factory assembled switchgear.
- b. This specification shall be used in conjunction with all specifications, switchgear data sheets, single line diagrams, and other drawings attached to the specification / purchase requisition.

3.0 CODES & STANDARDS

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

3.1	Indian Electricity Rules 1956	Latest edition
3.2	Indian Electricity act 1910	Latest edition
3.3	Switchgear and control gear	IEC : 60694, IEC: 60298, IEC : 62271-200, IEC : 60529, IS: 3427, IS: 12729, IS: 12063, IS: 13947, IS: 9046
3.4	Circuit breaker	IEC 62271 - 100, IS 13118, IS 2516
3.5	Isolators & earthing switches	IEC 62271 - 102

3.6	Current transformers	IS:2705, IEC:60185
3.7	Voltage transformer	IS:3156, IEC:60186,
3.8	Indicating Instruments	IS:1248
3.9	Energy meters	IS 13010
3.10	Relays	IS:8686, IS:3231, IS:3842
3.11	Control switches and push buttons	IS 6875
3.12	HV fuses	IS 9385
3.13	Arrangement of Switchgear bus bars, main connections and auxiliary wiring	IS:375
3.14	Code of practice for phosphating iron & steel	IS 6005
3.15	Colours for ready mixed paints	IS 5
3.16	Code of practice for installation and maintenance of switchgear	IS 3072

4.0 PANEL CONSTRUCTION

4.1	Enclosure Type	Free standing, Indoor, Fully compartmentalised, Metal clad, Vermin proof
4.2	Enclosure degree of protection	IP 4X for high voltage compartment IP 5X for low voltage compartment
4.3	Enclosure material	Pre-Galvanized CRCA steel
4.3.1	Load bearing members	2.5 mm thick
4.3.2	Doors and covers	2.0 mm thick
4.3.3	Gland plate	3.0 mm MS for multicore and 5.0 mm Aluminium for single core cables. All gland plates should be detachable type with gasket
4.4	Dimension of Panel	Maximum 2700mm, Operating height maximum 1600mm. In case of Extension of Existing make panels, vendor shall match the dimension of existing panel.
4.5	Extensibility	On either side

4.6	Separate Compartments for	Bus bar, Circuit Breaker, HV incoming cable, HV outgoing cable, PT, LV instruments & relays
4.7	Transparent inspection window	For cable compartment at height of cable termination.
4.8	Bus end cable box	For direct cable feeder from bus
4.9	Breaker compartment door	Separate, with lockable handle (Design with breaker trolley as the front cover is not acceptable). Door of one panel should not cause hindrance for opening of adjacent panel.
4.10	Inter compartmental connections	
4.10.1	Breaker to bus bar compartment	Through seal-off bushings
4.10.2	Breaker to cable compartment	Through seal-off bushings
4.11	Pressure relief devices	To be provided for each HV compartment
4.12	Bus support insulator	Non-hygroscopic, track-resistant, high strength, Epoxy insulators (Calculation for validating dynamic force withstand capability to be submitted during detailed engineering)
4.13	Fixing arrangement	Doors - Concealed hinged, door greater than 500mm shall have minimum three sets of hinges Covers - SS bolts Gasket - Neoprene
4.14	Required HV cable termination height in the cable compartment	650 mm for 11 KV. 1000mm for 33 KV
4.15	Panel Base Frame	Steel Base frame as per manufacturer's standard.
4.16	Handle	Removable bolted covers with handle for cable chamber and busbar chamber. Panel no./identification to be provided on cable box cover also.

4.17	APFC	Controlling of Capacitor Banks' switching shall be done by APFC. Although APFC shall not be in bidder's scope, Space for cut out shall be provided in the Capacitor panel. Space requirement-150X150 mm ²
4.18	Technical particulars	As per Annexure –C

5.0 CIRCUIT BREAKER

5.1	Type	Truck or cassette type
5.2	Mounting	On withdrawable truck or carriage, with locking facility in service position.
5.3	Switching duty	<ul style="list-style-type: none"> a. Transformer (oil filled and dry type) b. Motor (of small and large ratings – DOL starting with starting current 6 to 8 times the full load current & with a maximum of 3 starts per hour) c. Underground cable with length up to 10 km
5.4	Interrupting medium	Vacuum
5.5	Breaker operation	Three separate identical single pole units operated through the common shaft
5.6	Operating Mechanism	Re-strike free, Trip free, with electrical anti-pumping feature
5.6.1	Type	Motor wound, spring charged, stored energy type with manual charging facility
5.6.2	Operation on supply failure	One O-C-O operation possible after failure of power supply to the spring charging motor
5.7	Breaker indications & push buttons	
5.7.1	ON/ OFF / Emergency trip push button	<ul style="list-style-type: none"> a. Manual / mechanical. b. Emergency Off push button should be provided with a protective flap. c. Mechanical ON shall have padlocking facility.

5.7.2	Mechanical ON – OFF indication	On breaker trolley front
5.7.3	Operation counter	On breaker trolley front
5.7.4	Test-service position indicator	On breaker trolley front
5.7.5	Mechanism charge / discharge indicator	On breaker trolley front
5.8	Breaker positions	Service, Test and Isolated
5.9	Inter changeability	Possible, only with breaker of same rating
5.10	Breaker Control	On panel front only
5.11	Handle	Breaker shall be provided with handles for easy handling, rack in–out operation and manual spring charging as applicable.
5.12	Technical particulars	As per Annexure-C

6.0 FUNCTIONAL REQUIREMENTS

6.1	Interlocks	
6.1.1	Breaker compartment door opening	Opening of door and rack out to test/isolated position should be possible with breaker in OFF position only.
6.1.2	Breaker compartment door closing	Should be possible even when breaker is in isolated position
6.1.3	Racking mechanism safety interlock	Mechanical type
6.1.4	Racking in or out of breaker inhibited	When the breaker is closed
6.1.5	Racking in the circuit breaker inhibited	Unless the control plug is fully engaged
6.1.6	Disconnection of the control plug inhibited	As long as the breaker is in service position
6.1.7	Opening of cable compartment cover of Incomer Panels inhibited	As long as cable end is alive
6.2	Safety Devices	

6.2.1	Exposure to live parts	In case the breaker panel door is required to be opened during a contingency, the personnel should not be exposed to any live part. Suitable shrouds/barriers/insulating sleeves should be provided.
6.2.2	Breaker handing	In case the breaker is mounted on a carriage which does not naturally roll out on the floor, a trolley for handling the breaker is to be provided.
6.3	Operation of breaker	In either service or test position
6.3.1	Closing from local	Only when local/remote selector switch is in local position
6.3.2	Closing from remote	Only when local/remote selector switch is in remote position
6.3.3	Tripping from local	Only when local/remote selector switch is in local position
6.3.4	Tripping from remote	Only when local/remote selector switch is in remote position
6.3.5	Tripping from protective relays	Irrespective of position of local/remote switch
6.3.6	Testing of breaker	In test or isolated position keeping control plug connected
6.4	Safety shutters.	
6.4.1	Automatic safety shutter for female primary disconnects	To fully cover contacts when breaker is withdrawn to test. Independent operating mechanism for bus bar & cable side shutters, separately pad-lockable in closed position.
6.4.2	Label for identification	For Bus side and cable side shutters
6.4.3	Warning label on shutters of incoming and other connections	Clearly visible label "Isolate elsewhere before earthing" be provided
6.5	Breaker electrical operation features	
6.5.1	Trip circuit supervision	To be given for breaker close & open condition
6.5.2	Trip circuit supervision relay contact	For indication, alarm & to inhibit closing of breaker

6.5.3	Emergency trip push button contact	Wired directly to trip coil (wired to Master trip relay if second trip coil provided)
6.5.4	Emergency trip push button contact	Wired to inhibit closing of breaker
6.5.5	Master trip relay contact (if given)	Wired to inhibit closing of breaker
6.6	DC control supply bus in all panels	Fed by two DC incoming sources in Bus coupler panel with auto changeover facility
6.7	PT supply bus in all panels	Fed normally by bus PT with automatic changeover facility to incomer line PT

7.0 SURGE SUPPRESSOR

7.1	Provision	To be provided in all panels except bus coupler and BPT.
7.2	Type	Gapless, metal oxide type
7.3	Technical particulars	As per Annexure -C

8.0 CURRENT TRANSFORMER

8.1	Type	Shall be cast resin type with insulation class of E or better.
8.2	Rating and technical particulars	As per Annexure – C (Technical particulars) and Annexure – F (SLDs)
8.3	CBCT	If specified, bidder shall clearly mention his proposal for mounting the same.

9.0 POTENTIAL TRANSFORMER

9.1	Type	Shall be cast resin type with insulation class of E or better.
9.2	Rating and technical particulars	As per Annexure – C (Technical particulars) and Annexure – F (SLDs)

9.3	Mounting	It shall be mounted on a withdrawable carriage. Mounting of PT on the breaker truck is not acceptable. In case it is mounted on the panel rear top, access to the PT and the reinforcement in the panel for allowing a person to stand should be provided.
9.4	Neutral	The HV neutral connection to earth shall be easily accessible for disconnection during HV test.

10.0 FEEDER AND BUS EARTHING

10.1	Earthing arrangement	Through separate earthing truck for bus & feeder
10.2	Short time withstand capacity of earthing truck	Equal to rating of breaker. Refer technical parameters.
10.3	Operation from front	Mechanically operated by separate switch.
10.4	Interlocks	To prevent inadvertent closing on live circuit, with padlocking arrangement to lock truck in close or open position.

11.0 EQUIPMENT EARTHING

11.1	Material of earthing bus	Aluminium
11.2	Earth bus joints	All bolted joints in the bus should be made by connection of two bolts.
11.3	Rating	Sized for rated short circuit current for 3 seconds
11.4	Enclosure & non-current carrying part of the switchboard / components	Effectively bonded to the earth bus.
11.5	Hinged doors	Earthed through flexible copper braid
11.6	Circuit breaker frame /carriage	Earthed before the main circuit breaker contacts/ control circuit contacts are plugged in the associated stationary contacts

11.7	Metallic cases of relays, instruments and other LT panel mounted equipment	Connected to the earth bus by independent copper wires of size not less than 2.5 sq. mm with green colour insulation. For this purpose LT compartment should have a clear designated earth bus to which earth connections from all components are to be connected.
11.8	CT and PT neutral	Earthed at one place at the terminal blocks through links.

12.0 METERS

12.1	Mounting	Flush mounted
12.2	Multifunction Meter	
12.2.1	Model	Rish Delta Energy
12.2.2	Make	Rishabh
12.2.3	SCADA Interfacing	RS485 rear port suitable for integration on Modbus Protocol
12.2.4	Size	96x96 mm ²
12.2.5	Panels where to be provided	All panels
12.2.6	Accuracy Class	1
12.2.7	Auxiliary Supply	48 – 240VDC and AC i.e universal type.
12.3	Voltmeter	Digital type with programmable ratio
12.3.1	Size	96x96 mm ²
12.3.2	Panels where to be provided	Incomer and bus PT panel
12.3.3	Voltmeter switch	Inbuilt in meter
12.3.4	Accuracy Class	1.0
12.4	Energy meter provision	Energy meter is not in supplier's scope. Only space and CT/PT wiring is to be provided in all panels except bus coupler and bus PT. Space for Energy meter shall be 200(w) X 350(h) mm ²

13.0 INDICATION, ALARMS & ANNUNCIATION

13.1	Indications	Flush mounted, High intensity, clustered LED type
13.1.1	Breaker ON	Red
13.1.2	Breaker Off	Green

TECHNICAL SPECIFICATION FOR HT INDOOR SWITCHGEAR (33 & 11kV)

13.1.3	Spring Charged	Blue
13.1.4	DC control supply fail	Amber
13.1.5	AC control supply fail	Amber
13.1.6	Auto trip	Amber
13.1.7	Test Position	White
13.1.8	Service Position	White
13.1.9	Heater circuit healthy	Yellow (Indication with integrated push button for checking)
13.1.10	Trip circuit healthy	White
13.1.11	PT supply as applicable	R, Y B
13.2	Annunciator (For 33kV Panels only)	
13.2.1	Type	Static type alongwith alarm. Annunciations shall be repetitive type and shall be capable of registering the fleeting signal. Fascia test facility should also be provided.
13.2.2	Note	LED type indications may not be provided for alarm signals provided on annunciator.
13.2.3	Mounting	Flush mounted
13.2.4	Fascia	12 window
13.2.5	Signals to provided on Fascia	Window 1 – Main Protection Operated (Distance /Differential) Window 2 – Backup O/C & E/F Protection Operated Window 3 – LBB operated Window 4 – CB Autotrip Window 5 – Trip Circuit Unhealthy Window 6 – DC Fail Window 7 – AC Fail Window 8 – VT Fuse Fail Window 9 – Protection Relay Faulty
13.2.6	Push Buttons	For test, accept and reset
13.2.7	Potential Free Contacts	To be provided for event logger

13.3	Alarm scheme with isolation switch	<p>a. For DC fail, TC fail and CB auto trip in 11kV panels</p> <p>b. For all signals wired to annunciator in 33kV panels</p>
------	------------------------------------	--

Sequence of operation of the annunciator shall be as follows-

S No.	Alarm Condition	Fault Contact	Visual Annunciation	Audible Annunciation
a.	Normal	Open	Off	Off
b.	Abnormal	Close	Flashing	On
c.	Accept	Close	Steady on	Off
d.	Return to normal	Open	Steady On	Off
e.	Reset	Open	Off	Off
f.	Reset before return to normal	Close	Flashing	On

14.0 SELECTOR SWITCHES & PUSH BUTTONS

14.1	Selector switches	Flush mounted on LV compartment door, with shrouded terminals
14.1.1	TNC switch with pistol grip	Lockable, spring return to normal position
14.1.2	Local / SCADA selector switch	2 pole
14.1.3	Rotary ON/OFF switches	For heater / illumination circuit
14.1.4	Rating	16 A
14.2	Push Button	Flush mounted on LV compartment door, with shrouded terminals
14.2.1	Emergency trip push button	Red color with stay put
14.2.2	Accept push buttons	Black color – Trip alarm / DC fail alarm
14.2.3	Reset push buttons	Yellow color – Trip alarm / DC fail alarm
14.2.4	Rating	10 A

15.0 INTERNAL WIRING

15.1	Internal wiring	1100 V grade, PVC insulated (FRLS) stranded flexible copper wire.
15.2	Size	2.5 sq mm for CT circuit, 1.5 sq mm for PT & control circuits

15.3	Colour code	
15.3.1	CT & PT	R Ph – Red Y Ph – Yellow B Ph – Blue Neutral – Black
15.3.2	Others	DC– grey, AC-black, Earth – green
15.4	Ferrules	At both ends of wire
15.5	Ferrule type	Interlocked type (one additional red colour ferrule for all wires in trip circuit)
15.6	Lugs	Tinned copper, pre-insulated, ring type, fork type and pin type as applicable. CT circuits should use ring type lugs only.
15.7	Spare contacts	Spare contacts of relays and contactors etc. should be wired upto the terminal block.
15.8	Wiring enclosure	Plastic channels, Inter panel wiring through PVC sleeves
15.9	Interpanel wiring	Wires with ferrule to be terminated in the adjacent shipping section should be supplied with one end terminated and the other end bunched and coiled.
15.10	Auxiliary supply	Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided on the same set of terminals in all the panels with proper segregation.

16.0 TERMINAL BLOCKS

16.1	Rating and Type	1100 V grade, moulded piece, stud type screw driver operated terminals complete with insulated barriers, washers, nuts and lock nuts.
16.2	Segregation	TBs shall be segregated.
16.3	Suitability	For termination of minimum 6sqmm flexible copper conductor.

16.4	Marking and covers	White fibre markings strip with clear plastic, slip-on / clip-on terminal covers to be provided.
16.5	Disconnecting Facility	To be provided in CT and PT terminals
16.6	Shorting & Earthing Facility	To be provided in CT Terminals
16.7	Spare Terminals	20% in each TB row
16.8	Spare Terminal Block in Capacitor Bank Panel	Separate Terminal Block with 50 number terminals required (20 Numbers Disconnecting and 30 Number Non Disconnecting type)
16.9	TB shrouds & separators	Moulded non- inflammable plastic material
16.10	Clearance between 2 sets of TB	100 mm min
16.11	Clearance with cable gland plate	250 mm min
16.12	Clearance between AC / DC set of TB	100 mm min
16.13	Test terminal blocks	Screw driver operated stud type for metering circuit

17.0 RELAYS

17.1	Protection Relays – General Features	
17.1.1	Technology and Functionality	Numerical , microprocessor based with provision for multifunction protection, control, metering and monitoring
17.1.2	Mounting	Flush Mounting, IP5X
17.1.3	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the protection and control unit to the required level of complexity as per the application.
17.1.4	Programming and configuration	Relay shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required. Programming software and communication cord for offered relays should be included in scope of supply.

17.1.5	SCADA Interface port	RS485 rear port for interfacing with SCADA on IEC103 and dual fibre optic port for interfacing with SCADA on IEC 61850 & PRP compatible. Through these ports relays shall be connected to switches. Protocol shall be selectable at site. If relays have any other rear port, hardware/software required to achieve the above said compatibility will be in supplier's scope. Ethernet switches at switchgear end shall be suitably mounted in an auxiliary compartment in switchgear panel.
17.1.6	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.
17.1.7	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.
17.1.8	PC Interface port	Front port (preferably serial) for configuration/data downloads using PC. Cost of licensed software and communication cord, required for programming of offered protection relays shall be included in the cost of switchgear.
17.1.9	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.

17.1.10	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.
17.1.11	Event and Fault records	Relay shall have the facility of recording of various parameters during event/fault with option to set the duration of record through settable pre fault and post fault time. Relay shall store records for last 10 events and 10 faults (minimum). It should be possible to download records locally to PC and remotely to SCADA.
17.1.12	Self diagnosis	Relay shall be able to detect internal failures. A watchdog relay with changeover contact shall provide information about the failure.
17.1.13	Time synchronization	All relays shall be capable of being synchronized with the system clock using SCADA interface and PC.
17.1.14	Operation Indicators	LEDs with push button for resetting.
17.1.15	Test Facility	Inbuilt with necessary test plugs.
17.2	Protection Relays for 11kV Incomer panel	
17.2.1	Relay 1	3-phase Directional Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Undervoltage and overvoltage protection
		Sync Check function
		PT supervision (fuse failure monitoring)
17.2.2	Relay 2	High Impedance Restricted Earth fault protection.
17.2.3	User Configurable DIs and Dos	Relay-1 & 2 should have a total of 16 Dis and 10 Dos (minimum). Each relay should have atleast 2 Dis and 4 Dos
17.2.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.

17.2.5	SLD	Refer annexure – F1
17.3	Protection Relays for 11kV Bus Section panel	
17.3.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Sync Check function
		User Configurable 12 Dis and 6 Dos (minimum)
17.3.2	SLD	Refer annexure – F2
17.4	Protection Relays for 11kV Outgoing panel	
17.4.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		User Configurable 12 Dis and 6 Dos (minimum)
17.4.2	SLD	Refer annexure – F3
17.5	Protection Relays for 11kV Station Transformer panel	
17.5.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		User Configurable 12 DIs and 6 DOs (minimum)
17.5.2	SLD	Refer annexure – F4
17.6	Protection Relays for 11kV Capacitor panel	
17.6.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Undervoltage and Overvoltage protection(From Bus PT)
		Neutral Unbalance protection(From RVT associated to Cap Bank)
		PT supervision (fuse failure monitoring)
		Timer for on time delay (minimum 600 seconds)
		User Configurable 12 DIs and 6 DOs (minimum)
17.6.2	SLD	Refer annexure – F5.

17.7	Protection Relays for 33kV Incomer	
17.7.1	Relay 1 (If Distance protection is considered as primary protection)	Distance Protection
		Sync check function
		PT supervision
		Power swing blocking
	Relay 1 (If Line differential protection is considered as primary protection)	Line differential protection
		Software based CT ratio correction
Selection of Relay 1	Dedicated port for communication with remote end relay through optical fibre. This port should be in addition to PC interface and SCADA interface ports.	
	Selection of Relay-1 (primary protection) will depend on site requirements. Hence bid shall contain prices of Incomer panel - <ul style="list-style-type: none"> a. With Distance protection as primary protection b. With Line differential protection as primary protection. 	
17.7.2	Relay 2	3-phase Directional Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Sync check function, if not provided in relay 1.
		Circuit Breaker failure protection
		PT supervision, if not provided in relay 1
17.7.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 DOs
17.7.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
17.7.5	SLD	Refer annexure – F6
17.8	Protection Relays for 33kV Transformer Feeder Panel	
17.8.1	Relay 1	Biased differential protection
		REF protection

		Software based ratio and vector correction feature (without ICT)
		H2 and H5 harmonic restraint
17.8.2	Relay 2	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Circuit Breaker failure protection
17.8.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 DOs.
17.8.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
17.8.5	SLD	Refer annexure – F7
17.9	Protection Relays for 33kV Buscoupler Panel	
17.9.1	Relay 1	3-phase Overcurrent and earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Sync check function
		Circuit Breaker failure protection
		PT supervision (fuse failure monitoring) for Bus PT-1
		User Configurable 16 DIs and 8 DOs (minimum)
17.9.2	Relay 2	PT supervision (fuse failure monitoring) for Bus PT-2. May be provided as integral feature of relay-1.
17.9.3	SLD	Refer annexure – F8
17.10	Protection Relays for 33kV Outgoing Panel (For Installation at KCC Consumer Premises)	
17.10.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Circuit Breaker failure protection
		User Configurable 12 DIs and 6 DOs (minimum)
17.10.2	SLD	Refer annexure – F9

17.11	Protection Relays for 33kV Incomer from 66/33kV Autotransformer	
17.11.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Sync check function
		Undervoltage and overvoltage protection
		Circuit Breaker failure protection
		PT supervision (fuse failure monitoring)
17.11.2	Relay 2	High Impedance Restricted Earth fault protection
17.11.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 DOs
17.11.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable
17.11.5	SLD	Refer annexure – F10
17.12	Protection Relays for 33kV Outgoing from 66/33kV Autotransformer	
17.12.1	Relay 1 (Distance protection is considered as primary protection)	Distance Protection
		PT supervision
		Power swing blocking
	Relay 1 (Line differential protection is considered as primary protection)	Line differential protection
		Software based CT ratio correction
		Dedicated port for communication with remote end relay through optical fibre. This port should be in addition to PC interface and SCADA interface ports.
	Selection of Relay-1	Selection of primary protection will depend on site requirements. Hence bid shall contain prices of Incomer panel –
		<ul style="list-style-type: none"> a. With Distance protection as primary protection b. With Line differential protection as primary protection.
	17.12.2	Relay 2	3-phase Overcurrent and Earthfault protection with

		IDMT, Definite time and instantaneous characteristics.
		Circuit Breaker failure protection
17.12.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 DOs
17.12.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
17.12.5	SLD	Refer annexure – F11
17.13	Protection Relays for 33kV Buscoupler for Switchboard of 66/33kV Autotransformer	
17.13.1	Relay 1	3-phase Overcurrent and earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Sync check function
		Circuit Breaker failure protection
		PT supervision (fuse failure monitoring) for Bus PT-1
		User Configurable 16 DIs and 8 DOs (minimum)
17.13.2	Relay 2	PT supervision (fuse failure monitoring) for Bus PT-2. May be provided as integral feature of relay-1.
17.13.3	SLD	Refer annexure – F12
17.14	Protection Relays – SCADA Interfacing	
17.14.1	Configuration and wiring of DIs in Protection Relays (All panels) for routing status signals to SCADA	DI-1 – TC Unhealthy DI-2 – CB Autotrip (contact from lockout relay) DI-3 – CB Open DI-4 – CB Close DI-5 – CB in service DI-6 – CB in test DI-7 – Spring Charged DI-8 – L/R switch in local DI-9 – AC fail DI-10 – Adjacent Panel DC Fail/DC MCB Trip DI-11 – Adjacent Panel Protection Relay fail

		DI-12 – PT MCB trip (metering and protection, for incomer and capacitor panel only) Sequence of DIs should be strictly as mentioned above. Change in sequence of DIs will not be acceptable.
17.14.2	Configuration and wiring of DOs in Protection relays (all panels) for execution of SCADA commands through SCADA interface port (refer clause 16.1.5).	DO-1 – CB Open DO-2 – CB close DO-3-Electrical Reset Sequence of DOs should be strictly as mentioned above. Change in sequence of DOs will not be acceptable.
17.14.3	Looping of numerical relays	All relays in the switchboard have to be looped to form a common bus for interfacing with SCADA.
17.14.4	Spare DIs and DOs	Should be wired upto terminal block for future use.
17.15	Transformer Monitoring cum AVR Relay	
17.15.1	Features	As per annexure –B
17.15.2	Requirement	To be provided in 33KV Transformer panel only
17.16	Auxiliary Relays – General Features	
17.16.1	Relays for auxiliary, supervision, trip and timer relays	Static or electromechanical type.
17.16.2	Reset mechanism for auxiliary relays	Self reset contacts except for lock-out relays.
17.16.3	Reset mechanism for lockout relays	Electrical reset type for 11kV outgoing panels only. Hand reset type for all other panels.
17.16.4	Operation indicators	With hand-reset operation indicators (flags) or LEDs with pushbuttons for resetting.
17.17	Auxiliary relays – Requirement	
17.17.1	Anti pumping (94), lockout (86) and trip circuit supervision (74) relays	For each breaker
17.17.2	PT selection relays	To be provided for selection between Bus PT and Line PT of respective sections.

17.17.3	Switchgear with two incomer & bus coupler	Lockout relay (86) contact of each incoming breakers to be wired in series in closing circuit of other incoming breakers & bus coupler.
17.17.4	Auxiliary Relays, contact multiplication relays etc.	To effect interlocks and to exchange signals of status & control
17.17.5	Transformer trouble relays (For 33kV Transformer feeder panel only)	Auxiliary relays with indicating flags (contactors will not be accepted) should be provided for the following trip and alarm commands – <ul style="list-style-type: none"> a. Buchholz trip b. OSR trip c. PRV trip d. SPR trip e. WTI Trip f. OTI Trip g. Buchholz Alarm h. Low oil level alarm i. OTI Alarm j. WTI Alarm.
17.18	General Requirements for all relays/contactors	Auxiliary supply will be 50/220VDC based on requirement. All relays/contactors shall be suitable for continuous operation at 15% overvoltage.

18.0 SPACE HEATERS

18.1	Type	Thermostat controlled with switch for isolation
18.2	Location	In Breaker & HV cable compartment, mounted on an insulator. Heater position in cable compartment should be easily accessible after cable termination. Heater position in breaker chamber shall be accessible with breaker racked-in.

19.0 SOCKETS, SWITCHES & ILLUMINATION LAMPS

19.1	Illumination lamp with switch	For LV & cable chamber
------	-------------------------------	------------------------

19.2	Universal type (5/15 A) Socket with Switch	In LV chamber
------	--	---------------

20.0 NAMEPLATES AND MARKING

20.1	Nameplates	To be provided as per the following description
20.1.1	Equipment Nameplates	<p>a. All equipment mounted on front side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved.</p> <p>b. All front mounted equipment shall be also provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.</p>
20.1.2	Feeder Nameplates	<p>a. Large and bold name plate carrying the feeder identification/ numbers shall be provided on the top of each panel on front as well as rear side. On rear side, nameplate should be provided on frame.</p> <p>b. Rear bottom of each panel shall have a nameplate clearly indicating the following: Customer Name – BSES Delhi; PO No. & date; Drawing Reference No. etc.</p>
20.1.3	Rating Plate	<p>Following details are to be provided on Panel rating plate:</p> <ol style="list-style-type: none"> Customer Name – BSES Yamuna Power Limited PO No. & Date – Complete CT Rating plate details Complete PT Rating plate details Complete CB Rating Plate details Date of Manufacturing- Warranty Period- Customer care No-
20.1.4	Material	Non-rusting metal or 3 ply lamicaid. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
20.1.5	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
20.2	Markings	Each switch shall bear clear inscription identifying its function.

		Similar inscription shall also be provided on each device whose function is not otherwise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.
--	--	--

21.0 SURFACE TREATMENT & PAINTING

21.1	Surface Treatment	Sand blasting or by seven tank process.
21.2	Paint type	Powder coated. Pure polyester base grade-A structure finish.
21.3	Paint shade	RAL 7032 for external & internal surface
21.4	Paint thickness	Minimum 50 microns

22.0 APPROVED MAKES OF COMPONENTS

22.1	Numerical Relays	R series of ABB, Siprotec series of Siemens, Micom series of Schneider/Alstom. Numerical relays used in complete switchboard should be of same make. Use of two different makes of relays in a switchboard is not acceptable.
22.2	Transformer monitoring cum AVR relay	A-eberle/Easun-MR
22.3	Electromechanical Relays	Alstom/Schneider/Siemens/ABB/ER
22.4	Miniature Relays	ABB/Jyoti/Omran
22.5	Contactors	ABB/Siemens/Telemecanique
22.6	Instrument transformers	ECS/ Pragati/ Gemini/Schneider/CGL/Kappa/Narayan power tech
22.7	MCBs	Siemens/Schneider/Legrand/ABB
22.8	Control switches	Switron/Kaycee
22.9	Test terminal blocks	IMP/Schneider/Alstom
22.10	Terminal blocks	Elmex/Connectwell

22.11	Indicating lamps	Siemens/ Teknic/ Binay
22.12	Surge Suppressors	Oblum/Tyco
22.13	Meters	Rishabh/Conzerv

23.0 INSPECTION , TESTING & QUALITY ASSURANCE

23.1	Type Tests	The product must be of type tested quality as per applicable Indian standards / IEC
23.1.1	Type test report validity period	Last five years from date of bid submission. Bidder with type test report more than 5 years old needs to re-conduct the tests without any commercial implication to BSES
23.1.2	Pressure relief device operation	Test certificate for panel to be submitted
23.2	Acceptance & Routine tests	As per the specification and relevant standards. Charges for these tests shall be deemed to be included in the equipment price. In addition to these tests, following tests have to be carried out as acceptance tests -
23.2.1	Primary injection test	To be carried out on panels selected for testing
23.2.2	Temperature rise test	One panel per Purchase order (PO with minimum 10 panels) without any commercial implication to BSES. In-house testing is acceptable.
23.2.3	Paint Thickness/ Peel off	To be carried out on panels selected for testing
23.3	Inspection	The purchaser/owner reserves the right to witness all the acceptance/routine tests during inspection.
23.4	Notice to purchaser for conducting type tests	At least three weeks in advance
23.5	Test reports before dispatch for approval	Six (6) copies of acceptance and routine test reports
23.6	Quality Assurance	
23.6.1	Vendor quality plan	To be submitted for purchaser approval

23.6.2	Inspection points	To be mutually identified & agreed in quality plan
--------	-------------------	--

24.0 DRAWINGS & DATA SUBMISSION MATRIX

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A3/A4 sheet (based on legibility) in box file with separators for each section. PDF shall also be provided of all documents via USB. Language of the documents shall be English only. Deficient/ improper document/ drawing submission shall be liable for rejection.

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
24.1	Contact Person Name, Email ID and Mobile Number	Required			
24.2	Consolidated Deviation Sheet	Required	Required		
24.3	GTP	Required	Required		
24.4	Relevant Type Test as per IS/IEC	Required			
24.5	Power Cable and control cable Philosophy and Schedule		Required		
24.6	Manufacturer's quality assurance plan and certification for quality standards		Required		
24.7	Sizing Calculation of Associated Equipment		Required		
24.8	Recommended Spares Apart from spares stated in Spec(for five years of operation)		Required		
24.9	11 kV / 33 kV Switchgear drawing				
24.9.1	General Arrangement	Required	Required		
24.9.2	Sectional Layout		Required		
24.9.3	Door Layout		Required		
24.9.4	LV Box Internal Layout		Required		

TECHNICAL SPECIFICATION FOR HT INDOOR SWITCHGEAR (33 & 11kV)

24.9.5	SLD	Required	Required		
24.9.6	Schematic Circuit diagram and Scheme of Each type of Panel		Required		
24.9.7	Communication Architecture		Required		
24.9.8	Bus Bar Arrangement		Required		
24.9.9	QAP		Required		
24.9.10	Panel wise BOQ		Required		
24.9.11	Logic Operation Diagram		Required		
24.9.12	Plan		Required		
24.9.13	Synch Logic Diagram		Required		
24.9.14	Foundation Diagram		Required		
24.9.15	DI sheet		Required		
24.9.16	DO Sheet		Required		
24.9.17	TB Details		Required		
24.9.18	Make of all Component as per specification		Required		
24.10	Drawing of Substation Room		Required		
24.11	Ventilation detail requirement of GIS Room		Required		
24.12	Installation, erection and commissioning manual for switchgear		Required		
24.13	Inspection Reports			Required	
24.14	As manufacturing Drawings			Required	
24.15	Operation and Maintenance Manual			Required	Required
24.16	Trouble shooting manual			Required	Required
24.17	As built Drawings				Required
24.18	Test Report				Required
24.19	Weekly progress report				Required

25.0 PACKING

25.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, panels may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
25.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
25.3	Packing Identification Label to be provided on each packing case with the following details	
25.3.1	Individual serial number	
25.3.2	Purchaser's name	
25.3.3	PO number (along with SAP item code, if any) & date	
25.3.4	Equipment Tag no. (if any)	
25.3.5	Destination	
25.3.6	Project Details	
25.3.7	Manufacturer / Supplier's name	
25.3.8	Address of Manufacturer / Supplier / it's agent	
25.3.9	Description and Quantity	
25.3.10	Country of origin	
25.3.11	Month & year of Manufacturing	
25.3.12	Case measurements	
25.3.13	Gross and net weights in kilograms	
25.3.14	All necessary slinging and stacking instructions	

26.0 SHIPPING

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

27.0 HANDLING AND STORAGE

27.1	Handling and Storage	<p>Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.</p>
------	----------------------	--

28.0 PROGRESS REPORTING

28.1	Outline Document	<p>To be submitted for purchaser approval for outline of production, inspection, testing, inspection, packing, dispatch, documentation programme</p>
------	------------------	--

28.2	Detailed Progress report	<p>To be submitted to Purchaser once a month containing:</p> <ul style="list-style-type: none"> a. Progress on material procurement b. Progress on fabrication (As applicable) c. Progress on assembly (As applicable) d. Progress on internal stage inspection e. Reason for any delay in total programme f. Details of test failures if any in manufacturing stages g. Progress on final box up h. Constraints / Forward path
------	--------------------------	---

29.0 DEVIATION

29.1	Deviation	<p>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.</p>
------	-----------	--

30.0 ACCESSORIES & TOOLS

30.1	Type and Quantity	Bidder to indicate
30.2	Special tools & tackles required for erection, testing, commissioning and maintenance of the switchboard	The cost of these items shall be indicated separately in the bid as optional.
30.3	Suitable handling truck / trolley for lifting and moving the circuit breaker	To be supplied. (Two trolleys for each type/rating of breaker)

ANNEXURE – A - SCOPE OF SUPPLY

Scope of supply should include the following –

- 1.1 Design, manufacture, assembly, testing at manufacturer's works, properly packed for transport, supply and FOR delivery at site of following 11kV / 33kV Switchgears as per enclosed specification and single line diagram.
- 1.2 Base channel frame of the switchgears with hardware.
- 1.3 Two trolleys for breaker of each size are to be provided per switchboard.
- 1.4 Programming software and communication cord for numerical relays.
- 1.5 Unit price of 33kV Incomer with Distance relay as primary protection and 33kV Incomer with Line differential relay as primary protection should be mentioned separately in the bid. Primary protection to be used in Incomer panel will be finalized based on site requirement.
- 1.6 Unit price of Bus PT should be indicated separately in the bid to enable addition/deletion based on site requirement.
- 1.7 Bidder should indicate price of one set of special tools and tackles (if any) required for maintenance of switchgear and its components.
- 1.8 Bidder should indicate price of each spare as per Annexure E.
- 1.9 All relevant drawings, data and instruction manuals

ANNEXURE – B – TRANSFORMER MONITORING CUM AVR RELAY

1	General features	
1.1	Technology and Functionality	Microprocessor based with provision for multifunction control and monitoring.
1.2	Mounting	Flush Mounting
1.3	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the control unit to the required level of complexity as per the application.
1.4	Programming and configuration	AVR shall utilize a user friendly setting and operating multilingual software in windows environment with menus and icons for fast access to the data required.
1.5	User Machine Interface	UMI with an alphanumeric key pad and graphical LCD

		display with backlight indicating measurement values and operating messages. Capability to access and change all settings and parameters.
1.6	PC Interface port	Front port (preferably serial) for configuration using PC. Cost of licensed software and communication cord, required for programming of offered protection relays using PC, shall be mentioned separately in the bid.
1.7	SCADA Interface port	RS485 rear port for interfacing with SCADA on IEC103 and dual fibre optic port for interfacing with SCADA on IEC 61850 & PRP compatible. Through these ports relays shall be connected to switches. Protocol shall be selectable at site. If relays have any other rear port, hardware/software required to achieve the above said compatibility will be in supplier's scope. Ethernet switches at switchgear end shall be suitably mounted in an auxiliary compartment in switchgear panel.
1.8	Self diagnosis	Shall be able to detect internal failures. A watchdog relay with changeover contact shall provide information about the failure.
1.9	Auxiliary supply	220VDC or 48VDC
2	Inputs and Outputs	
2.1	CT Input	1/5A selectable through programming
2.2	PT Input	110VAC
2.3	Binary Inputs	Sixteen programmable binary inputs should be provided
2.4	Analog Inputs (4-20mA)	One input to be provided
2.5	PT-100 direct input	Two inputs to be provided
2.6	Direct Resistance Input	For tap position indication (18 steps)
2.7	Binary Outputs	Ten programmable binary outputs should be provided
3	Control	

3.1	Control Tasks	Ability to implement control functions through programmable logics
3.2	Voltage setting	Programmable Voltage set point
3.3	Voltage Regulation	Raise/Lower tap position to maintain the preset value of voltage.
3.4	Voltage Regulation modes	Automatic and Manual
3.5	Operation Modes	Local and Remote
3.6	Fan and Pump control	To be provided
3.7	Transformer Paralleling	Capability to parallel transformers whose AVR's are interconnected via a communication network.
4	SCADA Interfacing	
4.1	Configuration of DIs for routing alarm/trip signals to SCADA.	DI-1 – Buchholz trip DI-2 – OSR Trip DI-3 – PRV trip DI-4 – SPR trip DI-5 – OTI trip DI-6 – WTI trip DI-7 – Buchholz alarm DI-8 – Oil Level low alarm (MOG alarm) DI-9 – WTI alarm DI-10 – OTI alarm DI-11 – Tap changer trouble/stuck/out of step DI-12 – Tap changer motor supply fail DI-13 – Tap changer in local control All signals from DI-1 to DI-10 are to be wired up from transformer trouble auxiliary relays.
4.2	Configuration of DOs for executing commands from SCADA through interface port/CRP	DO-1 – Tap raise DO-2 – Tap lower DO-3 – Fan group 1 control DO-4 – Fan group 2 control
4.3	Spare DIs and DOs	To be wired upto the terminal block.
5	Measurement, Event Recording and Monitoring	

5.1	Measured Quantities (optional)	Voltage, Current, Active Power, Reactive Power, Apparent Power, Power factor, frequency
5.2	Event Recording	Facility for recording parameters during various events such as tap change, change in binary input status etc.
5.3	Monitoring	Capability to monitor important transformer parameters such as Oil temperature, Winding Temperature etc and give indication/alarm when the value of a particular parameter exceeds the preset value.

ANNEXURE – C - TECHNICAL PARTICULARS (DATA BY PURCHASER)

1.0	SWITCHGEAR		
1.1	Type	Metal clad, air insulated with VCB type circuit breaker	
1.2	Service	Indoor	
1.3	Mounting	Free standing, floor mounted	
1.4	System Voltage	11 KV	33kV
1.5	Voltage variation	+/- 10%	
1.6	Frequency	50 Hz +/- 5%	
1.7	Phase	3	
1.8	Rated voltage	12 KV	36 kV
1.9	Rated current	As per SLDs given in Annexure-F	
1.10	Short time rating for 3 sec.	25kA	25kA
1.11	Internal arc classification and rating		
1.11.1	Classification	IAC – A - FLR	IAC – A - FLR
1.11.2	Rating	25kA for 1 second	25kA for 1 second.
1.12	Insulation level (PF rms / Impulse peak)	28 kV / 75 kV	70 kV/ 170 kV

1.13	System ground	Effectively earthed	Effectively earthed
1.14	Enclosure degree of protection	IP – 4X for high voltage compartment and IP – 5X for metering and protection compartment	
1.15	Bus bar - Main	Rating as per SLDs given in annexure - F, Short time rating as per clause 1.10.	
1.15.1	Material	Tinned Electrolytic copper	
1.15.2	Bus bar sleeve	Sleeved with shrouds on joints. Tape on joints is not acceptable.	
1.15.3	Bus identification	Colour coded	
1.15.4	Temperature rise	40 deg. C for conventional joints. 55 deg. C for silver plated joints	
1.16	Auxiliary bus bar	Electrolytic grade tinned copper	
1.17	Auxiliary DC Supply	220 V DC / 48 V DC	
1.18	Auxiliary AC supply	240 V AC 50 Hz	
1.19	Hardware	Stainless steel.	
1.20	Earth bus	Aluminium	
1.21	Bus duct entry	From top (where ever applicable)	
1.22	Power cable entry	From bottom and rear	
1.23	Control cable entry	From bottom and front (i.e breaker compartment)	
2.0	CIRCUIT BREAKER		
2.1	Voltage class, insulation level, short time rating	As specified for switchgear	
2.2	Rated current	As per SLDs given in annexure - F. Use of two breakers in parallel to meet the required current rating shall not be acceptable.	
2.3	Duty cycle	O – 0.3 sec – CO - 3min - CO	
2.4	Short circuit rating		
2.4.1	A.C sym. breaking current	25kA	25kA
2.4.2	Short circuit making current	62.5kA	62.5kA
2.5	Operation time		

2.5.1	Break time	Not more than 4 cycles
2.5.2	Make time	Not more than 5 cycles
2.6	Range of Auxiliary Voltage	
2.6.1	Closing	85% - 110%
2.6.2	Tripping	70% - 110%
2.6.3	Spring Charging	85% - 110%
2.7	No. of spare aux. Contacts of Breaker, for Owner's use.	Minimum 6 NO + 6 NC
2.8	No. of spare contacts of Service and Test position limit switch	2 NO
3.0	CURRENT TRANSFORMERS	
3.1	Voltage class, insulation level and short time rating	As specified for switchgear
3.2	Type	Cast resin, window / bar primary type
3.3	Class of insulation	Class E or better
3.4	Ratio	As per SLDs given in annexure - F
3.5	Number of secondaries	As per SLDs given in annexure - F
3.6	Accuracy class	
3.6.1	Protection core	5P20
3.6.2	Protection (Diff. / REF)	PS
3.6.3	Metering	0.2s
3.6.4	Core balance CT	PS
3.7	Burden (VA)	Adequate for the protection & instruments offered
3.8	Excitation current of PS Class CTs	30 mA at $V_k/4$
3.8	Knee Point Voltage of PS Class CTs (V_k)	$\geq 40 (R_{ct} + 4)$

3.9	Primary operating current sensitivity of CBCTs	5A	
4.0	VOLTAGE TRANSFORMERS		
4.1	Type	Cast resin, draw out type, single phase units	
4.2	Rated Voltage		
4.2.1	Primary	11000/sq.rt.3	33000/sq.rt.3
4.2.2	Secondary	110V/sq.rt.3	
4.3	No. of phases	3	
4.4	No. of secondary windings	2	
4.5	Method of connection	Star/Star	
4.6	Rated voltage factor	1.2 continuous, 1.9 for 30 seconds	
4.7	Class of insulation	Class E or better	
4.8	Accuracy class		
4.8.1	Protection	3P	
4.8.2	Metering	0.2	
4.9	Primary and secondary fuses	HRC current limiting type, Primary fuse replacement shall be possible with VT in withdrawn position	
5.0	HV FUSES		
5.1	Voltage class	12kV	36kV
5.2	Rupturing capacity	50kA	
5.3	Rated current	As per application	
6.0	SURGE ARRESTORS	For 11kV switchgear	For 33kV switchgear
6.1	Rated Voltage	9kV	30kV
6.2	Maximum continuous operating voltage (MCOV)	7.65kV	25kV
6.3	Discharge current	10kA	10kA
6.4	Discharge class	3	3

Note - The auxiliary DC voltage shall be checked on a case to case basis by Purchaser

ANNEXURE – D - GUARANTEED TECHNICAL PARTICULARS (DATA BY BIDDER)

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
1.0	SWITCHGEAR ASSEMBLY					
1.1	Make					
1.2	Type					
1.3	Reference Standard					
1.4	Voltage (Normal/Max.) kV					
1.6	Frequency (Hz)					
1.7	Short Circuit Rating					
1.7.1	Short time current and duration.					
1.8	Internal Arc Classification and rating (Refer Annexure –C)					
1.8.1	Classification					
1.8.2	Rating with gas ducts/deflectors					
1.8.3	Rating without gas ducts/deflectors					
1.9	Insulation Level					
1.9.1	Impulse Withstand (kV peak)					
1.9.2	1 minute 50 Hz. Voltage Withstand (kV rms)					
2.0	CONSTRUCTION					
2.1	Metal Clad Construction Yes/No					
2.2	Degree of protection :					
2.3	Minimum thickness of sheet metal used (mm)					
2.4	Draw out feature provide for					
2.4.1	Breaker with Service, Test & Isolated position -Yes/No					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
2.4.1	Voltage Transformer : Yes/ No					
2.4.3	Protective relays : Yes/ No					
2.5	Breaker Cubicle					
2.5.1	Cubicle door can be closed with breaker in Test and isolated position : Yes/ No					
2.5.1	Working zone units from floor level (mm)					
2.6	All meters, switches & relays flush mounted type: Yes/No					
2.7	Minimum clear space required					
2.7.1	Front for breaker withdrawal (mm)					
2.7.2	Rear (mm)					
2.8	Typical Vertical Section					
2.8.1	Overall Dimensions					
a.	Length (mm)					
b.	Breadth (mm)					
c.	Height (mm)					
2.8.2	Weight (kg)					
3.0	BUS BAR					
3.1	Make					
3.2	Material & Grade					
3.3	Reference Standard					
3.4	Cross Sectional area (mm ²)					
3.5	Bus connection (Joints)					
3.5.1	Silver Plated Yes/No					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
3.5.2	Conventional made with anti oxide grease Yes/No					
3.6	Rated Continuous Current Amps					
3.7	Maximum temperature rise at rated continuous current °C					
3.8	Short time current and duration (KA and secs)					
3.9	D.C. Resistance at 85°C ($\Omega/m/\varnothing$)					
3.10	Minimum clearance of bus bar and connection					
3.10.1	Phase to phase (mm)					
3.10.2	Phase to earth (mm)					
3.11	Bus Bar provided with					
3.11.1	Insulation Sleeve					
3.11.2	Phase barriers					
3.11.3	Cast Resin shrouds for joints					
3.12	Bus bar support spacing (mm)					
3.13	Bus support insulators					
3.13.1	Make					
3.13.2	Type					
3.13.3	Reference Standard					
3.13.4	Voltage Class (kV)					
3.13.5	Min. creepage distance (mm)					
3.13.6	Cantilever strength Kg/mm ²					
3.13.7	Net Weight (kg)					
4.0	CIRCUIT BREAKER					
4.1	Make					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
4.2	Type					
4.3	Reference Standard					
4.4	Rated Voltage					
4.5	Rated Frequency					
4.6	Rated Current					
4.6.1	Rated Current and its reference ambient temperature.					
4.6.2	Continuous current to limit the maximum temperature rise to 55 Deg C for silver plated connections and 40 Deg C for conventional connections.					
4.7	Rated operating Duty					
4.8	Symmetrical Breaking capacity at rated voltage & operating duty KA rms					
4.9	Rated making Current (KAp)					
4.10	Short time current and duration (KA and secs)					
4.11	Insulation Level					
4.11.1	Impulse voltage withstand on 1/50 full wave					
4.11.2	1 minute 50 Hz. Voltage withstand					
4.12	Maximum over voltage factor when switching off					
4.12.1	Un loaded transformer					
4.12.2	Loaded transformer					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
4.12.3	Un loaded cables					
4.12.4	Capacitors					
4.12.5	Motors					
4.13	Opening time maximum No load condition (ms)					
4.14	Number of permissible breaker operations under vacuum loss					
4.15	At 100% Breaking capacity					
4.15.1	Opening time-Max. (ms)					
4.15.2	Arcing time-Max (ms)					
4.15.3	Total break time (ms)					
a.	Make time (Max) (ms)					
b.	Total closing time (ms)					
4.17	Total length of contact travel (mm)					
4.18	No. of breaker operations permissible without requiring inspection, replacement of contacts and other main parts.					
4.18.1	At 100% rated current					
4.18.2	At 100% rated breaking current					
4.19	Type of contacts					
4.20	Material of contact					
4.21	Minimum clearance in air (mm) from live part					
4.21.1	Between phases					
4.21.2	Between live parts and ground					
4.22	Type of arc control device provided					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
4.23	Operating mechanism-closing					
4.23.1	Type					
4.23.2	No. of breaker operations stored					
4.23.3	Trip free or fixed trip					
4.23.4	Anti pumping features provided					
4.24	Operating mechanism-tripping					
4.24.1	Type					
4.24.2	No. of breaker operations stored					
4.24.3	Trip free or fixed trip (V)					
4.24.4	Anti pumping features provided (%)					
4.25	Spring Charging motor					
4.25.1	Rating (kW)					
4.25.2	Make					
4.25.3	Voltage and permissible variation (%)					
4.26	Closing coil					
4.26.1	Voltage (V)					
4.26.2	Permissible voltage variation (%)					
4.26.3	Closing current at rated voltage (A)					
4.26.4	Power at rated voltage (W)					
4.27	Tripping Coil					
4.27.1	Voltage					
4.27.2	Permissible voltage variation (%)					
4.27.3	Tripping Current at rated Voltage (A)					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
4.27.4	Power at rated voltage (W)					
4.28	Breaker/Accessories Accessories such as control switch indication lamps etc. furnished as specified: (Please attach separate sheet giving details of all accessories, inter locks and safety shutters)					
4.28.1	Mechanical Safety Interlock					
4.28.2	Automatic Safety Interlock					
4.28.3	Operational Interlock					
4.28.4	Emergency manual trip					
4.28.5	Operation counter					
4.28.6	Change/discharge indicator					
4.28.7	Manual spring charging facility					
4.28.8	Auxiliary switch with 6NO+ 6 NC for Owner's use.					
4.28.9	Contacts wear indicator					
4.29	Auxiliary Switch					
4.29.1	Switch contacts type					
4.29.2	Contacts rating at					
a.	Make & Continuous (Amps)					
b.	Break (Inductive) (Amps)					
4.30	Net weight of the breaker (Kg)					
4.31	Impact load foundation design (to include dead load plus impact value on opening at maximum interrupting rating) (kG)					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
4.32	On Vacuum loss (Amps)					
4.32.1	Possible load current breaking (Amps)					
4.32.2	Possible fault current breaking (Amps)					
4.33	Overall Dimensions					
4.33.1	Length (mm)					
4.33.2	Breadth (mm)					
4.33.3	Height (mm)					
4.34	Type test report on identical breaker furnished					
5.0	CONTROL & INDICATIONS					
5.1	Push Buttons Make					
5.1.1	Type & Catalog No.					
5.1.2	Contact rating at 110V / 220V D,C,					
5.1.3	Make & continuous (Amps)					
5.2	LED lamps: Make :					
5.2.1	Type & Catalog No.					
5.2.2	Watts/Voltage					
5.2.3	Lamps & Lens replaceable from front with glass cover					
5.3	Selector switch: Make					
5.3.1	Type & Catalog No.					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
5.3.2	Contact rating.					
5.3.3	Make & continuous (Amps)					
5.3.4	Break (inductive) (Amps)					
6.0	CURRENT TRANSFORMER					
6.1	Make					
6.2	Type & voltage level					
6.3	Reference standard					
6.4	C.T. ratio as specified					
6.5	Short circuit withstand Short time current for 1 Sec. - kA rms Dynamic current - kA peak					
6.6	Class of insulation					
6.7	Temperature rise					
6.8	Basic insulation level					
6.9	For metering & protection					
6.9.1	CT Ratio					
6.9.2	Class of accuracy					
6.9.3	Rated burden VA					
6.9.4	Knee point voltage V					
6.9.5	Excitation current at $V_k/4$					
6.9.6	Rated saturating current Amp					
6.10	For differential protection					
6.10.1	CT Ratio					
6.10.2	Class of accuracy					
6.10.3	Rated burden VA					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
6.10.4	Knee point voltage V					
6.10.5	Excitation current at $V_k/4$ Amps					
6.10.6	Rated saturating current Amp					
6.10.7	Secondary resistance (Ω)					
6.11	For restricted earth fault protection					
6.11.1	CT Ratio					
6.11.2	Class of accuracy					
6.11.3	Rated burden VA					
6.11.4	Knee point voltage V					
6.11.5	Excitation current at $V_k/4$					
6.11.6	Amps					
6.11.7	Rated saturating current Amp					
6.11.8	Secondary resistance (Ω)					
6.12	For stand by earth fault protection					
6.12.1	CT Ratio					
6.12.2	Class of accuracy					
6.12.3	Rated burden VA					
6.12.4	Knee point voltage V					
6.12.5	Excitation current at $V_k/4$ Amps					
6.12.6	Rated saturating current Amp					
6.12.7	Over current rating Continuous % over load (%)					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
6.13	For sensitive earth fault protection (CBCT) CT Ratio					
6.13.1	Class of accuracy					
6.13.2	Rated burden VA					
6.13.3	Knee point voltage V					
6.13.4	Excitation current at $V_k/4$ Amps					
6.13.5	Rated saturating current Amp					
6.13.6	Over current rating Continuous % over load (%)					
7.0	POTENTIAL TRANSFORMER					
7.1	Make					
7.2	Type and voltage level					
7.3	Reference Standard					
7.4	Voltage Ratio					
7.5	Accuracy					
7.5.1	Winding-1					
7.5.2	Winding-2					
7.6	Rated Burden (VA)					
7.6.1	Winding-1					
7.6.2	Winding-2					
7.7	Over voltage factor					
7.7.1	Continuous					
7.7.2	30 seconds					
7.8	Class of Insulation					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
7.9	Temperature rise over ambient (°C)					
7.10	Basic Impulse level (kV peak)					
7.11	Winding connection					
7.11.1	Primary					
7.11.2	Secondary					
7.12	Fuses					
7.12.1	Continuous rating HV/LV (Amp)					
7.12.2	Symmetrical fault rating HV/LV kA rms					
7.12.3	Make					
7.13	Maximum ratio error at					
7.13.1	90% to 100% of rated voltage and 25% to 100% of rated secondary burden at Unity Power factor.					
7.13.2	90% to 106% of rated voltage and 10% to 50% of rated secondary burden at 0.2 p.f.					
7.14	Maximum phase difference at					
7.14.1	90% to 100% of rated voltage and 25% to 100% of rated secondary burden at unity p.f.					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
7.14.2	90% to 106 of rated voltage and 10% to 50% of rated secondary burden at 0.2 p.f.					
7.15	Weight (kg)					
8.0	RELAYS					
8.1	Manufacturer					
8.2	Model Type					
8.3	Draw out type with built in test facilities. Yes/No					
8.4	Built in test facility . Yes/No					
8.5	Type of mounting					
8.6	Reference standard					
8.7	All relays furnished as per drawing and specification					
8.8	All relevant relay leaflets and catalogue furnished					
8.9	Communication port type					
8.10	Auxiliary supply					
8.11	Measurement and data acquisition feature.					
8.12	Control and supervision					
a	IEC protocol					
b	Open protocol feature					
c	Programming facility					
d	Separate output for individual element					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
e	Event recording facility Number of events					
f	Required softwares offered					
8.13	C.T. secondary current					
8.14	Self diagnostic feature					
8.15	Modular design					
8.16	Relay details:-					
8.16.1	Overcurrent					
a	Make					
b	Type					
c	Characteristics available					
d	Range of settings a) Current b) Time					
e	Range of settings a) Current b) Time					
f	Rated burden					
8.16.2	Synchronizing check relay (if applicable) :					
a	Make					
b	Type					
c	Setting range					
8.16.3	Earth fault					
a	Make					
b	Type					
c	Characteristics available					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
d	Range of settings a) Current b)Time					
e	Rated burden					
8.16.4	Over current (Directional) if applicable					
a	Make					
b	Type					
c	Characteristics available					
d	Range of settings a) Current b) Time					
e	Rated burden					
8.16.5	Earth fault (Directional) If applicable					
a	Make					
b	Type					
c	Characteristics available					
d	Range of settings a) Current b)Time					
e	Rated burden					
8.16.6	Neutral unbalance relay					
a	Make					
b	Type					
c	Characteristics available					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
d	Range of settings Current Time					
e	Rated burden					
8.16.7	Under Voltage Relay					
a	Make					
b	Type					
c	Range of setting					
d	Rated burden					
8.16.8	Over Voltage Relay					
A	Make					
b	Type					
c	Range of setting					
d	Rated burden					
8.16.9	Busbar Differential Relay					
a	Make					
b	Type					
c	High impedance /Low impedance					
d	Facility for CT ratio adjustment possible through software. Yes/No					
e	CT supervision facility available. Yes/No					
8.16.10	Transformer Differential Relay					
a	Make					
b	Type					
c	High impedance /Low impedance					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
d	Facility for CT ratio adjustment possible through software. Yes/No					
e	Facility of transformer vector group adjustment through software. Yes/No					
f	Setting range.					
g	Rated burden.					
8.16.11	Restricted earth fault relay					
a	Make					
b	Type					
c	Combined with differential relay. Yes/No					
d	Setting range					
e	Rated burden.					
8.16.12	Standby earth fault relay					
a	Make					
b	Type					
c	Characteristics					
d	Setting range					
e	Rated burden					
8.17	Terminal block for relay testing provided (Yes / No)					
9.0	METERS					
9.1	Multifunction Meter					
a	Model					
b	Make					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
c	SCADA Interfacing					
d	Size					
e	Panels where to be provided					
f	Accuracy Class					
g	Auxiliary Supply					
9.2	Voltmeter					
a	Make					
b	Type					
c	Reference standard					
d	Size					
e	Accuracy class					
10.0	SECONDARY WIRING					
10.1	Type and insulation					
10.2	Voltage grade					
10.3	Conductor material					
10.4	Conductor size (minimum) and insulation wiring					
10.4.1	Potential circuit					
10.4.2	Control & current circuit					
11.0	TERMINAL BLOCK					
11.1	Make					
11.2	Type					
11.3	Catalog No.					
11.4	20% Spare terminals furnished					
12.0	CABLE TERMINATIONS					
12.1	Clearance for power cable					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
	termination					
12.2	Removable gland plate					
12.2.1	Material for multi core cable					
12.2.2	Material for single core cable					
12.2.3	Thickness of the plate					
13.0	NAME PLATE					
13.1	Material					
13.2	Thickness					
13.3	Size for					
13.3.1	Breaker cubicle					
13.3.2	Instruments/devices					
14.0	Space Heater/Plug Socket					
14.1	Cubicle Heater					
14.1.1	Thermostat controlled					
14.1.2	Wattage					
14.1.3	Voltage					
14.1.4	Resistance (ohms)					
14.1.5	Thermostat range					
14.2	Plug Socket					
14.2.1	Type					
14.2.2	Rating					
14.3.	Cubicle heater & plug socket circuit provided with MCBs					
15.0	A.C/D.C Supply					
15.1	Isolating Switches for incoming supply					
15.1.1	A. C. Type & rating					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
15.1.2	D.C. Type & rating					
15.2	Isolating Switch at each cubicle					
15.2.1	A. C. Supply-type & rating					
15.2.2	D.C. Supply-type & rating					
16.0	Tropical Protection					
16.1	Any special treatment for tropical protection					
17.0	Painting					
17.1	Finish of Switchgear					
17.1.1	Inside					
17.1.2	Outside					
18.0	No. of Accessories Furnished					
18.1	Breaker lifting & handling trolley					
18.2	Any other					
19.0	TESTS					
19.1	Reference Standard					
19.2	Routine tests to be performed on Switchgear					
19.3	Type Tests certificates submitted					
20.0	Drawing/Data					
20.1	General arrangement for Panel Board					
20.2	Foundation plan					
20.3	Bill of material					
20.4	Cross Sectional drawing for every type of switchgear (Add sheets if					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing	Capacitor	Station Trafo
	necessary)					

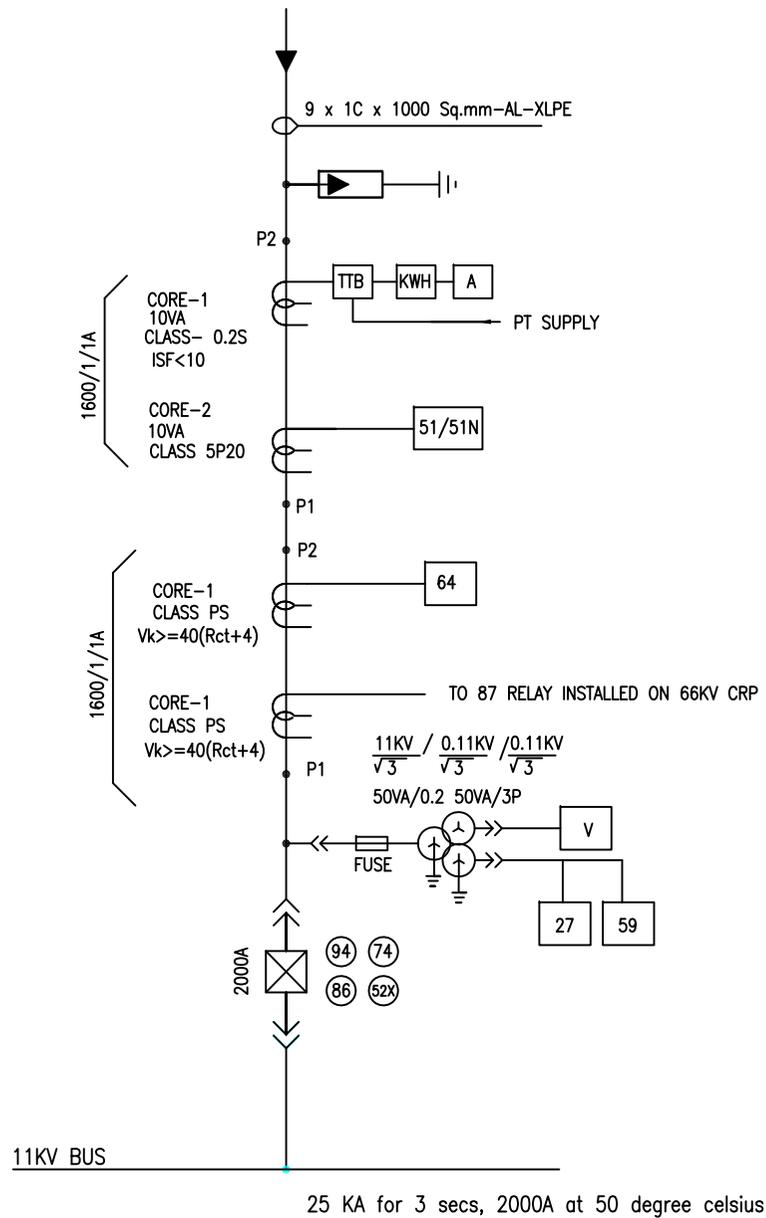
Place : Signature :
 Printed Name : Designation :
 Business Address : (Including Telex, Telephone & Telefax No.)
 Name & Address of the Principal Officer :

ANNEXURE – E – SPARES REQUIREMENT

Unit rate of all below mentioned spares have to be provided in the bid.

S No.	Description	Qty
1	Line voltage transformer	3 (1 set)
2	Bus voltage transformer	3 (1 set)
3	Current transformer of each ratio	3 (1 set)
4	Trip Coil	4
5	Closing Coil	4
6	CB Spring charging motor	2
7	Auxiliary switch	2 sets (2 Nos. each type)
8	Bursting disc / pressure relief plate complete	2
9	Numerical relay of each type	1 nos. (each type)
10	Vacuum Interrupter Bottle	1 set (3 nos.) of each rating
11	Breaker contacts for busbar	1 set (3 nos.) of each rating
12	Breaker testing cable with plug suitable for breaker on one side and plug suitable for the panel on the other side	3 meter(each type)
13	SCADA Spare	20% of Supplied Items

ANNEXURE-F1



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

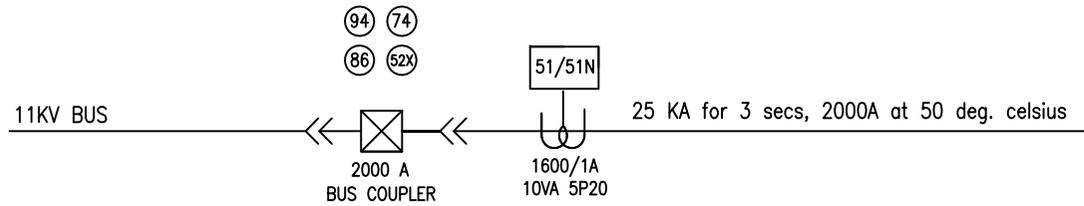
SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

NOTE:-

1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRAWN	RAJESH	TITLE:-	 BSES Yamuna Power Limited SPECIFICATION NO. SP-HTSWG-01-R3 SLD-SWG-11KV-01
CHECKED	G.S	STANDARD SLD FOR 11KV INCOMER	
APPD.	A.A		
DATE	07.08.18		
SCALE	NTS		

ANNEXURE – F2



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

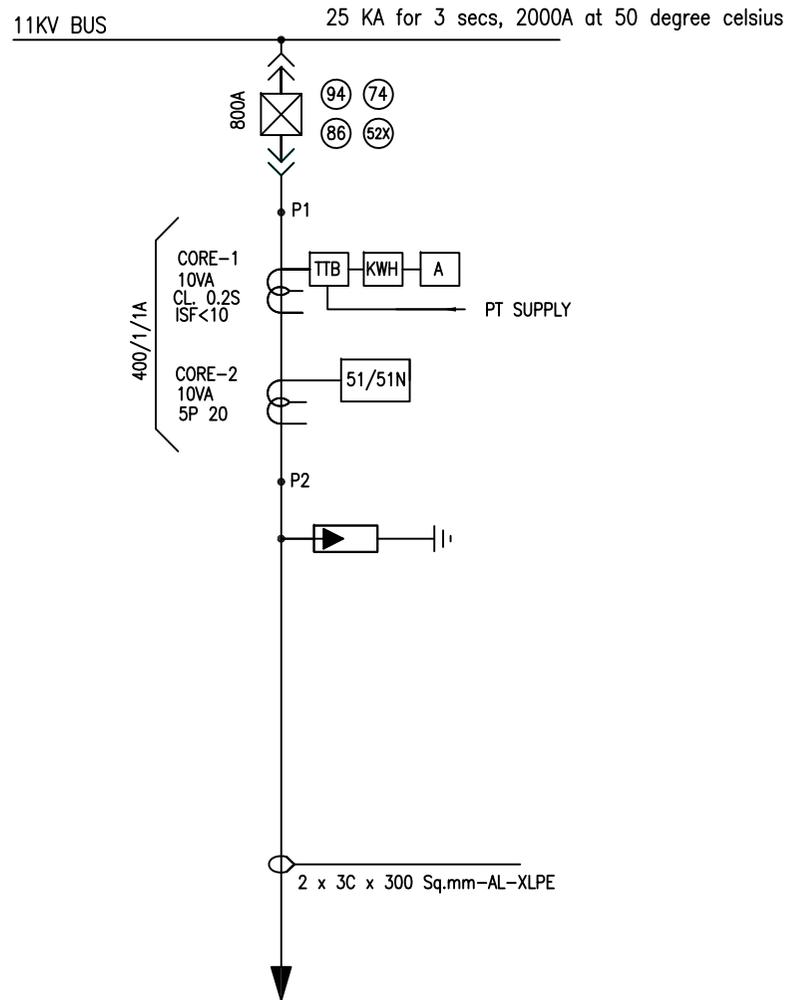
SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

NOTE:–

1. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRAWN	RAJESH	TITLE:–	 BSES Yamuna Power Limited SPECIFICATION NO. SP-HTSWG-01-R3 SLD-SWG-11KV-02
CHECKED	G.S	STANDARD SLD FOR 11KV	
APPD.	AA	BUS SECTION	
DATE	07.08.18		
SCALE	NTS		

ANNEXURE-F3



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

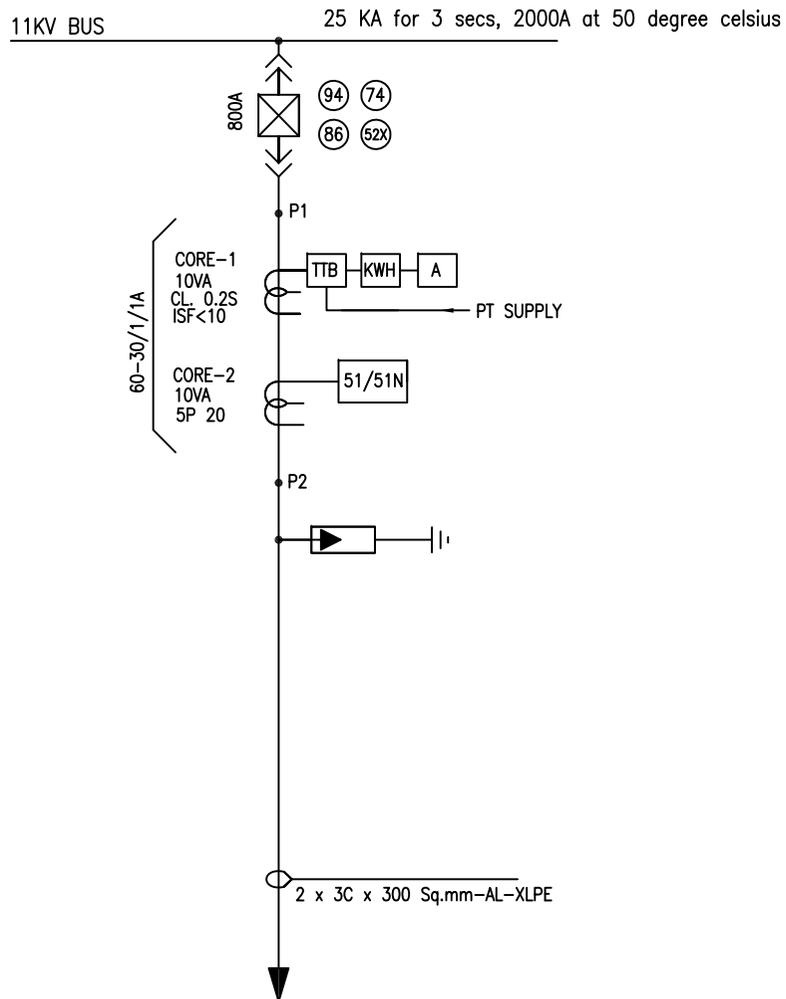
SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

NOTE:-

1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRAWN	RAJESH	TITLE:-	 BSES Yamuna Power Limited SPECIFICATION NO. SP-HTSWG-01-R3
CHECKED	G.S	STANDARD SLD FOR 11KV OUTGOING FEEDER	
APPD.	AA		
DATE	07.08.18		
SCALE	NTS		
			SLD-SWG-11KV-03

ANNEXURE-F4



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

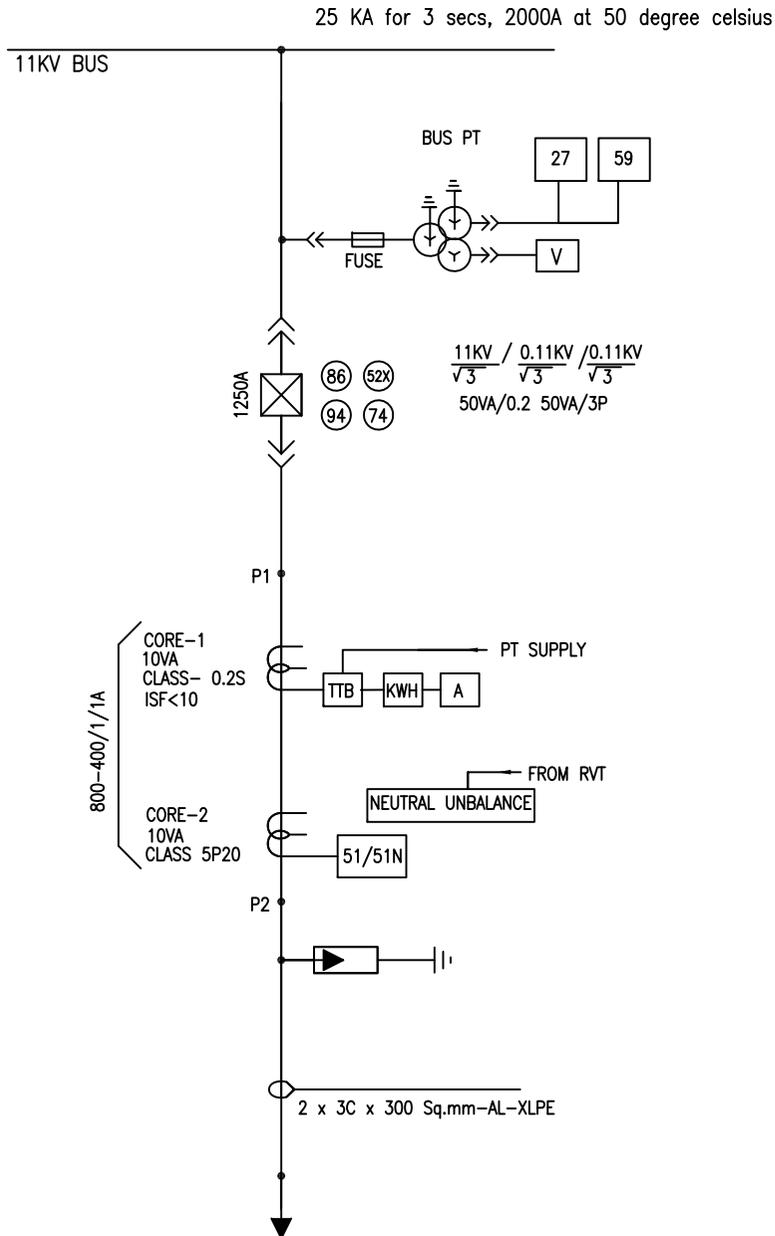
SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

NOTE:-

1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRAWN	RAJESH	TITLE:-	 BSES Yamuna Power Limited SPECIFICATION NO. SP-HTSWG-01-R3 SLD-SWG-11KV-04
CHECKED	G.S	STANDARD SLD FOR 11KV STATION TRANSFORMER FEEDER	
APPD.	AA		
DATE	07.08.18		
SCALE	NTS		

ANNEXURE-F5



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

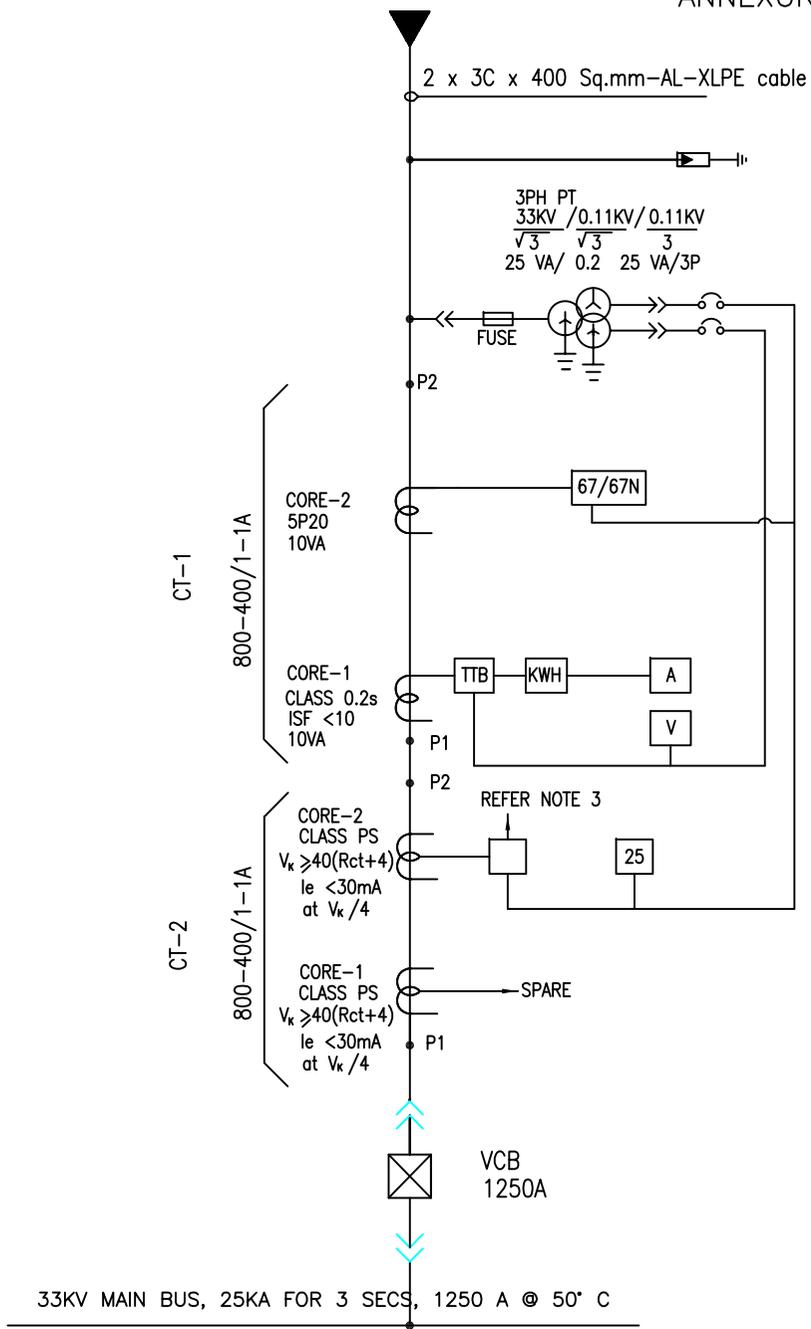
SYMBOL	DESCRIPTION
	ENERGY METER
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

NOTE:-

1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS
3. ONE BPT TO BE CONSIDERED FOR EACH CAPACITOR PANEL

DRAWN	RAJESH	TITLE:-	BSES BSES Yamuna Power Limited SPECIFICATION NO. SP-HTSWG-01-R3 SLD-SWG-11KV-05
CHECKED	G.S	STANDARD SLD FOR 11KV CAPACITOR FEEDER	
APPD.	A.A		
DATE	07.08.18		
SCALE	NTS		

ANNEXURE-F6



LEGEND

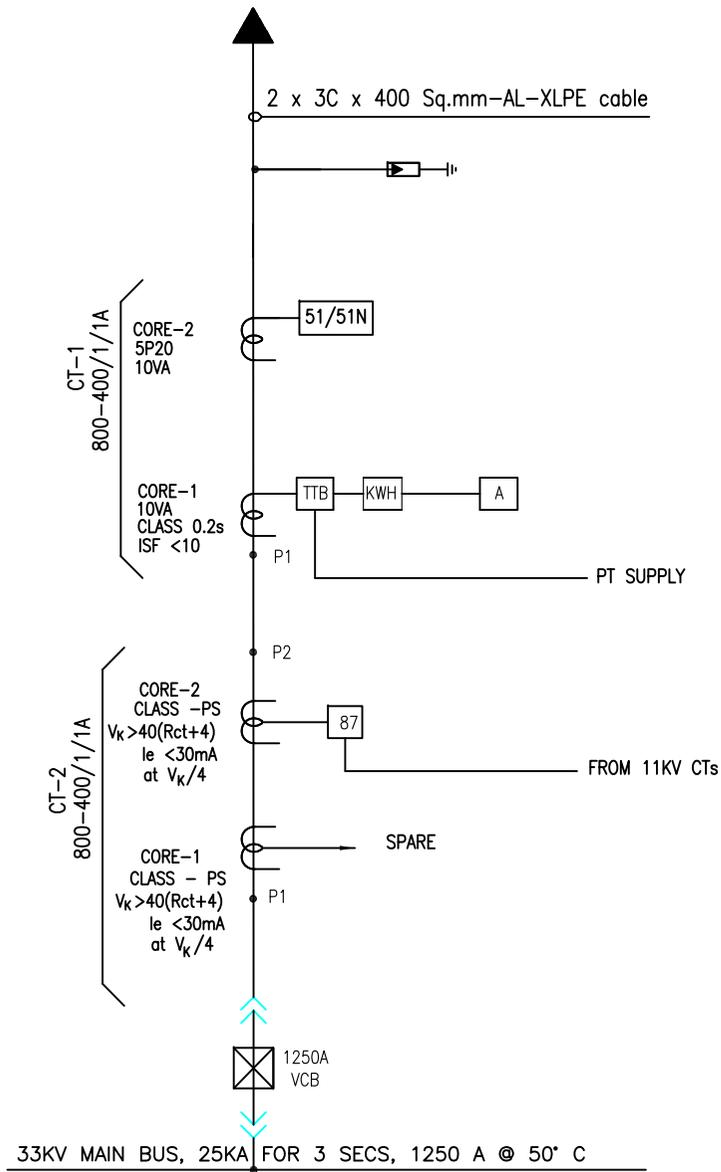
SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

- NOTE: 1. KWH METER NOT IN SUPPLIER'S SCOPE
 2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS
 3. LINE DIFFERENTIAL OR DISTANCE RELAY. REFER CLAUSE 16.7.1 OF SPECIFICATION

DRAWN	RAJESH	TITLE	BSES BSES Yamuna Power Limited
CHECKED	G.S		
APPD.	A.A	TYPICAL SLD FOR	SPECIFICATION NO. SP-HTSWG-01-R3
DATE	07.08.2018	33KV INCOMER	SLD-SWG-33KV-01
SCALE	NTS		

ANNEXURE-F7



LEGEND

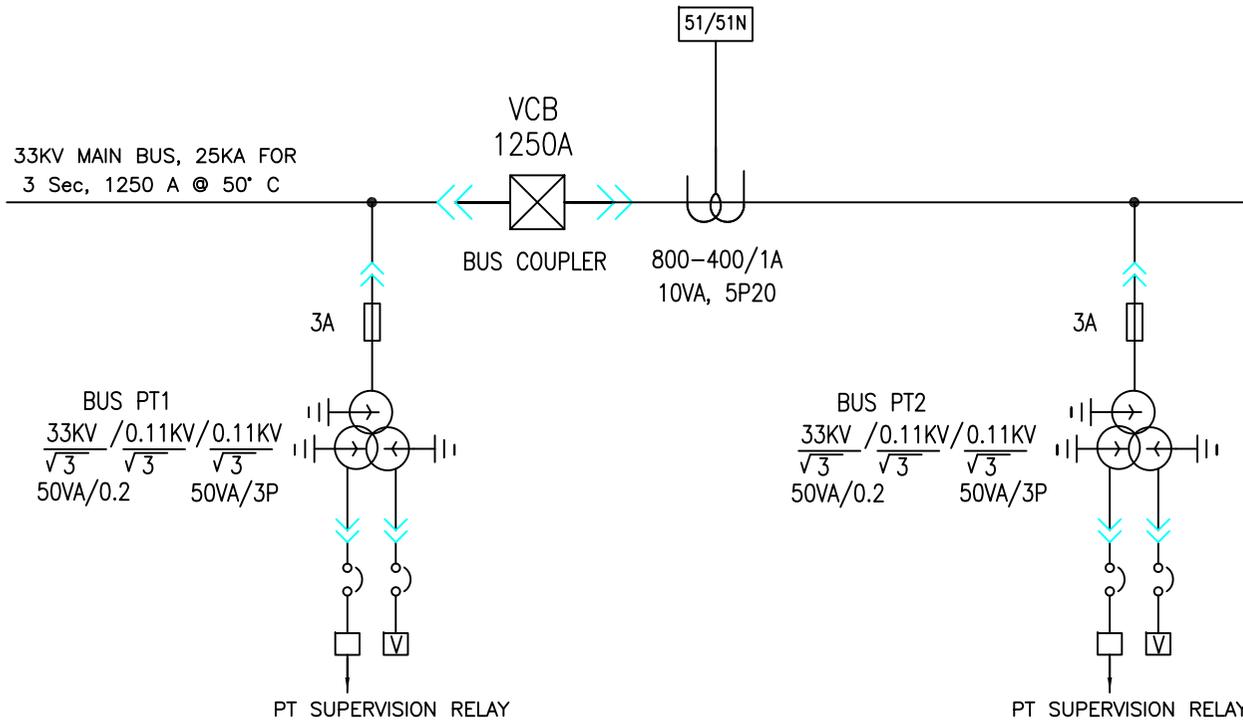
SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

- NOTE: 1. KWH METER NOT IN SUPPLIER'S SCOPE
 2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRAWN	RAJESH	TITLE	BSES BSES Yamuna Power Limited
CHECKED	G.S		
APPD.	A.A	TYPICAL SLD FOR 33/11KV TRANSFORMER FEEDER	SPECIFICATION NO. SP-HTSWG-01-R3
DATE	07.08.2018		SLD-SWG-33KV-02
SCALE	NTS		

ANNEXURE-F8



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

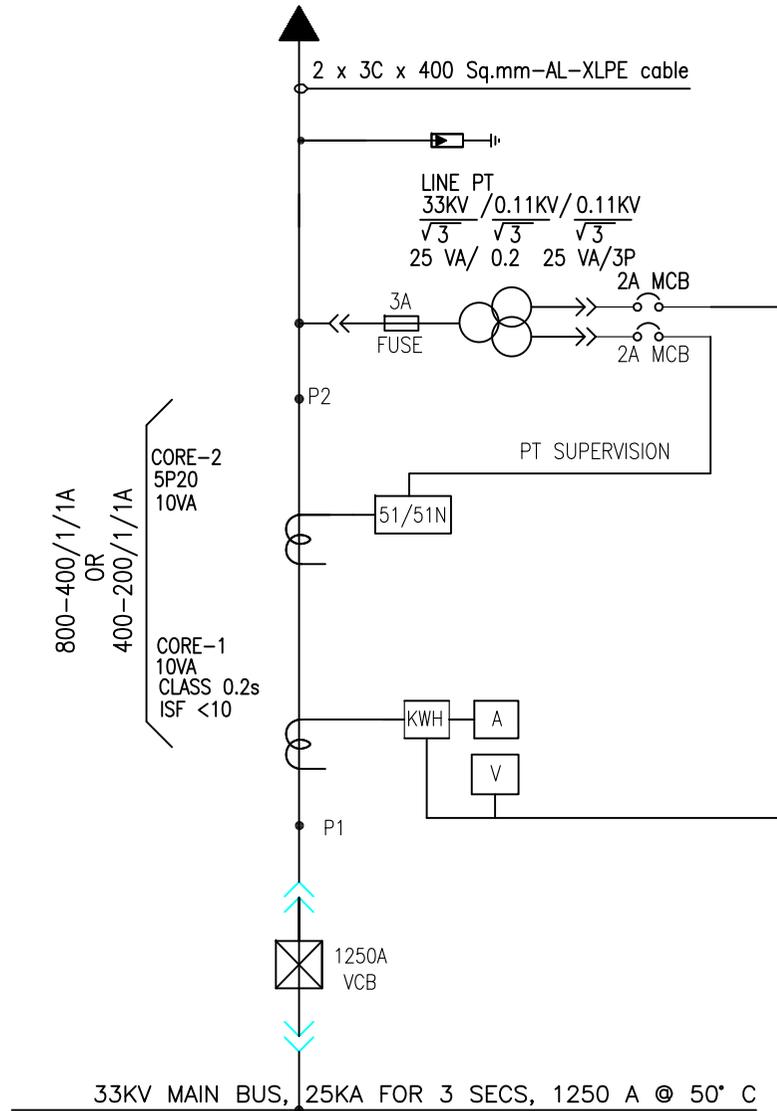
SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

NOTE:-

- REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRAWN	RAJESH	TITLE TYPICAL SLD FOR 33KV BUS COUPLER CUM BUS PT	 BSES Yamuna Power Limited SPECIFICATION NO. SP-HTSWG-01-R3 SLD-SWG-33KV-03
CHECKED	G.S		
APPD.	A.A		
DATE	07.08.2018		
SCALE	NTS		

ANNEXURE-F9



LEGEND

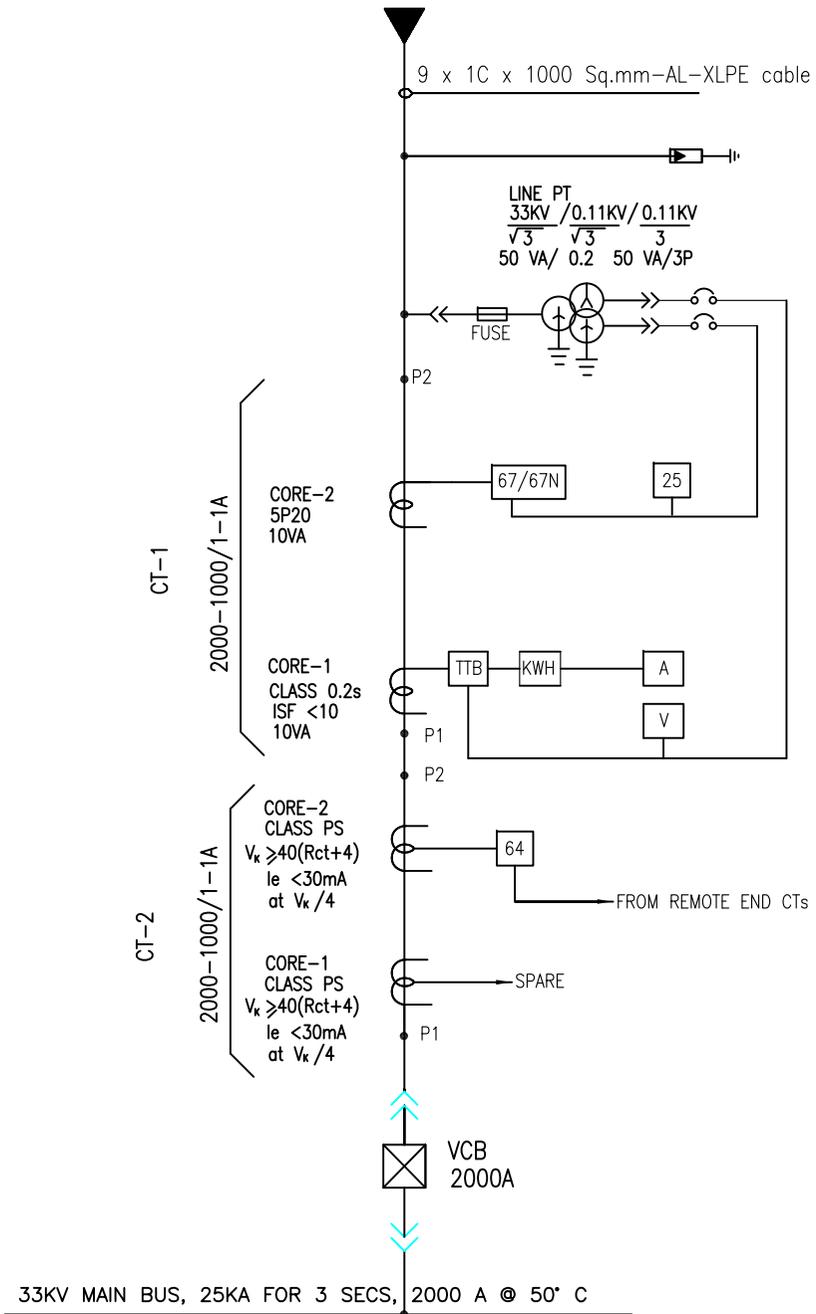
SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

- NOTE:
1. KWH METER NOT IN SUPPLIER'S SCOPE
 2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS
 3. TTB NOT REQUIRED IN THIS PANEL

DRAWN	RAJESH	TITLE TYPICAL SLD FOR 33 KV OUTGOING FEEDER (FOR INSTALLATION AT KCC CONSUMERS PREMISES)	 BSES BSES Yamuna Power Limited
CHECKED	G.S		
APPD.	A.A		
DATE	07.08.2018		
SCALE	NTS		
		SLD-SWG-33KV-04	

ANNEXURE-F10



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

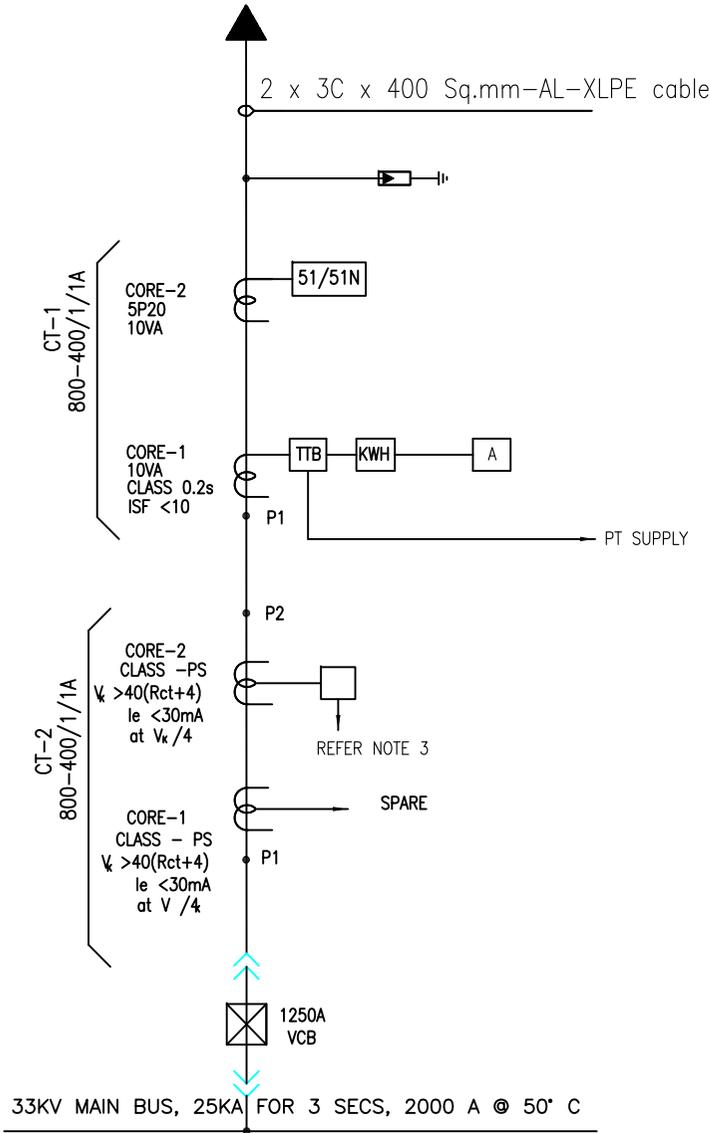
NOTE: 1. KWH METER NOT IN SUPPLIER'S SCOPE
 2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRAWN	RAJESH
CHECKED	G.S
APPD.	A.A
DATE	07.08.2018
SCALE	NTS

TITLE
TYPICAL SLD FOR 33KV INCOMER FROM 66/33KV AUTO TRANSFORMER

BSES BSES Yamuna Power Limited
SPECIFICATION NO. SP-HTSWG-01-R3
SLD-SWG-33KV-05

ANNEXURE-F11



LEGEND

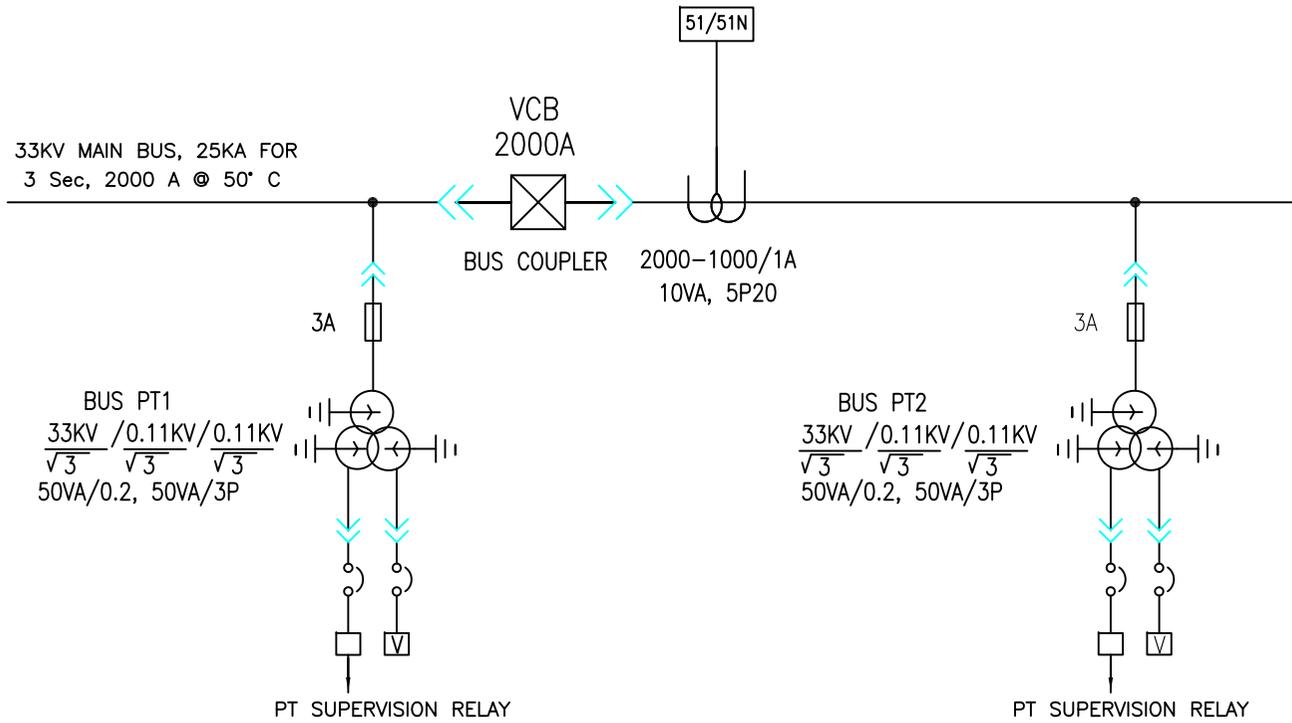
SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

- NOTE: 1. KWH METER NOT IN SUPPLIER'S SCOPE
 2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS
 3. LINE DIFFERENTIAL OR DISTANCE RELAY. REFER CLAUSE 16.12.1 OF SPECIFICATION

DRAWN	RAJESH	TITLE TYPICAL SLD FOR 33KV OUTGOING FROM 66/33KV AUTO TRANSFORMER	 BSES Yamuna Power Limited SPECIFICATION NO. SP-HTSWG-01-R3 SLD-SWG-33KV-06
CHECKED	G.S		
APPD.	A.A		
DATE	07.08.2018		
SCALE	NTS		

ANNEXURE-F12



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

SYMBOL	DESCRIPTION
	ENERGY METER
	NEGATIVE PHASE SEQUENCE PROTECTION
	SYNC CHECK
	O/C & E/F RELAY
	UNDER VOLTAGE RELAY
	DIFFERENTIAL RELAY
	DISTANCE RELAY
	OVER VOLTAGE RELAY
	REF RELAY
	DIRECTIONAL O/C & E/F RELAY
	TEST TERMINAL BLOCK

NOTE:-

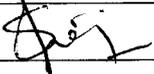
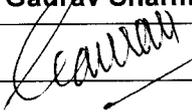
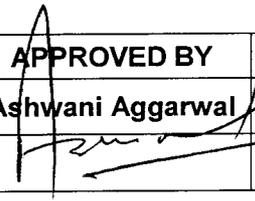
- REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRAWN	RAJESH	TITLE	 BSES BSES Yamuna Power Limited
CHECKED	G.S	TYPICAL SLD FOR	
APPD.	A.A	BUS COUPLER CUM BUS PT	
DATE	07.08.2018	PANEL FOR 33KV SWITCH	
SCALE	NTS	BOARD OF 66/33KV AUTO TRANSFORMER	
			SPECIFICATION NO. SP-HTSWG-01-R3
			SLD-SWG-33KV-07

TECHNICAL SPECIFICATION

FOR

415V AC DISTRIBUTION BOARD

PREPARED BY	REVIEWED BY	APPROVED BY	REV	0
Srinivas Gopu	Gaurav Sharma	Ashwani Aggarwal	DATE	04/12/2017
			PAGE	Page 1 of 13

INDEX

1.0	SCOPE.....	3
2.0	CODES & STANDARD.....	3
3.0	SERVICE CONDITION.....	3
4.0	CONFIGURATION.....	3
5.0	CONSTRUCTION.....	5
6.0	BUSBAR.....	5
7.0	CURRENT TRANSFORMER.....	6
8.0	TERMINALS AND WIRING.....	6
9.0	METERS, INDICATIONS AND PUSH BUTTONS.....	6
10.0	NAME PLATES & MARKINGS.....	7
11.0	FINISHING.....	7
12.0	APPROVED MAKE OF COMPONENTS.....	8
13.0	INSPECTION & TESTING.....	8
14.0	PACKING, SHIPPING, HANDLING, & SITE SUPPORT.....	8
15.0	DEVIATIONS.....	9
16.0	DOCUMENTS SUBMISSION.....	9
17.0	GUARANTEED TECHNICAL PARTICULARS.....	10

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**1.0 SCOPE**

This specification covers the design, engineering, manufacture, assembly and testing at manufacturer's works and supply of 415V AC Distribution board (ACDB) along with all hardware and accessories required for installation and operation.

2.0 STANDARDS & CODES

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

3.0 SERVICE CONDITIONS

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

4.0 CONFIGURATION

4.1	Incomers	Two incomers, each having motorized 630A MCCB. MCCBs shall have microprocessor based over current and earth fault release. Auto changeover shall be provided between the two incomers alongwith necessary electrical interlocks in event of
-----	----------	---

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD

		failure of either of the two			
4.2	Outgoing feeders	The number of outgoing feeders from AC boards shall be such that each substation equipment is fed by separate feeder (refer below).			
	Application	Type of Switchgear	No of Poles	Rating (A)	Quantity
	Transformer Oil filtration	MCCB	4	100	2
	Welding(Outdoor)	MCB	2	63	4
	Power Socket(Indoor)	MCB	4	32	5
	Outdoor Lighting	MCB	4	32	2
	Indoor Lighting	MCB	4	32	2
	Battery Charger	MCB	4	32	2
	BMK	MCB	4	32	8
	Marshalling Box(PTR)	MCB	4	32	3
	AC Supply	MCB	4	32	2
	UPS	MCB	2	16	1
	11kV Switchgear	MCB	2	16	3
	CRP	MCB	2	16	2
	RTU/SCADA	MCB	2	16	2
	Fire Fighting	MCB	2	16	2
	EPAX	MCB	2	16	1
	Power Socket	MCB	2	16	4

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**5.0 CONSTRUCTION**

5.1	General construction	Board shall be of modular construction with provision for complete compartmentalization of all feeders. It shall be free-standing type comprising dust-tight and vermin-proof sheet steel cabinets suitable for indoor installation with IP-54 degree of protection. Necessary busbar support insulators, cable glands, cable supports and terminal blocks etc. The board shall preferably be of single front type.
5.2	Material	The Board shall be made out of at least 2.0 mm thick cold rolled steel sheet, suitably reinforced to provide flat level surfaces. No welds, rivets, hinges or bolts shall be visible from outside.
5.3	Equipment Mounting	All switches provided on the distribution board shall be on front side of the cabinets, operable from outside. All instruments and control devices shall be mounted on the front of cabinets and fully wired to the terminal blocks.
5.4	Busbar housing	The busbars shall be housed in totally enclosed busbar chambers. Incoming connections from the busbar to various feeders shall be designed so as not to disturb cable connections. Busbar arrangement should ensure safety of the operation/maintenance personnel and facilitate working on any outgoing module without the need for switching off in-feed to the adjacent modules, as far as possible
5.5	Cable alleys	A cable alley preferably 230 mm wide shall be provided in each vertical section for taking cables into the compartments. Cable alleys shall be provided on sides of busbar chamber
5.6	Cable glands	Compression type cable glands shall be provided to hold the cables to avoid any pressure or tension on the terminal block connections.
5.7	Gland Plate	Gland plate shall be 3.0mm thick.
5.8	Doors	The doors of cabinets shall be lockable and shall be fitted with double lipped gaskets.

6.0 BUSBAR

6.1	Material	Busbar shall be of tinned electrolytic copper or aluminium.
6.2	Size	Busbar shall be of tinned electrolytic copper or aluminium.
6.3	Supports	The busbar shall be supported by means of durable non-hygroscopic, non-combustible and non-tracking polyester fibreglass material or porcelain. Supports shall be capable of withstanding the maximum short circuit stresses
6.4	Sleeves and shrouds	Busbars shall be encased in heat-shrinkable sleeves of insulating material which shall be suitable for the operating temperature of busbars during normal service. The busbar joints shall be provided with removable thermosetting plastic shrouds.

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**7.0 CURRENT TRANSFORMER**

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

8.0 TERMINALS AND WIRING

8.1	Secondary Wiring	
8.1.1	Grade and type	1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.
8.1.2	Ferruling	Each wire shall bear an identifying ferrule or tag at each end or connecting point.
8.1.3	Size	2.5sqmm copper (minimum)
8.2	Terminals	Terminals of appropriate size shall be provided inside each cabinet for incoming and outgoing cables.
8.2.1	Grade	1100 V grade, moulded piece terminals complete with insulated barriers, washers, nuts and lock nuts.
8.2.2	Power Terminals type	Stud type, nut driver operated
8.2.3	Control terminals type	Stud type, screw driver operated suitable for minimum 6sqmm wire.
8.2.4	Spare terminals	20% spare terminals should be provided in each terminal block.
8.2.5	Accessibility	Placement of terminals shall enable proper cable termination. Terminals shall be readily accessible for inspection and maintenance.
8.2.6	Marking	The terminals shall be serially numbered to facilitate installation and maintenance.

9.0 METERS, INDICATIONS AND PUSH BUTTONS

9.1	Meters	
9.1.1	Multifunction Meter	For incomer feeders. Meter should have facility to store peak load current in memory.
9.1.2	Type	Digital with inbuilt phase selector
9.1.3	Accuracy Class	1.0
9.1.4	Auxiliary supply	240VAC with 10 % tolerance

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD

9.2	Indicating lamps	Indicating lamps shall be of low wattage cluster LED type.
9.2.1	Incomer/ Outgoing On	Red
9.2.2	Incomer/ Outgoing Off	Green
9.2.3	Incomer/ Outgoing Trip	Amber
9.3	Push buttons	For manual operation of incomer

10.0 NAME PLATES & MARKINGS

10.1	Panel nameplate	Panel shall have a nameplate clearly indicating the following: a. Panel Serial No.- b. Customer Name - BSES Yamuna Power Ltd c. PO No. & date - d. Type of Panel - e. Current rating - f. Guarantee period -
10.2	Feeder nameplate	Large and bold name plate carrying the feeder identification shall be provided on the top of each module. Blank insert type name plates shall be provided on each outgoing feeder.
10.3	Equipment nameplate	a. All equipment mounted on front side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. b. All front mounted equipment shall also be provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.
10.4	Danger plate	Panel shall have a danger plate of anodized Aluminium clearly indicating the danger logo and voltage details.
10.5	Material	Non-rusting metal or 3 ply lamicaid. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
10.6	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
10.7	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not otherwise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

11.0 FINISHING

11.1	Primer	Two coats
11.2	Finish	Powder Coating
11.3	Colour shade	RAL 7032 (Siemens Grey)

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD

11.4	Paint thickness	70 microns (minimum)
------	-----------------	----------------------

12.0 APPROVED MAKE OF COMPONENTS

12.1	Switch	Siemens / L&T (Salzer)
12.2	HRC Fuse Links	GE/ Siemens/ L&T
12.3	Meters	Rishabh/Schneider/AE
12.4	AC Contractors	L&T/Siemens/Telemecanique/GE/ABB
12.5	Terminals	Connectwell/Elmex/Wago/Phoenix
12.6	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
12.7	MCCB	L&T/Siemens/ ABB/GE/Schneider
12.8	MCB	Datar/Legrand/Hager/Schneider/ABB
12.9	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

13.0 INSPECTION AND TESTING

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

14.0 PACKING, SHIPPING, HANDLING & SITE SUPPORT

14.1	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.
14.2	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.
14.3	Packing Identification Label	On each packing case, following details are required:
14.3.1	Individual serial number	
14.3.2	Purchaser's name	
14.3.3	PO number (along with SAP item code, if any) & date	
14.3.4	Equipment Tag no. (if any)	

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD

14.3.5	Destination	
14.3.6	Manufacturer / Supplier's name	
14.3.7	Address of Manufacturer / Supplier / it's agent	
14.3.8	Description	
14.3.9	Country of origin	
14.3.10	Month & year of Manufacturing	
14.3.11	Case measurements	
14.3.12	Gross and net weight	
14.3.13	All necessary slinging and stacking instructions	
14.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.
14.5	Handling and Storage	Manufacturer instruction shall be followed.
14.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.	

15.0 DEVIATIONS

15.1	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.
------	-----------	---

16.0 DOCUMENTS SUBMISSION

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

16.1	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
16.2	Completely filled compliance GTP sheet as per clause 16.0 of this specification
16.3	Complete product catalogue, Manual and calibration certificate of the equipment
16.4	Type test reports
16.5	Deviation Sheet (if any)

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**17.0 GUARANTEED TECHNICAL PARTICULARS**

S. No.	Description	Specification requirement	Bidder's Data
1	GENERAL FEATURES		
1.1	Make		
1.2	Type		
1.3	Reference Standard		
1.4	Rated Operational voltage	415V AC \pm 10%	
1.5	Rated Nominal Current	630A	
1.6	Rated frequency	50 Hz (+3%, -5%)	
1.7	Rated Insulation voltage	1100V	
1.8	Rated Impulse withstand voltage	8kV	
1.9	Service supply for heating, lighting and power sockets	240VAC \pm 10%,	
1.10	Mounting	Floor (Free standing)	
1.11	Connections	Cable entry – Bottom	
1.12	Configuration	Single front	
1.13	Enclosure thickness		
1.13.1	Load Bearing Member	\geq 2.5mm	
1.13.2	Doors and Covers	\geq 2 mm	
1.14	Enclosure Material	CRCA Sheet	
1.15	Enclosure degree of protection	IP 54	
1.16	Mechanical safety interlocks	As specified in technical specification	
1.17	Power Cable Termination	Shall be as per the specification	
1.18	Paint shade	RAL 7032 (Siemens Grey)	
1.19	Typical vertical section (Overall dimension (mm) and weight (Kg))	Required	
1.19.1	Incomer		
1.19.2	Outgoings		
1.20	Dimensions of the ACDB Panel	L (mm) X D (mm) X H (mm)	
1.21	Weights of the ACDB Panel	(in kg.)	
1.22	Marking on the panel	As per the specification	
2	INCOMER MCCB		
2.1	Make & Model of MCCB	Required	
2.2	Catalogue of MCCB	Required	

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD

2.3	Continuous Current at 40 deg C/ 50 deg C	630A	
2.4	Rated ultimate breaking capacity at rated voltage	50kA	
2.5	Rated service breaking capacity Ics	Ics = 100% Icu at rated voltage	
2.6	Rated making current	Icm = 220% Icu	
2.7	Utilization Category	A	
2.8	Overload setting	50 -100% (Inverse time characteristics)	
2.9	Overcurrent setting	200-1000% (Instantaneous characteristics)	
2.10	Earthfault setting	20-100% (Instantaneous)	
2.11	Dimension(HxWxD)	Required	
2.12	Weight	Required	
4	BUS AND BUS TAPS		
4.1	Make		
4.2	Material and grade of buses and joints	High conductivity electrolytic grade aluminium	
4.3	Reference standard		
4.4	Continuous Current (at site condition, 50°C ambient) within cubicle	630A	
4.5	Cross sectional Area		
4.6	DC resistance	ohm/m/ph	
4.7	Skin-effect ratio		
4.8	Reactance	ohm/m/ph	
4.9	Losses-middle phase	w/m/ph	
4.10	Minimum clearance of bus bar and joints	Required	
4.10.1	Phase to phase (mm)		
4.10.2	Phase to earth (mm)		
4.11	Bus bar insulation	i. Heat shrinkable sleeves rated for maximum operating voltage	
		ii. Cast resin shrouds for joint	
4.12	Bus joints	Silver	
4.13	Bus bar support insulator	Required	
4.13.1	Spacing (mm)		
4.13.2	Make		
4.13.3	Type		
4.13.4	Reference standard		

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD

4.13.5	Voltage class (kV)		
4.13.6	Minimum creepage distance (mm)		
4.13.7	Cantilever strength (Kg/sq.cm.)		
5	CURRENT TRANSFORMER		
5.1	Make		
5.2	Type	Resin Cast	
5.3	Reference standard		
5.4	CT ratios		
5.5	Class of Insulation	Class-E	
5.6	Protection class	5P20	
5.7	Metering class	5	
5.8	VA burden for Relaying CT-Incomer	Based on requirement.	
6.0	AMMETERS/MULTIFUNCTION METERS AND VOLTMETERS		
6.1	Make & Model no.		
6.2	Type	Digital	
6.3	Accuracy class	1	
7.0	CONTROL & INDICATIONS		
7.1	Push button		
7.1.1	Make and model no.		
7.1.2	Type	Flush mounted type with touch proof terminals	
7.2	LEDs		
7.2.1	Make & Model no.		
7.2.2	Type	Flush mounted type with touch proof terminals	
8.0	TERMINAL BLOCKS		
8.1	Make & Model no.		
8.2	Spare terminals	Equal to 20% of active terminals in each TB	
8.3	Power terminals	Stud type, nut driver operated	
8.4	Control terminals	Stud type, screw driver operated suitable for minimum 6sqmm wire.	
9.0	TESTS		
9.1	Confirmation of routine tests to be performed as per IS 60947	Yes/No	
9.2	IP 55 test shall be carried out during inspection	Yes/No	
9.3	Confirmation of Type tests to be performed (or report submitted)	Type test report no./date	

TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD

	as per IS 60947		
9.4	Confirmation of Acceptance tests to be performed during inspection as per IS 60947	Yes/No	
9.5	Temperature rise test to be carried out at NABL accredited lab.	Yes/No	
10.0	Deviation sheet against each clause of the specification	To be submitted	

TECHNICAL SPECIFICATION

FOR

SMPS BASED BATTERY CHARGER

Prepared by <i>AA</i> AA	Reviewed by <i>GS</i> GS	Approved by <i>AA</i> AA	Rev	00
			Date	12 Apr 2019
			Page	1 of 11

INDEX

1	SCOPE OF SUPPLY.....	3
2	CODES & STANDARDS.....	3
3	SERVICE CONDITIONS	3
4	CHARGER DESIGN FEATURES	4
5	METERING, ANNUNCIATION & INDICATION.....	5
6	APPROVED MAKE OF COMPONENTS	7
7	MIMIC DIAGRAM, LABEL & FINISH.....	7
8	QUALITY ASSURANCE, INSPECTION & TESTING	8
9	DEVIATIONS.....	8
10	GTP	8
11	DRAWING AND DATA SUBMISSION MATRIX	9
12	PACKING	10
13	SHIPPING	11
14	HANDLING AND STORAGE	11

1 SCOPE OF SUPPLY

This specification covers the design, manufacturing, testing, supply, erection & commissioning of 220 VDC/ 50 VDC SMPS based 2X100% Float Cum Boost Charger at site for indoor installation with all necessary accessories associated with it.

2 CODES & STANDARDS

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

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

3 SERVICE CONDITIONS

3.1	Max Ambient Temperature	50 deg C
3.2	Max Daily average ambient temp	40 deg C
3.3	Min Ambient Temp	0 deg C
3.4	Maximum Humidity	95%
3.5	Minimum Humidity	10%
3.6	Maximum annual rainfall	750 mm
3.7	Average no of rainy days per annum	60

TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER

3.8	Rainy months	June to Oct
3.9	Altitude above MSL	300 M
3.10	Seismic Zone	IV

4 CHARGER DESIGN FEATURES

4.1	Type	SMPS Based
4.2	Rating	a. 70 A for 50 V b. 35 A for 220 V
4.3	Configuration	2X100% Float cum Boost Charger.
4.4	Incoming Supply	Provision of Two Incoming Supply with Auto Changeover Facility
4.5	Panel type	Metal enclosed frame construction
4.6	Overall Dimension	L - 1500 mm x D - 700 mm x H - 1900 mm
4.7	Cable Entry	Bottom
4.8	Location	Indoor, non air conditioned environment
4.9	Doors for front access	With anti theft hinge & handle
4.10	Cover for rear access	With Allen screw M6 size & handle
4.11	Construction	Sheet metal 2.0mm thick CRCA
4.12	Base frame	75mm ISMC
4.13	Lifting lugs	Four number
4.14	Gland plate	3mm metallic, un drilled & removable type
4.15	Enclosure protection	IP42 Minimum
4.16	Power terminal	Bus bar type, minimum 300mm above gland plate
4.17	Control terminal	Nylon66 with brass clamp
4.18	Bus bar	Tinned copper with insulation sleeve
4.19	Earth bus bar	Aluminum sized for rated fault duty for 1sec
4.20	Earth bus internal connection to all non current carrying metal parts	By copper flexible wire 2.5 sqmm
4.21	Earth bus external connection to owner earth	Al bus on both sides of panel with two holes for M10 bolt
4.22	Cooling	Natural ventilation without fan
4.23	Panel heater	Thermostatically controlled through MCB
4.24	Panel internal wiring	Multi strand flexible color coded PVC insulated copper wire 1.5 sqmm 1100volt grade with 1.5 sqmm ferruling (other than circuit wiring related to PCB cards)
4.25	Input isolation transformer	Dry type
4.26	Isolation & protection device	Mounted at height minimum 1000mm from bottom
4.26.1	MCCB	For charger input, output & battery input
4.26.2	Battery & test resistor load	Lockable change over switch with one position for charger, second for 'OFF' & third position for external test resistor.
4.27	Hardware (Nut, bolts & handle)	Stainless steel
4.28	Essential provision	Surge suppression, harmonic suppression, blocking

TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER

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

5 METERING, ANNUNCIATION & INDICATION

5.1	Ammeter (96x96mm)	Digital type, for AC input, DC output & battery current. Auxiliary supply for meters should be 48V to 230V AC/DC (Universal type)
5.2	Voltmeter (96x96mm)	Digital type, with selector switch for AC input, DC output & battery voltage. Auxiliary supply for meters should be 48V to 230V AC/DC (Universal type)
5.3	LED indication on panel front	
5.3.1	Status	
5.3.1.1	Input AC supply available on R,Y & B phase	Red/yellow/blue color LED
5.3.1.2	Float cum Boost charger AC MCCB 'ON'	Red color LED for each charger module
5.3.1.3	Charger output DC 'ON'	Red color LED for each charger module
5.3.1.4	Outgoing DCDB feeder ON	Red color LED for each other
5.3.2	Fault	

TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER

5.3.2.1	DC earth fault	Amber color LED
5.3.2.2	Battery MCCB OFF	Amber color LED
5.3.2.3	Charger output DC under/over voltage	Amber color LED
5.3.2.4	AC mains undervoltage	Amber color LED
5.4	Annunciation	Hooter with isolating switch for fault annunciation.
5.5	Potential free contacts for remote indication to be wired upto terminal block	<ul style="list-style-type: none"> a. AC under voltage b. AC over voltage c. CH-A AC MCCB trip/OFF d. CH-B AC MCCB trip/OFF e. CH-A Rect/Cond. fuse fail f. CH-B Rect/Cond. fuse fail g. CH-A DC MCCB trip/OFF h. CH-B DC MCCB trip/OFF i. Battery MCCB trip/OFF j. CH-A DC under voltage k. CH-B DC under voltage l. CH-A DC over voltage m. CH-B DC over voltage n. Battery DC under voltage o. Battery DC over voltage p. DC Bus over voltage q. DC Earth fault r. Battery Charger in boost mode
5.6	Microprocessor based monitoring unit cum controller	Charger should have a microprocessor based controller
5.6.1	Analog signals to be monitored by controller	<ul style="list-style-type: none"> a. AC Input Voltage and current b. DC output voltage and current for Charger -1 and Charger -2 c. Battery voltage and current
5.6.2	Alarms/Faults signals to be monitored by controller	<ul style="list-style-type: none"> a. AC under voltage b. AC over voltage c. CH-A AC MCCB trip/OFF d. CH-B AC MCCB trip/OFF e. CH-A Rect/Cond. fuse fail f. CH-B Rect/Cond. fuse fail g. CH-A DC MCCB trip/OFF h. CH-B DC MCCB trip/OFF i. Battery MCCB trip/OFF j. CH-A DC under voltage k. CH-B DC under voltage l. CH-A DC over voltage m. CH-B DC over voltage n. Battery DC under voltage o. Battery DC over voltage p. DC Bus over voltage q. DC Earth fault r. Battery Charger in boost mode

TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER

5.6.3	SCADA Interfacing	Microprocessor controller should have RS485 port capable of transmitting all analog and alarm/fault signal to RTU on open MODBUS protocol. Any hardware/software required to achieve the said compatibility shall be in bidder's scope.
5.6.4	Display	Backlit display capable of displaying all the analog and fault/alarm signals mentioned above.

6 APPROVED MAKE OF COMPONENTS

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

7 MIMIC DIAGRAM, LABEL & FINISH

7.1	Mimic diagram	To be provided
7.2	Name plate on panel front	
7.2.1	Material	Anodized aluminum 16SWG
7.2.2	Background	SATIN SILVER
7.2.3	Letter, diagram & boder	Black
7.2.4	Process	Etching
7.2.5	Name plate details	<ol style="list-style-type: none"> Manufacturer name Month & year of manufacture Equipment type Input & Output rating Owner name & order number Guarantee period Weight of panel Degree of protection Sr. No.
7.3	Labels for meters, indication & all cards / sub assemblies in panel	Anodized aluminum with white character on black background
7.4	Danger plate on front & rear side	Anodized aluminum with white letters on red background
7.5	Painting surface preparation	Shot blasting or chemical 7 tank process
7.6	Painting external finish	Powder coated polyester base grade A, shade –RAL 7032, uniform
7.7	Painting internal finish	Powder coated polyester base grade A, shade – white, uniform thickness 50 micron minimum

TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER

7.8	Labels for all components in panel	Anodized aluminum with white character on black background, fixed by rivets only
7.9	SLD	SLD of charges shall be provided at backside of the main door of Charger on Aluminium plate

8 QUALITY ASSURANCE, INSPECTION & TESTING

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

9 DEVIATIONS

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

10 GTP

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

11 DRAWING AND DATA SUBMISSION MATRIX

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

TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER

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

12 PACKING

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

TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER

12.6.3	PO number (along with SAP item code, if any) & date
12.6.4	Equipment Tag no. (if any)
12.6.5	Destination
12.6.6	Project Details
12.6.7	Manufacturer / Supplier's name
12.6.8	Address of Manufacturer / Supplier / it's agent
12.6.9	Description and Quantity
12.6.10	Country of origin
12.6.11	Month & year of Manufacturing
12.6.12	Case measurements
12.6.13	Gross and net weights in kilograms
12.6.14	All necessary slinging and stacking instructions

13 SHIPPING

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

14 HANDLING AND STORAGE

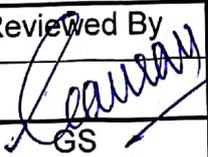
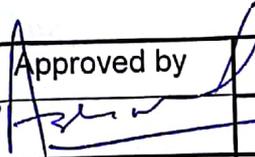
14.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
------	----------------------	---

TECHNICAL SPECIFICATION

FOR

50VDC/220VDC

DISTRIBUTION BOARD

Prepared by	Reviewed By	Approved by	Rev	00
 AH	 GS	 AA	Date	07 th Aug 2018
			Page	1 of 16

TECHNICAL SPECIFICATION FOR DCDB

INDEX

1	SCOPE.....	3
2	STANDARDS AND CODES.....	3
3	SERVICE CONDITION.....	3
4	CONSTRUCTION.....	4
5	CONFIGURATION	5
6	BUSBARS.....	6
7	TERMINALS AND WIRING.....	6
8	METERS, INDICATIONS, PUSH BUTTONS & HEATERS	7
9	NAME PLATES & MARKINGS.....	7
10	FINISH.....	8
11	APPROVED MAKES OF COMPONENTS	8
12	INSPECTION AND TESTING	9
13	PACKING, SHIPPING, HANDLING AND SITE SUPPORT	9
14	DEVIATIONS.....	10
15	DOCUMENT SUBMISSION	10
16	GUARANTEED TECHNICAL PARTICULARS	11

TECHNICAL SPECIFICATION FOR DCDB**1 SCOPE**

This specification covers the design, engineering, manufacture, assembly and testing at Manufacturer's works and supply of 220 VDC/50 VDC Distribution board (DCDB) along with all hardware and accessories required for installation and operation.

2 STANDARDS AND CODES

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

3 SERVICE CONDITION

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

TECHNICAL SPECIFICATION FOR DCDB

4 CONSTRUCTION

4.1	General construction	It shall be free-standing type comprising dust-tight and vermin-proof sheet steel cabinets suitable for indoor installation with IP-54 degree of protection. Necessary busbar support insulators, cable glands, cable supports and terminal blocks etc. The board shall preferably be of single front type.
4.2	Material	The Board shall be made cold rolled steel sheet having Thickness of 2.5 mm of load bearing member and 2 mm for Doors and covers , suitably reinforced to provide flat level surfaces. No welds, rivets, hinges or bolts shall be visible from outside.
4.3	Equipment Mounting	All switches provided on the distribution board shall be on front side of the cabinets, operable from outside. All instruments and control devices shall be mounted on the front of cabinets and fully wired to the terminal blocks.
4.4	Busbar housing	The busbars shall be housed in totally enclosed busbar chambers. Incoming connections from the busbar to various feeders shall be designed so as not to disturb cable connections. Busbar arrangement should ensure safety of the operation/maintenance personnel and facilitate working on any outgoing module without the need for switching off in-feed to the adjacent modules, as far as possible
4.5	Cable alleys	A cable alley preferably 230 mm wide shall be provided in each vertical section for taking cables into the compartments. Cable alleys shall be provided on sides of busbar chamber.
4.6	Cable entry	Cable entry should be from bottom
4.7	Cable glands	Compression type cable glands shall be provided to hold the cables to avoid any pressure or tension on the terminal block connections.
4.8	Gland Plate	Gland plate shall be 3.0mm thick.
4.9	Doors	The doors of cabinets shall be lockable and shall be fitted with double lipped gaskets.
4.10	Gasket	All doors, removable covers and panels shall be gasketed all around with neoprene gaskets. Gaskets shall be embedded through machine only.
4.11	Ventilating louvers	Ventilating louvers shall have screens and filters. The screens shall be made of either brass or GI wires mesh.
4.12	Foundation	The panels shall be fixed on the embedded foundation channels with intervening layers anti vibration strips made of shock absorbing materials.
4.13	Base Frame	Base frames shall be supplied along with panels. 100mm channel painted black.

TECHNICAL SPECIFICATION FOR DCDB

4.14	Mounting	Equipment on front of panel shall be flush mounted. No equipment shall be mounted on the doors.
4.15	Working level	The center lines of switches, push buttons and indicating lamps shall not be less than 750mm and higher than 1600mm from panel base.
4.16	Dimension	500(L)X500(D)X1800(H) mm ³

5 CONFIGURATION

5.1	Incomers	One incomers having Double Pole DC MCB with Aux Switch.		
5.2	Outgoing feeders	All outgoing feeders shall have MCB. Number of outgoing feeders shall be as per table attached		
Application		No of Poles	Rating of DP MCB(In Amp)	Quantity
Incomer		2	100	1
Emergency Lighting DB		2	32	1
Fire Alarm System		2	32	1
SCADA		2	32	2
CRP		2	32	4
11 kV Switchgear		2	32	4
Testing Purpose		2	32	1
NIFPS		2	32	4
Spare 1		2	100	1
Spare 2		2	32	8

TECHNICAL SPECIFICATION FOR DCDB

6 BUSBARS

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

7 TERMINALS AND WIRING

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

TECHNICAL SPECIFICATION FOR DCDB

8 METERS, INDICATIONS, PUSH BUTTONS & HEATERS

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

9 NAME PLATES & MARKINGS

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

TECHNICAL SPECIFICATION FOR DCDB

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

10 FINISH

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

11 APPROVED MAKES OF COMPONENTS

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

TECHNICAL SPECIFICATION FOR DCDB**12 INSPECTION AND TESTING**

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

13 PACKING, SHIPPING, HANDLING AND SITE SUPPORT

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

TECHNICAL SPECIFICATION FOR DCDB

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

14 DEVIATIONS

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

15 DOCUMENT SUBMISSION

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

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

TECHNICAL SPECIFICATION FOR DCDB

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

16 GUARANTEED TECHNICAL PARTICULARS

S. No.	Description	Specification requirement	Bidder's Data
16.1	GENERAL FEATURES		
16.1.1	Make		
16.1.2	Type		
16.1.3	Reference Standard		
16.1.4	Rated Operational voltage	220 VDC/50 VDC	
16.1.5	Rated Nominal Current	100	

TECHNICAL SPECIFICATION FOR DCDB

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

TECHNICAL SPECIFICATION FOR DCDB

16.2	MCB		
16.2.1	Make	Datar/Legrand/Hager/Schneider/ABB	
16.2.2	Incomer	100A	
16.2.3	Emergency Lighting DB	32A	
16.2.4	Fire Alarm System	32A	
16.2.5	SCADA	32A	
16.2.6	CRP	32A	
16.2.7	11 kV Switchgear	32A	
16.2.8	Testing Purpose	32A	
16.2.9	NIFPS	32A	
16.2.10	Spare 1	32A	
16.2.11	Spare 2	32A	
16.3	BUS AND BUS TAPS		
16.3.1	Make		
16.3.2	Material	Tinned electrolytic copper or Aluminium	
16.3.3	Reference standard		
16.3.4	Continuous Current (at site condition, 50°C ambient) within cubicle		
16.3.5	Short Circuit withstand Current for 1 sec	15 KA	
16.3.6	Cross sectional Area		
16.3.7	DC resistance	ohm/m/ph	
16.3.8	Reactance	ohm/m/ph	
16.3.9	Losses-middle phase	w/m/ph	
16.3.10	Minimum clearance of bus bar and joints	Required	

TECHNICAL SPECIFICATION FOR DCDB

16.3.11	Phase to phase (mm)		
16.3.12	Phase to earth (mm)		
16.3.13	Bus bar insulation	i. Heat shrinkable sleeves rated for maximum operating voltage	
		ii. Cast resin shrouds for joint	
16.3.14	Bus joints	Silver	
16.3.15	Bus bar support insulator	Required	
16.3.16	Spacing (mm)		
16.3.17	Make		
16.3.18	Type		
16.3.19	Reference standard		
16.3.20	Voltage class (kV)		
16.3.21	Minimum creepage distance (mm)		
16.3.22	Cantilever strength (Kg/sq.cm.)		
16.4	Wiring and Terminals		
16.4.1	Wiring		
a	Grade and type	1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.	
b	Ferruling	Each wire shall bear an identifying ferrule or tag at each end or connecting point.	
c	Spare	20% Spare Wiring	
16.4.2	Terminals		
a	Grade	1100 V grade, moulded piece terminals complete with insulated barriers, washers, nuts and lock nuts.	
b	Power Terminals type	Stud type, nut driver operated	
c	Control terminals type	Stud type, screw driver operated	
d	Spare terminals	20% spare	
e	Accessibility	Placement of terminals shall enable proper cable termination. Terminals shall be readily accessible for inspection and maintenance.	
f	Marking	The terminals shall be serially numbered to facilitate installation and maintenance.	
16.5	METERS, INDICATIONS, PUSH BUTTONS & HEATERS		

TECHNICAL SPECIFICATION FOR DCDB

16.5.1	Ammeter	DC Moving coil ammeter of size 96 sq.mm. with external shunt. Rating of Ammeter shall be 0-100A DC.	
a	Model No Ammeter		
b	Make of Ammeter		
16.5.2	Voltmeter	DC Moving coil voltmeter of size 96.sq.mm to read the DC Bus voltage. Rating of Voltmeter shall be 0-300VDC	
a	Model No Voltmeter		
b	Make of Voltmeter	Rishabh/Schneider/AE	
c	Type	Digital type	
16.5.3	Indicating lamps	Cluster LED type.	
a	Make of Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S	
b	Incomer/ Outgoing On	Red	
c	Incomer/ Outgoing Off	Green	
d	Incomer/ Outgoing Trip	Amber	
e	Push buttons Make	L&T/Siemens/Vaishno/Schneider	
16.5.4	Heaters	Cubicle space heater having rating of 100W. Thermostat for space heater shall be provided with temperature range 0-90 ⁰	
16.5.5	CFL	Cubicle lamp shall be provided in DCDB having rating of 11 W.	
16.6	NAME PLATES & MARKINGS		
a	Panel nameplate	Panel Serial No.-	
b		Customer Name - BSES Yamuna Power Ltd	
c		PO No. & date -	
d		Type of Panel -	
e		Current rating -	
f		Guarantee period -	

TECHNICAL SPECIFICATION FOR DCDB

16.6.1	Feeder nameplate	As per Spec	
a	Equipment nameplate	As per Spec	
b	Material	As per Spec	
c	Fixing	As per Spec	
d	Markings	As per Spec	
16.7	FINISH		
a	Primer	Two coats	
b	Paint	Two finishing coats of epoxy based paint of Shade RAL 7032 with glossy finish.	
c	Paint thickness	50 microns (minimum)	

TECHNICAL SPECIFICATION
FOR
50 V & 220 V
LI-ION BATTERY BANK

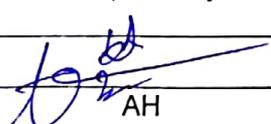
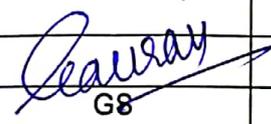
Prepared by	Reviewed by	Approved by	Page 1 of 10	
 AH	 GS	 AA	Rev	00
			Date	11 Apr 2019

TABLE OF CONTENT

1.0	SCOPE	3
2.0	CODES & STANDARDS	3
3.0	SERVICE CONDITIONS	3
4.0	DC DISTRIBUTION SYSTEM DATA	3
5.0	GENERAL FEATURES.....	4
6.0	BATTERY MANAGEMENT SYSTEM	5
7.0	CABINET	6
8.0	EQUIPMENT LIST	6
9.0	INSPECTION & TESTING	7
10.0	GTP	7
11.0	DEVIATIONS	7
12.0	DRAWING AND DATA SUBMISSION MATRIX	7
13.0	PACKING.....	9
14.0	SHIPPING.....	10
15.0	HANDLING AND STORAGE	10
16.0	QUALITY AND ASSURANCE	10

TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK

1.0 SCOPE

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

2.0 CODES & STANDARDS

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

Standard Name / No	Standard's Description
Indian Electricity Act	Latest Edition
CBIP manual	Latest Edition
IEC 62281	Safety of primary and secondary lithium cells and batteries during transport
UL 1642	Individual cell compliance
UL 1973	Battery module complies

3.0 SERVICE CONDITIONS

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

4.0 DC DISTRIBUTION SYSTEM DATA

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

TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK
5.0 GENERAL FEATURES

5.1	Number of Modules	6 (Maximum)
5.2	Connection of Modules	Parallel
5.3	DC battery bank Ah rating	300 Ah for 50 V / 150 Ah for 220 V
5.4	Voltage Output	50V / 220 V
5.5	Battery Efficiency	>90%
5.6	Gas Evolution from Battery	None
5.7	DC load curve	With High discharge characteristics.
5.8	Location of Module	Indoor
5.9	Ingress Protection	IP 4X
5.10	Installation	On cabinet, painted with anti corrosive paint.
5.11	Battery type	Li Ion Battery
5.12	Cell Chemistry	Nickel Cobalt Manganese
5.13	Battery lifting/withdrawing arrangement	Suitable arrangement on Module
5.14	Battery Module marking	PO Number and Date, Customer Name- BSES Yamuna Power Limited, Manufacturer name, month & year of manufacturer, Warranty Period, Nominal voltage, rated Ah capacity & cell number , Customer Care Number
5.15	Terminal polarity marking	Positive & negative marked on Module
5.16	Battery cell shorting metal links	Nickel plated copper with protective insulating sleeve
5.17	Insulating shrouds	For all battery terminals & shorting links
5.18	Insulating pads for battery rack	At the bottom of rack supports, made from high impact material
5.19	Battery suitable for Ripple content	5% minimum in DC charger output
5.20	Key parameters	Design capacity, full charge capacity, remaining capacity, state of charge, state of health, cycle count, total voltage, current, max cell voltage, min cell voltage, max cell temp, min cell temp, max FET temp., Life Cycle, Charging Current

6.0 BATTERY MANAGEMENT SYSTEM

Module must comprise BMS(Battery Management System) which monitors battery internal vital parameters, measures and displays various alarms/warnings; establish a communication link with the external system i.e. Charger, SCADA..Commissioning and communication of the module with SCADA shall also be in Vendor's scope.

6.1	Communication	
6.1.1	Protocol For SCADA Interface	Modbus
6.1.2	Port	RS-485
6.1.3	Key Battery Parameters to be Integrated With SCADA	Design Capacity (DC)
6.1.4		Full Charge Capacity (FCC)
6.1.5		Remaining Capacity (RC)
6.1.6		State of Charge (SOC)
6.1.7		State of Health (SOH)
6.1.8		Cycle Count
6.1.9		Total Voltage
6.1.10		Current
6.1.11		Life Cycle
6.1.12		Charging Current
6.1.13		Max. Cell Voltage
6.1.14		Min. Cell Voltage
6.1.15		Max. Cell Temperature
6.1.16		Min. Cell Temperature
6.1.17	Max. FET Temperature	
6.1.18	Status LED	Dual color type
6.1.19	SOC LED	Dual color type
6.1.20	In-built data logging	Upto 6 months
6.1.21	Protection feedback to SCADA	From S.No 6.2.7 to 6.2.13
6.2	Safety Feature	
6.2.1	Module reverse polarity protection	
6.2.2	Internal fuse	
6.2.3	Controllable internal fuse	
6.2.4	Protective terminal covering to avoid unintentional contact	
6.2.5	Secondary level hardware protection for overvoltage	
6.2.6	Heat propagation resistant cell holding structure	
6.2.7	Overvoltage protection	
6.2.8	Under voltage protection	

TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK

6.2.9	Over charging current protection
6.2.10	Over discharge current protection
6.2.11	Over temperature during discharge protection
6.2.12	Over temp during charge protection
6.2.13	Over internal FET temp protection
6.3	Arrangement for Bypassing the BMS

7.0 CABINET

7.1	Panel Type	Simplex panel with Dimension 0.6x0.6 x1.4 m ³ Max.
7.2	Pocket	Pocket for Drawing is required
7.3	Display	Local Display on Cabinet shall be provided having key battery Parameter
7.4	Ingress Protection	IP4X in accordance with IS 13947
7.5	Cooling	Natural
7.6	Enclosure material	Pre-galvanized, cold-rolled sheet steel of thickness not less than 2.0 mm. Stiffeners shall be provided wherever necessary.
7.7	Doors	Double leaf doors shall be provided at the rear. Doors shall have handles with built-in locking facility
7.8	Gland Plate	At least two separate gland plates of removable type with gasket shall be provided for each panel. They shall be of sheet steel of thickness not less than 3.0 mm.
7.9	Gaskets	All doors, removable covers and panels shall be Gasketed all around with neoprene gaskets
7.10	Foundation	The panels shall be fixed on the embedded foundation channels with intervening layers anti vibration strips made of shock absorbing materials
7.11	Base Frame	Base frames shall be supplied along with panels.

8.0 EQUIPMENT LIST

8.1	Battery Cabinet
8.2	Battery Module
8.3	Communication cable
8.4	DC power cable
8.5	Cable terminal block/bus-bar
8.6	Earth cable

TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK

8.7	Tools and Accessories for Maintenance
8.8	Mandatory and Recommended Spares if Any

9.0 INSPECTION & TESTING

9.1	Type test	Equipment shall be type tested from CPRI/ERDA/NABL accredited lab as per IEC/IS/UL standard.
9.2	Routine test	As per relevant standard
9.3	Acceptance test	To be performed in presence of Owner at manufacturer works shall be as per approved QAP
9.4	Heating Compliance	JIS C8712
9.5	ROHS Compliance	Required

10.0 GTP

Vendor Must Submit clause wise compliance against specification at the time of drawing approval.

11.0 DEVIATIONS

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

12.0 DRAWING AND DATA SUBMISSION MATRIX

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
12.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
12.2	Deviation Sheet (as per "Deviations" Clause)	Required			
12.3	GTP		Required		
12.4	Relevant Type Test as per IS/IEC/UL	Required	Required		

TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK

12.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
12.6	Sizing Calculation of Associated Equipment		Required		
12.7	Recommended Spares for five years of operation)		Required		
12.8	Li Ion drawing				
12.8.1	General Arrangement	Required	Required		
12.8.2	Sectional Layout		Required		
12.8.3	Cabinet Layout		Required		
12.8.4	Battery Layout		Required		
12.8.5	SLD	Required	Required		
12.8.6	Schematic Circuit diagram and Scheme of Each type of Panel		Required		
12.8.7	Communication Architecture		Required		
12.8.8	QAP		Required		
12.8.9	BOQ		Required		
12.8.10	Plan		Required		
12.8.11	Foundation Diagram		Required		
12.8.12	Make of all Component as per specification		Required		
12.8.13	Drawing of Substation Room		Required		
12.9	Installation, erection and commissioning manual		Required		
12.10	Inspection Reports			Required	
12.11	As manufacturing Drawings			Required	
12.12	Operation and Maintenance Manual			Required	
12.13	Trouble shooting manual			Required	
12.14	As built Drawings				Required

13.0 PACKING

13.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
13.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
13.3	Packing Identification Label to be provided on each packing case with the following details	
13.3.1	Individual serial number	
13.3.2	Purchaser's name	
13.3.3	PO number (along with SAP item code, if any) & date	
13.3.4	Equipment Tag no. (if any)	
13.3.5	Destination	
13.3.6	Project Details	
13.3.7	Manufacturer / Supplier's name	
13.3.8	Address of Manufacturer / Supplier / it's agent	
13.3.9	Description and Quantity	
13.3.10	Country of origin	
13.3.11	Month & year of Manufacturing	
13.3.12	Case measurements	
13.3.13	Gross and net weights in kilograms	
13.3.14	All necessary slinging and stacking instructions	

TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK**14.0 SHIPPING**

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

15.0 HANDLING AND STORAGE

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

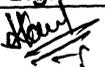
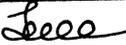
16.0 QUALITY AND ASSURANCE

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

BSES

Specification Of Control Cables

Specification no : SP-EWLP-01-R1

Prepared by		Approved by		Revision	Date
Name	Sign.	Name	Sign.		
Hemanshi Kaul		K Sheshadri		01	23, April'2012

Index

1. General specification	3-7
2. Annexure A : Scope & Project specific details	8
3. Annexure B : General Technical Particulars.....	9-10

General Specification

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

National Standards

Indian Standards	
IS- 1554 Part-1	PVC insulated Cables
IS- 5831 : 1984	PVC insulation & sheath of electric cables.
IS- 10810 : 1984	Methods of test for cables.
IS- 8130 : 1984	Conductors for insulated electric cables and flexible cords.
IS- 3975 : 1999	Mild steel wires, formed wires and tapes for armoring of cables.

International Standards

IEC 60228 Ed.3.0 b	Conductors of insulated cables.
IEC 60332-3-21 Ed.1.0 b	Tests on electric cables under fire conditions. Part 3-21. Tests on bunched wires or cables.
IEC 60502-1 Ed. 2.1 b	Power cables with extruded insulation and their accessories for rated voltage from 1kV upto 30kV –Part 1: cables for rated voltages of 1kV and 3kV
IEC 60811	Common test methods for insulating and sheathing materials of electric cables.
IEC 60885 Ed.1.0 b	Electric test methods for electric cables.
IEC 60227	PVC insulated cables of rated voltages up to and including 450/750 V.
IEC 60028 Ed. 2.0 b	International Standard of Resistance for Copper

2.0.0	Cable construction Features	Size & dimensions of each item mentioned under this clause shall be followed as detailed out in GTP, refer Annexure B
2.1.1	Conductor	
	Stranded, plain copper, circular	Shall be made from high conductivity copper rods
2.1.2	Insulation	Extruded PVC Insulation Type A as per IS 5831
2.1.3	Core Identification	As per Cl.10.1 (f) of IS-1554 Part-1
2.1.4	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 as per IS 5831
2.1.5	Armour	a) As per Cl 13.2 of IS 1554 Part-1: Galvanized steel round wire armour. b) Minimum area of coverage of armouring shall be 90 %.
2.1.6	Outer Sheath	a) Extruded outer sheath of PVC type ST-2 as per IS 5831 b) Colour : Black d) The Outer Sheath shall be embossed with: d-1 : The voltage designation d-2 : Type of construction / cable code (for e.g. AYWY) d-3 : Manufacturers Name or Trade mark d-4 : Number of Cores and nominal cross sectional area of conductors

	Continue...Outer Sheath	d-5 : The drum progressive length of cable at every metre.
		d-6 : Name of buyer i.e. BSES
		d-7 : Month & Year of Manufacturing
		d-8: P.O.No. and P.O.Date
2.1.7	Sealing of Cable end	Both ends of the cable shall be sealed with PVC Cap.
4.0.0	Testing & Inspection	Tests shall be carried out in accordance with IEC / IS standards.
		a) Routine Test: As per IS 1554 part -1
		b) Type Test
		b-1: Cables must be of type tested quality . Type test reports shall be submitted for the type, size & rating of cable offered along with bid.
		b-2 : If the manufacturer's lab is accredited by govt. /authorised body then it shall be acceptable for type testing.
		b-3 : Type test on one cable drum of each rating and type , from first lot, shall be conducted at Govt. approved / Internationally accredited labs.
		c) Acceptance test : Shall be conducted as per IS 1554 Part-1 for each lot of cable
		c1) A minimum of two samples per Purchase order shall be drawn after receipt of cable in BSES stores for chemical composition and purity test of aluminium. Bidder to bear cost of test.
		d) Inspection
		d-1 :The Buyer reserves the right to witness all tests specified on completed cables
		d-2 : The Buyer reserves the right to inspect cables at the Sellers works at any time prior to dispatch, to prove compliance with the specifications.
		d-3 : In-process and final inspection call intimation shall be given in advance to purchaser.
		e) Test certificates: Three sets of complete test certificates (routine & acceptance tests) need to be submitted along with the delivery of cables.

5.0.0	Drawing, Data & Manuals	
5.0.1	To be submitted along with bid	The seller has to submit: a) Cross section drawing of cable b) Completely filled GTP c) Type test certificates d) Complete cable catalogue and Manual along with the bid.
5.0.2	After award of contract	Within 15 days, the seller has to submit four sets of above-mentioned drawings for buyer's approval.
5.0.3	Final As Built	6 sets hardcopy + One Soft copy of all documents including type test certificates
6.0.0	Drum Length & tolerance	500+ - 5% Mtr.
6.0.1	Overall tolerance in cable Length	- 2 %
6.0.2	Short length of cables	a) Minimum acceptable short length shall be above 100 Mtrs. Manufacturer shall be required to take prior approval from Engineering for any short length supply. b) Manufacturer shall not be allowed to put two cable pieces of different short lengths in same cable drum.
7.0.0	Packing, Shipping, Handling & Storage	
	a) Drum Identification Labels	
		a-1 Drum identification number
		a-2 Cable voltage grade
		a-3 Cable code (e.g. YWY)
		a-4 Number of cores and cross sectional area
		a-5 Cable quantity (Metres)
		a-6 Purchase order number and SAP item code
		a-7 : Total weight of cable and drum (kg)
		a-8 : Manufacturer's & Buyer's name
		a-9 : Month & Year of Manufacturing
		a-10 : Direction of rotation of drum
		a-11 : Cable length initial reading & end reading shall be marked on drum. Cable starting end shall be taken out from winding to read this drum reading with proper sealing to protect against external damage.
	b) Shipping information	The seller shall give complete shipping information

		concerning the weight, size of each package.
	c) Transit damage	The seller shall be held responsible for all transit damage due to improper packing.
	d) Type of Drum	Wooden drums with anti termite treatment. (The drums shall be with M.S. spindle plate with nut-bolts)
8.0.0	Quality Assurance	
8.0.1	Vendor quality plan	To be submitted for purchaser approval
8.0.2	Inspection points	To be mutually identified & agreed in quality plan
9.0.0	Progress reporting	
9.0.1	Outline Document	To be submitted for purchaser approval for outline of production, inspection, testing, inspection, packing, dispatch, documentation programme
9.0.2	Detailed Progress report	To be submitted to Purchaser once a month containing <ul style="list-style-type: none"> i) Progress on material procurement ii) Progress on fabrication (As applicable) iii) Progress on assembly (As applicable) iv) Progress on internal stage inspection v) Reason for any delay in total programme vi) Details of test failures if any in manufacturing stages vii) Progress on final box up Constraints / Forward path
10.0.0	Deviation	a) Deviations from this specification are only acceptable where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and the Buyer has accepted, in writing, the deviations before the order is placed.
		b) In the absence of a list of deviations, it will be assumed by the Buyer that the Seller complies fully with this specification.

Annexure – A**Scope & Project Specific Details****1.0.0 Scope**

1.0.0	Scope	Design, manufacture, testing & supply of Control cables
2.0.0	Delivery Schedule	To be filled up as per purchase requisition.

2.0.0 Document Submission

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

	Along with offer	For Approval after award of contract	Final approval after	Remarks
Drawings	2 copies (Typical drgs)	2 copies	2 copies + 1 soft copy in CD	See Clause 5.0.0 for details of required drawings
Calculations	2 copies (Typical)	2 copies		
Catalogues	1 copy			
Type Test Report	2 copies			Type test and sample routine test reports

Annexure- B**GUARANTEED TECHNICAL PARTICULARS**

(Standard Cable sizes are 4c x2.5, 8c x 2.5, 12c x2.5, 16c x 2.5, 19 c x 2.5, 27c x 2.5 Sqmm & 4c x 4, 8c x 4, 10c x 4 Sqmm)

For each size separate GTP need to be furnished

Sr.	Description	Buyer's requirement	Seller's data
	Purchase Req. No.	....
	Guarantee Period: 5 Years	60/66 Months	
1.0	Make	....
2.0	Type (AS PER IS 1554 part -1)	YWY	
3.0	Voltage Grade (KV)	1.1	
4.0	Maximum Conductor temperature		
A	Continuos (° C)	70°C	
B	Short time (° C)	160°C	
5.0	Conductor		
A	Size (mm ²)	2.5 / 4 sq mm	
B	No. of wires in each conductor Nos.	As per Manufacturer standard	
C	Dia. of wires in each conductor before compaction (mm)	As per Manufacturer standard	
D	Shape of Conductor	As per Cl.2.1.1 of specification	
E	Diameter over conductor mm	....
F	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
6.0	Insulation	As per Table 1 of IS:5831 – 1984	
A	Nominal thickness (mm)	As per Cl.2.1.2 of specification & Table 2 of IS 1554(Part-1)	
B	Minimum thickness (mm)		
C	Core Identification	As per Cl.10.1 (f) of IS: 1554 (Part-1)	
D	Diameter over Insulation (mm) Approx.	....
7.0	Inner Sheath	As per Table 2 of IS:5831 – 1984	
A	Minimum thickness (mm)	As per Table 4 of IS 1554(Part-1)	

B	Approx. dia. Over sheath (mm)- Apprx.	....
8.0	Galvanised Steel Armour	As per Cl 2.1.5 of specification	
A	Number of armour wire	As per Manufacturer Std.	
B	Nominal Dia of Round Wire	As per Table 5 of IS 1554(Part-1)	
C	Dia. over Armour – Apprx.	....
D	Lay Ratio	....
E	Confirm minimum 90% coverage (submit calculation)		
9.0	Outer Sheath	As per Table 2 of IS:5831 – 1984	
A	Thickness (Minimum)	As per Table 7 of IS 1554(Part-1)	
B	Colour	Black	
10.0	Approx. overall dia. (mm)	....
11.0	Drum Length & tolerance	As per Spec.Cl. 6.0.0	
12.0	End Cap	Required	
13.0	Drums provide with MS Spindle plate & Nut bolts arrangement	Required	
14.0	Net Weight of cable (Kg/Km.) – Apprx.	....
15.0	Continuous current rating for standard I.S. condition laid Direct		
	a) In ground 30° C Amps	....
	b) In duct 30° C Amps	....
	c) In Air 40° C Amps	....
16.0	Short circuit current for 1 sec of conductor. (KAmp)	....
17.0	Electrical Parameters at Maximum Operating temperature:		
A	Resistance (Ohm/Km) (AC Resistance)	....
B	Reactance at 50 C/s (Ohm/Km )	....
C	Impedance (Ohm/Km )	....
D	Capacitance (Micro farad / KM)	....
18.0	Recommended minimum bending radius	.... x O/D	

**TECHNICAL SPECIFICATION
FOR
LT POWER CABLE
(Single & Multi-Core)
Specification No. : SP-LTPC-63-R0**

PREPARED BY	REVIEWED BY	APPROVED BY	REV	00
Ankita Arora	Gaurav Sharma	Devender Sharma	DATE	August 19, 2015
<i>Ankita</i>	<i>Gaurav</i>	<i>Devender</i>	PAGE	1 of 35

INDEX

1. SCOPE OF SUPPLY.....	3
2. CODES & STANDARDS.....	3
3. CABLE DESIGN.....	4
4. CABLE DRUM.....	6
5. PACKING, SHIPPING, HANDLING & STORAGE.....	8
6. QUALITY ASSURANCE, TESTING & INSPECTION.....	8
7. DRAWING, DATA & MANUALS.....	9
8. PROGRESS REPORTING.....	10
9. DEVIATION.....	10
10. TECHNICAL PARTICULARS.....	10
11. ANNEXURE - A: SCOPE & PROJECT SPECIFIC DETAILS.....	11
12. ANNEXURE - B: GTP (MULTI-CORE CABLE).....	12
13. ANNEXURE - C: GTP (SINGLE CORE CABLE).....	17
14. ANNEXURE - D: ARMOUR COVERAGE PERCENTAGE	21
15. ANNEXURE – E: QUALITY ASSURANCE PLAN.....	22
16. ANNEXURE - F: LIST of SUB-VENDORS.....	35

TECHNICAL SPECIFICATION FOR LT POWER CABLE**1.0 SCOPE OF SUPPLY**

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

2.0 CODES & STANDARDS

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

2.1	IS- 7098 (Part-1)	Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V.
2.2	IS- 6474	Polyethylene insulation & sheath of electric cables.
2.3	IS- 5831	PVC insulation and sheath of electrical cables.
2.4	IS : 10810	Methods of tests for cables.
2.5	IS : 8130	Conductors for insulated electrical cables and flexible cords.
2.6	IS : 3975	Low carbon galvanized steel wires, formed wires and tapes for armouring of cables.
2.7	IS- 4026	Aluminum ingots, billets and wire bars (EC grade)
2.8	IS-5484	EC Grade aluminium rod produced by continuous casting and rolling
2.9	IS : 10418	Specification for drums for electric cables.
2.10	IS : 3961	Recommended current ratings for cables.
2.11	IS:1255	Installation and Maintenance of power cables upto and including 33 kV rating.
2.12	IS:4826	Specification for hot-dipped galvanized coatings on round steel wires
2.13	IS:1717	Metallic Materials – Wire – Simple torsion test
2.14	IEC 60228	Conductors of insulated cables. Guide to the dimensional limits of circular conductors.
2.15	IEC 60331	Fire resisting characteristics of electric cables.
2.16	IEC 60332 - 3	Tests on electric cables under fire conditions. Part 3: Tests on bunched wires or cables.

TECHNICAL SPECIFICATION FOR LT POWER CABLE

2.17	IEC 60502	Extruded solid dielectric insulated power cables for rated voltages from 1kV to 30 kV.
2.18	IEC 60754 - 1	Test on gases evolved during combustion of materials from cables. Part 1: Determination of the amount of halogen acid gas evolved during combustion of polymeric material taken from cables.
2.19	IEC 60811	Common test methods for insulating and sheathing materials of electric cables.
2.20	IEC 60885	Electric test methods for electric cables.
2.21	IEC 60304	Standard colours for insulation for low frequency cables and wires.
2.22	IEC 60227	PVC insulated cables of rated voltages up to and including 450/750 V.
2.23	IEC 1034	Measurement of smoke density of electric cables burning under defined conditions.

3.0 CABLE DESIGN

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

3.1	Conductor	<ul style="list-style-type: none">a) Electrolytic Grade Stranded Aluminium Conductorb) Grade: H2 as per IS:8130/1984c) Class 2d) Chemical composition as per IS 4026e) Shape :<ul style="list-style-type: none">i) Compacted Circular for sizes up to 16 sqmm and for Single core cables.ii) Sector shaped for sizes above 25Sqmm
3.2	Insulation	Extruded XLPE Insulation as per IS:7098 Part-1
3.3	Core Identification	As per Cl.10 of IS 7098 Part-1

TECHNICAL SPECIFICATION FOR LT POWER CABLE

3.4	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 (IS:5831-1984)
3.5	Armour	<ul style="list-style-type: none">a) For 2CX10Sqmm - Galvanized Steel Wireb) For all sizes above 10Sqmm – Galvanized Steel Strip.c) Not applicable for Single core cables of sizes i.e. 500 & 630 sqmmd) Minimum area of coverage of armouring shall be 90%e) The breaking load of armour joint shall not be less than 95% of that of armour wire/strip.f) Zero negative tolerance for thickness of armour strip shall be as per IS:3975.g) Zinc rich paint shall be applied on strip/wire and its joint surface.
3.6	Outer Sheath	<ul style="list-style-type: none">a) Extruded outer sheath of PVC (ST-2) shall be as per IS:5831.b) Colour : Yellow (For Multi core cables) Black (For Single core 500 /630 Sqmm)c) Outer sheath of all the LT cables shall be UV resistant; as these cables are laid in air exposed to sun. Bidder to ensure the same for these requirements supported by required test.d) Shape of the cable over the outer sheath shall be circular, when manufactured /completed. <p>Regular Ovality check shall be carried out at Factory, to detect any abnormality. Manufacturing quality shall be such that cable will retain its circular shape, even after it is laid at site.</p>

TECHNICAL SPECIFICATION FOR LT POWER CABLE

		<p>e) The Outer Sheath shall be embossed with following minimum text:</p> <p>(i) The voltage designation</p> <p>(ii) Type of construction / cable code (for e.g. A2XFY)</p> <p>(iii) Manufacturers Name / Trade mark</p> <p>(iv) Number of Cores and nominal cross sectional area of conductor.</p> <p>(v) Progressive (Sequential) length of cable at every meter, starting from zero for every drum. Colour filled in for the progressive marking, shall be with proper contrast in colouring.</p> <p>(vi) Name of buyer i.e. BYPL (BSES Yamuna Power Limited)</p> <p>(vii) Month & Year of Manufacturing</p> <p>(viii) IS reference, i.e. IS:7098</p> <p>(ix) P.O No. and Date</p> <p>(x) Font size shall be 5/5mm</p> <p>(xi) ISI mark</p> <p>The embossing shall be progressive, automatic, in line and marking shall be legible and indelible.</p>
3.7	Bending Radius	Bending Radius of cable shall comply to IS:1255.
3.8	Sealing of Cable end	Both ends of the cable shall be sealed by means of non-hygroscopic heat shrinkable HDPE caps.

4.0 CABLE DRUM

4.1	Reference Standard	Cable drums shall comply with IS: 10418.
4.2	Type of Drum	Wooden drums with anti termite treatment. (The drums shall be provided with M.S. spindle plate and nut-bolts arrangement as per IS:10418).

TECHNICAL SPECIFICATION FOR LT POWER CABLE

4.3	Drum Length & Tolerance	500 +/- 5% Mtr
4.4	Overall Tolerance	+/-2 % for the total cable length for the entire order.
4.5	Short Length of Cables	<p>a) Minimum acceptable short length shall be 1% of the total ordered quantity and no length shall be less than 250Mtrs. Manufacturer shall be required to take prior approval from Engineering for any short length supply. Short length will be accepted in last lot.</p> <p>b) Manufacturer shall not be allowed to put two cable pieces of different short lengths in same cable drum.</p>
4.6	Preventive Measure for Cable Drum	<p>a) The surface of the drum and the outer most cable layer shall be covered with water proof layer.</p> <p>b) Ferrous part of wooden drum shall be treated with suitable rust preventive paint/coating to minimize rusting during storage.</p>
4.7	Drum Identification Labels	<p>a) Drum identification number</p> <p>b) Cable voltage grade</p> <p>c) Cable code (eg. A2XFY/A2XWY)</p> <p>d) Number of cores and cross sectional area</p> <p>e) Cable quantity i.e. cable length (Meters)</p> <p>f) Purchase order number, date and SAP item code</p> <p>g) Total weight of cable and drum (kg)</p> <p>h) Manufacturer's and Buyer's name</p> <p>i) Month & year of manufacturing</p> <p>j) Direction of rotation of drum; An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.</p> <p>k) Cable length final end-markings (i.e. reading at the inner end and reading at the outer end, just before packing shall be marked on the drum).</p>

TECHNICAL SPECIFICATION FOR LT POWER CABLE**5.0 Packing, Shipping, Handling & Storage**

5.1	Shipping Information	The seller shall give complete shipping information concerning the weight, size of each package.
5.2	Transit Damage	The seller shall be held responsible for all transit damage due to improper packing.
5.3	Cable Drum Handling	The drums shall be with M.S spindle plate (with nut-bolts) of adequate size to suit the spindle rods, normally required for handling the drums, according to expected weight of the cable drums as per IS:10418

6.0 Quality Assurance, Testing & Inspection

All the tests shall be carried out in accordance with IEC / IS standards.

6.1	Quality Assurance Plan	As per Annexure – E. In event of order Manufacturer has to submit the signed copy of QAP.
6.2	Inspection hold points	AS per QAP
6.3	Routine Test	a) Measurement of Electrical Resistance b) HV test with power frequency AC voltage
6.4	Type Test	a) Cables must be of type tested quality. Type test reports shall be submitted for the type, size and rating of cable offered along with bid. Type test shall not be more than 5 years old. In event of type test being older than 5 years, bidder has to conduct the same at CPRI/ERDA, NABL approved Lab without commercial implication to BSES. b) Bidder supplying cable to BSES for the first time shall have to conduct type test on sample randomly selected from lot in event of order from CPRI/ERDA. c) UV resistance test to be carried out on one sample from CPRI/ERDA as per ASTM standard (sample shall meet minimum 80% retention after exposure of 21 days as per ASTM standard).

TECHNICAL SPECIFICATION FOR LT POWER CABLE

6.5	Acceptance Test (Shall be conducted as per Cl.15.2 of IS 7098 Part-1 for each lot of cable)	<ul style="list-style-type: none"> a) For cable sizes upto 50sqmm – one sample for chemical composition and purity test of aluminium shall be conducted per 100km of ordered quantity and multiple thereof. b) For cable sizes above 50sqmm – one sample for chemical composition and purity test of aluminium shall be conducted per 50km of ordered quantity and multiple thereof. c) Chemical composition and purity test of aluminium shall be conducted from the lot offered to BSES on each size involved in the purchase order. Test shall be carried out at NABL accredited third party laboratory without any price implication to BSES. d) The sample will be selected either during acceptance test or after receipt of cable in BSES stores.
6.6	Inspection	<ul style="list-style-type: none"> a) The buyer reserves the right to witness all tests specified on completed cables. b) The buyer reserves the right to inspect cables at the seller's works at any time prior to dispatch either in finished form or during manufacturing, to prove compliance with the specifications. c) In-process and final inspection call intimation shall be given in advance to purchaser/CES.
6.7	Test Certificates	Complete test certificates (routine & acceptance tests) need to be submitted along with the delivery of cables.

7.0 Drawing, Data & Manuals

7.1	To be submitted along with bid	The vendor has to submit: <ul style="list-style-type: none"> a) Cross section drawing of cable b) Completely filled GTP c) Type test certificates d) Complete cable catalogue and manual along with the bid e) Copy of BIS licence
7.2	After award of contract	Within 7 days, the seller has to submit four sets of above mentioned drawings for buyer's approval along with the signed copy of QAP (Annexure – E).



SP-LTPC-63-R0

TECHNICAL SPECIFICATION FOR LT POWER CABLE

7.3	Final As Built	6 sets hardcopy + One Soft copy of all documents including type test certificates
-----	----------------	---

8.0 Progress Reporting

8.1	Outline Document	To be submitted for purchaser approval for outline of production-inspection, testing-inspection, packing, dispatch, documentation programme.
8.2	Detailed Progress Report	To be submitted to purchaser once a month containing <ul style="list-style-type: none">(i) Progress on material procurement(ii) Progress on fabrication (As applicable)(iii) Progress on assembly (As applicable)(iv) Progress on internal stage inspection(v) Reason for any delay in total programme(vi) Details of test failures if any in manufacturing stages(vii) Progress on final box up constraints/forward path

9.0 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.

10.0 Technical Particulars

- a. GTP - As per Annexure-B for Multi-core cables.
- b. GTP - As per Annexure-C for Single-core cables (500sqmm and 630sqmm cables).
- c. Armour Coverage Percentage – As per Annexure-D.
- d. Quality Assurance Plan – As per Annexure-E.
- e. List of sub-vendors for Raw Material – As per Annexure-F.

Annexure – A**Scope & Project Specific Details****1.0.0 Scope**

1.0.0	Scope	Design, manufacture, testing & supply of L.T Power Cables
2.0.0	Delivery Schedule	To be filled up as per purchase requisition.

2.0.0 Document Submission

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	2 copies (Typical Drawings)	2 Copies	2 Copies + 1 soft copy in CD	See Clause 7.0 for details of required drawings
Calculations	2 Copies (Typical)	2 Copies		
Catalogues	1 Copy			
Type Test Report	2 Copies			Type test and sample routine test reports

ANNEXURE – B**GUARANTEED TECHNICAL PARTICULARS (Multi-core)****(Standard Cable sizes are 2cx10, 2c x25, 4cx25, 4cx95 4c x50, 4c x150, 4c x 300)****For each size /rating separate GTP need to be furnished**

S.No.	Description	Buyer's Requirement	Seller's data
	Purchase Req. No.	....
	Guarantee Period: (Min)	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by vendor	IS 7098 Part -1 / IEC 60502	
1	Make	....
2	Type (as required by purchaser)		
A	For 2CX10Sqmm	A2XWY	
B	For Sizes above 10Sqmm	A2XFY	
3	Voltage Grade (kV)	1.1	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl.3.1	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

B	Make of Al	Ref Annexure E	
C	Size (mm ²)	..... sq mm	
D	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
E	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	
F	Shape of Conductor	As per Cl.3.1 (e)	
G	Diameter over conductor (mm)	.....
H	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
6	Insulation		
A	Insulation Material	As per Cl. 3.2	
B	Nominal thickness (mm)	As per Table 3 of IS 7098 Part-1	
C	Diameter over Insulation (mm) Approx.	.....
D	Make of insulation compound	Ref: Annexure E	
7	Inner Sheath		
A	Material and Type	As per Cl. 3.4	
B	Minimum thickness	As per Table 5 of IS 7098 Part-1	
C	Approx. dia. Over sheath (mm)	.....
8	Galvanized Steel Armour	As per manufacturer's standard and as per purchaser's site - specific condition	
A	Material		
a)	For 2CX10Sqmm	G.I.Wire	
(i)	Wire Dia (mm)	1.4+/-0.040	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

(ii)	No. of wires	As per Manufacturer Standard	
b)	For sizes above 10Sqmm	G.I.Strip	
(i)	Strip size (Width and Thickness)	4x0.8 (Zero negative tolerance for thickness)	
(ii)	No. of Strips	As per Manufacturer Standard	
B	Area covered by Armour	Min 90% and calculations shall be strictly as per Annexure D	
C	Dia. over Armour – Approx.	.....
9	Outer Sheath		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Yellow	
D	Embossing Details	As per Cl.3.6 (f)	
10	Approx. overall dia. (mm)	.....
11	Overall order tolerance	± 2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec.Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec.Cl. 4.7	
D	Drums provide with MS Spindle plate & nut-bolts arrangement (as per IS:10418)	Required	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

13	End Cap	Required	
14	Weights	.....
a)	Net Weight of cable (Kg/Km.) – Approx		
b)	Weight of empty drum	Kg	
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	.....
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius	..... x O/D	
19	Derating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		

TECHNICAL SPECIFICATION FOR LT POWER CABLE

d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry cure	
22	Type test	Is copy of latest valid TTR for respective sizes enclosed? Yes / No	

Annexure- C**GUARANTEED TECHNICAL PARTICULARS (Single Core)****(Separate GTP needs to be furnished for 500 & 630 sq mm cables)**

S.No.	Description	Buyer's Requirement	Seller's data
	Purchase Req. No.	-	
	Guarantee Period: (Min)	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by vendor	IS 7098 Part -1 / IEC 60502	
1	Make	.....
2	Type	A2XY (Unarmoured)	
3	Voltage Grade (kV)	1.1 kV	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl.2.1.1	
B	Size (mm ²)	500 / 630 sq mm	
C	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

D	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	
E	Shape of conductor	Compacted Circular	
F	Diameter over conductor	.....
G	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
H	Make of Al	Ref Annexure E	
6	Insulation	As per Table 3 of IS 7098 Part-1	
A	Insulation Material	As per Cl. 3.2	
B	Nominal thickness		
(i)	For 1Cx500sqmm	2.2mm	
(ii)	For 1Cx630sqmm	2.4mm	
C	Diameter over Insulation (mm) Approx.	.....
D	Make of insulation compound	Refer Annexure E	
7	Inner Sheath	Not applicable	
8	Armour	Not applicable	
9	Outer Sheath		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Yellow	
D	Embossing Details	As per Cl.3.6 (f)	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

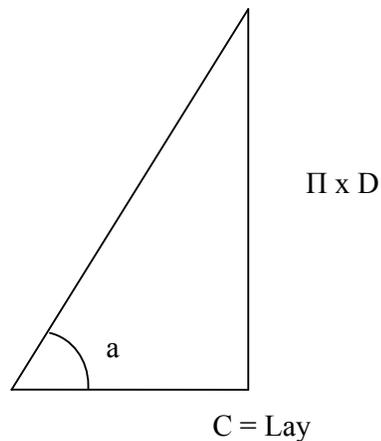
10	Approx. overall dia. (mm)	.....
11	Overall order tolerance	± 2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec.Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec.Cl. 4.7	
D	Drums provide with MS Spindle plate & nut-bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	....
a)	Net Weight of cable (Kg/Km.) – Approx		
b)	Weight of empty drum	Kg	
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	.....
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius	..... x O/D	
19	Derating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry cure	
22	Type test	Is copy of latest valid TTR for respective sizes enclosed? Yes / No	

Annexure – D

ARMOUR COVERAGE PERCENTAGE



$$\text{Percent coverage} = \frac{N \times d}{W} \times 100$$

Where

N = number of parallel wires / Strips

d = diameter of wire / width of formed wires

$W = \pi \times D \times \cos a$,

D = diameter under armour

a = angle between armouring wire / formed wires and axis of cable

$\tan a = \pi \times D/C$, and

C = lay length of armouring wires / formed wires.

Min 90% armour coverage shall be provided both in case of wires and strips.

The gap between armour wires / formed wires shall not exceed one armour wire / formed wire space and there shall be no cross over / over-riding of armour wire / formed wire. So, the minimum area of coverage of armouring shall be 90%.



SP-LTPC-63-R0

TECHNICAL SPECIFICATION FOR LT POWER CABLE

Annexure – E
Quality Assurance Plan

QUALITY ASSURANCE PLAN FOR XLPE INSULATED 1.1KV LT POWER CABLE

Sl. No.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REF. DOCUMENT	ACCEPTANCE STANDARDS	FORMAT OF RECORD	AGENCY		REMARKS
									M	B	
1	2	3	4	5	6	7	8	9	10	11	12
A)	Raw Material										
1)	Aluminum Rod	a) Make / Type / Grade	Maj.	Vis.	100%	BSES Approved Documents/ Specifications	BSES Approved Documents/ Specifications	Reg./Sheet	P	V	
		b) Tensile strength	Cri.	Physical	1 Sample/lot	IS:5484	IS:5484	Int. Test Records	P	V	
		c) Elongation	Cri.	Physical	----do---	-- do --	-- do --	-- do --	P	V	
		d) Resistivity/Conductivity	Cri.	Elec.	----do---	-- do --	-- do --	-- do --	P	V	On drawn Wire
		e) Diameter	Cri.	Physical	100%	-- do --	-- do --	-- do --	P	V	
		f) Purity	Cri.	Chemical	1 Sample/lot	-- do --	-- do --	-- do --	V	V	Manufacturer's test certificate
		g) Surface Finish	Cri.	Vis.	100%	Smooth Surface	Smooth Surface	T.C	P	V	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

2)	XLPE Compound	a) Visual checks on packing	Maj.	Vis.	100%	BSES Approved Documents /Specifications	BSES Approved Documents/ Specifications	Reg./Sheet	P	V	
		b) Hot set	Maj.	Physical	1sample/lot	IS:7098-1/88	IS:7098-1/88	-- do --	P	V	
		c) Tensile strength	Maj.	Physical	-- do --	-- do --	-- do --	-- do --	P	V	
		d) Elongation	Maj.	Physical	-- do --	-- do --	-- do --	-- do --	P	V	
		e) Volume resistivity	Maj.	Electrical	-- do --	-- do --	-- do --	-- do --	P	V	
		f) Specific gravity	Maj.	Physical	-- do --	-- do --	-- do --	-- do --	P	V	
3)	Armour Wires / Strips (G.S)	a) Dimension	Maj.	Physical	1sample / lot	IS:3975 & Data Sheet	IS:3975 & Data Sheet	Reg./Sheet	P	V	
		b) T.S & Elongation	Maj.	Physical	-- do --	IS:3975	IS:3975	-- do --	P	V	
		c) Mass & Uniformity of zinc coating	Maj.	Chemical	-- do --	IS:3975 / IS:4826	IS:3975 / IS:4826	-- do --	P	V	
		d) Torsion / winding test	Maj.	Physical	-- do --	IS:3975	IS:3975	-- do --	P	V	
		e) Wrapping test	Maj.	Physical	-- do --	IS:3975	IS:3975	-- do --	P	V	



SP-LTPC-63-R0

TECHNICAL SPECIFICATION FOR LT POWER CABLE

4)	PVC Compound	a) Make / Type / Grade	Maj.	Physical	100%	BSES Approved Documents/ Specifications	BSES Approved Documents/ Specifications	Reg./Sheet	P	V	
		b) T.S & Elongation	Maj.	Physical	1sample / lot	IS:5831/84	IS:5831/84	-- do --	P	V	
		c) Thermal Stability	Maj.	Physical	-- do --	IS 5831 & IS 10810 (Part-60)	IS 5831 & IS 10810 (Part-60)	-- do --	P	V	
		d) Specific Gravity	Maj.	Chemical	-- do --	IS:5831/84	IS:5831/84	-- do --	P	V	
5)	Wooden Drum	a) Dimension	Maj.	Physical	1sample / lot	IS:10418	IS:10418	Reg./Sheet	P	V	
		b) Anti-termite treatment	Maj.	Chemical	Plant standard	Plant standard	Plant standard	-- do --	P	V	
B)	Process & Stage Inspection										
1)	Wire Drawing	a) Diameter	Maj.	Physical	Sample	IS:8130/84	IS:8130/84	Reg./Sheet	P	V	
		b) Surface Finish	Maj.	Vis.	100%	Smooth Surface	Smooth Surface	T.C	P	V	
		c) Tensile Strength	Maj.	Physical	1sample / lot	IS:8130/84	IS:8130/84	Reg./Sheet	P	V	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

		d) Elongation test	Maj.	Physical	-- do --	IS:8130/84	IS:8130/84	-- do --	P	V	
		e) Wrapping Test	Maj.	Physical	-- do --	IS:8130/84	IS:8130/84	-- do --	P	V	
2)	Stranding	a) No. / dia of wires	Maj.	Count	At the time of m/c setting	IS:8130/84	IS:8130/84	Reg./Sheet	P	V	
		b) Diameter of conductor	Maj.	Physical	At the time of m/c setting and once in each shift	-- do --	-- do --	-- do --	P	V	
		c) Lay Length	Maj.	Physical	During m/c setting	-- do --	-- do --	-- do --	P	V	
		d) Direction of Lay	Maj.	Physical	One sample/Set ting of each size	-- do --	-- do --	-- do --	P	V	
		e) Weight	Maj.	Physical	Each unloaded reel	-- do --	-- do --	-- do --	P	V	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

		f) Surface Finish	Maj.	Vis.	100%	No surface defects and free from sharp edges, scratches, grease, oil etc.		T.C	P	V	
		g) Resistance	Cri.	Physical	1 sample from starting & finishing end of each length	IS:8130/84	IS:8130/84	-- do --	P	V	
3)	Insulation	a) Material	Maj.	Physical	During m/c setting	IS:7098-1/88	IS:7098-1/88	Reg./Sheet	P	V	
		b) Thickness	Cri.	Physical	During m/c setting and at standard length	-- do --	-- do --	-- do --	P	V	
		c) Surface Finish	Maj.	Vis.	100%	Surface shall be smooth and free from defects		T.C	P	V	
		d) Spark Testing	Cri.	Electrical	100%	IS:7098-1/88	IS:7098-1/88	Reg./Sheet	P	V	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

		e) Colour of Cores	Maj.	Vis.	100%	-- do --	-- do --	-- do --	P	V	
		f) Thermal Stability	Cri.	Chemical	One sample/Set ting of each size	-- do --	-- do --	-- do --	P	V	
		g) Core Identification	Maj.	Vis.	10%	-- do --	-- do --	-- do --	P	V	
		h) Hot set test	Maj.	Physical	1sample / lot	-- do --	-- do --	-- do --	P	V	
		i) Diameter	Maj.	Physical	-- do --	-- do --	-- do --	-- do --	P	V	
		j) Resistance	Cri.	Physical	-- do --	-- do --	-- do --	-- do --	P	V	
		k) Curing	Maj.	Vis.	100%	-- do --	-- do --	-- do --	P	V	
4)	Laying up	a) Identification of cores	Maj.	Vis.	During m/c setting	IS:7098-1/88	IS:7098-1/88	Reg./Sheet	P	V	
		b) Direction of lay & core sequence	Maj.	Vis.	-- do --	-- do --	-- do --	-- do --	P	V	
		c) Lay length	Minor	Vis.	-- do --	Once in a shift.	Once in a shift.	-- do --	P	V	
		d) Shape of laid up assembly	Minor	Vis.	-- do --	Reasonable circular	Reasonable circular	-- do --	P	V	
		e) Dia. Over laid up assembly	Maj.	Physical	-- do --	Once in a shift.	Once in a shift.	-- do --	P	V	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

5)	Innersheath	a) Material & type	Maj.	Vis.	During m/c setting	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	Reg./Sheet	P	V	
		b) Thickness	Maj.	Physical	During m/s setting & at std. length	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	-- do --	P	V	
		c) Dia. Over sheath	Maj.	Physical	During m/c setting	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	-- do --	P	V	
		d) Surface finish	Minor	Vis.	100%	Surface shall be smooth and free from defects		T.C	P	V	
6)	Armouring	a) Dimension of armour wires/strips	Maj.	Physical	At the time of m/c setting	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	Reg./Sheet	P	V	
		b) No. of wires/strips	Maj.	Count	At the time of m/c setting	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	-- do --	P	V	



SP-LTPC-63-R0

TECHNICAL SPECIFICATION FOR LT POWER CABLE

		c) Direction of lay	Maj.	Vis.	One sample/Set ting of each size	IS:7098-1/88	IS:7098-1/88	-- do --	P	V	
		d) Surface finish	Maj.	Vis.	100%	Surface shall be smooth and free from defects		T.C	P	V	
		e) Lay Length	Minor	Vis.	At the time of m/c setting	IS:7098-1/88	IS:7098-1/88	Reg./Sheet	P	V	
		f) Coverage & quality of armouring	Maj.	Vis.	100%	IS:7098-1/88 and IS:3975	IS:7098-1/88 and IS:3975	-- do --	P	V	
7)	Outer Sheath	a) Material & type	Maj.	Vis.	During m/c setting	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	Reg./Sheet	P	V	
		b) Thickness	Maj.	Physical	During m/s setting & at std. length	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	-- do --	P	V	
		c) Overall diameter	Maj.	Physical	During m/s setting & at std. length	Measurement	Measurement	-- do --	P	V	



SP-LTPC-63-R0

TECHNICAL SPECIFICATION FOR LT POWER CABLE

		d) Surface finish	Maj.	Vis.	100%	Surface shall be smooth and free from defects		T.C	P	V	
		e) Embossing/Marking quality	Maj.	Vis.	100%	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	Reg./Sheet	P	V	
		f) Colour of sheath	Maj.	Vis.	During m/c setting	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	-- do --	P	V	
		g) Sequential marking	Maj.	Vis.	Full Length	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	-- do --	P	V	
C)	Final Inspection										
1)	Routine Tests	a) Conductor Resistance	Maj.	Elec.	100%	IS:7098-1/88	IS:7098-1/88	Test Report	P	V	
		b) High Voltage Test	Maj.	Elec.	100%	IS:7098-1/88	IS:7098-1/88	Test Report	P	V	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

2)	Acceptance Tests										
Acceptance test shall be carried out for each type and size of the cables on the cable drums randomly selected as per sampling plan mentioned in IS:7098 Part-1.											
i)	For Conductor	a) Tensile Test (for Aluminium)	Cri.	Elec.	As per IS:7098-1/88	As per IS:7098-1/88	As per IS:7098-1/88	Test Certificate	P	W	
		b) Wrapping Test (for Aluminium)	Cri.	Elec.	-- do --	-- do --	-- do --	-- do --	P	W	
		c) Resistance Test	Cri.	Elec.	-- do --	-- do --	-- do --	-- do --	P	W	
ii)	For armour wire/formed wire (as applicable)	a) Measurement of Dimensions	Cri.	Measurement	One sample of each offered lot of all offered sizes	As per IS:7098-1/88 and IS:3975	As per IS:7098-1/88 and IS:3975	Test Certificate	P	W	
		b) Tensile Test	Cri.	Physical	-- do --	-- do --	-- do --	-- do --	P	W	
		c) Elongation Test	Cri.	Physical	-- do --	-- do --	-- do --	-- do --	P	W	
		d) Torsion Test (for round wires only)	Cri.	Physical	-- do --	-- do --	-- do --	-- do --	P	W	
		e) Wrapping Test	Cri.	Physical	-- do --	-- do --	-- do --	-- do --	P	W	
		f) Resistance Test	Cri.	Electrical	-- do --	-- do --	-- do --	-- do --	P	W	
		g) Mass of zinc coating	Cri.	Chemical	-- do --	-- do --	-- do --	-- do --	P	W	
		h) Uniformity of zinc coating	Cri.	Chemical	-- do --	-- do --	-- do --	-- do --	P	W	

TECHNICAL SPECIFICATION FOR LT POWER CABLE

		l) Adhesion Test	Cri.	Physical	-- do --	-- do --	-- do --	-- do --	P	W	
		j) Freedom from defects	Cri.	Visual	-- do --	-- do --	-- do --	-- do --	P	W	
iii)	For XLPE Insulation and PVC sheath	a) Test for thickness	Cri.	Measurement	One sample of each offered lot of all offered sizes	As per IS:7098-1/88 and IS:1554-1/88	As per IS:7098-1/88 and IS:1554-1/88	Test Report	P	W	
		b) Hot set test (for insulation)	Cri.	Electrical	-- do --	-- do --	-- do --	-- do --	P	W	
		c) Tensile strength and Elongation at break	Cri.	Physical	-- do --	-- do --	-- do --	-- do --	P	W	
		d) Thermal Stability Test (for PVC sheath)	Cri.	Chemical	-- do --	-- do --	-- do --	-- do --	P	W	
iv)	For Completed Cables	a) High Voltage Test	Cri.	Electrical	-- do --	As per IS:7098-1/88 and IS:1554-1/88	As per IS:7098-1/88 and IS:1554-1/88	-- do --	P	W	
		b) Insulation Resistance Test (Volume Resistivity Method)	Cri.	Electrical	-- do --	-- do --	-- do --	-- do --	P	W	
		c) Flammability Test	Cri.	Electrical	-- do --	As per IEC-332 (Part-3) (Category-B) and IS:7098-1/88	As per IEC-332 (Part-3) (Category-B) and IS:7098-1/88	-- do --	P	W	



SP-LTPC-63-R0

TECHNICAL SPECIFICATION FOR LT POWER CABLE

		d) Surface Finish	Maj.	Physical	One length of each size	Surface shall be smooth and free from defects		T.C	P	W	
		e) Length Measurement (Rewinding)	Maj.	Physical	1 drum per lot	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	-- do --	P	W	
		f) Armour Coverage	Maj.	Physical	-- do --	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	-- do --	P	W	
3)	Type Tests	As per IS:7098-1/88							Review and verification of type test clearance from BSES Engg.		
D	Packing & Marking	a) End Sealing	Maj.	Visual	100%	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	_____	P	_____	
		b) Stenciling/Marking	Minor	Visual	100%	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	_____	P	_____	
		c) Packing	Maj.	Visual	100%	BSES specifications/ IS:7098-1/88	BSES specifications/ IS:7098-1/88	_____	P	_____	



SP-LTPC-63-R0

TECHNICAL SPECIFICATION FOR LT POWER CABLE

Note:-

1. BSES may witness raw material and in process inspection in addition to routine / acceptance / type test at any time or stage of manufacturing.
2. Checks specified above for Raw material, In process and Final inspection shall be as relevant to the specific cable construction.

Abbreviations used in the above Quality Plan :-

M	Manufacturer	P	Perform
B	BSES	V	Verification
Vis.	Visual	W	Witness
Maj.	Major	T.C	Test Certificates
Cri.	Critical	Reg.	Register
Elec.	Electrical		

Annexure - F
List of Sub-Vendors
For critical items

S. No.	Description of Material	Sub-Vendors
1	E.C Grade Aluminium Rod	Bharat Aluminium Co. Ltd. (BALCO) Hindustan Aluminium Co. Ltd. (HINDALCO) National Aluminium Co. Ltd. (NALCO)
2	XLPE Compound	Kalpena Industries Ltd. KLJ Polymers and Chemicals Ltd. Dow Chemical, U.S.A Borealis, Sweden Hanwha, Seoul, South Korea

TECHNICAL SPECIFICATION OF INSULATING FLOORS IN SWITCHGEAR ROOMS

TECHNICAL SPECIFICATION

FOR

**INSULATING FLOORS IN SWITCHGEAR
ROOMS**

Specification No. SP-INSFLR-103-R0

DEPARTMENT	PREPARED BY	REVIEWED BY	APPROVED BY	REV	0
CES	Minita	Gaurav Sharma	Ashwani Agarwal	DATE	31/05/2017
	<i>Minita</i>	<i>Gaurav</i>	<i>Ashwani</i>	PAGE	Page 1 of 6
SAFETY	Paridhi Bansal	Arun Raj	Umesh Purbey		
	<i>Paridhi</i>	<i>Arun</i>	<i>Umesh</i>		

TECHNICAL SPECIFICATION OF INSULATING FLOORS IN SWITCHGEAR ROOMS

INDEX TABLE

1.	SCOPE	3
2.	STANDARDS & CODES	3
3.	SERVICE CONDITIONS	3
4.	GENERAL REQUIREMENTS OF INSULATING PAINTS ON FLOORS	3
5.	TESTING AND INSPECTION	4
6.	INSTALLATION	4
7.	DEVIATIONS	4
8.	DOCUMENTS SUBMISSION	4
	ANNEXURE A- GENERAL TECHNICAL PARTICULARS OF INSULATING FLOORS	5

TECHNICAL SPECIFICATION OF INSULATING FLOORS IN SWITCHGEAR ROOMS

1. SCOPE

This specification covers the basic requirement, the testing and inspection, supply and installation/fixing of insulating paints on floors in front of the switchgear panels at BYPL grid locations.

2. STANDARDS & CODES

2.1.	IS 15652:2006	Specification of Insulating mats for electrical purposes
2.2.	CEA guidelines, 2010	Measures relating to safety and Electric supply

3. SERVICE CONDITIONS

The insulating floor against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

3.1.	Average Grade atmosphere	Heavily polluted, Dry
3.2.	Maximum altitude above sea level	1000 meters
3.3.	Ambient air temperature	Highest 50 deg C Average 40 deg C Minimum 0 deg C
3.4.	Relative Humidity	10 to 100 %

4. GENERAL REQUIREMENTS OF INSULATING PAINTS ON FLOORS

4.1.	General Properties	<ul style="list-style-type: none"> a. The Insulating coating shall be self leveling, solvent free, and have high breakdown voltage, loaded with special insulating additives. b. The material of the insulating floor shall be epoxy resin. c. It shall be resistant to chemicals and oils. d. It shall be tough, wear & weather resistant. e. It shall exhibit high build, high adhesion with smooth and glossy finish and slip resistant. f. It shall be easy to apply/install, clean and repair on floors.
4.2.	Colour of the finished item	The insulating floors shall be light Grey in colour
4.3.	Class of the insulating floor to be used	For 11kV voltage : Class B For 33kV voltage : Class C
4.4.	Thickness of the paint on floor	For 33kV voltage : 3 mm +/- 10% For 11kV : 2.5 mm +/- 10%

TECHNICAL SPECIFICATION OF INSULATING FLOORS IN SWITCHGEAR ROOMS

4.5.	AC proof voltage	For 33kV : 36kV minimum For 11kV: 22 kV minimum
4.6.	Dielectric strength	For 33kV: 65kV rms For 11kV: 45kV rms

5. TESTING AND INSPECTION

5.1.	Routine and Acceptance tests in the factory	All the routine and acceptance tests shall be performed as per IS 15652. The purchaser reserves the right to witness the tests at the time of inspection.
5.2.	Inspection at site	The purchaser reserves the right to verify the material at the time of applying the insulating floors at site. Following tests shall also be verified at site: 1. Dielectric strength 2. Ac proof voltage 3. Thickness
5.3.	Type Test Reports	All the Type test reports of the material to be used as the insulating floors as per IS 15652 from CPRI/ERDA shall be submitted.

6. INSTALLATION

6.1.	Application of insulating paints	a. The insulating paint shall be applied in accordance with manufacturer's installation procedure. b. The purchaser may witness the painting process.
------	----------------------------------	--

7. DEVIATIONS

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

8. DOCUMENTS SUBMISSION

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

8.1.	Complete product catalogue, and Manual
8.2.	Type test reports from CPRI/ERDA
8.3.	P.O. copy and Performance Certificates and feedback for similar type of job done in any other power industry (distribution, transmission and generation).
8.4.	Deviation Sheet (if any)
8.5.	Filled copy of GTP (Annexure A)

TECHNICAL SPECIFICATION OF INSULATING FLOORS IN SWITCHGEAR ROOMS

ANNEXURE A- GENERAL TECHNICAL PARTICULARS OF INSULATING FLOORS

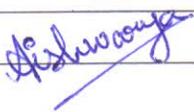
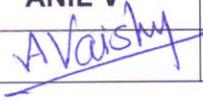
S. No.	Particulars	BYPL Requirements		Bidder's Data	
1	Make	To be Specified			
2	Application	11kV Indoor	33kV Indoor		
3	Ambient temperature range	0 to 50 deg C			
4	Standard reference	IS 15652:2006			
5	Material to be used	Epoxy Resin			
6	Surface finish	Free from harmful physical irregularities			
7	Solids	100% solvent free			
8	Colour & Appearance	Light grey , viscous liquid			
9	Class of Coating	B	C		
10	Mix Ratio				
11	Specific Gravity				
12	Pot life (in hrs)				
13	Touch dry (in hrs)				
14	Tack free (in hrs)				
15	Hard dry (in hrs)				
16	Full cure (in days)				
17	Dimensions				
17.1	Length	According to the site requirements			
17.2	Width	1000mm ± 20mm			
17.3	Thickness	2.5 mm ± 10%	3 mm ± 10%		
18	Dielectric Properties				
18.1	Dielectric constant (ASTM D150 - 150kHz)				
18.2	Insulation resistance with water	minimum 10 ⁶ M Ohm with 500V megger			
18.2	Leakage current	Not more than 10µA			
18.3	AC dielectric strength	45kV rms (min)	65kV rms (min)		
18.4	AC proof voltage	22kV	36kV		
19	Mechanical Properties				
19.1	Abrasion resistance (ASTM D 4060)				
19.2	Hardness shore D (ASTM D 2240)				
19.3	Scratch hardness (BS 3900E-2)				
19.4	Pull-Off Adhesion (ASTM D 4541)				
19.5	Tensile strength (ASTM D 638)				

TECHNICAL SPECIFICATION OF INSULATING FLOORS IN SWITCHGEAR ROOMS

20	Temperature resistance				
21	Gloss(ASTM D523)				
22	Ageing Properties				
22.1	Tensile strength & elongation at break after subjection mat to ageing	not less than 75% of the corresponding values			
22.2	Durability of coating (in years)				
23	Thermal Properties				
23.1	Flame Retardance	Self extinguishing			
23.2	Marking : Each coating shall be marked with	Class, Lot no., Roll no., Manufacturer's name, BYPL as a customer name, BYPL PO no. and date, BIS marking			
24	Tests				
24.1	Type test reports to be submitted	Type test reports not older than 5 years from CPRI/ERDA lab			
24.2	QAP for Acceptance and Routine tests	To be submitted			
24.3	Acceptance test	To be carried out during inspection			

TECHNICAL SPECIFICATION

*SCADA RTU/ DCU & NETWORK
AUTOMATION SYSTEM
FOR
66/33/11kV NEW GRID STATION
(IEC 61850 PROTOCOL)*

PREPARED BY	REVIEWED BY	APPROVED BY	REV	0
			DATE	28 th Feb 2019
AISHWARYA V	GAGAN S	ANIL V	PAGE	1 of 50
				

Sr.No.	Table of Contents	Page No.
1	Scope of the Document	4
2	Climate conditions for system	4
3	Technical requirements	
3.a	General requirements for Supplier/ BA	5
3.b	General System Design	5
3.c	System architecture	7
3.d	Communication Interface and Protocol	8
3.e	IEC 61850 compliant Managed Ethernet switch & network	8
3.f	RTU/ DCU Enclosure	9
3.g	RTU/ DCU System	10
3.h	Control Wiring, Name plate and Markings System	11
3.i	RTU/ DCU Commissioning	13
3.j	Time synchronization & SOE	13
3.k	Response Times and I/O Capacities	14
3.l	Multi Function Meters (MFM)	15
3.m	Transformer Monitoring Unit cum Automatic Voltage Regulator	15
3.n	Maintenance, Diagnostics & Reliability	15
3.o	Interchangeability & Future extendibility	16
3.p	Service life and Warranty Support	18
3.q	RTU/ DCU and Network Earthing System	18
3.r	DR Download	20
3.s	RTU Auxiliary Power supply system	20
4	SCADA Commands, Indications and Measurands Data	20
5	Quality control, Checklist	20
6	Pre-dispatch Inspection (FAT) & Minimum Testing Facility	20
7	Packing and Forwarding	21
8	System Spares, Tools & Software Tools with Licenses	22
9	Drawings & Documents, Configuration Backup and Certificates	23

10	Trainings and Hands-on	25
11	Site Acceptance Test (SAT)	27
12	Annexure	
12.a	RTU/ DCU System Architecture Drawing	29
12.b	Signal List- 11/33/66kV	30
12.c	List of Abbreviations	50

Sr. No.	Topic	Description
1	Scope of the Document	<p>BYPL already has SCADA Control Centre implementation consisting of MCC (Master Control Centre) and (BCC) Business Continuity Centre (commissioned by M/s ABB Ltd. with Network Manager Ver 5.5) through which currently 54 grid stations and approx 90 DMS stations are being controlled and monitored. The present SCADA RTU/ DCU & Network system enable remote monitoring and controlling of all equipments of the unmanned grid stations. This document states that the new RTU/ DCU & Network automation system supplied will integrate with the existing SCADA infrastructure enabling remote monitoring and controlling of grid equipments, facilitating unmanned station provision.</p> <p>The scope of this specification covers all the Technical requirements of the RTU/ DCU & Network Automation system including System Architecture design, Manufacturing, Quality, Testing facility at manufacturer's works, packing, forwarding with loading/ unloading at site/ stores.</p> <p>It also states the installation, commissioning and testing of all the equipments supplied or required for efficient and trouble free SCADA RTU/ DCU & Network Automation system. The scope also covers supply of spares, trainings, configuration tools and documents.</p> <p>This document describes the automation requirement for C&R/ switchgear panels, IEDs, and all other items required for SCADA controlled 66/33/11 kV power system supplied in grid.</p> <p>The specific requirements are covered under technical requirements (Ref. 3)</p>
2.	Climate conditions for system	<p>The atmosphere of Delhi/National Capital Region (NCR) is generally laden with mild acid and dust suspended during dry months and subjected to fog in cold months. The design of the equipments and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1g</p> <ul style="list-style-type: none"> • Max. Ambient Temperature (Working): 50°C • Min. Ambient Temperature: 0°C • Max. Humidity: 95% non-condensing • Min. Humidity: 10% • Avg. no. of Thunderstorm days per annum: 50 • Avg. Annual Rainfall: 750mm

		The supplier/ BA is required to submit climate compliance test certificate for supplied SCADA RTU/ DCU & network Automation system.
3	Technical Requirements	
3.a	General requirements for Supplier/ Business Associates (BA)	<p>The supplier/ BA should have at least 10 years of experience in design, manufacturing and supply of SCADA RTU/ DCU & Network Automation system integrated with the protection system for controlling and monitoring of the electricity transmission and distribution network.</p> <p>The supplier/ BA needs to submit the proof of completing minimum 5 such projects with other Indian utilities/ concerns as its experience certificate.</p> <p>The supplier/BA should have direct business office at Delhi/NCR. In case of support through business partners details of customers supported by the service partners to be submitted to BYPL.</p> <p>The supplier/ BA should have experience of SCADA RTU/ DCU and Network system integration with numerical relays/ IEDs on standard international protocols (Ref 3.d).</p> <p>The supplier/ BA shall produce a well- structured project plan constituting of timelines for installation, commissioning and testing of the SCADA RTU/ DCU and Network Automation system to which he will have strictly abide.</p> <p>The supplier/ BA can offer an innovative and advanced system and the ways and cost to integrate the same in the existing infrastructure. The offer is subjected to an approval from BYPL after a thorough discussion between the supplier/BA and BYPL. In case, an approval is not awarded to the supplier/BA's offered innovative system, BYPLs existing/ desired infrastructure prevails and the supplier/BA shall provide the system accordingly.</p> <p>The supplier/ BA should optimize on the cost of software products offered to BYPL considering already available licenses with BYPL. The supplier/BA should clearly indicate licensing policy for the software tools offered.</p> <p>The supplier/ BA should be technically capable to provide necessary training to the personnel recommended by BYPL to maintain the system and troubleshooting reports (Ref. 10)</p>
3.b	General System	The SCADA RTU/ DCU & Network Automation system shall be modular

	<p>Design</p>	<p>and suitable for remote operation and monitoring of the complete substation including future expansions.</p> <p>The systems shall be state of the art, suitable for operation under electrical environment present in high voltage substations (66/33/11kV), follow the latest engineering practice, and ensure long-term compatibility requirements and continuity of equipment supply and the safety of the operating staff. The housing of the SCADA RTU/ DCU & Network Automation system hardware should be IP class protected suitable for both indoor and outdoor installations.</p> <p>The offered SCADA RTU/ DCU & Network Automation system shall support remote control and monitoring from existing remote SCADA control centers (MCC/ BCC) via gateways.</p> <p>The system shall be designed such that personnel without any background knowledge in Microprocessor-based technology are able to operate the system. The operator Interface shall be intuitive such that operating personnel shall be able to operate the system easily after having received some basic training.</p> <p>The system shall incorporate the control, monitoring and protection functions specified, self-monitoring, signaling and testing facilities, measuring as well as memory functions, event recording and evaluation of disturbance records.</p> <p>Maintenance, modification, diagnosis or extension of components shall not cause a shutdown of the whole SCADA RTU/ DCU & Network Automation system. Self-monitoring of components, modules and communication shall be incorporated to increase the availability and the reliability of the equipment and minimize maintenance.</p> <p>The SCADA RTU/ DCU and Network Automation system should be processor, co-processor, power supply, rack and media redundant.</p> <p>The SCADA RTU/ DCU & Network Automation system should be web accessible with facility to upload/ download the system configuration files and controlling & monitoring of equipments.</p> <p>The SCADA RTU/ DCU & Network Automation system should be cyber secured with user configured password protection.</p>
--	---------------	---

<p>3.c</p>	<p>System Architecture</p>	<p>The SCADA RTU/ DCU & Network Automation system shall be based on decentralized architecture and on concept of bay-oriented, distributed intelligence.</p> <p>Functions shall be decentralized, object-oriented and located as close as possible to the process.</p> <p>The main process information of the station shall be stored in distributed databases. The typical SCADA RTU/ DCU & Network Automation system architecture shall be structured in two levels, i.e. station and bay level.</p> <p>At bay level, the IEDs shall provide all bay level functions regarding control, monitoring and protection information, inputs for status indications, outputs for commands and measurand/ analog data. The IEDs should be directly connected to the switchgear without any needs for additional interposition or transducers.</p> <p>Each bay control IED shall be independent from each other and its SCADA functioning shall not be affected by any fault occurring in any of the other bay control units of the station.</p> <p>The data exchange between the electronic devices on bay and station level shall take place via the communication infrastructure. Data exchange is to be realized on dual star Bus topology using IEC 61850 protocol with a redundant managed switched ethernet communication infrastructure. The ethernet switch must be IEC 61850 compliant and KEMA, CE and FCC certified.</p> <p>The communication shall be made in 1+1 mode (PRP) for IEC 61850 protocol, including the fiber link between the individual bay IEDs to bay switch and Ethernet link between the bay switch to RTU/ DCU, such that failure of one link shall not affect the normal operation of the SCADA RTU/DCU & Network Automation system. However it shall be alarmed in SCADA RTU/ DCU & Network Automation system.</p> <p>Communication shall be on serial link between IEDs like MFMs, DCDBs and the processor.</p> <p>The supplier/ BA shall provide an industrial grade 14" (minimum size) station HMI mounted on the RTU/ DCU enclosure having touch-screen monitor (in-built processors and communication) with required software. This HMI should be configured for local monitoring and controlling.</p>
------------	----------------------------	---

		<p>Clear control priorities shall prevent operation of a single switch at the same time from more than one of the various control levels, i.e. MCC/ BCC, station HMI, bay level or apparatus level. The priority shall always be on the lowest enabled control level.</p>										
3.d	Communication Interface and Protocol	<p>The communication protocol for gateway to control centers must be on IEC 60870-5-104 protocol. While the communication for sub-station IEDs of Bay level and station level must be on IEC 61850 protocol. In addition the RTU/ DCU should have RTU/ DCU serial Modbus RS485 protocol for communication to MFMs and DCDBs. DCDB, NIDS, NIFPS (8 No. DI signals for integration) and APFC should also interfaced with RTU through hard-wiring.</p> <p>Different protocols to integrate the SCADA RTU/ DCU & Network Automation system are as given in Table 3.d [1]:</p> <table border="1"> <thead> <tr> <th colspan="2">Table 3.d [1]</th> </tr> </thead> <tbody> <tr> <td>RTU/ DCU to SCADA Control Centers (MCC/ BCC)</td> <td>IEC 104</td> </tr> <tr> <td>RTU/ DCU to Transformer Monitoring Unit/ NIDS/ APFC</td> <td>IEC 61850</td> </tr> <tr> <td>RTU/ DCU to Bay Control Units/ Relays</td> <td>IEC 61850</td> </tr> <tr> <td>RTU/ DCU to MFMs and DCDB</td> <td>RTU/ DCU serial Modbus RS485</td> </tr> </tbody> </table> <p>NOTE: Converters (protocol/ media/ power supply) of any sort will not be permitted for RTU/ DCU and Network Automation system.</p>	Table 3.d [1]		RTU/ DCU to SCADA Control Centers (MCC/ BCC)	IEC 104	RTU/ DCU to Transformer Monitoring Unit/ NIDS/ APFC	IEC 61850	RTU/ DCU to Bay Control Units/ Relays	IEC 61850	RTU/ DCU to MFMs and DCDB	RTU/ DCU serial Modbus RS485
Table 3.d [1]												
RTU/ DCU to SCADA Control Centers (MCC/ BCC)	IEC 104											
RTU/ DCU to Transformer Monitoring Unit/ NIDS/ APFC	IEC 61850											
RTU/ DCU to Bay Control Units/ Relays	IEC 61850											
RTU/ DCU to MFMs and DCDB	RTU/ DCU serial Modbus RS485											
3.e	IEC 61850 compliant Managed Ethernet switch & network	<p>The IEC 61850 compliant Managed Ethernet switch shall meet the demand of power system automation systems (IEC 61850-3, IEEE 1613 compliance).</p> <ul style="list-style-type: none"> • Ethernet switch shall be industrial grade. • Ethernet switch shall be 19" rack mounted. • Ethernet switch shall operate at 36 to 72 VDC power supply. • Operating Temperature: -40°C to +85°C. • All port shall be user configurable with minimum configuration of 100Mbps. 										

		<ul style="list-style-type: none"> • Communication type: Fiber Optics and Ethernet copper CAT6/ above cable. • LED indicators on all ports shall be blinking with data transfer. • Diagnostic/ error/ warning LED. • The switch should have a diagnostic/ error/ warning LED. • It should support remote user setting configuration. • It should own separate maintenance/ console port. • Latency shall be not more than 10ms. • Should be KEMA, CE and FCC Certified. • Switch should be extendable for future expansion. • Minimum 20% spares of utilized hardware and accessories to be provided by the supplier/ BA. • On-site warranty for the switch must be 5 years. The warranty certificate is required to be submitted by the supplier/ BA to BYPL at the time of SAT. <table border="1"> <thead> <tr> <th colspan="2">Table 3.e [1] BYPL approved Makes</th> </tr> <tr> <th>S.No.</th> <th>Make</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Ruggedcom</td> </tr> <tr> <td>2</td> <td>Hirschman</td> </tr> <tr> <td>3</td> <td>GarrettCom</td> </tr> </tbody> </table> <p>The specified makes are to be strictly adhered to and no change will be considered hereto.</p>	Table 3.e [1] BYPL approved Makes		S.No.	Make	1	Ruggedcom	2	Hirschman	3	GarrettCom
Table 3.e [1] BYPL approved Makes												
S.No.	Make											
1	Ruggedcom											
2	Hirschman											
3	GarrettCom											
3.f	RTU/ DCU Enclosure	<p>RTU/ DCU enclosure should be suitably sized to accommodate all RTU/ DCU and network accessories, self-standing, fabricated 14 gauge, CRC sheet, duly powder coated paint (RAL 7032 Siemens Grey Structure Shade) with black color plinth and IP class protected suitable for both indoor and outdoor installations.</p> <p>Enclosure Details:</p> <ul style="list-style-type: none"> • Panel should have a front toughened glass door behind which the RTU/ DCU racks should be mounted on a swing door frame. Doors should have Ergoform- S lock system with key. • The whole RTU/ DCU hardware should be housed in an energy-efficient Air Conditioned cabinet with temperature and humidity controller. • Enclosure should have Orange color mounting plate fitted on its rear 										

		<p>wall.</p> <ul style="list-style-type: none"> • It should have gland plates suitably sized, fabricated with 3mm CRC sheet, duly powder coated paint (RAL 7032 Siemens Grey Structure Shade). • Enclosure should have sufficient illumination system with door interlocks, crankcase heaters, Rat/ Rodents repellent system, drawing pocket etc. • It should have a roof mounted exhaust fan with a removable screwed covering, to be used as an alternative in case of AC failure. • Copper earth strip of suitable size to be provided for both power and electronics, separately. • A minimum 30% free space should be provided for spares for future expansion. <table border="1"> <thead> <tr> <th colspan="2">Table 3.f [1] BYPL approved Makes</th> </tr> <tr> <th>S.No.</th> <th>Make</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Rittal</td> </tr> </tbody> </table> <p>The specified makes are to be strictly adhered to and no change will be considered hereto.</p>	Table 3.f [1] BYPL approved Makes		S.No.	Make	1	Rittal
Table 3.f [1] BYPL approved Makes								
S.No.	Make							
1	Rittal							
3.g	RTU/ DCU System	<p>In general the RTU/ DCU system design should aim to minimize power consumption and heat generation. The RTU/ DCU shall be modular type, housed in a 19” rack consisting of processor, co-processor, Digital Input/ Output and Analog Input/ Output modules, power supply and communication interface module, Ethernet switches etc. The auxiliary supply of RTU/ DCU and network system should be 48VDC nominal range: 36-72 VDC.</p> <p>RTU/ DCU system should be completely wired up with all the required accessories like MCB, heavy duty CMRs (miniature contactors), rack mounted DC-DC converters, contactors, screw terminals, PVC duct, galvanized GI mounting channels etc. and should be enclosed in an air-conditioned self- standing enclosure.</p> <p>RTU/ DCU system:</p> <ul style="list-style-type: none"> • RTU/ DCU should be modular and expandable • RTU/ DCU system should have redundant processor, co-processor, power supply, rack, ethernet switch, bay and station network level. 						

		<ul style="list-style-type: none"> • It should have a under voltage and earth leakage detection system. • RTU/ DCU processor should communicate to MCC and BCC on IEC 60870-5-104 protocol on a single IP address. • Processor and co-processor should be capable to communicate with IEDs (Protection Relays, Digital RTCC relay, bay controller etc.) on IEC 61850 protocol and MFMs, DCDBs to communicate on RS485 RTU/ DCU modbus slave. DCDB, NIDS and APFC should also interface with RTU through hard-wiring. • RTU/ DCU system should have programmable logic capabilities supported by easy to use editor facilities. These capabilities shall enable the RTU/ DCU to perform functions using ladder, FBD and statement language as per IEC standard. • Internal battery backup to hold data in SOE buffer memory & also maintain the time & date. • All digital and analog input-output modules should be housed in a separate rack. • Digital input and output modules should be 16 channels, 48VDC and potential free contact respectively. • Analog input should be 8/ 16 channel, 16-bit resolution, and universal type, configurable for all ranges between $\pm 10\text{VDC}$ and $\pm 20\text{mA}$. • RTU/ DCU system should have minimum 20% spares of utilized RTU/DCU & Network hardware and accessories, completely wired up to the last terminal. <table border="1"> <caption>Table 3.g [1] BYPL approved Makes with Type</caption> <thead> <tr> <th>S.No.</th> <th>Make</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>ABB Ltd.</td> <td>RTUtil560</td> </tr> <tr> <td>2</td> <td>Schneider</td> <td>Sietel DP</td> </tr> <tr> <td>3</td> <td>Synnergy</td> <td>Husky</td> </tr> <tr> <td>4</td> <td>Siemens</td> <td>AK3</td> </tr> </tbody> </table> <p>The specified makes are to be strictly adhered to and no change will be considered hereto.</p>	S.No.	Make	Type	1	ABB Ltd.	RTUtil560	2	Schneider	Sietel DP	3	Synnergy	Husky	4	Siemens	AK3
S.No.	Make	Type															
1	ABB Ltd.	RTUtil560															
2	Schneider	Sietel DP															
3	Synnergy	Husky															
4	Siemens	AK3															
3.h	Control Wiring, Name Plate and Marking System	<p>Panel Control Wiring</p> <p>Suitable size and color control and power wiring to be used for the connection of RTU/ DCU equipment and accessories along with proper and suitable lugs and ferrules. Control wire used inside the panels should be as per international color standards, approved by BYPL.</p> <p>Field Control Wiring</p>															

- All control and power cables used in the RTU/ DCU and Network Automation system should be multi-core, FRLS, armored with copper multi-strand.
- All communication cables used in the RTU/ DCU and Network Automation system should be tinned copper high density shielded or armored with PVC FRLS.
All Optical Fiber Cables (OFC) used in the RTU/ DCU and Network Automation system should be of proper size, armored and suitable for multi/ single mode operations.
- Laying of control and communication cable from field to RTU/ DCU should be in separate cable trays and conduit/ duct of suitable size.

From Field Ethernet Switch to RTU Ethernet switch (LAN Cable CAT6/ above)

PRP Network 1: Blue
PRP Network 2: Black

From Device to Field Ethernet Switch (Suitable OFC multi/ single mode)

Optical Network 1: Orange
Optical Network 2: Yellow

- The field wiring material and laying plan is to be submitted by the supplier/ BA and should be duly approved by the engineering staff of SCADA, BYPL before the commencement of work.
- During execution if any replacement/ changes (due to site constraint) are required in the material/ field wiring and laying that shall be duly made by the supplier/ BA without any additional costs within the committed time (maximum one (1) week).

Table 3.h [2] Field Control Wiring

Description	Color Code
RS485 Wire	Grey
Ethernet	Different color CAT6/ above cable for different networks of the system

Equipment Name Plate

- All equipments either in RTU/ DCU panel or field should have proper name plate.

		<ul style="list-style-type: none"> • The name plate material, size, and text font and size are to be submitted by the supplier/ BA and should be duly approved by the engineering staff of SCADA, BYPL before the commencement of work. • Sample name plates are to submit for approval before field installations, any changes suggested by BYPL shall be duly incorporated. • During the execution any change in name plate size, text font or size suggested by BYPL shall be duly incorporated without any additional costs within the committed time (maximum one (1) week). <p>Marking System</p> <ul style="list-style-type: none"> • The panel and field control wiring Marking System should be proper for the system. The name plates should be properly engraved and all wires should have proper size ferrule nos. and printing life for both should be of minimum 10 years.
3.i	RTU/ DCU Commissioning	<ul style="list-style-type: none"> • The supplier/ BA will install all network, control and RTU system as per BYPL approved network system architecture • The supplier/ BA will configure, validate and submit the network as per system requirement which will be verified and approved by SCADA engineering in-charge. • The supplier/ BA will be responsible for commissioning of RTU/ DCU with all IEDs as per Annexure 12.b provided. • RTU/ DCU network commissioning engineer (supplier/ BA) will be responsible for IEC 61850 protocol files. • During the local testing, only and only if the punch points are thorough then only final testing will be done. • Final point-to-point testing from SCADA Center is to be necessarily cleared before SAT.
3.j	Time synchronization and SOE	<p>A dedicated GPS signal from the SCADA MCC & BCC (FEP) will be provided for the synchronization of the entire system. This GPS signal would be available to the RTU/ DCU at regular specified intervals and the RTU/ DCU in turn should synchronize all devices via the inter bay bus using SNTP protocol as defined in IEC 61850 standard.</p> <p>To analyze the chronology or sequence of events occurring in the power system, time tagging of data is required which shall be achieved through</p>

		<p>SOE feature of RTU. The RTU shall have an internal clock with the stability of 10ppm or better. The RTU time shall be set from time synchronization messages received from master station using IEC 60870-5- 104 protocol. In addition, the message can be transmitted using NTP/SNTP. SOE time resolution shall be 1ms or better.</p> <p>The RTU shall maintain a clock and shall time-stamp the digital status data. Any digital status input data point in the RTU shall be assignable as an SOE point. Each time a SOE status indication point changes the state, the RTU shall time-tag the change and store in SOE buffer within the RTU. A minimum of 10000 events shall be stored in the SOE buffer. SOE shall be transferred to Master Station as per IEC 60870-5-104 protocol. SOE buffer & time shall be maintained by RTU on power supply interruption.</p>																
3.k	Response Times and I/O Capacities	<p>The total I/O count in a major substation will become large and it must be ensured that the hardware and communication links have sufficient performance to ensure prompt processing of data, Ref. Tables 3.k [1] and 3.k [2].</p> <p>As I/O at the bay level, both digital and analog will typically be handled by intelligent relays or specialized IEDs, it is therefore important to ensure that these devices have sufficient I/O capacity and dual communication ports for PRP protocol.</p> <table border="1"> <caption>Table 3.k [1] Minimum system response times for a substation</caption> <tr> <td>Digital Input</td> <td>1s</td> </tr> <tr> <td>Analog Input</td> <td>1s</td> </tr> <tr> <td>Digital Output</td> <td>0.75s</td> </tr> <tr> <td>Disturbance Record File</td> <td>3s</td> </tr> </table> <table border="1"> <caption>Table 3.k [2] Typical I/O capacities for a substation</caption> <tr> <td>Digital Input</td> <td>8192</td> </tr> <tr> <td>Digital Output</td> <td>2048</td> </tr> <tr> <td>Analog Input</td> <td>2048</td> </tr> <tr> <td>Analog Output</td> <td>512</td> </tr> </table> <p>The above are the minimum capacity which may change during detailed engineering of RTU/ DCU. The RTU/ DCU should have the capability of I/Os expansion.</p>	Digital Input	1s	Analog Input	1s	Digital Output	0.75s	Disturbance Record File	3s	Digital Input	8192	Digital Output	2048	Analog Input	2048	Analog Output	512
Digital Input	1s																	
Analog Input	1s																	
Digital Output	0.75s																	
Disturbance Record File	3s																	
Digital Input	8192																	
Digital Output	2048																	
Analog Input	2048																	
Analog Output	512																	

3.l	Multi Function Meters (MFM)	<p>A single network loop of MFMs should not have more than eight (8) MFMs. MFM communication network on RTU/ DCU serial Modbus RS485 should be protected against surges and electrical leakages therefore, it is necessary to install Surge Protection Devices placed in between the RTU/ DCU & MFM serial network loop.</p> <p>The inter-looping of MFMs to be made by 22 guage Belden 8761 non-screened cable while the extension of the communication network from MFM to RTU/ DCU to be made by 22 guage Belden 8761 Belden screened cable. The typical diagram for this connection is mentioned in the System Architecture diagram, Annexure 12.a.</p> <p>Minimum two (2) spare links from CRP to RTU/DCU to be provided by supplier/ BA for future extension.</p> <p>All hardware of the RTU/ DCU and Network Automation system and CT & PT wirings to MFMs and its configurations fall in supplier/ BAs scope.</p> <p>The integration of MFM to be done as per the technical document and parameter configuration as per Annexure 12.b.</p>
3.m	Transformer Monitoring cum Automatic Voltage Regulator (AVR) Unit	<p>A digital transformer monitoring cum automatic voltage regulator unit is to be provided as per the tender document for each transformer and it should fulfill the following requirements for SCADA integration and configuration:</p> <ul style="list-style-type: none"> • As the name suggests, it should have the functionality of automatic voltage control. • A digital transformer monitoring cum automatic voltage regulator unit should have the facility to measure CT, PT, Oil temperature, winding temperature and tap position etc. further these parameters shall be telemetered to SCADA RTU/ DCU on IEC 61850 protocol. • It should have facility to control tap position, fan control etc. further these parameters shall be telemetered to SCADA RTU/ DCU on IEC 61850 protocol for monitoring and controlling. • It shall have Microprocessor based Numerical relay having LCD display along with the software to make the parameters settings of the device and it shall be possible to do the parameter setting through keyboard unit. • It should have the feature to set the parameters related to voltage regulation and fan control from MCC & BCC.

		<ul style="list-style-type: none"> • The unit shall have suitable interface to communicate with higher level SCADA system as per the protocol proposed in the integrated package solution. • The unit should be capable of taking tap position, oil temperature inputs directly without any transducers. • The parameters configuration should be as per Annexure 12.b.
3.n	Maintenance, Diagnostics and Reliability	<p>Maintenance:</p> <p>It is a requirement that all RTU/ DCUs require no routine or planned maintenance. Therefore, no fans or moving parts shall be used in the RTU/ DCU to avoid any need for maintenance. To ensure this, the RTU/ DCU should be constructed to resist the entry of dust. A single technician shall be able to remove and replace for repair purposes, without special tools and test equipments involved in the operation of RTU/ DCU. Restoration of equipment to full operational use shall be possible within 15 minutes (nominally) of repairs being completed. It should not be necessary to dismantle (remove multiple pieces of) the RTU/ DCU in order to replace a module.</p> <p>Diagnostics:</p> <p>The vendor should provide remote maintenance and monitoring diagnostic and configuration tools (Laptop) which should be able to access the RTU/ DCU and all other IEDs using BYPLs TCP/ IP WAN network. The station should use RTU/ DCUs pass through access capability to monitor the station devices and carry out parameterization of the IEDs, Protection Relays and network devices in the station.</p> <ul style="list-style-type: none"> • The supplier is required to provide diagnostic and configuration software to run in the supplied tools and access the RTU/ DCU. This software tool shall allow building of new configuration file, modification and configuration of RTU/ DCU configuration file along with the below listed facilities: <ul style="list-style-type: none"> ▪ Monitoring of all inputs, control of all outputs and testing of calculation logic. Monitoring of all inputs and logic at card level, logic level and protocol level. ▪ Display of communication statistics and eavesdropping of communications channels, including Ethernet, IP, IEC103, IEC 104, IEC 61850 and Modbus. ▪ Download & upload of RTU/ DCU software, database configuration and calculations, upload the complete

		<p>configuration from RTU/ DCU to modify and then download to RTU/ DCU.</p> <ul style="list-style-type: none"> ▪ On-line help. ▪ Display current firmware, software and configuration running in the RTU/ DCU. ▪ Configuration and diagnostic software must run on latest Microsoft Windows version. <ul style="list-style-type: none"> • The diagnostic and configuration utility software shall be provided on a CD/ DVD which is compatible with laptop/ PC. The current version number of such software shall be provided. <p>Reliability:</p> <p>The RTU/ DCU and Network Automation system will normally remain in continuous service, 24X7, to provide SCADA facilities. A high level of reliability is required as failure can result in the interruption of the operation and monitoring of the Power System Control.</p> <p>Predicted availability of equipment supplied should exceed the following:</p> <table border="1"> <thead> <tr> <th colspan="2">Table 3.n [1]</th> </tr> <tr> <th>System Function</th> <th>System Availability</th> </tr> </thead> <tbody> <tr> <td>Control and monitoring of any one breaker/ equipment</td> <td>99.99%</td> </tr> <tr> <td>Monitoring of any one status & measurand data indication</td> <td>99.99%</td> </tr> <tr> <td>Monitoring of any one status/ measurand/analog input</td> <td>99.99%</td> </tr> </tbody> </table>	Table 3.n [1]		System Function	System Availability	Control and monitoring of any one breaker/ equipment	99.99%	Monitoring of any one status & measurand data indication	99.99%	Monitoring of any one status/ measurand/analog input	99.99%
Table 3.n [1]												
System Function	System Availability											
Control and monitoring of any one breaker/ equipment	99.99%											
Monitoring of any one status & measurand data indication	99.99%											
Monitoring of any one status/ measurand/analog input	99.99%											
3.o	Interchangeability & Future Extendibility	<p>Interchangeability:</p> <p>RTU/ DCU parts like processors, co-processors and interface modules and network hardware shall be interchangeable individually, and as a whole RTU/ DCU without the need of re-configuration with pre-programmed flash memory. Any such change or replacement shall not reduce the capability of the equipment to conform to requirements of this specification.</p> <p>Each module and switch links of the RTU/ DCU and Network Automation system should have Hot Swap feature i.e., at the time of removal/ insertion of modules and switch links, the system should not become faulty and automatically recognize the new module and switch link without any need</p>										

		<p>of system reboot.</p> <p>Future Extendibility:</p> <p>Offered SCADA RTU/ DCU & Network Automation system shall be suitable for extension in future for additional bays. During such requirements, all the drawings and configurations, alarms/ events list etc displayed shall be designed in such a manner that its extension shall be easily performed by the BYPL user. During such event, normal operation of the existing substation shall be unaffected and system shall not require a shutdown. The BA shall provide all the necessary software tools along with the source codes to perform addition of bays in future and complete integration with RTU/ DCU & Network Automation system by the user. These software tools shall be able to configure IEDs, add additional analog variables, alarm list, event list, modify interlocking logics etc. for additional bays/ equipment which shall be added in future. Offered RTU/ DCU & Network Automation System including switches shall have minimum 20% spare of utilized RTU/DCU & Network Automation system hardware and accessories, completely wired up to the last terminal.</p>
3.p	Service life, Warranty and Replacement Support	<p>Service Life:</p> <p>BYPL prefers that the major equipments of RTU/ DCU and Network Automation system shall be capable of complying with this standard, including performing its intended purpose, for a minimum of 10 years from the date of supply.</p> <p>The supplier/BA shall provide a service support letter containing:</p> <ul style="list-style-type: none"> • The date at which the product was released for sale. • The anticipated date at which the product will be withdrawn from sale, but support will continue to be supplied. • The anticipated date of when the product support will be withdrawn i.e. spares will no longer be available and technical support will no longer be provided. <p>Warranty and Replacement Support:</p> <p>During the guaranteed availability period, the spare parts supplied by the supplier/ BA shall be made available to the supplier/ BA for usage subject to replenishment within the committed time (maximum eight (8) weeks). Thus, after the system is revived the inventory of spares with BYPL shall be fully replenished by the supplier/ BA. However, any additional spares</p>

		<p>required to meet the availability of the system (which is not a part of the above spares supplied by the supplier/ BA) would have to be supplied immediately by the supplier/ BA free of cost to BYPL.</p> <ul style="list-style-type: none"> • RTU/ DCU and Network Automation System Hardware: Minimum 5 years • RTU/ DCU and Network Automation System Accessories: 2 years • Managed Ethernet Switch: 5 years <p>At the time of failure or non-availability of the system, during the warranty period, the supplier/ BA is required to visit the site on BYPLs call within 24hrs, free of cost to revive the system.</p> <p>The supplier/ BA should submit a liability warranty support certificate to BYPL.</p>
3.q	RTU/ DCU & Network Earthing System	<p>Two types of earthing should be provided by the supplier/ BA: power and electronics. Both should be of copper, isolated and suitably sized (as per BYPLs approval). Power earthing should be connected to the RTU/ DCU Enclosure, light, fan, AC while the electronic earthing will be connected to the inside modules of the RTU/ DCU.</p> <p>Color of earthing wire: Green and Yellow/ Green</p> <p>In the receiving station, grid earthing will be used for RTU earthing.</p>
3.r	DR Download	<p>The proposed SCADA network should be configured for remote downloading of DR over WAN from any one (1) location falling under BYPL jurisdiction.</p> <p>All the required configuration settings of the supplied network are to be made by the supplier/ BA.</p>
3.s	RTU Auxiliary Power supply system	<p>Power for the RTU/ DCU & Network Automation system shall be derived from substation 48/ 220V DC system. The power supply system will have a wide range, 48 VDC nominal : 36- 72 V. The supplier/ BA may use DC- DC converter to convert grid control voltage 220VDC to 48VDC with wide operating range. The power supply system should be redundant and distributed through MCB of suitable ratings. Power supply should also be equipped with surge protection device.</p>

4	SCADA Commands, Indications & Measurands Data	As per Annexure 12.b.
5	Quality Control and Checklist	<p>The supplier/ BA is required to submit a plan of different stages of manufacturing and testing based on which subsequent reports and certificates shall be submitted. If during this period the manufacturing and quality is found unsatisfactory as to workmanship or material, the same is liable for rejection and the supplier/ BA will be obliged to provide standardized equipment as per BYPLs specifications.</p> <p>Checklist:</p> <ol style="list-style-type: none"> 1. Space required for future expansion 2. Component layout 3. Wiring termination details 4. Equipment/ component make used in the panel with their specifications
6	Pre- Dispatch Inspection (FAT) & Minimum Testing Facility	<p>Pre-Dispatch Inspection (FAT):</p> <p>After submitting and on BYPLs acceptance of the Test certificate and Quality Report, the supplier/ BA is required to call BYPL for Pre-Dispatch Inspection. The supplier/ BA should ensure the completion of manufacturing and set-up for Pre-Dispatch Inspection.</p> <p>Pre-Dispatch Inspection will be treated as FAT, which will only be carried on if the minimum testing facility has been arranged by the supplier/ BA.</p> <p>In case FAT is waived off, all the below mentioned points will be tested during SAT.</p> <p>The following tests are to be carried out under FAT:</p> <ol style="list-style-type: none"> 1) Visual inspection of dimensions, workmanship, quality and specifications of the equipments as per the approved drawing and tender document. 2) Test certificate and Quality Report verification as submitted 3) Simulation of RTU/ DCU & SCADA Network connectivity, data acquisition from IEDs/ MFMs and functionalities like: <ul style="list-style-type: none"> • Indications, Commands and Measurands data • Time synchronization • Sequence of Events

		<ul style="list-style-type: none"> • Redundancy, diagnostic feature • Interchangeability • Hot Swapping • Any other functionality as per the tender document <p>4) During the Pre-dispatch inspection period if the vendor fails to simulate any of the functionality mentioned above and as per the tender document then BYPL has the rights to scrap the inspection and another FAT will be arranged for which the supplier/ BA will bear the travel expenses including both side airfares, cab rent, food and lodging.</p> <p>Minimum Testing Facility: The minimum testing facility should include:</p> <ol style="list-style-type: none"> 1) Minimum number of each type of relays being supplied by the supplier/ BA for SCADA RTU/ DCU and Network Automation system. 2) Complete SCADA RTU/ DCU and Network Automation system with redundancy connecting to each type of IED, at least two (2), being supplied by the supplier/ BA for the aforementioned system.
7	Packing & Forwarding	<p>The supplier/ BA shall ensure that all equipment covered by this specification shall be prepared for rail/ road transport (local equipment) and be packed in such a manner so as to protect it from damage in transit. All equipment/ material are to be transported with proper packing and markings.</p> <p>Any damage to the equipment(s) during the transit will be borne by the supplier/ BA and the replaced damaged equipment(s) will be made available to BYPL within the committed time (maximum eight (8) weeks).</p>
8	System Spares, Tools & Software Tools with Licenses	<p>The bidder is required to list the spares, which may be required for ensuring the availability during the guaranteed availability period. The final list of spares shall form part of scope and accordingly the price thereof shall be quoted by the bidder and shall be considered in the evaluation of the bids.</p> <p>The list shall include the following:</p> <ul style="list-style-type: none"> • Item identification • Recommended spares quantities (minimum 20% of utilized Hardware of SCADA/ DCU and Network Automation System)

- Base price of proposed spares
- Procurement lead time probability of returning the replaced/ repaired spare parts
- Procurement lead time probability of the spare material BYPL may need to procure apart from this Tender
- Quantity of item held in local office by supplier/ BA as emergency spare parts.

All spare parts shall be fully tested, however BYPL has the right to return the tested spare part on being found faulty for which the BA/ supplier shall provide with replacement within the committed time (maximum eight (8) weeks).

Table 8 [1] Mandatory Spares

S.No.	Item	Qty	UOM
1.	RTU/ DCU & Network Hardware		
1.1	Rack redundant	1	No. each type
1.2	Rack I/O	1	No. each type
1.3	DI module with cable	1	No. each type
1.4	DO module with cable	1	No. each type
1.5	AI module with cable	1	No. each type
1.6	Managed Ethernet switch	1	No. each type
1.7	OFC patch cord	5	No. each type
1.8	Power Supply SMPS	2	No. each type
1.9	MCB	2	No. each type
1.10	Main Processor	1	No. each type
1.11	Co-processor connecting IEC 61850 protocol devices	1	No. each type
1.12	Co-processor connecting serial devices	1	No. each type
1.13	Power supply for RTU rack	1	No. each type
2.	RTU/ DCU Panel Accessories (Converters, Power Supplies etc.)	Minimum 20% of Utilized	No. each type
3.	Communication Cable- RS485, LAN	Hardware of SCADA/ DCU and Network Automation System	
4.	Control Cable		

Table 8 [2] Software Configuration Tools		
S.No.	Item	Qty
1	RTU/ DCU configuration tools with software and cables	2 Nos.
2	Network configuration tools with software and cables	1 Nos.

9	<p>Drawings & Documents, Configuration Backup and Certificates</p>	<p>Drawings & Documents:</p> <p>Following drawings and documents shall be prepared on BYPLs specifications and statutory requirements and shall be submitted before the starting of manufacturing:</p> <ol style="list-style-type: none"> 1. Completely filled in Technical Particulars 2. General description of the equipment and all components including brochures 3. Bill of material 4. Type test certificates 5. System Design Architecture Drawing 6. Layout drawings of Control cable, communication cable and cable tray linking RTU/ DCU panel, communication panels/ hardware 7. Hardware Specification 8. Sizing Calculations of various components 9. Response Time Calculations 10. Functional Design Document 11. Power Distribution Schematic Diagrams for each RTU 12. Standard documentation per IED, according to IEC 61850 13. MICS document (Model Implementation Conformance Statement) 14. PICS document (Protocol Implementation Conformance Statement) 15. Conformance Test certificate 16. ICD File (IED Capability Description file) 17. SCD file (Substation Configuration Description) <p>After the award of the contract four (4) copies of drawings, drawn to scale, describing the equipments in detail shall be forwarded for approval and the supplier/ BA shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto-positive suitable for reproduction, before the dispatch of the equipments. Soft copy (Compact Disk CD) of the drawings, GTP, Test certificates shall be submitted after the final approval of the same to BYPL.</p> <p>All the documents and drawings shall be in English language.</p>
----------	---	---

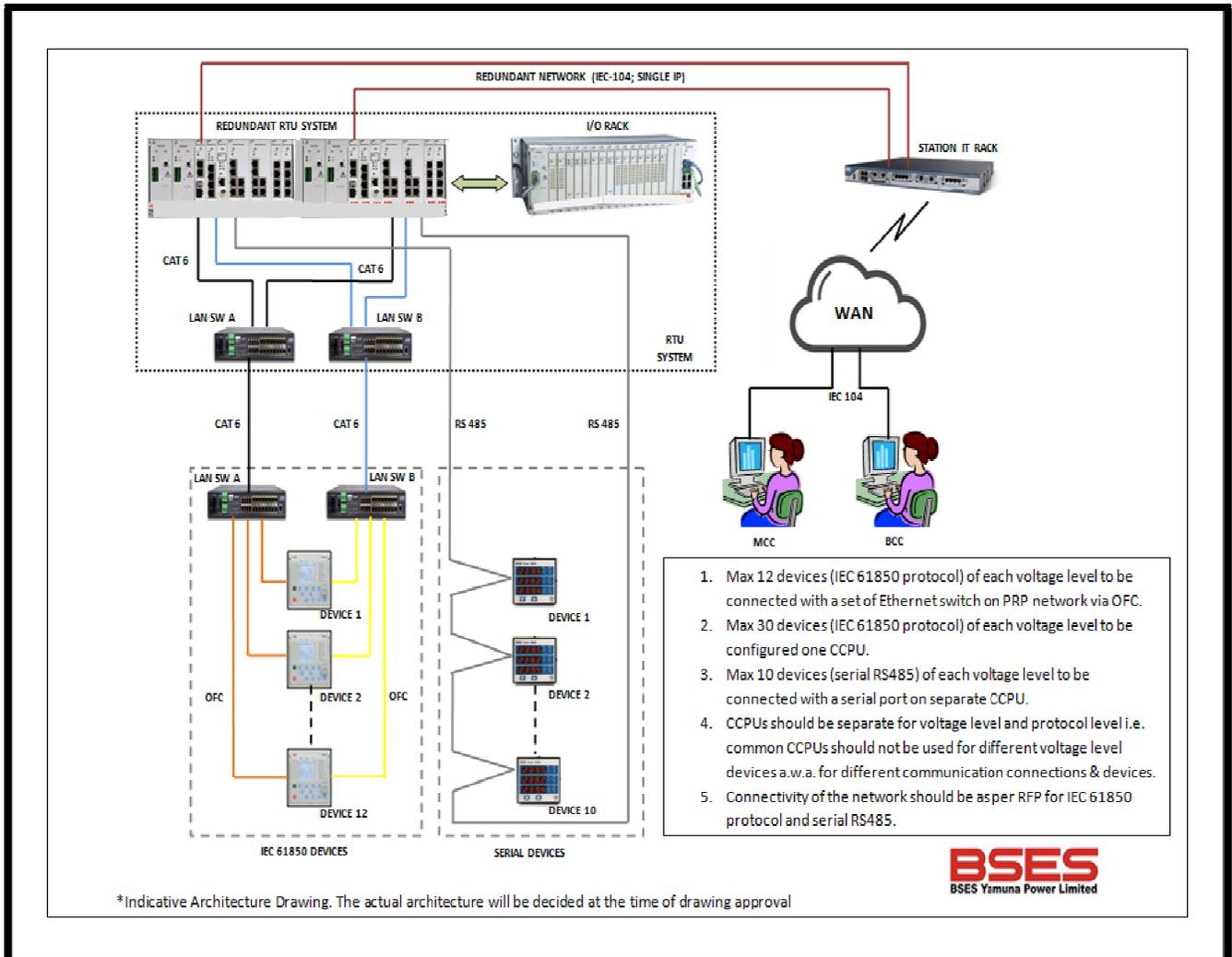
		<p>After execution any minor/ major change(s) made at the site to be incorporated in the documents and drawings and duly submitted to BYPL in the form of hard and soft copy.</p> <p>Instruction Manuals: Bidder shall furnish two (2) soft copies (CD) and four (4) hard copies of nicely bound manuals (in English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipments as well as the auxiliary devices.</p> <p>Configuration Backup: All Configuration files for RTU/ DCU and network automation system should be provided to BYPL.</p> <p>Certificates:</p> <ol style="list-style-type: none"> 1. Test certificates of all the tests required and conducted by the supplier/ BA. 2. System and equipments warranty certificates 3. Maintenance and Service Agreement Certificates <p>The supplier/ BA shall ensure that all the certificates mentioned in this document along with SAT document are submitted to BYPL at the time of SAT.</p>
<p>10</p>	<p>Trainings and Hands-on</p>	<p>The supplier/ BA personnel who are experienced instructors and who speak understandable English shall conduct training. The supplier/ BA shall arrange on its own cost all hardware training platform required for successful training and understanding at BYPLs works. The supplier/BA shall provide all necessary training material. Each trainee shall receive individual copies of all technical manuals and all other documents used for training. These materials shall be sent to BYPL at least two (2) months before the scheduled commencement of the particular training course. Class materials, including the documents sent before the training courses as well as class handouts, shall become the property of BYPL. BYPL reserves the right to copy such materials, but for in-house training and use only. Hands-on training shall utilize equipment identical to that being supplied to BYPL. The schedule, location, and detailed contents of each course will be finalized during BYPL and supplier/ BAs discussions. If the supplier/ BA have utilized 3rd party equipment or outsourced work to a 3rd party then experienced instructors of the 3rd party are required to be part of</p>

		<p>the training sessions.</p> <p>System Hardware Course</p> <p>A computer system hardware course shall be offered, but at the system level. The training course shall be designed to give BYPL hardware personnel sufficient knowledge of the overall design and operation of the system, so that they can correct obvious problems, configure the hardware, perform preventive maintenance, run diagnostic programs, and communicate with contract maintenance personnel. The following shall be covered:</p> <ul style="list-style-type: none">• System hardware design architecture overview: Configuration of the system hardware.• Equipment Maintenance: Basic theory of operation, maintenance techniques and diagnostic procedures for each element of the computer system, e.g., processors, auxiliary memories, ethernet, routers and printers. Configuration of all the hardware equipment.• System Expansion: Techniques and procedures to expand and add equipment such as loggers, monitors and communication channels.• System Maintenance: Theory of operation, maintenance techniques and practices, diagnostic procedures and (where applicable) expansion techniques and procedures. Classes shall include hands-on training for the specific subsystems that are part of BYPLs equipment or part of similarly designed and configured subsystems. All interfaces to the computing equipment shall be taught in detail.• Operational Training: Practical training on preventive and corrective maintenance of all equipment, including use of special tools and instruments. This training shall be provided on BYPLs equipment or on similarly configured systems. <p>System Software Course</p> <p>The contractor shall provide a computer system software course that covers the following subjects:</p> <ul style="list-style-type: none">• System Programming: Including all applicable programming languages and all stand-alone service and utility packages provided with the system. An introduction to software architecture, effect of tuning parameters (OS software, Network software, database software etc.) on the performance of the system.• Operating System: Including the user aspects of the operating
--	--	--

		<p>system, such as program loading and integrating procedures, scheduling, management, service and utility functions and system expansion techniques and procedures.</p> <ul style="list-style-type: none"> • System Initialization and Failover: Including design, theory of operation and practice • Diagnostics: Including the execution of diagnostic procedure and the interpretation of diagnostic outputs. • Software Documentation: Orientation in the organization and use of system software documentation. • Hands-on Training: One week, with allocated computer time for trainee performance of unstructured exercises and with the course instructor available for assistance as necessary. <p>Application Software Course</p> <p>The supplier/ BA shall provide comprehensive application software courses covering all applications including the database and display building course. The training shall include:</p> <ul style="list-style-type: none"> • Overview: Block diagrams of the application software and data flows. Programming standards and program Interface conventions. • Application Functions: Functional capabilities, design and major algorithm. Associated maintenance and expansion techniques. • Software Development: Techniques and conventions to be used for the preparation and integration of new software functions. • Software Generation: Generation of application software from source code and associated software configuration control procedures. • Software Documentation: Orientation in the organization and use of functional and detailed design documentation and of programmer and user manuals. • Hands-on Training: One week, with allocated computer time for trainee performance of unstructured exercises and with the course instructor available for assistance as necessary. <p>Requirement of Training</p> <p>The supplier/ BA shall provide training for a batch (maximum of 10 people) for five (5) days in two slots (Time of which will be decided by BYPL and supplier/ BA) on the following courses.</p> <p>Name of Course:</p>
--	--	---

		<ul style="list-style-type: none"> • System Hardware • System Software • Application Software
<p>11.</p>	<p>SAT</p>	<p>This document exclusively covers the SAT for SCADA RTU/ DCU and Network Automation system.</p> <p>After the successful commissioning and testing of the SCADA RTU/ DCU & Network Automation system and liquidation of all punch points, the system will be put on continuous running mode for a cycle of minimum thirty (30) days after clearance on punch-points. During this period, if the RTU/ DCUs performance due to configuration and/ or hardware does not meet the criteria as per points 3.k and 3.n, the cycle will be reset.</p> <p>During the cycle, availability and operational efficacy of the system will be checked and after successful validation SAT will be concluded.</p> <p>SAT will include the validation of the following:</p> <ol style="list-style-type: none"> 1. Network 2. SCADA RTU/ DCU and Network redundancy 3. Validation of SOE 4. Indication, Command and Measurand data <p>BYPL reserves the right to financially penalize the supplier/ BA on failure of SAT as per the technical and tender document.</p>

Annexure 12.a (RTU/ DCU System Architecture Drawing)



*Indicative Architecture Drawing. The actual architecture will be decided at the time of drawing approval

Annexure 12.b (Signal List- 11/33/66kV)

A. 11kV Outgoing feeders- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker ON	✓		DPI
2.	Breaker OFF			SPI
3.	Trip Ckt Healthy	✓		SPI
4.	Spring Charge	✓		SPI
5.	Breaker in Service	✓		SPI
6.	Breaker in Test	✓		SPI
7.	Auto Trip (86) Operated	✓		SPI
8.	Panel DC Fail	✓		SPI
9.	L/R switch in SCADA	✓		SPI
10.	Relay Int Fault	✓		SPI
11.	Over Current Operated	✓		SPI
12.	Earth Fault Operated	✓		SPI
13.	BKR Close COMMAND		✓	DCO
14.	BKR Open COMMAND			
15.	Auto Trip (86) relay reset from Remote		✓	SCO
16.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
17.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

B. 11kV Incomers: IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Trip Ckt Healthy	✓		SPI
4.	Spring Charge	✓		SPI
5.	Breaker in Service	✓		SPI
6.	Breaker in Test	✓		SPI
7.	Auto trip (86) Operated	✓		SPI
8.	VT fuse Blown- Metering	✓		SPI
9.	VT fuse Blown- Protection	✓		SPI
10.	Panel DC Fail			SPI
11.	L/R Switch in SCADA	✓		SPI
12.	Relay Int Fault	✓		SPI
13.	Over Current Operated (All Stages)	✓		SPI
14.	Earth Fault Operated (All Stages)	✓		SPI
15.	Under Voltage Prot. Operated	✓		SPI
16.	Over Voltage Prot. Operated	✓		
17.	REF Operated	✓		SPI
18.	BKR Close COMMAND		✓	DCO
19.	BKR Open COMMAND			
20.	Auto trip (86) relay reset from Remote		✓	SCO
21.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
22.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

C. 11kV Bus Coupler: IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Trip Ckt Healthy	✓		SPI
4.	Spring Charge	✓		SPI
5.	Breaker in Service	✓		SPI
6.	Breaker in Test			SPI
7.	Auto trip (86) Operated	✓		SPI
8.	Panel DC Fail	✓		SPI
9.	L/R Switch in SCADA	✓		SPI
10.	Relay Int. Fault	✓		SPI
11.	PT MCB- Metering operated	✓		SPI
12.	PT MCB- Protection operated	✓		SPI
13.	Over Current Operated	✓		SPI
14.	Earth Fault Operated	✓		SPI
15.	BKR Close COMMAND		✓	DCO
16.	BKR Open COMMAND			
17.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

D. 11Kv Capacitors: IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Bank ISO ON	✓		DPI
4.	Bank ISO OFF			
5.	Trip Ckt Healthy	✓		SPI
6.	Spring Charge	✓		SPI
7.	Breaker in Service	✓		SPI
8.	Breaker in Test	✓		SPI
9.	Master Trip (86) Operated	✓		SPI
10.	Bus PT fuse Blown-Metering	✓		SPI
11.	Bus PT fuse Blown-Protection	✓		SPI
12.	Panel DC Fail	✓		SPI
13.	L/R Switch in SCADA	✓		SPI
14.	Over Current Operated	✓		SPI
15.	Earth Fault Operated	✓		SPI
16.	Under Volt. Prot. Operated	✓		SPI
17.	Over Volt. Prot. Operated	✓		SPI
18.	Neg. Phase sequence Operated	✓		SPI
19.	Timer Relay operated/ Normal	✓		DPI
20.	Relay Int. Fault	✓		SPI
21.	BKR Close COMMAND		✓	DCO
22.	BKR Open COMMAND			
23.	BANK ISO OPN		✓	DCO
24.	BANK ISO CLS			
25.	Master trip (86) reset from remote		✓	SCO
26.	3phase R, Y, B- Curr & Volt, React. Pow, Neu. Curr	✓		AI/ MV
27.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F	✓		AI

	Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose			
--	--	--	--	--

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

E. 33 & 66 kV Incomers/ Outgoing- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Front Bus (89A) ISO ON (In-case of O/D)	✓		DPI
4.	Front Bus (89A) ISO OFF (In-case of O/D)			
5.	Rear Bus (89B) ISO ON (In-case of O/D)	✓		DPI
6.	Rear Bus (89B) ISO OFF (In-case of O/D)			
7.	LINE ISO (89L) ON (In-case of O/D)	✓		DPI
8.	LINE ISO (89L) OFF (In-case of O/D)			
9.	EARTH SWITCH (89LE)- 1 ON (In-case of O/D)	✓		DPI
10.	EARTH SWITCH (89LE)- 1 OFF (In-case of O/D)			
11.	EARTH SWITCH (89LE)- 2 ON (In-case of O/D)	✓		DPI
12.	EARTH SWITCH (89LE)- 2 OFF (In-case of O/D)			
13.	Breaker in Service (In-case of I/D BKR)	✓		SPI
14.	Breaker in Test (In-case of I/D BKR)	✓		SPI
15.	Trip Ckt Healthy- 1 & 2	✓		SPI
16.	Spring Charge	✓		SPI

17.	Master Trip (86) Operated	✓		SPI
18.	SF6 Pressure Low & SF6 Lock Out	✓		SPI
19.	VT fuse Fail	✓		
20.	L/R Switch in Remote	✓		SPI
21.	LBB Operated	✓		SPI
22.	Panel DC Fail	✓		SPI
23.	Relay Int. Fault	✓		SPI
24.	Over Current Operated (All Stages)	✓		SPI
25.	Earth Fault Operated (All Stages)	✓		SPI
26.	DIFF. Prot Operated	✓		SPI
27.	DIST. Prot Operated	✓		SPI
28.	BKR Close COMMAND		✓	DCO
29.	BKR Open COMMAND			
30.	Front Bus (89A) ISO OPN COMMAND (In-case of O/D)		✓	DCO
31.	Front Bus (89A) ISO CLS COMMAND (In-case of O/D)			
32.	Rear Bus (89B) ISO OPN COMMAND (In-case of O/D)		✓	DCO
33.	Rear Bus (89B) ISO CLS COMMAND (In-case of O/D)			
34.	LINE ISO (89L) OPN COMMAND (In-case of O/D)		✓	DCO
35.	LINE ISO (89L) CLS COMMAND (In-case of O/D)			
36.	Master trip (86) relay reset from remote		✓	SCO
37.	3phase R, Y, B- Curr & Volt, Active & React. Pow, Pow Factor, Max Demand, Neu. Curr etc.	✓		AI/ MV
38.	Fault current and phase indication of faulty phase	✓		AI

	viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose			
--	--	--	--	--

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

F. 33 & 66 kV Transformer- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Front Bus (89A) ISO ON (In-case of O/D)	✓		DPI
4.	Front Bus (89A) ISO OFF (In-case of O/D)			
5.	Rear Bus (89B) ISO ON (In-case of O/D)	✓		DPI
6.	Rear Bus (89B) ISO OFF (In-case of O/D)			
7.	TRF ISO (89T) ON (In-case of O/D)	✓		DPI
8.	TRF ISO (89T) OFF (In-case of O/D)			
9.	EARTH SWITCH (89LE)- 1 ON (In-case of O/D)	✓		DPI
10.	EARTH SWITCH (89LE)- 1 OFF (In-case of O/D)			
11.	EARTH SWITCH (89LE)- 2 ON (In-case of O/D)	✓		DPI
12.	EARTH SWITCH (89LE)- 2 OFF (In-case of O/D)			
13.	Breaker in Service (In-case of I/D BKR)	✓		DPI
14.	Breaker in Test (In-case of I/D BKR)			

15.	Trip Ckt Healthy- 1 & 2	✓		SPI
16.	Spring Charge	✓		SPI
17.	Auto Trip (86) Operated	✓		SPI
18.	Differential Operated	✓		SPI
19.	LBB Operated	✓		SPI
20.	REF/SEF Prot Operated	✓		SPI
21.	SF6 Pressure Low & SF6 Lock Out	✓		SPI
22.	Panel DC Fail	✓		SPI
23.	L/R Switch in Remote	✓		SPI
24.	LBB Operated	✓		SPI
25.	Relay Int. Fault	✓		SPI
26.	Over Current Operated	✓		SPI
27.	Earth Fault Operated	✓		SPI
28.	BKR CLS COMMAND		✓	DCO
29.	BKR OPN COMMAND			
30.	Front Bus (89A) ISO OPN COMMAND (In-case of O/D)		✓	DCO
31.	Front Bus (89A) ISO CLS COMMAND (In-case of O/D)			
32.	Rear Bus (89B) ISO OPN COMMAND (In-case of O/D)		✓	DCO
33.	Rear Bus (89B) ISO CLS COMMAND (In-case of O/D)			
34.	TRF ISO (89T) OPN COMMAND (In-case of O/D)		✓	DCO
35.	TRF ISO (89T) CLS COMMAND (In-case of O/D)			
36.	Master trip (86) relay reset from remote		✓	SCO
37.	3phase R, Y, B- Curr & Volt, Active & React. Pow, Pow Factor, Max Demand, Neu. Curr etc.	✓		AI/ MV
38.	Fault current and phase indication of faulty phase	✓		AI

	viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay). Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Relay). Fault Differential and Bias current in Line and T/F Differential Relay, Fault distance (in distance relay), Disturbance Records, Fault graphs for remote diagnosis purpose.			
--	---	--	--	--

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

G. Signals Related with CRP

Sr. No.	Signal Detail	Type of Signal on IEC61850
1	Signals of Differential Relay	
	Digital Input Signals	
1	Differential Trip Bph	Single Point Information
2	Differential Trip Rph	Single Point Information
3	Differential Trip Yph	Single Point Information
4	Differential Highset Trip	Single Point Information
5	Differential Trip	Single Point Information
6	Inrush detected	Single Point Information
7	REF Trip	Single Point Information
8	Trafo. Differential lockout operated	Single Point Information
9	Trafo. Differential watchdog operated	Single Point Information
10	Trafo. Differential communication fail	Single Point Information
11	Trafo Trouble Trip	Single Point Information
	Measurement Signals	
1	Current Bph	Measured Float
2	Current Rph	Measured Float
3	Current Yph	Measured Float
4	Fault Current Bph	Measured Float
5	Fault Current Rph	Measured Float
6	Fault Current Yph	Measured Float
7	Fault Current Nph	Measured Float

8	Fault locator in some relays	Measured Float
9	Sigma kA square	Measured Float
2	Signals of Distance Relay	
	Digital Input Signals	
1	Distance Relay Lockout Operated	Single Point Information
2	Distance Trip	Single Point Information
3	Distance Zone-1 operated	Single Point Information
4	Distance Zone-2 operated	Single Point Information
5	Distance Zone-3 operated	Single Point Information
6	Line Distance Relay Communication Fail	Single Point Information
7	Line Distance Relay watchdog operated	Single Point Information
3	Signals of Line Differential Relay	
	Digital Input Signals	
1	Conductor Broken	Single Point Information
2	Differential Trip	Single Point Information
3	Rph Differential Trip	Single Point Information
4	Yph Differential Trip	Single Point Information
5	Bph Differential Trip	Single Point Information
6	Distance Trip	Single Point Information
7	Distance Zone-1 operated	Single Point Information
8	Distance Zone-2 operated	Single Point Information
9	Distance Zone-3 operated	Single Point Information
10	Earth Fault high set trip	Single Point Information
11	Earth Fault IDMT trip	Single Point Information
12	General Trip	Single Point Information
13	Inter-trip	Single Point Information
14	Line differential block	Single Point Information
15	Line differential Channel-1 fail	Single Point Information
16	Line differential Channel-2 fail	Single Point Information
17	Line differential operated	Single Point Information
18	Line differential relay watchdog operated	Single Point Information
19	Phase fault high set trip	Single Point Information
20	Phase fault IDMT trip	Single Point Information
21	PT Fuse Fail	Single Point Information
22	Sync fail	Single Point Information
	Digital Output Signals	
1	General trip	Single Command Output
2	Line Diff. Operated	Single Command Output
	Measurement Signals	
1	Active Power	Measured Float
2	Current Bph	Measured Float

3	Current Rph	Measured Float
4	Current Yph	Measured Float
5	Fault Current Bph	Measured Float
6	Fault Current Rph	Measured Float
7	Fault Current Yph	Measured Float
8	Fault Current Nph	Measured Float
9	Fault Locator in some relays	Measured Float
10	Frequency	Measured Float
11	Power Factor	Measured Float
12	Reactive Power	Measured Float
13	Sigma kA square	Measured Float
14	Voltage BR	Measured Float
15	Voltage RY	Measured Float
16	Voltage YB	Measured Float
4	Signals of Overcurrent Earthfault Relay	
	Digital Input Signals	
1	50BF/LBB Operated	Single Point Information
2	86 Supervision	Single Point Information
3	Relay Communication fail	Single Point Information
4	Relay watchdog operated	Single Point Information
5	Isolator A status	Double Point Information
6	Isolator B status	Double Point Information
7	Cable door open	Single Point Information
8	CB in Remote	Single Point Information
9	CB Status	Double Point Information
10	Earth Fault General Trip	Single Point Information
11	Earth Fault High set Trip	Single Point Information
12	Earth Fault IDMT Trip	Single Point Information
13	Earth Switch AE status	Double Point Information
14	Earth Switch BE status	Double Point Information
15	Earth Switch LE status	Double Point Information
16	Line Isolator status	Double Point Information
17	Breaker L/R switch	Single Point Information
18	Negative Phase Sequence	Single Point Information
19	Phase Fault General Trip	Single Point Information
20	Phase Fault Highset Trip	Single Point Information
21	Phase Fault IDMT Trip	Single Point Information
22	Phase Fault Overload Trip	Single Point Information
23	PT Fuse Failure	Single Point Information
24	Relay Reset	Single Point Information
25	SF6 Gas Pressure Low	Single Point Information

26	SF6 Lockout Operated	Single Point Information
27	Spring Charged	Single Point Information
28	TCS Alarm-1	Single Point Information
29	TCS Alarm-2	Single Point Information
	Digital Output Signals	
1	CB Command	Double Command Output
2	Relay Reset	Single Command Output
	Spare Output	
	Measurement Signals	
1	Active Power	Measured Float
2	Current Bph	Measured Float
3	Current Rph	Measured Float
4	Current Yph	Measured Float
5	Fault Current Bph	Measured Float
6	Fault Current Rph	Measured Float
7	Fault Current Yph	Measured Float
8	Fault Current Nph	Measured Float
9	Fault Locator in some relays	Measured Float
10	Frequency	Measured Float
11	Power Factor	Measured Float
12	Reactive Power	Measured Float
13	Sigma kA square	Measured Float
14	Voltage BR	Measured Float
15	Voltage RY	Measured Float
16	Voltage YB	Measured Float

H. Transformer- TM cum AVR relay Signals- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through TM cum AVR	DO soft through TM cum AVR	Signal Type
1.	DC Fail	✓		SPI
2.	Oil Temp Alarm	✓		SPI
	Relay Int Fault	✓		SPI
3.	Oil Temp Trip	✓		SPI
4.	Winding Temp Alarm	✓		SPI
5.	Winding Temp Trip	✓		SPI
6.	Buchholz Alarm	✓		SPI
7.	Buchholz Trip	✓		SPI

8.	PRV Trip	✓		SPI
9.	OLTC OSR	✓		SPI
10.	MOG/LOW Oil Level Alarm	✓		SPI
11.	SPR Trip	✓		SPI
12.	OSR Main Tank	✓		SPI
13.	L/R Switch in Local	✓		DPI
14.	L/R Switch in Remote	✓		
15.	Auto Mode	✓		DPI
16.	Manual Mode	✓		
17.	Fan Fail	✓		SPI
18.	Tap Changer Fail	✓		SPI
19.	OLTC Out of Step/ Stuck up/ Motor trip	✓		SPI
20.	Tap Rise/ Low Command		✓	DCO
21.	Oil Temp	✓		AI
22.	Winding Temp	✓		AI
23.	Tap Position	✓		AI

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

I. 33 & 66kV Bus Coupler- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Front Bus (89A) ISO ON (In-case of O/D)	✓		DPI
4.	Front Bus (89A) ISO OFF (In-case of O/D)			
5.	Rear Bus (89B) ISO ON (In-case of O/D)	✓		DPI
6.	Rear Bus (89B) ISO OFF (In-case of O/D)			
7.	Earth Switch (89AE-1) -ON (In-case of O/D)	✓		DPI
8.	Earth Switch (89AE-1) - OFF (In-case of O/D)	✓		DPI
9.	Earth Switch (89AE-2) -ON (In-case of O/D)	✓		DPI

10.	Earth Switch (89AE-2) - OFF (In-case of O/D)	✓		DPI
11.	EARTH SWITCH (89BE-3) ON (In-case of O/D)	✓		DPI
12.	EARTH SWITCH (89BE-3) OFF (In-case of O/D)			
13.	EARTH SWITCH (89BE-4) OFF (In-case of O/D)	✓		DPI
14.	EARTH SWITCH (89BE-4) OFF (In-case of O/D)			
15.	Breaker in Service (In-case of I/D BKR)	✓		DPI
16.	Breaker in Test (In-case of I/D BKR)			
17.	Trip Ckt Healthy- 1 & 2	✓		SPI
18.	Spring Charge	✓		SPI
19.	Auto Trip (86) Operated	✓		SPI
20.	SF6 Pressure Low	✓		SPI
21.	SF6 Lock Out	✓		SPI
22.	VT fuse-1 Blown	✓		SPI
23.	VT fuse-2 Blown	✓		SPI
24.	Panel DC Fail	✓		SPI
25.	L/R Switch in Remote	✓		SPI
26.	LBB Operated	✓		SPI
27.	Relay Int. Fault	✓		SPI
28.	Over Current Operated (All Stages)	✓		SPI
29.	Earth Fault Operated (All Stages)	✓		SPI
30.	BKR Close COMMAND		✓	DCO
31.	BKR Open COMMAND			
32.	Front Bus (89A) ISO OPN COMMAND (In-case of O/D)		✓	DCO
33.	Front Bus (89A) ISO CLS COMMAND (In-case of O/D)			
34.	Rear Bus (89B) ISO OPN COMMAND (In-case of O/D)		✓	DCO
35.	Rear Bus (89B) ISO CLS COMMAND (In-case of O/D)			

	O/D)			
36.	Auto trip (86) relay reset from remote		✓	SCO
37.	3phase R, Y, B- Curr, BUS PT-01 & BUS PT-02 3 phase voltages	✓		AI/ MV
38.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbaethernetce (O/C & E/F Relay). Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Realy). Fault Differential and Bias current in line and T/F Diff Relay, Fault distance (in Distance Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

J. 33 & 66kV CAP Bank- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Front Bus (89A) ISO ON (In-case of O/D)	✓		DPI
4.	Front Bus (89A) ISO OFF (In-case of O/D)	✓		DPI
5.	Rear Bus (89B) ISO ON (In-case of O/D)	✓		DPI
6.	Rear Bus (89B) ISO OFF (In-case of O/D)			
7.	CAP Bank ISO ON (In-	✓		DPI

	case of O/D)			
8.	CAP Bank ISO ON (In-case of O/D)	✓		DPI
9.	Earth Switch ON (In-case of O/D)	✓		DPI
10.	Earth Switch OFF (In-case of O/D)			
11.	Trip coil Ckt Healthy- 1 & 2	✓		SPI
12.	Spring Charge	✓		SPI
13.	Auto Trip (86) Operated	✓		SPI
14.	SF6 Pressure Low & SF6 Lock Out	✓		SPI
15.	VT fuse Blown	✓		SPI
16.	Cap Discharge Time	✓		SPI
17.	Neutral Displacement	✓		SPI
18.	Panel DC Fail	✓		SPI
19.	L/R Switch in Remote	✓		SPI
20.	LBB Operated	✓		SPI
21.	Relay Int. Fault	✓		SPI
22.	Over Current Operated	✓		SPI
23.	Earth Fault Operated	✓		SPI
24.	Under Voltage Prot. Operated	✓		SPI
25.	Over Voltage Prot. Operated	✓		SPI
26.	BKR Close COMMAND		✓	DCO
27.	BKR Open COMMAND			
28.	Front Bus (89A) ISO OPN COMMAND (In-case of O/D)		✓	DCO
29.	Front Bus (89A) ISO CLS COMMAND (In-case of O/D)			
30.	Rear Bus (89B) ISO OPN COMMAND (In-case of O/D)		✓	DCO
31.	Rear Bus (89B) ISO CLS COMMAND (In-case of O/D)			
32.	CAP Bank ISO OPN Command		✓	DCO
33.	CAP Bank ISO CLS			

	Command			
34.	3phase R, Y, B- Curr & voltage, Reactive Pow, Neu Curr	✓		AI/ MV
35.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbaethernetce (O/C & E/F Relay). Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Realy). Fault Differential and Bias current in line and T/F Diff Relay, Fault distance (in Distance Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

K. BUS PT-1 & 2- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	BUS A (89A) ON	✓		DPI
2.	BUS A (89A) OFF			
3.	BUS B (89B) ON	✓		DPI
4.	BUS B (89B) ON			
5.	Earth Switch (89LE)-1 ON	✓		DPI
6.	Earth Switch (89LE)-1 OFF			
7.	Earth Switch (89LE)-2 ON	✓		DPI
8.	Earth Switch (89LE)-2 OFF			
9.	BUS-A ISO OPN COMMAND		✓	DCO
10.	BUS-A ISO CLS COMMAND			
11.	BUS-B ISO OPN COMMAND		✓	DCO

12.	BUS-B ISO CLS COMMAND		✓	DCO
-----	-----------------------	--	---	-----

L. Smoke Detector- ALL sensors, Manual Call Points- Modbus Protocol

S.No.	Signal List	Soft Signals	Signal Type
1.	All Sensors Alarm operated Signals All Sensors Alarm operated Signals (10 to 20 Sensors)	✓	SPI
2.	All Manual Call Points- MCP- 1, MCP- 2, etc.	✓	

M. Battery Charger- Modbus Protocol

S.No.	Signal List	DI/ AI soft through RTU	Signal Type
1.	Battery CHG Mains AC Fail	✓	SPI
2.	Charger A AC MCCB Trip	✓	SPI
3.	Charger A DC MCCB Trip	✓	SPI
4.	Charger B AC MCCB Trip	✓	SPI
5.	Charger B DC MCCB Trip	✓	SPI
6.	Charger A/B in boost	✓	SPI
7.	Charger A/B rectifier Capacitor Fuse Blown	✓	SPI
8.	Battery MCCB Trip	✓	SPI
9.	DC system Earth	✓	SPI
10.	Insulation Fault	✓	SPI
11.	Charger A Current	✓	AI
12.	Charger A Voltage	✓	AI
13.	Charger B Current	✓	AI
14.	Charger B Voltage	✓	AI
15.	Battery Current	✓	AI
16.	Battery Voltage	✓	AI

N. LT Board

S.No.	Signal List	DI Hard Wire to RTU	Signal Type
1.	LT AC Fail	✓	SPI
2.	R,Y,B Phase Current		AI/ MV/ MFI

O. Fire Fighting (All T/Fs)

S.No.	Signal List	DI Hard Wire to RTU	Signal Type
1.	SYSTEM OPERATED	✓	SPI
2.	SYSTEM OUT OF SERVICE	✓	SPI
3.	TCIV CLOSED	✓	SPI
4.	FIRE DETECTOR TRIP	✓	SPI
5.	N2 CYLINDER PRESSURE LOW	✓	SPI
6.	FIRE SYSTEM ALARM	✓	SPI
7.	DC SUPPLY FAIL	✓	SPI

P. MFM- BUS PT- 1, 2 Signals (Front & Rear Bus)- Modbus Protocol

S.No.	Signal List	Data Type
1.	R-Ph Current	MV/ MFI
2.	Y-Ph Current	MV/ MFI
3.	B-Ph Current	MV/ MFI
4.	Neutral Current	MV/ MFI
5.	R-Y Ph Voltage	MV/ MFI
6.	Y-B Ph Voltage	MV/ MFI
7.	B-R Ph Voltage	MV/ MFI

Q. MFM- Signals- All Feeders (Including Bus Section/ Coupler)- Modbus Protocol

S.No.	Signal List	Data Type
1.	R-Ph Current	MV/ MFI
2.	Y-Ph Current	MV/ MFI

3.	B-Ph Current	MV/ MFI
4.	Neutral Current	MV/ MFI
5.	R-Y Ph Voltage	MV/ MFI
6.	Y-B Ph Voltage	MV/ MFI
7.	B-R Ph Voltage	MV/ MFI
8.	Active Power	MV/ MFI
9.	Active Energy	MV/ MFI
10.	Reactive Power	MV/ MFI
11.	Power Factor	MV/ MFI
12.	Max Demand	MV/ MFI
13.	Phase angle 1	MV/ MFI
14.	Phase angle 2	MV/ MFI
15.	Phase angle 3	MV/ MFI
16.	THD Mean Current	MV/ MFI
17.	THD Mean Voltage	MV/ MFI

Annexure 12.c (List of Abbreviations)

1. SCADA: Supervisory Control and Data Acquisition
2. RTU: Remote Terminal Unit
3. DCU: Data Concentrator Unit
4. C&R: Control and Relay
5. BA: Business Associates
6. I/O: Input/ Output
7. MFM: Multi Function Meter
8. TM: Transformer Monitoring
9. BYPL: BSES Yamuna Power Ltd.
10. MCC: Master Control Center
11. BCC: Business Continuity Center
12. IED: Intelligent Electronic Devices
13. NCR: National Capital Region
14. IEC: International Electrotechnical Commission
15. KEMA: Keuring van Elektrotechnische Materialen te Arnhem
16. CE: Conformité Européene
17. FCC: Federal Communications Commission
18. PRP: Parallel Redundancy Protocol
19. LAN: Local Area Network
20. NIDS: Network Intrusion Detection System
21. NIFPS: Nitrogen Injection Fire Protection System
22. DCDB: DC Distribution Board
23. APFC: Automatic Power factor Controller
24. HMI: Human Machine Interface
25. TCP/ IP: Transmission Control Protocol/ Internet Protocol
26. GPS: Global Positioning System
27. FEP: Front-End processor
28. SNTP: Simple Network Time Protocol
29. CRC: Cold Rolled Close
30. MCB: Miniature Circuit Breakers
31. CMR: Contact Multiplying Relay
32. PVC: Polyvinyl Chloride
33. GI: Galvanized Iron
34. RTCC: Remote Tap Changer Control
35. CT: Current Transformer
36. PT: Potential Transformer
37. WAN: Wide Area Network
38. DI: Digital Input
39. DO: Digital Output
40. AI: Analog Input
41. FRLS: Fire Retardant Low Smoke

- 42. OFC: Optical Fiber Cable
- 43. GTP: Guaranteed Technical Particulars
- 44. DCO: Double Command Input
- 45. DPI: Double Point Indication
- 46. MV: Measured Value
- 47. SCO: Single Command Input
- 48. SPI: Single Point Indication
- 49. BCU: Bay Control Unit
- 50. SAT: Site Acceptance Test
- 51. AVR: Automatic Voltage Regulator