

Bharat Heavy Electricals Ltd
Electronics Division
Mysore Road, Bangalore – 560 026

Tender Document for "Supply & Commissioning of UPS to North Chennai (1x800MW), Uppur (2x800 MW), NSPCL Rourkela (1x250 MW) & NTPC Dadri FGD (2x490 MW) projects "

TENDER REFERENCE	SBA0000341
TENDER DOCUMENT AVAILABLE FROM	08th June 2018
LAST DATE AND TIME FOR SUBMISSION OF TENDER	02nd July 2018 upto 13:00 Hrs
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This Tender Document Contains documents as per below index:

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ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
 भारत हेवी इलेक्ट्रिकल्स लिमिटेड

Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division

PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE:PR:001- Rev 01

INSTRUCTIONS TO BIDDERS

Bidder is requested to read the instructions carefully and submit their quotation taking into consideration of all the points:

A. GENERAL INSTRUCTIONS:

1. Any Purchase Order resulting from this enquiry shall be governed by the Instructions to Bidders (document reference: CE: PR: 001 – Rev 01), General Conditions of Contract (document reference: CE: PR: 002 - Rev 01) and Special Conditions of Contract, if any, of the enquiry.
2. Any deviations from or additions to the “General Conditions of Contract” or “Special Conditions of Contract” require BHEL’s express written consent. The general terms of business or sale of the bidder shall not apply to this tender.
3. Regret letter (either through post or by mail or by EPS) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender. Supplier shall be liable for removal as a registered vendor of BHEL when the supplier fails to quote against four consecutive tender enquiries for the same item or all enquiries in last two years for the same item, whichever is earlier.
4. Procurement directly from the manufacturers is preferred. However, if the OEM/ Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer/ supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer/ supplier or the manufacturer/ supplier could bid directly but not both. Agent/Representative authorized by the OEM/Principal in turn cannot further sub authorize any other firm for submitting the offer or for placement of order.

In case bids are received from the manufacturer/ supplier and his agent, bid received from the agent shall be ignored.

5. Consultant / firm (and any of its affiliates) shall not be eligible to participate in the tender/s for the related goods for the same project if they were engaged for consultancy services for the same project.
6. If an Indian representative/associate/liaison office quotes on behalf of a foreign based bidder, such representative shall furnish the following documents:
 - a. Authorization letter to quote and negotiate on behalf of such foreign-based bidder.
 - b. Undertaking from such foreign based bidder that such contract will be honored and executed according to agreed scope of supply and commercial terms and conditions.
 - c. Undertaking shall be furnished by the Indian representative stating that the co-ordination and smooth execution of the contract and settlement of shortages/damages/replacement/repair of imported scope till the equipment is commissioned and handed over to customer will be the sole responsibility of the Indian representative/associates/agent/liaison office.
 - d. Refer **Annexure I** on “Guidelines for Indian Agents”.
7. In case of imported scope of supply, customs clearance & customs duty payment will be to BHEL account after the consignment is received at Indian Airport /Seaport. Bidders must provide all original documents required

for completing the customs clearance along with the shipment. Warehousing charges due to incomplete or missing documentation will be to supplier's account. All offers for imported scope of supply by air, must be made from any of the gateway ports (within the country) indicated (**Refer Annexure II**).

8. The offers of the bidders who are on the banned list and also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of the banned firms is available on BHEL website: http://www.bhel.com/vender_registration/vender.php
9. Business dealings with bidders will be suspended if they are found to have indulged in any malpractices/misconduct which are contrary to business ethics like bribery, corruption, fraud, pilferage, cartel formation, submission of fake/false/forged documents, certificates, information to BHEL or if they tamper with tendering procedure affecting the ordering process or fail to execute a contract, or rejection of 3 consecutive supplies or if their firms / works are under strike/lockout for a long period. Bidder may refer "Guidelines for Suspension of Business Dealings with Suppliers/ Contractors" available on www.bhel.com for more details.
10. The bidder along with its associate/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to your notice.

B. GUIDELINES FOR PREPARATION OF OFFER:

1. Quotation shall be submitted in Single Part Bid, Two Part Bid or Three Part Bid, as called for in the tender:
 - **SINGLE PART BID:** Technical and Commercial Bid with prices along with price summary & filled in BHEL Standard Commercial terms and conditions in a single sealed envelope.
 - **TWO PART BID:** Unpriced offer i.e. "Techno-commercial Bid" with filled in BHEL Standard Commercial terms and conditions in a sealed envelope **along with the copy of the "Price Bid" without the prices** should be enclosed in one cover and the cover must be super scribed "**Techno-commercial offer**) and Priced offer i.e. "Price Bid" containing price summary in a separate sealed envelope and must be super scribed "**Price Bid**". Both these envelopes shall be enclosed in a single sealed envelope superscribed with enquiry number, due date of tender and any other details as called for in the tender document.
 - **THREE PART BID:** Pre-qualification Bid (Part-I), Techno Commercial Bid with filled in BHEL Standard Commercial terms and conditions (Part-II), and Price Bid (Part-III). All three envelopes shall be enclosed in a single sealed envelope superscribed with enquiry number, due date of tender and any other details as called for in the tender document.

If any of the offers (Part I, Part II or Part III) are not submitted before the due date and time of submission (or) if any part of the offer is incomplete, the entire offer of the bidder is liable for rejection.

2. Supplier shall ensure to superscribe each envelope with RFQ number, RFQ Date, RFQ Due date and time, Item Description and Project clearly & boldly. Also mention on the envelope whether it is "Techno Commercial Bid" or "Price Bid" or "Pre-Qualification Bid". Please ensure complete address, department name and purchase executive name is mentioned on the envelope (before dropping in the tender box or handing over) so that the tender is available in time for bid opening.
3. BHEL standard Commercial Terms and Conditions (duly filled, signed & stamped) must accompany Technical-Commercial offer without fail and should be submitted in original only.

The above indicated submission of Offers in "sealed envelope/hard copy" as mentioned in points B.1-B.3 is applicable for tenders that are not floated through E-Procurement System (EPS).

4. Validity: Unless otherwise specified in SCC (special commercial conditions of contract), the offer will be valid for a period of 90 days from the date of part-I bid opening and in case of Negotiation/Counter-offer/Reverse

Auction, price validity will apply afresh for a period of _60_ days from the date of according final price by bidder (or) upto original validity period, whichever is later.

5. Any of the terms and conditions not acceptable to supplier, shall be explicitly mentioned in the Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if all terms and conditions of this enquiry are accepted by the supplier without deviation.
6. Deviation to this specification/item description, if any, shall be brought out clearly indicating “DEVIATION TO BHEL SPECIFICATION” without fail, as a part of Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if the entire specification of this enquiry is accepted without deviation.
7. Suppliers shall submit one set of original catalogue, datasheets, bill of materials, dimensional drawings, mounting details and/or any other relevant documents called in purchase specification as part of Technical Bid.
8. “Price Bid” shall be complete in all respects containing price break-up of all components along with all applicable taxes and duties, freight charges (if applicable) etc. Once submitted no modification / addition / deletion will be allowed in the “Price Bid.” Bidders are advised to thoroughly check the unit price, total price to avoid any discrepancy.
9. In addition, bidder shall also quote for erection & commissioning charges/erection supervision & commissioning charges (E&C service charges) if applicable, documentation charges, testing Charges (type & routine), training charges etc. as applicable along with corresponding tax. The price summary must indicate all the elements clearly.
10. For Physical Export projects or wherever services are rendered by foreign suppliers in India, bidders should indicate “lumpsum” Erection and Commissioning (or) Erection Supervision and Commissioning charges, as applicable (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for carrying out E&C activity and further handing over to customer. The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist (if any).
11. Wherever bidders require PAC (Project Authority Certificate)/applicable certificates for import of raw materials, components required for DECC,EPCG Power Projects, Export Projects or other similar projects wherein supplies are eligible for customs duty benefits, lists and quantities of such items and their values (CIF) has to be mentioned in the offer. Prices must be quoted taking into account of such benefits.
12. Prices should be indicated in both figures & words. Bid should be free from correction/overwriting, using corrective fluid, etc. Any interlineation, cutting, erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid else bid shall be liable for rejection. Any typographical error, totalling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure III** “Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid” and BHEL decision will be final.
13. Documents submitted with the offer shall be signed and stamped in each page by authorized representative of the bidder. However, this requirement is not mandatory for offers uploaded through E-Procurement System (EPS).

C. GUIDELINES FOR OFFER SUBMISSION:

The under-mentioned clauses 1, 2&3 will not be applicable for EPS tenders.

1. Offers / Quotations must be dropped in tender box before 13.00 Hrs. on or before due date mentioned in RFQ. The offers are to be dropped in the proper slot of the Tender Box kept in our reception area with caption "CE, SC&PV, DEFENCE". Tenders are opened on 3 days in a week (Monday/Wednesday/Friday). Tender must be deposited in the slot corresponding to the day (Monday - Box no.4/Wednesday - Box no. 6 /Friday - Box no.8) while depositing the offer.

2. E-Mail/ Internet/EDI offers received in time shall be considered only when such offers are complete in all respects. In case of offers received through E-mail, please send the offer to the email ID specified in the SCC document of the tender.
3. Offers of Vendors who already have a valid Technical/Commercial MOU with BHEL-EDN for the items of the RFQ shall mention the relevant MOU reference no. and give only such other details not covered in the MOU.
4. In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand or through posts/couriers, the offers are to be handed over either of the two purchase officers whose names are mentioned in the SCC document of tender RFQ.
5. Tenders will be opened on due date, time and venue as indicated in the RFQ in the presence of bidders at the venue indicated in the RFQ. For EPS tenders, e-mail notifications will be automatically generated and forwarded to registered e-mail ID/s of bidders during opening of tenders.
6. Bidder will be solely responsible:
 - a. For submission of offers before due date and time. Offers submitted after due date and time will be treated as "Late offers" and will be rejected.
 - b. For submission of offers in the correct compartment of the tender box based on the day of due date (Monday/Wednesday/Friday). Please check before dropping your offer in the correct tender box.
 - c. For depositing offers in proper sealed condition in the tender box. If the bidder drops the tender in the wrong tender box (or) if the tender document is handed over to the wrong person, BHEL will not be responsible for any such delays.
 - d. For offers received through email etc., suppliers are fully responsible for lack of secrecy on information and ensuring timely receipt of such offers in the tender box before due date & time (This clause will not be applicable for EPS tenders).

The above indicated submission of Offers as mentioned in points 6.a-6.d is applicable for tenders that are not floated through EPS.

- e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, system/software requirements etc. will be the sole responsibility of the bidder. Wherever assistance is needed for submission of e-tenders, help-line numbers as available in the web-site of service provider of BHEL may be contacted.

Purchase Executive/ BHEL shall not be responsible for any of the activities relating to submission of offer.

D. PROCESSING OF OFFERS RECEIVED:

1. Any discount/ revised offer submitted by the supplier on its own shall be accepted provided it is received on or before the due date and time of offer submission (i.e. Part-I bid). The discount shall be applied on pro-rata basis to all items unless specified otherwise by the bidder.
2. Changes in offers or Revised offers given after Part-I bid opening shall not be considered as a part of the original offer unless such changes/revisions are requested by BHEL. In case of withdrawal of any Technical/Commercial deviation(s) by the bidder before opening of price bids/conducting the Reverse Auction, revision of price/impact bid will not be accepted.
3. In case there is no change in the technical scope and/ or specifications and/ or commercial terms & conditions, the supplier will not be allowed to change any of their bids after Technical bids are opened (after the due date and time of tender opening).
4. In case of changes in scope and/ or technical specifications and/ or commercial terms & conditions by BHEL and it accounts for price implications from bidders, all techno-commercially acceptable bidders shall be asked

by BHEL (after freezing the scope, technical specifications and commercial terms & conditions) to submit the impact of such changes on their price bid. Impact price will be applicable only for changes in technical specification / commercial conditions by BHEL. The impact price must be submitted on or before the cut-off date specified by BHEL and the original price bid and the price impact bid will be opened together at the time of price bid opening.

5. BHEL reserves the right to adopt Reverse Auction or standard Price Bid Opening procedure for price evaluation, at its discretion. This shall be decided after completion of techno-commercial evaluation of tender (Refer BHEL website http://www.bhel.com/vender_registration/vender.php for Guidelines of Reverse Auction). In case BHEL does not resort to Reverse Auction, the price bids and price impacts (if any) already submitted and available with BHEL shall be opened as per BHEL's standard practice.
6. Un-opened bids (including price bids) will be returned to the respective bidders after release of Purchase order. Regarding Offers for EPS tenders that get rejected on PQC/ techno-commercial grounds, the bids for the subsequent parts will not be opened i.e., both technical bid and price bid (Parts-II & III) will not be opened in case of rejection on PQC ground and price bid (Part-II/Part-III, as applicable) will not be opened in case of rejection on techno-commercial ground.
7. After receipt of Purchase Order, supplier should submit required documents viz., specified drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report, O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.
8. Any deviation to the terms and conditions not mentioned in the quotation by supplier in response to this enquiry will not be considered, if put forth subsequently or after issue of Purchase Order, unless clarification is sought for by BHEL and agreed upon in the Purchase Order.
9. Evaluation shall be on the basis of delivered cost (i.e. "Total Cost to BHEL").

"Total Cost to BHEL" shall include total basic cost, packing & forwarding charges, taxes and/or duties (as applicable), freight charges, taxes on Services, customs clearance charges for imported items, any other cost indicated by bidder for execution of the contract and loading factors (for non-compliance to BHEL Standard Commercial Terms & Conditions). Benefits arising out of Nil Import Duty on DEEC, EPCG, DFIA Projects, Physical Exports or such 100% exemptions (statutory benefits), project imports, customer reimbursements of statutory duties (like Basic Customs Duty and cess on customs duty), Input tax credits as applicable will also be taken into account for arriving at the Total cost to BHEL (wherever applicable and as indicated in SCC document of tender).

For EPS tenders, it shall be noted that the prices (including discounts) vis-a-vis currency quoted in EPS portal only will be considered as Final for the purpose of evaluation of the lowest bidder. Bidder shall ensure to indicate the applicable taxes against each line item in online portal, failing to which the same will be considered as inclusive/NIL.

10. For evaluation of offers in foreign currency, the exchange rate (TT selling rate of SBI) shall be taken as under:

Single part bids:	Date of tender opening
Two/three part bids:	Date of Part-I bid opening
Reverse Auction:	Date of Part-I bid opening

In case of Performance Bank Guarantee (PBG) also, exchange rate will be considered as mentioned above for converting foreign currency to Indian currency and vice versa.

If the relevant day happens to be a bank holiday, then the exchange rate as on the previous working day of the bank (SBI) shall be taken.

11. Ranking (L-1, L-2 etc.) shall be done only for the techno-commercially acceptable offers.

E. INFORMATION ON PAYMENT TERMS:

1. All payments will be through Electronic Fund transfer (EFT). Vendor has to furnish necessary details as per BHEL standard format (**Refer Annexure IV**) for receiving all payments through NEFT.(Applicable for Indian vendors only)
2. In case of High Sea Sales transaction, customs clearance of the consignment landed on Indian Sea/Air ports will be done by BHEL based on the original HSS documents provided by vendors. All warehousing charges due to delay in submission of complete and or correct HSS documents to BHEL will be to supplier's account only. Such recovery will be made out of any of the available bills (**Refer Annexure V**).
3. Statutory deductions, if any, will be made and the deduction certificate shall be issued. In case vendor does not provide PAN details, the TDS deduction shall be at the maximum percentage stipulated as per the provisions of Income Tax Act.

In addition to the above, Foreign vendors shall also submit relevant details of their bankers like Swift Code, Banker's Name &Address etc.

4. Incomplete documentation will not be accepted. Delayed submission of invoice / documents may result in corresponding delay in payment. In this connection, request to also refer clause: G about invoicing & payment formalities under GST regime. Applicable documents shall be submitted to the purchaser at the time of execution of supplies/services for availing GST input credits.

F. STANDARD PAYMENT TERMS OF BHEL-EDN:

<u>PURCHASE ORDERS FOR:</u>	<u>SUPPLY WITH ERECTION & COMMISSIONING</u>	<u>SUPPLY WITH ERECTION SUPERVISION & COMMISSIONING</u>	<u>SUPPLY ONLY</u>
<u>INDIGENOUS PROCUREMENT</u>	<p>a. 90% of basic value + 100% of taxes and freight charges will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation, whichever is later.</p> <p>Balance 10% of basic value (Retention money) will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of E&C.</p> <p><u>Note:</u> In case PBG is not furnished, only 80% payment will be released against 90% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.</p>	<p>b. 95% of the basic value + 100% of taxes and freight charges will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation, whichever is later.</p> <p>Balance 5% of basic value (Retention money) will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of commissioning.</p> <p><u>Note:</u> In case PBG is not furnished, only 85% payment will be released against 95% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.</p>	<p>c. 100% of PO value with taxes and freight will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation, whichever is later.</p>

<u>PURCHASE ORDERS FOR:</u>	<u>SUPPLY WITH ERECTION & COMMISSIONING</u>	<u>SUPPLY WITH ERECTION SUPERVISION & COMMISSIONING</u>	<u>SUPPLY ONLY</u>
<u>IMPORT PROCUREMENT</u>	<p>d. 90% of the basic value will be paid on the 45th day, against usance draft of 45 days, from the date of AWB/BOL on submission of complete set of documents.</p> <p>Balance 10% of basic value (Retention money) will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of E&C.</p> <p><u>Note:</u> In case PBG is not furnished, only 80% payment will be released against 90% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.</p>	<p>e. 95% of the basic value will be paid on the 45th day, against usance draft of 45 days, from the date of AWB/BOL on submission of complete set of documents.</p> <p>Balance 5% of basic value (Retention money) will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of commissioning.</p> <p><u>Note:</u> In case PBG is not furnished, only 85% payment will be released against 95% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.</p>	<p>f. 100% of PO value will be paid against usance draft of 45 days from the date of AWB/BOL on submission of complete set of documents.</p>
<u>HIGH-SEA SALES PROCUREMENT</u>	<p>g. 90% of basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation, whichever is later.</p> <p>Balance 10% of basic value (Retention money) will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of E&C.</p> <p><u>Note:</u> In case PBG is not furnished, only 80% payment will be released against 90% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.</p>	<p>h. 95% of the basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation, whichever is later.</p> <p>Balance 5% of basic value (Retention money) will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of commissioning.</p> <p><u>Note:</u> In case PBG is not furnished, only 85% payment will be released against 95% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.</p>	<p>i. 100% of basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation, whichever is later.</p>

j. Comprehensive Annual Maintenance Contract:

Evaluation methodology: Unless and otherwise specified in SCC, CAMC will be applicable for a period of 04 years from the date of expiry of warranty period (or) from the date of completion of commissioning of equipment, whichever is later and the total AMC value should not be less than 20% of the main supply value. In case the quoted total AMC value is less than 20% of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price and apportioning towards AMC charges.

Payment terms: 100% AMC charges along with tax as applicable, will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of AMC on yearly basis.

k. Terms of Payment for Training: 100% payment will be made in 45 days from the date of completion of Training or 15 days from the date of submission of complete set of invoice along with documentary evidence, whichever is later.

LOADING FACTORS FOR DEVIATION IN PAYMENT TERMS (APPLICABLE FOR IMPORT PROCUREMENT ONLY):

- 1) For offers received with Sight draft payment term in place of Usance draft, loading applicable will be 1.0% of basic value.
 - 2) For offers received with Letter of Credit payment term with Usance of 45 days, loading applicable will be 2.5% of basic value.
Additional loading of 2% will be applicable for payment term as Letter of Credit at Sight.
- l.** Any payment term with credit period of less than 45 days for indigenous supply/HSS and any other variation of payment terms are liable for rejection.
- m.** Standard payment terms indicated in Clauses: F (a), (b), (c), (d), (e), (f), (g), (h), (i), (j) & (k) will not attract any loading.

Note 1: Basic value of Purchase Order mentioned above will include all components of the purchase order and will exclude only taxes, duties, freight, training charges, E&C and AMC charges (wherever applicable). Wherever the Purchase Order is split into import portion and indigenous portion of supply, the retention money will be 10% (where scope includes E&C) or 05% (where scope includes Erection supervision & Commissioning) of both purchase order values put together.

Note 2: If the E&C could not be completed till the end of the Warranty period due to reasons not attributable to the supplier, BHEL will release the retention money to the supplier against Bank Guarantee for equivalent value valid for an initial period of one year.

Note 3: In case of Physical Export projects or wherever services are rendered by foreign suppliers in India, E&C charges (if quoted separately/extra by bidder) will be paid in 15 days from the date of submission of supplementary invoice/ documents against proof of completion of E&C.

Note 4: In case of multiple packages/units in a power plant, payment of retention money/E&C charges will be processed on pro-rata basis.

Note 5: No deviation will be permitted from the duration of Guarantee/Warranty and/or Comprehensive Annual Maintenance Contract period specified in SCC.

G. Terms & Conditions to be complied under GST regime:

1. All invoices to contain BHEL-EDN (buyer) GSTIN number: 29AAACB4146P1ZB. However for CGST +SGST/UGST billing outside the state of Karnataka, invoice has to be generated with BHEL's Nodal Agency GSTIN number. Address of Nodal Agency along with GSTIN number will be provided by BHEL at the time of issuing dispatch clearance.
2. The Bidder shall mention Bidder's GSTIN number in all quotations and Invoices submitted.
3. The Bidder shall also mention HSN (Harmonized System of Nomenclature) / SAC (Services Accounting Code) mandatorily in all quotations and invoices submitted.
4. Invoice submitted should be in the format as specified under GST Laws viz., all details as mentioned in Invoice Rules like GST registration number(GSTIN), invoice number with date of issue, quantity, rate, value, taxes with nomenclature – CGST, SGST, UGST,IGST mentioned separately, HSN Code / SAC Code etc. Invoice should be submitted in original for buyer plus duplicate for credit availment.
5. Payment of GST to Vendor will be made only if it is matching with data uploaded by the Vendor in GST portal.
6. For invoices paid on Reverse charge basis – “Tax payable on reverse charge basis” to be mentioned on the invoice.
7. In case GST credit is delayed/denied to BHEL due to non/delayed receipt of goods and/or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to BHEL, GST amount will be recoverable from vendor along with interest levied/ leviable on BHEL.
8. In case vendor delays declaring such invoice in his return and GST credit availed by BHEL is denied or reversed subsequently as per GST law, GST amount paid by BHEL towards such ITC reversal as per GST law will be recoverable from vendor/contractor along with interest levied/ leviable on BHEL.
9. Vendor should intimate BHEL immediately on the same date of invoicing without any delay.
10. In case of discrepancy in the data uploaded by supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note (details to be uploaded in GSTN portal) for the shortages or rejections in the supplies, within the calendar month notified by BHEL.
11. Bidders to note that Rules & Regulations pertaining to E-way bill system are to be strictly adhered to, as and when notified by Govt. authorities.

H. Performance bank guarantee (PBG):

Performance bank guarantee (PBG) will be applicable as called in the tender documents. Unless otherwise specified in the SCC, the PBG against performance of the contract shall be valid for a period of 24 months from the date of dispatch of goods + claim period of 03 months, for a value equal to 10 % of the basic value of the purchase order which will include all components of the purchase order and will exclude only taxes, duties, freight, training charges, E&C and AMC charges (wherever applicable).

1. The BG issued in Indian Rupees by Banks in India is to be executed on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is

higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Bank issuing the guarantee.

2. No deviation for the duration and value of PBG will be permitted.
3. PBG shall be from any of the BHEL consortium of bankers (**refer Annexure VI**).
4. PBGs from nationalized banks are also acceptable.
5. PBG should be sent directly by the bank to the dealing executive mentioned in the purchase order located at the address mentioned in the purchase order.
6. PBG should be in the format specified (**refer Annexure VII**). No deviation to this format will be allowed. However in case BHEL changes the PBG format, bidder shall honor the same.
7. Bank Guarantee should be enforceable in Bangalore.
8. In Case of Bank Guarantees submitted by Foreign Vendors-
 - a. From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India) can be accepted subject to the condition that the Bank Guarantee should be enforceable in Bangalore.
 - b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)
 - b.1 Please note that Bank Guarantee issued by any of the Consortium Banks only will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter-Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. It shall be noted that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor.
 - b.2 In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at sl.no. b.1 is required to be followed.
 - b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time).
9. Expired BGs / PBGs will be returned only after expiry of the claim period or on completion of the contractual obligation with respect to Purchase Order.
10. PBG shall not be applicable for spares.

I. PROVISIONS APPLICABLE FOR MSE VENDORS (MICRO AND SMALL ENTERPRISES) :

Benefits/facilities as applicable for Micro and Small Enterprises (MSEs) shall be available to MSEs registered with Government designated authorities as per the Purchase & Price Preference Policy of the Government subject to them becoming eligible otherwise.

Vendors who qualify as MSE vendors are requested to submit applicable certificates (as specified by the Ministry of Micro, Small and Medium Enterprises) at the time of vendor registration. Vendors have to submit any of the following documents along with the tender documents in the Part I / Technical bid to avail the applicable benefits:

- a. Attested copy of valid NSIC certificate or
- b. Attested copy of either Entrepreneur's Memorandum part II (EM II) certificate/Udyog Aadhar certificate having deemed validity (five years from the date of issue of acknowledgement in EM II/Udyog Aadhar) or
- c. EM II/ Udyog Aadhaar certificate along with attested copy of a CA certificate (Format enclosed at Annexure VIII where deemed validity of EM II certificate/ Udyog Aadhar certificate of five years have expired) applicable for the relevant financial year (latest audited).

Date to be reckoned for determining the deemed validity will be the date of bid opening (Part-I in case of two-part bid and three-part bid).

Documents have to be notarized/attested by a Gazetted officer and must be valid as on the date of part I bid opening for the vendors to be eligible for the benefits applicable for MSE vendors. Please note that no benefit shall be applicable if any deficiency in the above required documents are not submitted before the price bid opening/Reverse Auction. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal.

Bidders to however note the documents that shall be furnished in order to establish credentials as MSE vendor should be as per the extant statutory requirements specified by the Ministry of Micro, Small and Medium Enterprises.

PURCHASE PREFERENCE FOR MSE VENDORS:

- d. MSE vendors quoting within a price band of L1 + 15% shall be allowed to supply up to 20% of the requirement against this tender provided
1. The MSE vendor matches the L1 price.
 2. L1 price is from a non MSE vendor.
 3. L1 price will be offered to the vendor nearest to L1 in terms of price ranking (L2 - nearest to L1). In case of non-acceptance by the MSE vendor (L2), next ranking MSE vendor will be offered who is within the L1 + 15% band (if L3 is also within 15% band).
 4. 20% of the 20% (i.e. 4% of the total enquired quantity) will be earmarked for SC/ST owned MSE firms provided conditions as mentioned in (1) and (2) are fulfilled.
 5. In case no vendor under SC / ST category firms are meeting the conditions mentioned in (1) and (2) or have not participated in the tender, in such cases the 4% quantity will be distributed among the other eligible MSE vendors who have participated in the tender.
 6. Serial no. 1 to 5 will not be applicable wherever it is not possible to split the tendered quantity/items on account of customer contract requirement, or the items tendered are systems. Such information that tendered quantity will not be split shall be indicated in the SCC.

J. INTEGRITY COMMITMENT IN THE TENDER PROCESS, AND EXECUTION OF CONTRACTS:

1. Commitment by BHEL: BHEL commits to take all measures necessary to prevent corruption in connection with the Tender process and execution of the Contract. BHEL will, during the tender process, treat all bidder / suppliers in a transparent and fair manner, and with equity.
2. Commitment by Bidder(s)/ Contractor(s):
 - a. The Bidder(s)/ Contractor(s) commit(s) to take all measures to prevent corruption and will not directly or indirectly try to influence any decision or benefit which he is not legally entitled to.
 - b. The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding or any actions to restrict competition.
 - c. The Bidder(s)/ Contractor(s) will not commit any offence under the relevant Acts. The Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain or pass on to others, any information or document provided by BHEL as part of business relationship.
 - d. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to the relevant guidelines issued from time to time by Government of India/ BHEL.

If the Bidder(s) / Contractor(s), before award or during execution of the Contract commit(s) a transgression of the above or in any other manner such as to put his reliability or credibility in question, BHEL is entitled to disqualify the Bidder(s) / Contractor (s) from the tender process or terminate the contract and/ or take suitable action as deemed fit.

K. Integrity Pact (IP):

- a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner.

A panel of independent External Monitors (IEMs) have been appointed to oversee implementation of IP in BHEL.

The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory who signs in the offer) along with techno-commercial bid. Only those Bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

- b) Please refer Section-8 of the IP for Role and Responsibilities of IEMs (Annexure IX). In case of any complaint arising out of the tendering process, the matter may be referred to the IEM mentioned in the tender.

Note: No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc. on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department.”

Annexure

Annexure I
Guidelines for Indian Agents

- **Definition of Indian Agent:** An Indian Agent of foreign principal is an individual, a partnership, an association of persons, a private or public company, that carries out specific obligation(s) towards processing of BHEL tender or finalization or execution of BHEL's contract on behalf of the foreign supplier.

In case of yes, vendor to note the following and reply accordingly:

- i. BHEL shall deal directly with foreign vendors, wherever required, for procurement of goods. However, if the foreign principal desires to avail of the services of an Indian agent, then the foreign principal should ensure compliance to regulatory guidelines - which require mandatory submission of an Agency Agreement.
- ii. It shall be incumbent on the Indian agent and the foreign principal to adhere to the relevant guidelines of Government of India, issued from time to time.
- iii. The Agency Agreement should specify the precise relationship between the foreign OEM / foreign principal and their Indian agent and their mutual interest in the business. All services to be rendered by agent/ associate, whether of general nature or in relation to the particular contract, must be clearly stated by the foreign supplier/ Indian agent. Any payment, which the agent or associate receives in India or abroad from the OEM, whether as commission or as a general retainer fee should be brought on record in the Agreement and be made explicit in order to ensure compliance to laws of the country.
- iv. Any agency commission to be paid by BHEL to the Indian agent shall be in Indian currency only.
- v. Tax deduction at source is applicable to the agency commission paid to the Indian agent as per the prevailing rules.
- vi. In the absence of any agency agreement, BHEL shall not deal with any Indian agent (authorized representatives / associate / consultant, or by whatever name called) and shall deal directly with the foreign principal only for all correspondence and business purposes.
- vii. The "Guidelines for Indian Agents of Foreign Suppliers" enclosed at annexure -'A' shall apply in all such cases.

- viii. The supply and execution of the Purchase Order (including indigenous supplies/ service) shall be in the scope of the OEM/ foreign principal. The OEM/ foreign principal should submit their offer inclusive of all indigenous supplies/ services and evaluation will be based on 'total cost to BHEL'. In case OEM/ foreign principal recommends placement of order(s) towards indigenous portion of supplies/ services on Indian supplier(s)/ agent on their behalf, the credentials/ capacity/ capability of the Indian supplier(s)/ agent to make the supplies/ services shall be checked by BHEL as per the extant guidelines of Supplier Evaluation, Approval & Review Procedure (SEARP), before opening of price bids. In this regard, details may be checked as per Annexure-B (copy enclosed). It will be the responsibility of the OEM/ foreign principal to get acquainted with the evaluation requirements of Indian supplier/ agent as per SEARP available on www.bhel.com.

The responsibility for successful execution of the contract (including indigenous supplies/ services) lies with the OEM/ foreign principal. All bank guarantees to this effect shall be in the scope of the OEM/ foreign principal.

—x—

Vendor's Signature with Seal

Guidelines for Indian Agents of Foreign Suppliers

- 1.0 There shall be compulsory registration of agents for all Global (Open) Tender and Limited Tender. An agent who is not registered with BHEL shall apply for registration in the registration form in line with SEARP.
- 1.1 Registered agents will file an authenticated Photostat copy duly attested by a Notary Public/Original certificate of the Principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/ remuneration/ salary/ retainership being paid by the principal to the agent before the placement of order by BHEL.
- 1.2 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order.
- 2.0 **Disclosure of particulars of agents/ representatives in India, if any.**
- 2.1 Tenderers of Foreign nationality shall furnish the following details in their offers:
- 2.1.1 The Bidder(s)/ Contractor(s) of foreign origin shall disclose the name and address of the agents/ representatives in India if any and the extent of authorization and authority given to commit the Principals. In case the agent/ representative be a foreign Company, it shall be confirmed whether it is existing Company and details of the same shall be furnished.
- 2.1.2 The amount of commission/ remuneration included in the quoted price(s) for such agents/ representatives in India.
- 2.1.3 Confirmation of the Tenderer that the commission/ remuneration, if any, payable to his agents/ representatives in India, may be paid by BHEL in Indian Rupees only.
- 2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:
- 2.2.1 The Bidder(s)/ Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any, indicating their nationality as well as their status, i.e. whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents/ representatives.
- 2.2.2 The amount of commission/ remuneration included in the price (s) quoted by the Tenderer for himself.
- 2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/ remuneration, if any, reserved for the Tenderer in the quoted price(s), may be paid by BHEL in India in equivalent Indian Rupees on satisfactory completion of the Project or supplies of Stores and Spares in case of operation items.
- 2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission/ remuneration, if any payable to the agents/ representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.
- 2.4 Failure to furnish correct and detailed information as called for in paragraph 2.0 above will render the concerned tender liable to rejection or in the event of a contract materializing, the same liable to termination by BHEL. Besides this there would be a penalty of banning business dealings with BHEL or damage or payment of a named sum.

ANNEXURE - II
LIST OF INTERNATIONAL GATEWAY AIRPORTS

For air based consignment, terms of delivery will be on FCA basis from following listed airports only. Vendors are requested to verify this list for use before submission of offer.

SCHEDULE NO	COUNTRY	CURRENCY CODE	AIRPORT
D01	UK	GBP	LONDON (HEATHROW)
D02	UK	GBP	NEW CASTLE
D03	UK	GBP	OXFORD. CHETLAM
D04	UK	GBP	BRISTOL. WELLINGBOROUGH
D05	UK	GBP	BIRMINGHAM
D06	UK	GBP	EAST MIDLANDS
D07	UK	GBP	MANCHESTER
D08	UK	GBP	LEEDS
D09	UK	GBP	GLASGOW
D10	FRANCE	EURO	PARIS (ROISSY) & LYON
D11	SWEDEN	EURO	STOCKHOLM
D12	SWEDEN	EURO	GOTHENBERG & MALMO
D13	ITALY	EURO	ROMA, MILAN
D14	ITALY	EURO	TURIN, BOLOGNA, FLORENCE
D15	NETHERLANDS	EURO	AMSTERDAM, ROTTERDAM
D16	AUSTRIA	EURO	VIENNA, LINZ, GRAZ
D17	BELGIUM	EURO	ANTWERP, BRUSSELS
D18	DENMARK	DKK	COPENHAGEN
D19	JAPAN	JPY	TOKYO, OSAKA
D20	SINGAPORE	SGD	SINGAPORE
D21	CANADA	CAD	TORONTO
D22	CANADA	CAD	MONTREAL
D23	USA	USD	NEW YORK, BOSTON
D24	USA	USD	CHICAGO
D25	USA	USD	SAN FRANCISCO, LOS ANGELES
D26	USA	USD	ALANTA, HOUSTON
D27	GERMANY	EURO	MUNICH, KOLN, DUSSELDORF, HANNOVER, HAMBURG, STUTTGART, DAMSTADT, MANIHIEM, NURUMBERG
D28	GERMANY	EURO	FRANKFURT
D29	GERMANY	EURO	BERLIN
D30	SWITZERLAND	SFR	BASLE, ZURICH, GENEVA
D31	SPAIN	EURO	BARCELONA
D32	AUSTRALIA	AUD	SYDNEY
D33	AUSTRALIA	AUD	MELBOURNE
D34	AUSTRALIA	AUD	PERTH
D35	CZECH	EURO	PRAGUE
D36	HONG KONG	HKD	HONG KONG
D37	NEW ZELAND	NZD	AUCKLAND
D38	RUSSIA	USD	MOSCOW
D39	SOUTH KOREA	USD	KIMPO INTERNATIONAL, INCHEON
D40	FINLAND	EURO	HELSINKI
D41	ROMANIA	EURO	BUCHAREST
D42	NORWAY	EURO	OSLO
D43	IRELAND	EURO	DUBLIN
D44	ISRAEL	USD	TEL AVIV
D45	UAE	USD	DUBAI
D46	OMAN	USD	MUSCAT
D47	EGYPT	USD	CAIRO
D48	TAIWAN	USD	TAIPEI
D49	UKRAINE	USD	KIEV
D50	CHINA	USD	SHANGHAI, SHENZHEN
D51	PHILIPINES	USD	MANILA
D52	MALAYSIA	USD	KUALALUMPUR, PE NANG
D53	CYPRUS	USD	LARNACA
D54	SOUTH AFRICA	USD	JOHANNESBERG, DURBAN
D55	SLOVAKIA	EURO	BARTISLOVA
D56	SAUDI ARABIA	SAR	RIYADH
D57	TURKEY	EURO	ISTANBUL
D58	THAILAND	USD	BANGKOK
D59	BRAZIL	USD	SAO PAULO, RIO DE JANEIRO

ANNEXURE – III
DISCREPANCY IN WORDS & FIGURES – QUOTED IN PRICE BID

Following guidelines will be followed in case of discrepancy in words & figures-quoted in price bid:

(a) If, in the price structure quoted for the required goods/services/works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.

(b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

(c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

(d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

ANNEXURE - IV
Electronic Funds Transfer (EFT) OR
Paylink Direct Credit Form

Please Fill up the form in CAPITAL LETTERS only.

TYPE OF REQUEST(Tick one): _____ CREATE _____ CHANGE

BHEL Vendor / Supplier Code:

Company Name :

Permanent Account Number(PAN):

Address

City: PINCODE STATE

Contact Person(s)

Telephone No:

Fax No:

e-mail id:

1 Bank Name:

2 Bank Address:

3 Bank Telephone No:

4 Bank Account No:

5 Account Type: Savings/Cash Credit

6 9 Digit Code Number of Bank and branch appearing on MICR cheque issued by Bank

7 Bank IFSC Code(applicable for NEFT)

8 Bank IFSC code(applicable for RTGS) (Indian Financial System Code)

- A I hereby certify that the particulars given above are true, correct and complete and that I, as a representative for the above named Company, hereby authorise BHEL, EDN, Bangalore to electronically deposit payments to the designated bank account.
- B If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold BHEL / transferring Bank responsible.
- C This authority remains in full force until BHEL, EDN, Bangalore receives written notification requesting a change or cancellation.
- D I have read the contents of the covering letter and agree to discharge the responsibility expected of me as a participant under ECS / EFT.

Date:

Authorised Signatory:

Designation:

Telephone No. with STD Code

Company Seal

Bank Certificate

We certify that _____ has an Account No _____ with us and we confirm that the bank details given above are correct as per our records.

Date:

(.....)

Place:

Signature

Please return completed form along with a blank cancelled cheque or photocopy thereof to:

Bharath Heavy Electricals Ltd,

Attn:

Electronics Division, Mysore Road,

BANGALORE - 560 026

In case of any Query, please call concerned purchase executive.

ANNEXURE - V
PRESENT PROCEDURE FOR SALE IN TRANSIT (HIGH SEA SALES)

In case of High Sea Sales, vendor should submit following documents:

1. ORIGINAL HIGH SEA SALES AGREEMENT

- Sale agreement (on Rs. 200/- non-judicial stamp paper & notarised with 2 witnesses with identity) has to be signed between BHEL and the Party importing material. The date of the sale documents should be in between the date of House Air Way Bill / Bill of Lading and before landing of the goods in Indian origin.
- Following shall be included in the High Sea Sales Agreement:
"THE BUYER ALSO UNDERTAKE DISCHARGES, THE OBLIGATION AND FULFILLMENT OF CONDITIONS, IF ANY, ATTACHED TO THE IMPORTATION, ASSESSMENT AND CLEARANCE OF THE GOODS IN TERMS CUSTOMS TARIFF ACT 1975, THE CUSTOMS ACT 1962 & RULES & REGULATIONS MADE THERE UNDER AND OTHER RELEVANT ACTS, ORDERS, NOTIFICATIONS".

2. ORIGINAL INVOICES: INDIGENOUS RUPEE INVOICE & FOREIGN CURRENCY INVOICE

- Prices should be C.I.F., designated airport/seaport basis.
- I.E.C., C.S.T., K.S.T. Nos. to be mentioned.
- Description of item (Nomenclature), Unit & Quantity in both the Foreign Currency & the Indigenous Invoice in Rupee shall be exactly as per Purchase Order Description of item, Quantity and Unit. The Indigenous Invoice value shall be exactly as per Purchase Order value.
- Seller should give Foreign Currency Invoice from the original consignor. The Foreign Currency Invoice value should be at least 2% (two per cent) less than the Indigenous Rupee Invoice value in equivalent foreign currency.

4. ORIGINAL HOUSE AIR WAY BILL/ BILL OF LADING

- The sale agents should duly endorse House Air Way Bill (HAWB) for air shipments or original Bill of Lading (O.B.L.) for sea shipments and Foreign Currency Invoice in favour of BHEL-EDN.

5. ORIGINAL CARGO ARRIVAL NOTICE FROM FORWARDER.

6. ORIGINAL DELIVERY ORDER ISSUED IN NAME OF BHEL-EDN.

7. ORIGINAL PACKING LIST.

8. A LETTER TO THE COMMISSIONER OF CUSTOMS FOR EFFECTING ABOVE SALE.

9. A LETTER TO THE DEPUTY ASSESSOR (OCTROI) FOR EFFECTING ABOVE SALE IN FAVOUR OF BHEL.

REMARKS: In case vendor needs any clarifications on the above, the same may be sought in writing.

Annexure-VI
BHEL MEMBER BANKS (LIST OF CONSORTIUM BANKS)

BANK GUARANTEE (BG) SHALL BE ISSUED FROM THE FOLLOWING BANKS ONLY:

	Nationalised Banks		Nationalised Banks
1	Allahabad Bank	19	Vijaya Bank
2	Andhra Bank		Public Sector Banks
3	Bank of Baroda	20	IDBI
4	Canara Bank		Foreign Banks
5	Corporation Bank	21	CITI Bank N.A
6	Central Bank	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Ltd. (HSBC)
8	Indian Overseas Bank	24	Standard Chartered Bank
9	Oriental Bank of Commerce	25	J P Morgan
10	Punjab National Bank		
11	Punjab & Sindh Bank		Private Banks
12	State Bank of India	26	Axis Bank
13	State Bank of Hyderabad	27	The Federal Bank Limited
14	Syndicate Bank	28	HDFC Bank
15	State Bank of Travancore	29	Kotak Mahindra Bank Ltd
16	UCO Bank	30	ICICI Bank
17	Union Bank of India	31	IndusInd Bank
18	United Bank of India	32	Yes Bank

Note:

- All BGs must be issued from BHEL consortium banks listed above.
- This list is subject to changes. Hence vendors are requested to check this list every time before issuing BGs.
- Bank Guarantees issued by Co-Operative Banks/Financial Institutions cannot to be accepted under any circumstance.

Annexure-VII

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To
NAME
& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____¹ through its Unit at.....(name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) with its registered office at _____² hereinafter referred to as the 'Vendor / Contractor / Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No.....dated³ valued at Rs.....⁴ (Rupees -----)/FC.....(in words.....) for⁵ (hereinafter called the 'Contract') and the Vendor / Contractor / Supplier having agreed to provide a Contract Performance Bank Guarantee, equivalent to% (.... Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we,, (hereinafter referred to as the Bank), having registered/Head office at and inter alia a branch at being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer any sum or sums upto a maximum amount of Rs --⁶ (Rupees -----) without any demur, immediately on first demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor / Contractor / Supplier in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the Vendor / Contractor / Supplier shall have no claim against us for making such payment.

We thebank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract/satisfactory completion of the performance guarantee period as per the terms of the Contract and that it shall continue to be enforceable till

all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

WeBANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Vendor / Contractor / Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Vendor / Contractor / Supplier and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Vendor / Contractor / Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Vendor / Contractor / Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Vendor / Contractor / Supplier and notwithstanding any security or other guarantee that the Employer may have in relation to the Vendor / Contractor / Supplier 's liabilities.

This Guarantee shall remain in force upto and including.....⁷ and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Vendor / Contractor / Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the⁸we shall be discharged from all liabilities under this guarantee thereafter.

We, BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁶
- b) This Guarantee shall be valid up to⁷
- c) Unless the Bank is served a written claim or demand on or before⁸ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Dated.....

Place of Issue.....

¹ NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited

² NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

³ DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

⁴ CONTRACT VALUE

⁵ PROJECT/SUPPLY DETAILS

⁶ BG AMOUNT IN FIGURES AND WORDS

⁷ VALIDITY DATE

⁸ DATE OF EXPIRY OF CLAIM PERIOD

Annexure – VIII
(Applicable only for MSE suppliers)
Certificate by Chartered Accountant on Letter Head

This is to certify that M/s
.....(hereinafter referred to as 'Company')
having its registered office at is registered under MSMED Act 2006,
(Entrepreneur Memorandum No (Part-11 dtd
Category: (Micro/Small) (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as
per the latest audited financial year..... as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722 (E) dated October 5, 2006:
Rs.....Lacs.

2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
Rs.Lacs.

The above investment of Rs.Lacs in within permissible limit of
Rs.....Lacs for.....Micro / Small (Strike off which is not
applicable) Category under MSMED Act 2006.

Or

The company has been graduated from its original category (Micro/ Small) (**Strike off which is not applicable**) and the date of graduation of such enterprise from its original category is (dd/mm/yyyy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O. No. 3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:

(Signature)

Name:

Membership Number:

Seal of Chartered Accountant

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi – 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for

_____. The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved

in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant IPC/ PC Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors". framed by the Principal.

Section 4 – Compensation for Damages

- 4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/Bid Security.
- 4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher.

Section 5 – Previous Transgression

- 5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- 5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 – Equal treatment of all Bidders/ Contractors/ Sub-contractors

- 6.1 The Bidder(s)/ Contractor(s) undertake(s) to obtain from all subcontractors a commitment consistent with this Integrity Pact and report Compliance to the Principal. This commitment shall be taken only from those sub-contractors whose contract value is more than 20 % of Bidder's/ Contractor's contract value with the Principal. The Bidder(s)/ Contractor(s) shall continue to remain responsible for any default by his Sub-contractor(s).
- 6.2 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors.
- 6.3 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 – Criminal Charges against violating Bidders/ Contractors /Sub-contractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 –Independent External Monitor(s)

- 8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

- 8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.
- 8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality.
- 8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.
- 8.5 As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or take corrective action, or heal the situation, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.
- 8.6 The Monitor will submit a written report to the CMD, BHEL within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise, submit proposals for correcting problematic situations.
- 8.7 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.
- 8.8 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant IPC / PC Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the

Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.9 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.10 The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

9.1 This Pact begins and shall be binding on and from the submission of bid(s) by bidder(s). It expires for the Contractor 12 months after the last payment under the respective contract and for all other Bidders 6 months after the contract has been awarded.

9.2 If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified as above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 – Other Provisions

10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders/ contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal

For & On behalf of the Bidder/ Contractor

(Office Seal)

(Office Seal)

Place-----

Date-----

Witness: _____

Witness: _____

(Name & Address) _____

(Name & Address) _____



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 भारत हेवी इलेक्ट्रिकल्स लिमिटेड

**Bharat Heavy Electricals Ltd.,
 (A Government of India undertaking)
 Electronics Division**

PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 002- Rev 01

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT

These 'General Commercial Conditions for Contract for Purchase' herein after referred to as GCC apply to all enquiries, tenders, requests for quotations, orders, contracts and agreements concerning the supply of goods and the rendering of related services (hereinafter referred to as "deliveries") to Bharat Heavy Electricals Limited and any of its units, regions or divisions (hereinafter referred to as "BHEL" or the Purchaser) or its projects/ customers.

Any deviations from or additions to these GCC require BHEL's express written consent. The general terms of business or sale of the vendor shall not apply to BHEL. Acceptance, receipt of shipments or services or effecting payment shall not mean that the general terms of business or sale of the vendor have been accepted.

Orders, agreements and amendments thereto shall be binding if made or confirmed by BHEL in writing. Only the Purchasing department of BHEL is authorized to issue the Purchase Order or any amendment thereof.

Definitions: Throughout these conditions and in the specifications, the following terms shall have the meanings assigned to them, unless the subject matter or the context requires otherwise.

- a) 'The Purchaser' means Bharat Heavy Electricals Limited, Electronics division, Mysore road, Bangalore 560 026, a Unit of Bharat Heavy Electricals Limited (A Govt. of India Undertaking) incorporated under the Companies Act having its registered office at BHEL House, Siri Fort, New Delhi-110049, India and shall be deemed to include its successors and assigns. It may also be referred to as BHEL.
- b) 'The vendor' means the person, firm, company or organization on whom the Purchase Order is placed and shall be deemed to include the vendor's successors, representative heirs, executors and administrator as the case may be. It may also be referred to as Seller, Contractor or Supplier.
- c) 'Contract' shall mean and include the Purchase Order incorporating various agreements, viz. tender/ RFQ, offer, letter of intent/acceptance/ award, the General Conditions of Contract and Special Conditions of Contract for Purchase, Specifications, Inspection/ Quality Plan, Schedule of Prices and Quantities, Drawings, if any enclosed or to be provided by BHEL or his authorized nominee and the samples or patterns if any to be provided under the provisions of the contract.
- d) 'Parties to the Contract' shall mean the 'The Vendor' and the Purchaser as named in the main body of the Purchase Order.

Order of Precedence:

In case of any inconsistency or contradiction between any of the documents, the order of precedence shall be Purchase Order, LOI / LOA, Special Conditions of Contract and General Conditions of Contract for commercial conditions; and specific agreement on technical conditions, RFQ/offer and specification for Technical Conditions.

Interpretation:

In the contract, except where the context requires otherwise:

- a) words indicating one gender include all genders;
- b) words indicating the singular also include the plural and words indicating the plural also include the singular;

- c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
- d) "Written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

Applicable Conditions:

1. **Price Basis:** All prices shall be firm until the purchase order is executed / completed in all respects. No price variations / escalation shall be permitted.
2. **Ordering and confirmation of Order:** Vendor shall send the order acceptance on their company letter head/ through e-mail within a week from the date of receipt of Purchase Order or such other period as specified/ agreed by BHEL. BHEL reserves the right to revoke the order placed if the order confirmation differs from the original order placed. The acceptance of goods/services/supplies by BHEL as well as payments made in this regard shall not imply acceptance of any deviations.
The purchase order will be deemed to have been accepted if no communication to the contrary is received within one week (or the time limit as specified/agreed by BHEL) from the date of receipt of the purchase order.
3. **Documentation:** After receipt of Purchase Order, vendor should submit necessary documents (if & as applicable) like drawings specified, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report, O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/ Customer.
At any stage within the contract period, the vendor shall notify of any error, fault or other defect found in BHEL's documents / specifications or any other items for reference. If and to the extent that (taking account of cost and time) any vendor exercising due care would have discovered the error, fault or other defect when examining the documents/specifications before submitting the tender, the time for completion shall not be extended. However if errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the vendor's documents, they shall be corrected at his cost, notwithstanding any consent or approval.
4. **Penalty:**
 - a. **For delay in documentation:** In the event of delay in submission of complete set of specified documents ((like drawings, bill of materials, datasheets, catalogues, quality plan etc. as called in tender specifications including soft copies wherever applicable) in required sets beyond two(02) weeks (or as agreed/indicated in the SCC/Purchase Order) from the date of receipt of Purchase Order (by email), penalty at 0.5% (half percent) per week or part thereof, limited to a maximum of 5% (five percent) of the basic material value of the Purchase Order will be applicable.

Penalty for delayed documentation if applicable, shall be deducted at the time of first supply payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted. GST as applicable will be recovered along with penalty amount.
 - b. **For delay in delivery:** In the event of delay in agreed contractual delivery as per Purchase Order, penalty @ 0.5 % (half percent) per week or part thereof but limited to a max of 10% (ten percent) value of undelivered portion (basic material cost) will be applicable. Delivery will commence from the date of issue of Manufacturing clearance along with approved document. The date for which Inspection call is issued by vendor along with test certificates / test reports / Certificate of Conformance / calibration reports, as proof of completion of manufacturing will be treated as date of deemed delivery for penalty calculation. In the absence of furnishing such document indicated above as proof of completion of manufacturing along with inspection call, actual date of inspection will be considered as date of deemed delivery and BHEL will not be responsible for delay in actual date of inspection.

Penalty for delayed delivery if applicable, shall be deducted at the time of first supply payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted. GST as applicable will be recovered along with penalty amount.

5. Contract variations (Increase or decrease in the scope of supply): BHEL may vary the contracted scope as per requirements at site. If vendor is of the opinion that the variation has an effect on the agreed price or delivery period, BHEL shall be informed of this immediately in writing along with technical details. Where unit rates are available in the Contract, the same shall be the basis for such additional work. Vendor shall not perform additional work before BHEL has issued written instructions/ amendment to the Purchase Order to that effect. The work which the vendor should have or could have anticipated in terms of delivering the service(s) and functionality (i.e.) as described in this agreement, or which is considered to be the result of an attributable error on the vendor's part, shall not be considered additional work.
6. Inspection: Prior written notice of at least 10 days shall be given along with internal test certificates/COC and applicable test certificates. Materials will be inspected by BHEL-EDN-QS/CQS or BHEL nominated Third Party Inspection Agency (TPIA) or BHEL authorized Inspection Agency or Customer / Consultant or jointly by BHEL & Customer / consultant. All tests have to be conducted as applicable in line with approved Quality plan or QA Checklist or Purchase specification and original reports shall be furnished to BHEL-EDN, Bangalore for verification/acceptance for issue of dispatch clearance.
All costs related to inspections & re-inspections shall be borne by vendor. Whether the Contract provides for tests on the premises of the vendor or any of his Sub-contractor/s, vendor shall be responsible to provide such assistance, labour, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by BHEL only if specifically agreed to in the purchase order.
7. Transit Insurance: Transit insurance coverage between vendor's works and project site shall be to the account of BHEL, unless specifically agreed otherwise. However, vendor shall send intimation directly to insurance agency (as mentioned in dispatch instructions issued by BHEL) through fax/courier/e-mail, immediately on dispatch of goods for covering insurance. A copy of such intimation sent by vendor to insurance agency shall be given to BHEL along with dispatch documents. Dispatch documents will be treated as incomplete without such intimation copy. BHEL shall not be responsible for sending intimations to insurance agency on behalf of the vendor.
8. Mode of dispatch:
Indigenous Scope: By road on Door Delivery Consignee Copy attached basis through your approved transporter (unless otherwise indicated in Dispatch Instructions), only on receipt of Dispatch Clearance from BHEL.
Imported Scope: By Air/Sea through BHEL approved Freight Forwarder/supplier approved Consolidator respectively as per agreed contractual terms, only on receipt of Dispatch Clearance from BHEL.
9. Changes in Statutory levies:
If any rates of Tax are increased or decreased, a new Tax is introduced, an existing Tax is abolished, or any change in interpretation or application of any Tax occurs in the course of the execution of Contract, which was or will be assessed on the bidder in connection with performance of the Contract, an equitable adjustment of the Contract Price shall be made to fully take into account any such change by addition to the Contract Price or deduction there from, as the case may be. However, these adjustments would be restricted to direct transactions between BHEL and the bidder /agent of foreign bidder (if applicable). These adjustments shall not be applicable on procurement of raw materials, intermediary components etc. by the bidder /agent.
10. Availing duty/tax exemption benefits by bidder, wherever applicable: BHEL shall issue the required Certificate/s, as per relevant policies of the Govt. of India, to facilitate the bidders to avail any such benefits under the Contract. In case of failure of the bidders to receive the benefits partly or fully from the Govt. of India and/or in case of any delay in receipt of such benefits, BHEL shall neither be liable nor responsible in any manner whatsoever.

11. Taxes against sub-vendor dispatches: All taxes/levies, as applicable in respect of all components, equipments and material to be despatched directly from the sub-vendor's works to Site irrespective of the fact whether such taxes and levies are assessable and chargeable on Vendor or the BHEL, shall be to the vendor's account and no separate claim in this regard will be entertained by BHEL.
12. High Sea Sales (HSS): Customs clearance of the consignment landed on Indian Sea/Air ports will be done by BHEL based on the original HSS documents provided by vendors.
Any delay in submission of complete/correct HSS documents to BHEL may incur demurrage charges. All demurrage charges on account of incomplete /incorrect HSS documents submission by vendor will be to vendor's account and all such charges will be recovered from any of the available vendor bills with BHEL.
13. Packaging and dispatch: The Seller shall package the goods safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by Sea/ Air / Rail/ Road to its destination suitably protected against loss, damage, corrosion in transit and the effect of tropical salt laden atmosphere. The packages shall be provided with fixtures/ hooks and sling marks as may be required for easy and safe handling. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols / instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
The packing, shipping, storage and processing of the goods must comply with the prevailing legislation and regulations concerning safety, the environment and working conditions. Any Imported/Physical Exports items packed with raw/ solid wood packing material should be treated as per ISPM – 15 (fumigation) and accompanied by Phytosanitary/ Fumigation certificate. If safety information sheets (MSDS – Material Safety Data Sheet) exist for an item or the packaging, vendor must provide this information without fail along with the consignment.
Each package must be marked with Consignee name, Purchase order number, Package number, Gross weight and net weight, dimensions (LxBxH) and Seller's name. Packing list of goods inside each package with PO item number and quantity must also be fixed securely outside the box to indicate the contents of each box. Total number of packages in the consignment must also be indicated in the packing list.
Separate packing & identification of items should be as follows.
1. Main Scope - All items must be tagged with part no. & item description.
2. Commissioning accessories/spares - All items must be tagged with part no. & item description.
3. Mandatory spares - All items must be tagged with part no. & item description.
Nevertheless, vendor shall adhere to dispatch & packing instructions issued by BHEL at the time of dispatch.
14. Assignment of Rights & Obligations; Subcontracting: Vendor is not permitted to subcontract the delivery or any part thereof to third party or to assign the rights and obligations resulting from this agreement in whole or in part to third parties without prior written permission from BHEL. Any permission or approval given by the BHEL shall, however, not absolve the vendor of the responsibility of his obligations under the Contract.
15. Progress report: Vendor shall render such report as to the progress of work and in such form as may be called for by the concerned purchase officer from time to time. The submission and acceptance of such reports shall not prejudice the rights of BHEL in any manner.
16. Non-disclosure and Information Obligations: Vendor shall provide with all necessary information pertaining to the goods as it could be of importance to BHEL. Vendor shall not reveal any specified confidential information that may be divulged by BHEL to Vendor's employees not involved with the tender/ contract & its execution and delivery or to third parties, unless BHEL has agreed to this in writing beforehand. Vendor shall not be entitled to use the BHEL name in advertisements and other commercial publications without prior written permission from BHEL.
17. Cancellation /Termination of contract: BHEL shall have the right to completely or partially terminate the agreement by means of written notice to that effect. Termination of the Contract, for whatever reason, shall be without prejudice to the rights of the parties accrued under the Contract up to the time of termination.
BHEL shall have the right to cancel/foreclose the Order/ Contract, wholly or in part, in case it is constrained to do so on account of any decline, diminution, curtailment or stoppage of the business.

18. Risk Purchase Clause: In case of failure of supplier, BHEL at its discretion may make purchase of the materials / services not supplied / rendered in time at the RISK & COST of the supplier. Under such situation, the supplier who fails to supply the goods in time shall be wholly liable to make good to BHEL any loss due to risk purchase.
- In case of items demanding services at site like erection and commissioning, vendor should send his servicemen/representatives within 7 days from the service call. In case a vendor fails to attend to the service call, BHEL at its discretion may also make arrangements to attend such service by other parties at the **RISK & COST** of the supplier. Under such situation the supplier who fails to attend the service shall be wholly liable to make good to BHEL any loss due to risk purchase/service including additional handling charges due to the change.
19. Shortages: In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages, caused by supplier's act or omission, shall be made good at free of cost within a reasonable time that BHEL may allow from such intimation.
- Transit Damages: In the event of receipt of goods in damaged condition or having found them so upon opening of packages at site, supplier shall make good of all such damages within a reasonable time from such intimation by BHEL. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will be reimbursed to supplier.
20. Remedial work: Notwithstanding any previous test or certification, BHEL may instruct the vendor to remove and replace materials/goods or remove and re-execute works/services which are not in accordance with the purchase order. Similarly BHEL may ask the vendor to supply materials or to execute any services which are urgently required for any safety reasons, whether arising out of or because of an accident, unforeseeable event or otherwise. In such an event, Vendor shall provide such services within a reasonable time as specified by BHEL.
21. Indemnity Clause: Vendor shall comply with all applicable safety regulations and take care for the safety of all persons involved. Vendor is fully responsible for the safety of its personnel or that of his subcontractor's men / property, during execution of the Purchase Order and related services. All statutory payments including PF, ESI or other related charges have to be borne by the vendor. Vendor is fully responsible for ensuring that all legal compliances are followed in course of such employment.
22. Product Information, Drawings and Documents: All specified drawings, technical documents or other technical information received by Vendor from BHEL or vice versa shall not, without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the Disclosing party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are binding only to the extent that they are by reference expressly included in the contract.
- Vendor, as per agreed date/s but not later than the date of delivery, provide free of charge information and drawings which are necessary to permit and enable BHEL to erect, commission, operate and maintain the product. Such information and drawings shall be supplied in as many numbers of copies as may be agreed upon.
- All intellectual properties, including designs, drawings and product information etc. exchanged during the formation and execution of the Contract shall continue to be the property of the disclosing party.
23. Intellectual Property Rights, Licenses: If any Patent, design, Trade mark or any other intellectual property rights apply to the delivery (goods/related service) or accompanying documentation shall be the exclusive property of the Vendor and BHEL shall be entitled to the legal use thereof free of charge by means of a non-exclusive, worldwide, perpetual license. All intellectual property rights that arise during the execution of the Purchase Order/ contract for delivery by vendor and/or by its employees or third parties involved by the vendor for performance of the agreement shall belong to BHEL. Vendor shall perform everything necessary to obtain or establish the above mentioned rights. The Vendor guarantees that the delivery does not infringe on any of the intellectual property rights of third parties. The Vendor shall do everything necessary to obtain or establish the alternate acceptable arrangement pending resolution of any (alleged)

claims by third parties. The Vendor shall indemnify BHEL against any (alleged) claims by third parties in this regard and shall reimburse BHEL for any damages suffered as a result thereof.

24. Force Majeure: Notwithstanding anything contained in the purchase order or any other document relevant thereto, neither party shall be liable for any failure or delay in performance to the extent said failures or delays are caused by the "Act of God" and occurring without its fault or negligence, provided that, force majeure will apply only if the failure to perform could not be avoided by the exercise of due care and vendor doing everything reasonably possible to resume its performance.

A party affected by an event of force majeure which may include fire, tempest, floods, earthquake, riot, war, damage by aircraft etc., shall give the other party written notice, with full details as soon as possible and in any event not later than seven (7) calendar days of the occurrence of the cause relied upon. If force majeure applies, dates by which performance obligations are scheduled to be met will be extended for a period of time equal to the time lost due to any delay so caused.

Notwithstanding above provisions, in an event of Force Majeure, BHEL reserves for itself the right to cancel the order/ contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements for completion of deliveries and other schedules.

25. Warranty:

Wherever required, and so provided in the specifications/ Purchaser Order, the Seller shall ensure that the goods supplied shall comply with the specifications laid down, for materials, workmanship and performance.

Unless otherwise specified in SCC, warranty period shall be applicable for a period of 24 months from the date of delivery of goods or 18 months from the date of commissioning of goods, whichever is earlier.

The warranty period as described above shall apply afresh to replaced, repaired or re-executed parts of a delivery. Unless otherwise specifically provided in the Purchase Order, Vendor's liability shall be co terminus with the expiration of the applicable warranty period.

26. Limitation of Liability: Vendor's liability towards this contract is limited to a maximum of 100% of the contract value and consequential damages are excluded. However the limits of liability will have no effect in cases of criminal negligence or wilful misconduct.

The total liability of Vendor for all claims arising out of or relating to the performance or breach of the Contract or use of any Products or Services or any order shall not exceed the total Contract price.

27. Liability during warranty: Vendor shall arrange replacement / repair of all the defective materials / services under its obligation during the warranty period. The rejected goods shall be taken away by vendor and replaced / repaired. In the event of the vendor's failure to comply, BHEL may take appropriate action including disposal of rejections and replenishment by any other sources at the cost and risk of the vendor. In case, defects attributable to vendor are detected during Warranty period or where the commissioning call is issued within the warranty period, vendor shall be responsible for replacement/ repair of the goods as required by BHEL at vendor's cost even after expiry of warranty period.

Further if the equipment or any part thereof cannot be used by reason of such defect and/or making good of such defect, the warranty period of the equipment or such part, as the case may be, shall be extended by a period equal to the period during which the equipment or such part cannot be used by BHEL because of any of the aforesaid reasons. Upon correction of the defects in the facilities or any part thereof by repair/replacement, such repair/replacement shall have the warranty period for a period of twelve (12) months from the time such replacement/repair of the equipment or any part thereof has been completed.

28. Liability after warranty period: At the end of the warranty, the Vendor's liability ceases except for latent defects. For the purpose of this clause, latent defects shall be the defects inherently lying within the material or arising out of design deficiency which do not manifest themselves during the warranty Period, but later. The Contractor's liability for latent defects warranty for the equipment including spares shall be limited to a period of six months from the end of the warranty period of the respective equipment including spares or first time commissioning, whichever is later but not later than one (01) year from the date of expiry of warranty period.

29. Compliance with Laws: Vendor shall, in performing the contract, comply with all applicable laws. The vendor shall make all remittances, give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the laws in relation to the execution and completion of the contract and for remedying of any defects; and the Contractor shall indemnify and hold BHEL harmless against and from the consequences of any failure to do so.
30. Settlement of Disputes: Except as otherwise specifically provided in the Purchase Order, decision of BHEL shall be binding on the vendor with respect to all questions relating to the interpretation or meaning of the terms and conditions and instructions herein before mentioned and as to the completion of supplies/work/services, other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the contract, instructions, orders or these conditions or otherwise concerning the supply or the execution or failure to execute the order, whether arising during the schedule of supply/work or after the completion or abandonment thereof. Any disputes or differences among the parties shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration. Vendor shall continue to perform the contract, pending settlement of dispute(s).
31. Arbitration Clause in case of Contract with vendors other than Public Sector Enterprise (PSE) or a Government Department:

ARBITRATION & CONCILIATION

The parties shall attempt to settle any disputes or difference arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract, or in connection with this contract through friendly discussions. In case no amicable settlement can be reached between the parties through such discussions, in respect of any dispute; then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL–EDN. Such Sole Arbitrator appointed, shall conduct the arbitration in English language.

The Arbitrator shall pass a reasoned award and the award of the Arbitration shall be final and binding upon the Parties.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Bangalore.

The cost of arbitration shall be borne as decided by the Arbitrator upon him entering the reference.

Subject to the Arbitration Clause as above, the Courts at Bangalore alone shall have exclusive jurisdiction over any matter arising out of or in connection with this Contract.

Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the parties shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and efficiency in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.

Arbitration Clause in case of Contract with a Public Sector Enterprise (PSE) or a Government Department:

In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred by either party for Arbitration to the Sole Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any Party aggrieved by such Award may make further reference for setting aside or revision of the Award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the Parties hereto finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.'

32. Applicable Laws and Jurisdiction of Courts: Prevailing Indian laws both substantive and procedural, including modifications thereto, shall govern the Contract. Subject to the conditions as aforesaid, the competent courts in Bangalore alone shall have jurisdiction to consider over any matters touching upon this contract.
33. General Terms: That any non-exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents.

That the headings used in this agreement are for convenience of reference only.

That all notices etc., to be given under the Purchase order shall be in writing, type script or printed and if sent by registered post or by courier service to the address given in this document shall be deemed to have been served on the date when in the ordinary course, they would have been delivered to the addressee.



ಭಾರತ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division

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CE: PR: 003- Rev 01

PB 2606 , Mysore Road Bangalore , 560026 INDIA

SPECIAL COMMERCIAL CONDITIONS OF CONTRACT

Reference is brought to BHEL's Instructions to Bidders (Document Ref: CE: PR: 001- Rev 01) and General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 01).

These two documents along with Special Conditions of Contract annexed to this RFQ will form an integral part of the contract as and when the RFQ culminates into a Purchase Order / Contract.

RFQ No: SBA0000341 RFQ Date: 08-06-18

Due Date: 02-07-18 Customer/Project: North Chennai (1x800MW), Uppur (2x800 MW), NSPCL Rourkela (1x250 MW) & NTPC Dadri FGD (2x490 MW)

Item Description: UPS

TYPE OF BID: TWO PART BID

Purchase Executives: Clarifications with regard to the tender shall be addressed to purchase officers whose e-mail IDs are given below: saravanababu@bhel.in or neelkantghode@bhel.in

Submission of documents post PO viz., drawings /data sheet etc. as indicated in Cl: 04 of GCC: Within 02 weeks from the date of receipt of Purchase Order. Delay in submission of complete set of specified documents in NIT, will attract Penalty as per GCC Clause no.:04.a.

Splitting of tendered quantity to MSE vendors: The tendered quantity will not be split to MSE vendor/s.

Destination: a) For Indigenous scope of supply, items are to be directly despatched to BHEL's Site Office or Stores located at/near North Chennai , Uppur, Rourkela & Dadri District/City in Tamil Nadu, Tamil nadu, Odhisha & Uttar Pradesh State. Consignee details and Road Permit, if applicable, will be issued by BHEL along with Despatch Clearance.

b) For Imported scope of supply, destination is North Chennai , Uppur, Rourkela & Dadri. In case of shipment by sea, port of discharge will be Chennai seaport and port of delivery shall be Bangalore.

Project Benefits:

Imported scope of supply:

a) Project Imports: Eligible for Concessional Basic Custom Duty.

Terms of Delivery:

• **Indigenous scope of supply:**

Ex-works < station of dispatch > (including Packing & Forwarding charges but excluding Taxes & Duties).

• **Imported scope of supply:**

F.C.A. (for air consignments) < indicate international port of dispatch > / C.I.F. (for sea consignments)

< ICD, Bangalore > (including Packing, Forwarding, Handling, Ancillary charges like processing of Sight Draft/ Letter of Credit, negotiation of bank documents, Export declaration, Country of Origin etc.).

Kindly indicate the approximate weight of the total imported consignment, which is required for calculating air-freight charges:

Under-mentioned details shall be provided against indigenous supplies and services:

a. GSTIN (no.) of place of supply: _____

b. HSN (Harmonized System of Nomenclature) code: _____

Applicable tax and Rate: _____ & _____

c. SAC (Service Accounting Code) no.: _____

Applicable tax and Rate: _____ & _____

d. If service is also involved, GSTIN (no.) of place of supply of service: _____

I. Bidders to mandatorily provide confirmation/compliance for the under-mentioned terms:

SL NO.	TERMS	BHEL ACCEPTABLE TERM	BIDDER'S CONFIRMATION	REMARKS,if any
01	Reverse Auction	Will be intimated separately to qualified bidders after finalization of techno-commercial evaluation. Non-acceptance to participate in RA may result in non-consideration of the bid, in case BHEL decides to go for RA. In case BHEL does not resort to Reverse Auction, the price bids and price impacts (if any) shall be opened as per BHEL's standard practice.	AGREE	
02	Delivery Period	Within <u>12</u> weeks from the date of issue of Manufacturing clearance along with approved document. Delay in contractual delivery will attract Penalty as per GCC Clause no.:04.b.	AGREE weeks	
03	Terms of Payment at the time of material supply	Refer Clause "F" of Instructions to Bidder for BHEL standard Payment terms and loading factors applicable for non-compliance against payment terms: Indigenous Scope: b)Supply with Erection Supervision & Commissioning Imported Scope: e)Supply with Erection Supervision & Commissioning High-Sea sales: h) Supply with Erection Supervision & Commissioning Spares: c) Supply only	AGREE	

II. Bidder to note that Deviations shall not be permitted for the below mentioned terms and are deemed to be complied. In case of non-compliance/deviation, offer shall be liable for rejection:

- (1) **Validity:** The offer will be valid for a period of 90 days from the date of part-I bid opening and in case of Negotiation/ Counter-offer/Reverse Auction, price validity will apply afresh for a period of 60 days from the date of according final price by bidder (or) upto original validity period, whichever is later.
- (2) **Guarantee/ Warranty for North Chennai (1x800MW), Uppur (2x800 MW), NSPCL Rourkela (1x250 MW) :** 36 months from the date of dispatch of goods or 30 months from the date of commissioning of goods, whichever is earlier.
- (3) **Guarantee/ Warranty for NTPC Dadri FGD (2x490 MW) :** 24 months from the date of dispatch of goods or 18 months from the date of commissioning of goods, whichever is earlier.
- (4) **Performance Bank Guarantee (PBG) for North Chennai (1x800MW), Uppur (2x800 MW), NSPCL Rourkela (1x250 MW) :** PBG will be applicable for a period of 36 months from the date of dispatch of goods + claim period of 03 months, for a value equal to 10% of the basic value of the purchase order. Refer Clause "H" of Instructions to Bidders. Also note that PBG should be in the format specified in Annexure VII of ITB and no deviation to this format will be allowed.
Note: In case PBG is not furnished, the 10% basic amount will be withheld from the supply invoice. This withheld amount will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.
- (5) **Performance Bank Guarantee (PBG) for NTPC Dadri FGD (2x490 MW) :** PBG will be applicable for a period of 24 months from the date of dispatch of goods + claim period of 03 months, for a value equal to 10% of the basic value of the purchase order. Refer Clause "H" of Instructions to Bidders. Also note that PBG should be in the format specified in Annexure VII of ITB and no deviation to this format will be allowed.

Note: In case PBG is not furnished, the 10% basic amount will be withheld from the supply invoice. This withheld amount will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.

- (6) **Despatch Documents:** Complete set of despatch documents (original + 1 photocopy set) as per Purchase Order shall be forwarded to Purchase Executive/BHEL directly. Depending upon the project/customer demands, despatch documents may include one or more documents from the following: Invoice (02 sets of original), Lorry Receipt (L/R), Packing List, Air Way Bill (AWB)/Bill Of Lading (BOL), Copy of High Sea Sales (HSS) agreement, Country of origin certificate, NIL Short Shipment Certificate, Original Performance Bank Guarantee (directly from issuing bank to BHEL), insurance intimation letter, POD (Proof of Delivery) on L/R.

The precise list of despatch documents needed for the project will be specified in the Purchase Order.

One set of Invoice, Packing List and L/R or AWB shall be e-mailed/faxed immediately to BHEL-EDN after despatch.

- (7) **Freight Charges (for indigenous scope of supply):** Freight charges shall be to vendor's account. Vendor to quote reasonable lump sum Freight charges separately, with applicable tax in priced offer.

- (8) **Evaluation criteria for tendered item/s:**

- (a) Items will be split on project-wise lowest offer. Price bid shall be submitted project wise with each project in a separate envelope, super scribing project name on them. Four separate price envelopes shall be submitted.

With this, we hereby confirm that all the terms & conditions as indicated in Instructions to Bidders (Document Ref: CE: PR: 001- Rev 01) & General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 01) are accepted without any deviation.

Vendor's Signature with Seal

Note :

The above filled-in and signed-sealed document (in original) shall be furnished as part of Part-I Bid without fail.

REQUEST FOR QUOTATION

	BHARAT HEAVY ELECTRICALS LIMITED Electronics Division PB No. 2606, Mysore Road Bangalore - 560026 INDIA	RFQ NUMBER: SBA0000341 RFQ DATE : 07.JUN.2018	Due Date 02.JUL.2018 Time: 13:00 HRS VENUE : NEW ENGG. BLDG
MMI:PU:RF:003			

To: Bidder	(for all correspondence) Purchase Executive : Saravana Babu A Phone : 2699 8728 Fax : 2698 9227 E-mail: saravanababu@bheledn.co.in
---------------	--

Please submit your lowest quotation subject to our terms and conditions attached for the material mentioned below. The quotation must be enclosed in a sealed envelope / Fax superscribed with RFQ no. and due date, should reach us on or before the due date by **13.00** hours IST and will be opened on the same day at **13.30** hours at the venue mentioned above. **PLEASE DROP THE OFFER IN THE BOX PROVIDED AT RECEPTION.**

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	EC-013 ANNUAL MAINTENANCE CONTRACT (AMC)	1	AU	1	Refer SCC for delivery clause.
2	PR0130000019 UPS System with ACDB UPS System with ACDB Test Certificate	8	ST	1 1 1 3 2	
3	PR0280000375 Commissioning Spares for UPS System COMMISSIONING SPARES FOR UPS SYSTEM Test Certificate	1	ST	1	
4	PR0880000040 Mandatory Spares for UPS System Mandatory Spares for UPS System Test Certificate	2	ST	1 1	

Total Number of Items - 4

"

Please note that the tender will be opened in the presence of the bidders or his authorised representatives (maximum two per organisation) who choose to be present with authorisation letters. Refer annexure for the terms and conditions.

~~Preference will be given to vendors who accepts our standard payment terms i.e.100% payment — 30 days after receipt of material at our works subject to acceptance.~~

Please specify Terms of delivery, Excise duty, sales tax, Ex-BHEL, Ex-works surcharge, Insurance,P&F, Freight and other taxes very clearly .

For evaluation,exchange rate(TT selling rate of SBI) as on scheduled date of tender opening (Part-I bid incase of two part bid) shall be considered.

The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected.The list of banned firms is available on BHEL web site www.bhel.com

- i). This is only RFQ not an order.
- ii). In all correspondence quote RFQ No. & due date.
- iii). In Quotation BHEL material code / RFQ Sl. No. should be mentioned clearly.
- iv). Quotation Envelope / Fax not superscribed with RFQ No. and due date is liable for rejection.
- ~~v). Quotation should remain valid for a minimum period of 90 days from due date.~~
- vi). In case of non-receipt of Quotation or regret letter for 3 consecutive RFQs you are liable to be removed from our vendors list.
- vii). All Prices should be written in words and numbers.
- viii). Excise Chapter Heading should be mentioned for all items where VAT is applicable .

For and On behalf of BHEL.

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APPENDIX-V to ANNEXURE-A

**PROJECT : 1) NORTH CHENNAI TPS (1x800 MW)
2) UPPUR TPS (2x800 MW)**

CUSTOMER : 1) & 2) M/s TANGEDCO

**CONSULTANT : 1) M/s FICHTNER
2) M/s TRACTEBEL**

SPECIFICATION

FOR

UNINTERRUPTIBLE POWER SUPPLY SYSTEM(UPS)

PQR:

The equipment offered must have proven performance of working in not less than two nos. different reheat type pulverized coal fired units of unit size not less than 500 MW capacity. The minimum capacity shall be 150 kVA rating UPS system and have been running successfully for at least two years prior to the date of this RFQ's technical bid opening. Satisfactory Performance Certificate from End-user along with approved datasheet shall be submitted for review. Technical offers of vendor not complying with this PQR requirement will be rejected.

On meeting PQR requirement, the PQR documents submitted by bidder will be sent to M/s TANGEDCO for review and approval. On receipt of M/s TANGEDCO approval for supply of UPS System, bidder's offer will be considered for further evaluation

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REVISION:00

APPROVED

RAJASEKAR K

PREPARED

ISSUED

DATE

SATHISH

416

06/06/2018



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CE/416/APPENDIX-V/UPS

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CONTENTS

Sl. No.	Description	Reference.
1.	Scope of Supply	CE/416/APPENDIX-V/UPS/SOS, Rev.00 Sheets 08
2.	Technical Requirements	CE/416/APPENDIX-V/UPS/TR, Rev.00 Sheets 14
3.	Feeder List	CE/416/APPENDIX-V/UPS/FL, Rev.00 Sheets 05
4.	Typical Battery Sizing Calculation	CE/416/APPENDIX-V/UPS/BSC, Rev.00 Sheets 03
5.	Single Line Diagram	CE/416/APPENDIX-V/UPS/SLD, Rev 00 Sheets 06

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**PROJECT : 1) NORTH CHENNAI TPS (1x800 MW)
2) UPPUR TPS (2x800 MW)**

CUSTOMER : 1) & 2) M/s TANGEDCO

**CONSULTANT : 1) M/s FICHTNER
2) M/s TRACTEBEL**

SCOPE OF SUPPLY

REVISION:00

APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED

Sathish

SATHISH

ISSUED

416

DATE

06/06/2018



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CE/416/APPENDIX-V/UPS/SOS

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SCOPE OF SUPPLY

Following UPS shall be as per Technical Requirement Ref: CE/416/APPENDIX-V/UPS/TR and detailed Scope of Supply.

A. To be offered by UPS Manufacturer for NORTH CHENNAI (1x800 MW) Project

S.NO	LOCATION	UPS RATING	ACDB-1 FEEDERS	ACDB-2 FEEDERS	QTY	E&C QTY
1	MAIN PLANT	2 x 230 kVA	158 Nos	158 Nos	1 Set	1 Set
2	PDB for Switches #	-	36 Nos	36 Nos	1 Set	-

PDB's shall be provided by UPS Manufacturer

B. "1 Set" of UPS system in Sl.No A. 1) & 2) comprises of the following:-

01. 100% capacity of IGBT based PWM Inverter with Output Voltage, Current, frequency, kVA & kW digital display/meter 2 Nos
02. 100% capacity static switches with input voltage, current, frequency digital display/meter at bypass line 2 Nos
03. Manual Bypass Switch. 1 No
04. 100% capacity of 12 pulse controlled float cum boost chargers 2 Nos
05. 100% Battery set each for 2 hour back-up 2 Sets *
06. Step down transformer 415V, 3 Ph. to 240V, 1 Ph of reqd. capacity 1 No.
07. Static Voltage Stabilizer with input & output ON Red indication and input & output voltage, current, frequency digital display/meter 1 Set
08. Input isolation transformer with input & output ON Red indication and input voltage, current, frequency digital display/meter & Output isolation transformer 1 No. each
09. AC power Distribution panels and digital type Ammeter, Voltmeter, Frequency meter, PF Meter, Watt meter & VA meter 2 Sets
10. Interconnecting Armoured FRLS ST2 (inner & outer sheath), PVC Type C insulated stranded Copper conductor power cable between UPS equipment & battery, UPS & ACDB As required.
11. Online Battery Health Monitoring System 2 Sets **
12. MCCB (at input, output, battery side, Bypass side, ACDB side, etc.) and tie breaker with ON, OFF & Trip indication 1 No. each
13. Battery Junction Boxes with MCCB, Voltmeter & Current Meter 1 Set each
14. Any other equipment necessary for completion of the system shall be provided by Bidder including suitable cable glands, lugs (for interconnection cables between UPS, Battery, ACDB and at UPS incomer), Base Frame, Anti-Vibration Pad, etc.

** Battery being procured by BHEL separately. (Battery AH rating for sizing Charger & Transformer shall be calculated as per Battery sizing methodology attached).*

***BHMS shall be provided by UPS Manufacturer including interconnecting cables and other accessories. Cable Route length from each individual cells to BHMS Module shall be min 30 meters.*

All equipment, enclosures and accessories for UPS System shall be designed, arranged, assembled and connected in accordance with the requirements of this specification.

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C. INTERCONNECTION CABLE DETAILS:

S. N O	LOCATION	CABLE ROUTING DISTANCE PER RUN		TOTAL MODBUS CABLE QTY (mtrs)*
		UPS to BATTERY	UPS to ACDB	
1	MAIN PLANT	50	80	150

* UPS Manufacturer has to calculate the cable cross-section of FRLS ST2 PVC Type C cable considering 4V drop UPS & Battery, 2V drop between UPS & ACDB considering above mentioned cable routing distance. Please note that above mentioned BOQ of FRLS ST2 PVC Type C cable and MODBUS cable shall be supplied in a roll/drum (without cutting) as per maximum length required above & available with Cable Manufacturer

D. MANDATORY SPARES for UPS System:

S.NO	ITEM	QUANTITY
01)	Fuses/Semiconductor Fuses	300% of installed of each type, current rating with each panel/board (in Nos)
02)	Miscellaneous parts for the power supplies such as SCRs, transistors, diodes, light bulbs, static switches, blocking diodes, etc.	Minimum of 10% or atleast two (whichever is more) of each type.
03)	Electronic Modules like Rectifier Control Card, Inverter Control Card, IGBT Module, DC-DC converter card or any other card.	1 Set of each type & rating
04)	Miniature Circuit breakers	20% of installed of 10 Nos of each type (which ever is more)
05)	Digital/analog panel meters/indicators	5% or 2 no. of each type (whichever is more)
06)	CT's, CVT's, VT's, Chokes, AC/DC isolators, contactors, timers, relays	10% or 2 Nos of each type and rating (whichever is more)
07)	Cooling Fans	10% or 2 Nos of each type and rating (whichever is more)
08)	Electronic Modules of each type & rating	One set of electronic modules with each set consisting of atleast one number of each type of electronic module for inverters, chargers, static switch, stabilizer, etc.
09)	MCCB for UPS, ACDB	20% of installed or 5 Nos of each type (whichever is more)

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SCOPE OF SUPPLY

Following UPS shall be as per Technical Requirement Ref: CE/416/APPENDIX-V/UPS/TR and detailed Scope of Supply.

A. To be offered by UPS Manufacturer for UPPUR (2x800 MW) project

S.NO	LOCATION	UPS RATING	ACDB-1 FEEDERS	ACDB-2 FEEDERS	QTY	E&C QTY
1	MAIN PLANT U-1	2 x 230 kVA	158 Nos	158 Nos	1 Set	1 Set
2	MAIN PLANT U-2	2 x 230 kVA	158 Nos	158 Nos	1 Set	1 Set
3	PDB for Switches U-1 #	-	36 Nos	36 Nos	1 Set	-
4	PDB for Switches U-2 #	-	36 Nos	36 Nos	1 Set	-

PDB's shall be provided by UPS Manufacturer

B. "1 Set" of UPS system in Sl.No A. 1) & 2) comprises of the following:-

01. 100% capacity of IGBT based PWM Inverter with Output Voltage, Current, frequency, kVA & kW digital display/meter 2 Nos
02. 100% capacity static switches with input voltage, current, frequency digital display/meter at bypass line 2 Nos
03. Manual Bypass Switch. 1 No
04. 100% capacity of 12 pulse controlled float cum boost chargers 2 Nos
05. 100% Battery set each for 2 hour back-up 2 Sets *
06. Step down transformer 415V, 3 Ph. to 240V, 1 Ph of reqd. capacity 1 No.
07. Static Voltage Stabilizer with input & output ON Red indication and input & output voltage, current, frequency digital display/meter 1 Set
08. Input isolation transformer with input & output ON Red indication and input voltage, current, frequency digital display/meter & Output isolation transformer 1 No. each
09. AC power Distribution panels and digital type Ammeter, Voltmeter, Frequency meter, PF Meter, Watt meter & VA meter 2 Sets
10. Interconnecting Armoured FRLS ST2 (inner & outer sheath), PVC Type C insulated stranded Copper conductor power cable between UPS equipment & battery, UPS & ACDB As required.
11. Online Battery Health Monitoring System 2 Sets **
12. MCCB (at input, output, battery side, Bypass side, ACDB side, etc.) and tie breaker with ON, OFF & Trip indication 1 No. each
13. Battery Junction Boxes with MCCB, Voltmeter & Current Meter 1 Set each
14. Any other equipment necessary for completion of the system shall be provided by Bidder including suitable cable glands, lugs (for interconnection cables between UPS, Battery, ACDB and at UPS incomer), Base Frame, Anti-Vibration Pad, etc.

* Battery being procured by BHEL separately.

**BHMS shall be provided by UPS Manufacturer including interconnecting cables and other accessories. Cable Route length from each individual cells to BHMS Module shall be min 30 meters.

All equipment, enclosures and accessories for UPS System shall be designed, arranged, assembled and connected in accordance with the requirements of this specification.

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D. INTERCONNECTION CABLE DETAILS:

S. N O	LOCATION	CABLE ROUTING DISTANCE PER RUN		TOTAL MODBUS CABLE QTY (mtrs)*
		UPS to BATTERY	UPS to ACDB	
1	MAIN PLANT U-1	50	80	150
2	MAIN PLANT U-1	50	80	150

* UPS Manufacturer has to calculate the cable cross-section of FRLS ST2 PVC Type C cable considering 4V drop UPS & Battery, 2V drop between UPS & ACDB considering above mentioned cable routing distance. Please note that above mentioned BOQ of FRLS ST2 PVC Type C cable and MODBUS cable shall be supplied in a roll/drum (without cutting) as per maximum length required above & available with Cable Manufacturer

D. MANDATORY SPARES for UPS System:

S.NO	ITEM	QUANTITY
01)	Fuses/Semiconductor Fuses	300% of installed of each type, current rating with each panel/board (in Nos)
02)	Miscellaneous parts for the power supplies such as SCRs, transistors, diodes, light bulbs, static switches, blocking diodes, etc.	Minimum of 10% or atleast two (whichever is more) of each type.
03)	Electronic Modules like Rectifier Control Card, Inverter Control Card, IGBT Module, DC-DC converter card or any other card.	1 Set of each type & rating
04)	Miniature Circuit breakers	20% of installed of 10 Nos of each type (which ever is more)
05)	Digital/analog panel meters/indicators	5% or 2 no. of each type (whichever is more)
06)	CT's, CVT's, VT's, Chokes, AC/DC isolators, contactors, timers, relays	10% or 2 Nos of each type and rating (whichever is more)
07)	Cooling Fans	10% or 2 Nos of each type and rating (whichever is more)
08)	Electronic Modules of each type & rating	One set of electronic modules with each set consisting of atleast one number of each type of electronic module for inverters, chargers, static switch, stabilizer, etc.
09)	MCCB for UPS, ACDB	20% of installed or 5 Nos of each type (whichever is more)

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- | | | |
|-----|---|---|
| 10) | Static switches of each type model & rating | 2 Nos |
| 11) | Manual bypass switch of each type, model & rating | One No. |
| 12) | Capacitors | 20% or 4 Nos of total qty of each type and rating whichever is more |
| 13) | Resistors, Integrated Circuits | 5% or 1 No of each type and rating (whichever is more) |
| 14) | BHMS – Electronic & Interface cards | 20% of installed or 5 Nos of each type (whichever is more) |



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1.0 GENERAL TECHNICAL REQUIREMENTS

- 1.1 Only the site-proven & type tested (in the last 5 years), electronic modules (in case of UPS System) will be acceptable unless otherwise decided by the purchaser in special circumstances.
- 1.2 For UPS, the type test shall be as per IEC-146, Degree of Protection test as per IS-2147 and the same are not to be specifically conducted for the projects if conducted on similar type/rating or similar type/higher rating UPS. If type tests are not available with supplier, then type tests has to be conducted and reports has to be submitted without any price implication to BHEL.
- 1.3 Erection supervision & commissioning of Battery with overall integration of complete system is responsibility of UPS vendor.
- 1.4 In case, there is any contradiction in any parameter/specification, the most stringent shall be considered as final and shall be offered accordingly.
- 1.5 In UPS System, the voltage window of inverter shall be suitably designed for 1.8V End Cell Voltage, 2.7V Boost Voltage for NORTH CHENNAI project and 1.1V End Cell Voltage, 1.68V Boost Voltage for UPPUR project. No. of Battery Cells shall be calculated accordingly.

2.0 DOCUMENTS TO BE FURNISHED

- 2.1.1. **After Placement of order:** Vendor must submit 2 sets hard copies of following documents for submission to Customer / Consultant. After approval of documents, vendor must submit 8 sets hard copies of documents for submission to Customer / Consultant.

A. Datasheet/Drawings:

- a) Covering Sheet
- b) Index Sheet
- c) Scope of Supply
- d) Charger & Transformer Sizing Calculation
- e) Technical datasheets of UPS, Stabilizer, ACDB, BHMS, PDB, Battery JB, etc.
- f) Heat Loss Calculation
- g) Bill of Material of UPS, Stabilizer, ACBD, BHMS, Cable Glands & Lugs, PDB, Battery JB, etc.
- h) Panel GA drawings including Internal View of UPS, Stabilizer, ACDB, BHMS, PDB, Battery JB, etc.
- i) Single Line Diagram
- j) Interconnection Drawing
- k) Earthing Drawing
- l) Power Circuit Drawing
- m) Analog & Binary Signal List (pdf & excel format)
- n) ACDB Termination drawing along with feeder termination details in Excel Sheet.
- o) UPS System Functional Description
- p) Catalog

B. Quality Assurance Plan

C. Type Test Reports

Note: If all above documents are not submitted within two weeks' time from receipt of Purchase Order vide e-mail / in person / courier, then the documents will be considered as incomplete and penalty (as mentioned in commercial terms and conditions) will be considered for delayed document submissions.



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2.1.2. **After Inspection but 1 week before dispatch:** For BHEL/CUSTOMER approval, vendor must send following documents in soft copy.

01. Preliminary Instruction /O&M Manual

2.1.3. **Along with the materials being dispatched:** Vendor must send five (5) sets of the following “As Built & Approved” status documents four (4) in hard copies & one (1) in soft copy.

- (a) Instruction/O&M Manual
- (b) Bill of Material
- (c) Data Sheets
- (d) Technical literatures/Catalogs
- (e) Drawings GA/layout/wiring/interconnection/schematic, etc.)

2.1.4. **After despatch of material within 1 week :** Vendor must send the following documents in soft copy directly to Site.

- (a) Instruction/O&M Manual
- (b) “As built & Approved drawings”.

NOTE: One (01) set soft copy of Final document shall also be provided to BHEL. The soft copy shall be in CD-ROM media and shall be in Acrobat (pdf) formats.



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**PROJECT : 1) NORTH CHENNAI TPS (1x800 MW)
2) UPPUR TPS (2x800 MW)**

CUSTOMER : 1) & 2) M/s TANGEDCO

**CONSULTANT : 1) M/s FICHTNER
2) M/s TRACTEBEL**

TECHNICAL REQUIREMENTS

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REVISION:00

APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED

ISSUED

DATE

Sathish

SATHISH

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06/06/2018



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1.01.00 GENERAL REQUIREMENTS

- 1.01.01** This subsection covers design, construction and performance requirements of parallel redundant industrial grade Uninterruptible Power Supply (UPS) System to be furnished by the Bidder for BTG, Station C & I Package The Bidder shall furnish separate parallel redundant industrial grade UPS System including static inverters, static switches, manual bypass switch, chargers, A.C. Power distribution panels with all required isolating and protecting devices and all other equipment and accessories required for completeness of this system. Bidder to note that there will be no common component like in phase transformer (IPT), common power supply to any redundant component and common point of failure in the UPS system.
- 1.01.02** The requirements of UPS system are specified herein on system basis. The Bidder shall be responsible for engineering and furnishing a complete and operational system fully meeting the intent and requirements of this specification and Owner approved drawings.
- 1.01.03** The equipment furnished under this subsection shall meet the requirements of all applicable codes and standards including ANSI, NEMA, TEEE, NEC and IS.
- 1.01.04** **The UPS System hardware shall be from the latest established product range of a qualified manufacturer. The Bidder shall furnish documents to satisfy the owner that the design, performance and high availability of the proposed UPS System and all system components have been established by a considerable record of successful operation in utility power station for similar application.** All UPS system cabinets, enclosures and distribution boards shall be manufactured, assembled, wired and fully tested as a complete assembly as per the requirements of this specification in the manufacturing works of a qualified manufacturer prior to shipment to the project site. Class of insulation of wound components (All transformers, chokes/inductances etc.) shall be class H with temp rating up to class B.
- 1.01.05** The UPS system equipment and the complete system shall have surge withstanding capability (SWC) to meet the requirements of ANSI C 37.90a – IEEE Standard 472 –1974. UPS system should be provided with Class C type surge protection device. The Class C type surge arrester should be single MOV type , pluggable, should have fault indication and should be tested as per IEC 61643-1 to withstand 40KA 8/20 μ s pulse. The arresters should have potential free contact to ensure maintainability.
- 1.01.06** All non-interrupting components of UPS system shall be capable of withstanding all available short circuit current without damage. Additionally, all circuit interrupting components shall be capable of withstanding and interrupting all encountered short circuit currents without damage.
- 1.01.07** All control and instrument circuits shall be fused. Fuses shall be mounted inside the enclosures and shall have easy accessibility. Fuses shall be Buss man low-peak type or Owner approved equivalent. All load fuses shall be to Owner's approval equal. The Bidder shall co-ordinate all load and line fuses applications to ensure that load fuses operate properly.



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1.01.08 The bidder shall be responsible for ensuring that UPS System and the downstream power distribution system for equipment to be serviced by are coordinated such that UPS loads continue to operate without interruption and in accordance with the power supply tolerance requirements (both voltage and frequency) for these UPS loads as long as at least one source is within the limits of voltage and frequency as specified herein. The Bidder shall furnish single line diagrams with his proposal to demonstrate how this requirement is met for all equipment and system covered under Bidders scope.

1.01.09 The UPS system will be installed in AC room.

1.01.10 Acoustic noise at rated linear load shall be < 75 dBA at 1 meter distance from UPS as per ISO 3746.

1.02.00 FUNCTIONAL REQUIREMENTS OF UPS

1.02.01 CAPACITY OF UPS SYSTEM FOR main plant PACKAGE, remote I/O panels and BOP/OFF-SITE PACKAGES

Parallel redundant UPS shall be sized by the bidder to cater to power for the bidder furnished loads such as plant control, monitoring system. Min. capacity shall be considered as per capacity mentioned in scope of supply at 50 deg. C ambient.

This base capacity shall be guaranteed at 240 V AC, 50 Hz single phase output at 50 deg. C & 95 % RH – non condensing at ambient conditions. Ratings other than standard ratings of the manufacturer shall not be acceptable.

1.02.02 The parallel redundant Uninterruptible Power Supply (UPS) system of continuous duty shall supply, regulated, filtered and uninterrupted 240 V, 50 Hz, single phase power, within specified tolerances, to system AC loads, UCB mounted monitoring system, and other critical loads. Each of these critical loads shall receive one feeder from the AC Distribution Board of Inverter-“A” and another feeder from the AC Distribution Board of Inverter-“B”. However, each inverter shall supply only 50% loads under normal conditions as indicated below. SLD of UPS shall also be referred by bidder.

1.02.03 All necessary equipment required for protecting UPS equipment and connected inputs and outputs shall be furnished by the Bidder as an integral part of this system. Complete UPS system shall be automatic without any manual interference at any time of operation.

1.02.04 True, 100% parallel redundant configuration also means availability of “Criss-Cross Redundancy”. Hence The UPS system design shall ensure that in case of one of the charger failure, the other healthy charger, shall feed to one of or both the invertors as the case may be and continue to charge the common/individual DC battery banks at all load conditions. UPS system shall work in “Criss-Cross Redundancy” configuration to safeguard the battery bank from unnecessary drainage. The bidder should note that this situation should not in any way lead to the discharge of the DC battery and maintain the UPS power supply to all loads.



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1.02.05 NORMAL OPERATION

Two inverters each of 100% capacity, two battery packs of 100% capacity and two 100% battery chargers are used for main plant UPS.

1. During normal operation, UPS loads shall be supplied by both 100% capacity inverters each working at 50% load. The inverters shall receive power from DC source (Charger / Battery), their static switches shall be in the respective "Inverter" position and the manual by-pass switch shall be in "Position-2". In this mode the two inverters shall act as standby for each other.

Necessary paralleling networks shall be included to ensure equal load sharing by both inverters. Load sharing network details shall be detailed to establish all functionalities including fuse clearance. Capabilities of the UPS System as well as each 100% rated inverters are fully satisfied. In addition to UPS output paralleling, Rectifier DC outputs shall also be properly paralleled.

2. One inverter will act as "Master", working on its internal oscillator and the other inverter will follow by using the synchronizing signal from master inverter for automatic control of its output frequency.

1.02.06 EMERGENCY OPERATION

The static transfer switches and the manual by-pass switch shall provide switching means during emergency operation as follows:

1. In case of failure of any inverter the static switch shall automatically transfer the UPS Loads of faulty inverter (say Inverter – "A") to the healthy Inverter-"B" which will start working at 100% capacity. Thus the feeding of UPS power is continued automatically to all load connected to both inverters despite power supply to all UPS loads connected to both inverters shall be maintained without interruption. Isolation of faulty inverter shall be automatic and achieved in less than 4 milli seconds.
2. Based on inverter failure alarm, the operator will transfer manual by-pass switch to "Position-1" bringing in the plant AC source as the standby source to healthy Inverter – "B" now working at 100% capacity. In this mode the healthy Inverter-"B" shall get the synchronizing signal from the stand by-AC source and automatic synchronization, operation on internal oscillator and transfer / retransfer to standby source shall be as follows:
 - i) The output frequency of the concerned inverter shall be automatically synchronized with the plant stand-by source by using synchronizing signal from the standby source. The frequency limits for this synchronism are specified in clause 7.03.05. If the frequency of the standby source is beyond these limits, the Inverter frequency control shall be automatically disconnected from stand-by synchronizing signal and the inverter shall maintain the output frequency at 50 Hz within + 0.1 percent under all conditions of load and input voltage by working on their own internal oscillators.
 - ii) During operation on its own internal oscillator, the inverters shall continuously monitor the frequency of standby source. Upon restoration of proper frequency conditions of stand-by source, the inverter shall automatically start using stand-by source frequency as the synchronizing signal for inverter output frequency control.



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- iii) During the operation of any inverter on its internal oscillator due to synchronising frequency being beyond the specified limits, the transfer of static switch from “Inverter” to “Standby” shall be inhibited.
- 3. During any fault in the branch circuit feeders or inverter output bus, the inverter shall be capable of clearing a fast acting fuse of largest rating in 4 milliseconds and simultaneously provide UPS power to all connected loads (i.e. 50% capacity). In view of the above fault clearing capability of each inverter and due to availability of plant AC source as standby source for inverters the static switches shall not transfer the loads to the other inverter for fault clearing purposes.
- 4. Retransfer of static switch shall be manual in all cases and shall be accomplished only after synchronism of the inverter output with the stand-by source has been automatically accomplished.
- 5. The manual bypass switch shall have the provision (position –4) for fully by-passing the UPS system and connecting all UPS loads to the standby AC source. This provision may be used during start up to limit the inrush current and at other occasions at the option of the operator.
- 6. In case of one of the charger failure, the other healthy charger, shall feed to one of or both the invertors as the case may be and continue to charge

1.03.00 STATIC INVERTERS AND AUXILIARY EQUIPMENT

1.03.01 The static inverters shall be solid state type using proven IGBT based pulse width modulation (PWM) to convert direct current power to essentially sinusoidal alternating current power as per this specification. The inverter equipment shall include all necessary circuitry and devices to conform to requirements like voltage regulation, current limiting, wave shaping, transient recovery, surge suppression network, automatic synchronization etc. as specified herein.

1.03.02 INVERTER CAPACITY

Each static inverter shall have the following minimum capabilities without causing any damage to the components and with current limit not operation :-

- 1) Continuous full load rating
- 2) Over load capacity: 125% of full load rating as above for 10 minutes, 150% for 1 minute, 200% for 10 seconds minimum & 300% for 4 msec for all specified input voltages.
- 3) Fuse clearing capacity : Upon a fault in any branch circuit lateral feeder, the inverter shall have the capacity to carry a load equal to one half of its full load rating plus it shall clear the largest rated fast acting fuse in 4 milliseconds or less. All fuses used in inverter power and control circuit shall be fast acting type operating in less than 5 millisecond and each of these fuses shall be provided with kick fuse and alarm contact. Indication and alarm shall be provided to enable fault location.
- 4) Step load pick up: Upon transfer of full load, the inverter output voltage shall not drop below 85% of nominal voltage during the first half cycle after transfer and 90% of nominal voltage in the next half cycle. The recovery to within + 1% of voltage shall be in less than 50 milliseconds.



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- 5) The inverter shall have sufficient I²t capacity to clear a slow acting HRC fuse having a continuous current rating equal to at least 20% of the continuous full load current rating of the inverter, while feeding 100% rated loads of the inverter.

1.03.03 INPUT VOLTAGE

The inverters shall be fed from a DC Battery and chargers which do not feed any other loads. Input voltage shall be nominal DC output voltage of battery and charger of range from final voltage after discharge of battery to maximum DC bus voltage during equalize charging of battery. The inverter shall also be capable of working satisfactorily meeting the specification requirements with only the chargers connected to its input without battery in circuit. Filtering on the input of the inverters shall be furnished is required to operate within the output ripple of the chargers furnished by the Bidder. Each inverter shall include equipment necessary to protect itself from damage resulting from excursions, loss, or restoration of DC input voltage and synchronizing voltage. The inverter output voltage shall be 230 V AC, 50 Hz, Single phase.

1.03.04 OVER LOADS, SHORT CIRCUITS AND LOAD LOSS PROECTION

1. The inverters shall be provided with suitable fuses at the input and output which will permit proper co-ordination with other protective devices and at the same time protect the inverter against damage due to internal faults. All necessary equipment shall be provided to protect the inverters against over loads, short circuits and 100% loss of load. The inverter shall be self-protecting against damage if energized with full load connected.
2. The inverter shall be provided with current limiting circuitry which will limit the output current to a value which will not damage the inverter or blow its fuses.
3. The inverter shall have sufficient I²t capability to prevent damage to itself until short circuit conditions on the output are cleared.
4. Each inverter shall be capable of operation with non-linear loads. For loads provided by owner, bidder may assure a non-linear wave form with a current crest factor of 3.0 occurring coincident with voltage peak. With non-linearity consisting of third, fifth and seventh order harmonics. Output waveform of the inverter(s) shall remain within specified limits when operating with non-linear loads at 100 percent rated load.
5. The inverters shall be self-protecting against all AC and DC transients, voltage surges and steady state abnormal voltages and current likely to be encountered in utility power station.

1.03.05 Automatic Synchronisation

Inverter equipment shall include stable solid state oscillator devices designed to automatically maintain the inverter output in phase and in synchronization with the standby AC source. The frequency regulation shall be automatic within + 0.1 Hz of all conditions of inputs, loads and temperature occurring simultaneously or in any combination.

Facility shall be provided for automatic transfer to internal oscillator operation when the standby source frequency is not within the synchronization limits.

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Provision shall be made for step less adjustment of synch disconnect frequency range from 50 Hz +/- 0.5 Hz to 50 Hz +/- 2 Hz.

Automatic adjustment of phase relationship between inverter output and standby AC source shall be gradual, at a controlled slew rate, which shall not exceed 0.1 Hz per second.

The inverter shall normally work on the internal oscillator with either of the two inverters as master synchronizer and the other following it. Suitable selector facility shall be provided to select the master. When any one inverter fails the healthy inverter gets the synchronizing signal from the standby AC source.

The DC input current shall never exceed the full load current except for a short circuit within the inverter. The limitation applies to transient as well as steady state currents and includes inrush currents upto initial energisation of the UPS, load energisation, short circuits external to the inverter etc. For any value of the load and load power factor drawn by the equipment served, the inverter shall not impose on DC source any voltage oscillations in excess of 5 volts (RMS total, all frequencies) or any current oscillations in excess of 3% (RMS total, all frequencies) of the DC current at full load.

1.03.06 The inverter shall meet the following specifications in addition to other requirements stated herein :-

1. Voltage input : As per system (Battery output) requirement
2. Nominal voltage output : 240V, 50Hz, single phase
3. Inverter capacity (output KVA) : As per clause 7.03.02
4. Voltage regulation :
 - a) Steady state : + 1 %
(0-100% load at all input voltages & all power factors)
 - b) Transient voltage regulation : + 5%
(on application or removal of 100% load)
 - c) Time to recover : <50 milli second
from transient to normal voltage with +/- 1% of steady state (on application or removal of 100% load)
5. Wave Form
 - a) Nominal Frequency : 50 Hz
 - b) Frequency regulation : +/- 0.1Hz
for all conditions of input supplies, loads and temperature occurring simultaneously or in any combination (automatically controlled)



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- c) Synchronization limits : 48 Hz to 52 Hz (factory test)
(for maintenance & synchronism between the inverter and standby AC source).
- d) Field adjustment range for (c) above : 50 +/- 0.5 Hz to 50 +/- 2 Hz
- e) Total harmonic content : <4% max.
- f) Harmonic content : <2.5%
max.for any single harmonic
- 6. Rated output current at rated output voltage with current limit not operating :
 - a) Current : 200%
 - b) Duration : 10 seconds
- 7. Overload capacity at 100% voltage :
 - a) For 4 ms (fuse clearing) : App. 300%
 - b) For 10 seconds : 200%
 - c) For 10 minutes : 125%
 - d) The proposed inverter has : ---
the capacity to clear largest acting fuse in 5 milli second & without entering into current limiting mode
- 8. Efficiency (watt output/watt input)
 - a) at 100% load 1.0 P.F. / 0.8 P.F : > 91% / 91%
 - b) at 75% load 1.0. P.F. / 0.8 P.F. : > 90% / 90%
 - c) at 50% load 1.0 P.F. / 0.8 P.F. : > 89% / 89 %
- 9. Duty : Continuous
- 10. Cooling : Natural convection or forced cooling using redundant fans.
Equipment to be designed for operation with full load even without cooling availability.
- 11. Ambient temperature : 50 deg C, maximum
- 12. SCR de-rating from peak voltage and peak ratings : 50%



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1.03.07 STATIC INVERTER AUXILIARY EQUIPMENT

In addition to the inverter equipment specified above, auxiliary equipment shall be furnished with each static inverter as follows:

- 1) Equipment and material furnished, mounted and wired on the front panel of the inverter enclosures :

ITEM	QUANTITY
Output ammeter, AC, indicating, Scale-0 to 150 percent of rated continuous full load inverter output current, 1 percent accuracy.	1
Output voltmeter, AC, indicating 0-300 volt scale, 1 percent accuracy.	1
Output KVA, AC indicating scale 0-150 percent of Rated capacity, 1 percent accuracy.	1
Input voltmeter DC, indicating 0-300 volts scale, 1 percent accuracy.	1
Frequency meter, 45-55 hertz, 1 percent accuracy.	1
Power factor meter, (0-1. 0-0), 1 percent accuracy	1
Inverter ON-OFF switch	1
Alarm Reset Push Button	1

- 2) Indicating lights listed below with proper actuating devices, circuitry and legend shall be furnished on front of the Ups panels. For these abnormal conditions which could be of a momentary nature, the indicating lights shall remain energized and the contract remain closed until cleared by a reset push button furnished on the panel. The indicating lights shall be of make subject to Owner's approval.

The following indications shall be provided as a minimum :

- a) DC voltage to the Inverter - Low
- b) DC voltage to the Inverter - High
- c) Loss of DC input to the inverter
- d) Inverter output voltage - High
- e) Inverter output voltage - Low (after a time delay to avoid unnecessary alarm due to low voltage on load in rush etc.)
- f) Inverter A failure / Inverter B failure
- g) Standby AC source failure
- h) Inverter A / Inverter B not synchronized with AC source
- i) Automatic transfer to AC source. Blown Fuse or Tripped Breaker.
- j) Inverter A/ Inverter B feeding 100% UPS Load
- k) Standby source feeding 100% UPS loads
- l) Redundant fan failure and temperature high (if provided)



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1.04.00 STATIC TRANSFER SWITCHES AND AUXILIARY EQUIPMENT

1.04.01 The static transfer switches shall be provided to perform the following functions

1) To transfer the load automatically without any break between the inverter to the standby inverter as required to maintain the continuity of power supply to UPS connection loads. The load shall be automatically transferred from "Inverter" to the inverter source upon any malfunction of one inverter.

2) To transfer UPS load under manual control from standby AC source to inverter when placing the UPS System in service and from inverter to standby AC source when taking the UPS out of service.

1.04.02 The static transfer switches shall have two modes of operation namely automatic and manual.

1.04.03 The static transfer switches shall use silicon controlled rectifiers and other static devices required for automatic transfer of load from "Inverter" to Standby" source and vice versa. The static switches shall conform to the requirements specified herein including the following:

1. Capacity (continuous) : Equal to the continuous full load capacity of the inverter.
2. Capacity (overload) : 200% for 10 seconds, 150% of continuous for 60 seconds and 125% of continuous rating for 10 minutes and 300% of continuous rating for 4 msec.
3. Capacity (Peak) : 1000 % of continuous rating for 5 cycles.
4. Transfer Time : < 4 msec. The transition shall be "make before break", voltage failure shall be sensed at the output of the static switch.
5. Voltage Rating (Nominal) : 240 Volts, 50 Hz. Single phase.
6. Transient Voltage Tolerance : 340 Volts peak above the normal line voltage.
7. Ambient temperature : 50 deg C max.
8. Cooling : Natural or forced circulation, using redundant fans.
9. Duty : Continuous

1.04.05 TRANSFER INITIATION

1) The transfer of static switch from normal "Inverter" position to "Stand-by" position shall be initiated by one of the following causes :

- a) Inverter failure and UPS System trouble
- b) Inverter output voltage failure
- c) Over current
- d) Manual push button operation
- e) Static Output voltage failure.

2) The UPS bus shall be monitored by two voltage detectors. One fast acting circuit shall be used for detecting a complete and instantaneous, voltage loss while the other slower acting averaging circuit with adjustable trip level shall be employed to detect voltage deviation beyond selected limits. Both voltage detector circuits shall automatically initiate operation of static transfer switch.



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3) The static switch shall automatically transfer the load from inverter to stand-by AC source when the maximum I²t capability of the inverter is reached when the inverter output voltage drops below 90%.

4) UPS bus current shall be continuously monitored by a current monitoring detector. This detector shall operate the static transfer switch when the load current exceeds the overload rating of any inverter. The detector shall rest when the load current falls below the rated current of the inverter resulting in retransfer of static switch with inverter position.

5) Over current transfer limit shall be continuously adjustable from inverter continuous rating to inverter current limit rating.

1.04.06 TRANSFER INHIBIT

The transfer of static switch shall be inhibited under the following conditions:

1) Automatic or manual transfer of load from inverter to stand-by AC source or vice versa, shall be inhibited when the inverter frequency is not synchronized to the alternative source.

2) Transfer resulting from overload shall be inhibited when the standby AC source is not available. In this case the load fed by the inverter shall be automatically disconnected

1.04.07 RETRANSFER TO NORMAL

1) The retransfer to normal shall be manual in all cases.

2) Manual transfers shall be initiated by push button actuation.

1.04.08 Static transfer switches shall be provided with necessary protective devices (circuit breakers / current limiting fuses) both in "Normal" as well as "Stand-by" position.

1.04.09 The static transfer switches shall be provided duly mounted and wired in enclosures furnished by the bidder.

1.04.10 The static switches shall be furnished with contacts to alarm failure of the alternate source or opening of any fuse protecting the static switches.

1.05.00 MANUAL BY-PASS SWITCH

1.05.01 The manual by-pass switch will be used to isolate any static switch from its load and stand-by power supply and to take the static switch out of service without power interruption to the load. In doing so the manual by-pass switch shall connect both load buses to a single inverter. The manual by-pass switch shall also provide the facility for by-passing the entire UPS system during start up at the option of the operator.

1.05.02 The manual bypass switch shall have make before break contacts to ensure continuous supply to UPS loads during the operation of this by-pass switch.



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1.05.03 The manual by-pass switch shall be rated for 600 Volts, 50 Hz and single phase operation. It shall have continuous load carrying capacity equal to full load inverter current and necessary short term load carrying and interrupting capacity to meet the requirements of the UPS system.

1.05.04 All other by-pass and disconnect devices shall be provided by the Bidder as required for orderly start up and shut down and maintenance of UPS system and system components.

1.05.05 The Bidder shall provide potential free contacts, one closed in each position, for use in DDCMIS.

1.05.06 The manual by-pass switch and required disconnect devices shall be furnished duly mounted and wired in enclosure, furnished by the Bidder.

1.06.00 FLOAT-CUM-BOOST CHARGERS AND AUXILIARY EQUIPMENT

Two no. 100% capacity SCR based fully controlled 12 pulse float cum boost chargers shall be furnished for main BTG UPS system. Each charger shall conform to the following requirements.

1.06.01 CHARGER CAPACITY

Each charger furnished for UPS system shall be adequately rated to ensure that any one shall meet full DC load of UPS system operating at 100% rating plus recharge the fully discharged UPS battery within 8 hours.

The Bidder shall furnish the charger rating calculations to the Owner to satisfy that this requirement is met. The charger shall be furnished as per rating approved by the Owner during engineering stage.

1.06.02 The chargers shall be supplied from a 415 volt, 50 Hz. 3 phase system. The chargers shall maintain the output voltage within plus and minus 0.5 percent from no load to full load with an input power supply deviation in voltage level of plus or minus 10 percent and input power supply deviation in frequency of plus or minus 5 percent and with both deviations present in any combination.

1.06.03 In addition to supplying DC power for inverters, the chargers shall be designed to charge a fully discharged battery without over loading or causing over voltage or without causing interrupting operation of AC or DC circuit breakers for the entire range of intended operating regimes. Suitable solid state electronic circuits shall be provided to ensure that the charging current is voltage regulated and current limited. After the battery is recharged the charger shall maintain the battery at full charge until the next emergency operation when the UPS battery is again required to provide DC power.

1.06.04 Float and equalizing controls shall have an adjustment range of + 5% continuous (without steps).



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1.06.05 The chargers shall be self-regulating, solid state, silicon controlled, full-wave rectifier type designed for single and parallel operation with the battery specified under clause 1.07.00. The chargers shall be designed for automatic load sharing during parallel operation.

1.06.06 The charger shall be current limited at 125% of full load to reduce output voltage for charger circuit protection and for protection of battery from overcharge. The current limit shall be continuously adjustable from 80% to 125%.

1.06.07 All necessary equipment and devices shall be provided to protect the charger from short circuits, transient voltage surges, load and supply fluctuation including sudden loss of input or load.

1.06.08 The charger shall have a slow walk-in circuit which shall prevent application of full load DC current in less than 10 seconds after AC power is energized.

1.06.09 The minimum full load efficiency at nominal input and float output shall be 96 %.The output regulation, ripple content and power factor shall meet the requirements of UPS system as well as the inverters furnished by the Bidder as per clause 1.03.00.

1.06.10 Chargers and auxiliary equipment shall be mounted in free standing cabinets furnished by the Bidder. Charger cabinets shall be folded steel construction with top, front, back and sides fabricated from not less than 3 mm thick sheet steel. The cabinet front, back, end sides shall extend to the floor to present a finished appearance. Cabinet door shall be provided to permit easy access to all components for maintenance or replacement. Doors shall have concealed hinges and three-point latches. Louvers shall be provided for ventilation as required for operation at the specified ambient but the cabinet top shall be solid. All louver openings shall be covered with corrosion resistant fine screen coverings.

1.06.11 GROUND DETECTOR SYSTEM

Each charger shall be furnished with a ground detector system consisting of a relay and a center tapped resistor. The resistor shall be connected between the positive bus and the negative bus.

The relay coil shall be connected between the centre tap of the resistor and ground. The relay shall be furnished with one normally open and one normally closed contact wired to terminal blocks for connection to external circuits.

1.06.12 UPS Signal interfacing with DDCMIS/DCS & PLC

a) The bidder shall provide alarms and status indications, current, voltage, frequency, PF, etc. through serial link with MODBUS or another compatible protocol.

b) The Bidder shall furnish 4-20 mA signals to DDCMIS/PLC for the following:

- i) Inverter A & B output voltages
- ii) Inverter A & B output currents
- iii) Inverter A & B output frequency
- iv) Static Stabilizer Voltage
- v) Static Stabilizer Current



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c) List of alarms (min.) to DDCMIS through potential free contacts shall be as follows:-

- i. Rectifier – 1 Trip.
- ii. Inverter – 1 Trip.
- iii. UPS battery low.
- iv. Rectifier – 2 Trip.
- v. Inverter – 2 Trip.
- vi. Load on static Bypass.
- vii. Static Bypass failure
- viii. ACDB – 1 Incomer Tripped.
- ix. ACDB – 2 Incomer Tripped.
- x. UPS – 1 Fan Tripped.
- xi. UPS – 2 Fan Tripped.

1.07.00 VOLTAGE STATIC STABILISER

1.07.01 One 415 Volt, 3 phase to 240 Volt, single phase transformer along with associated static voltage stabilizer shall be furnished with each UPS set.

This transformer and stabilizer combination shall convert 415 Volt + 10% plant auxiliary AC supply to 240V + 1% single phase standby AC Power which will serve as UPS system back up supply source.

1.07.02 The transformer and stabilizer shall be sized for 100 percent UPS load and shall coordinate with the largest branch circuit protection device for feeder short circuit current without sacrificing voltage regulation. The voltage stabilizer shall employ silicon solid state circuitry and shall maintain the specified output voltage for 0-100% load with input voltage variations as indicated above. Class of insulation of wound components like transformers, etc. shall be class H with temp rating up to class B.

1.07.03 The stabilizer shall meet the following characteristics as a minimum

- Fast rate of correction - within 5 cycles
- Output distortion - less than 5% under worst conditions
- Efficiency - better than 95%
- Overload Capacity – 300% for 200 msec.

The make and rating shall be subjected to Owners approval.

1.08.00 CONSTRUCTIONAL FEATURES FOR CABINETS/ENCLOSURES

The Construction details for UPS system cabinets/enclosure shall conform to the requirements indicated in Next Page

1.08.01 Grounding

Normal, AC power supply will be grounded at the source. For grounding other than this, I/P and O/P isolation transformers shall be furnished with the UPS.

All the transformers used anywhere in UPS circuitry shall be copper wire winded with class H insulation.



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CONSTRUCTIONAL FEATURES OF PANELS, CUBICLES & ENCLOSURES

All panels, cubicles and enclosures furnished as per this specification shall be of free standing type and shall be constructed of specified gauge of steel plates. The panel sheet thickness shall be not less than 2 mm unless otherwise specified herein.

The panels, shall be reinforced as required to ensure true surfaces and adequate support for instruments mounted thereon. All instrument cutouts, mounting studs, and support brackets shall be accurately located. All welds on the exposed panel surfaces shall be ground smooth. Finished panel surfaces shall be free from waves, bellies, or other imperfections. Unless specified, otherwise, panel doors shall be 4 points hinged and shall have turned back edges and additional bracing where required to ensure rigidity. Door hinges shall be of the concealed type. Door latches shall be of the three-point type to ensure tight closing. Door locks shall be furnished which will allow actuation of all locks by a single master key. All panels shall have removable lifting eyebolts for safe lifting from top during storage and installation handling.

Cabinet doors shall be hinged and shall have turned back edges and additional bracing where required ensuring rigidity. Hinges shall be of concealed type. Door latches shall be of three/four-point type to assure tight closing. Detachable lifting eyes or angles shall be furnished at the top of each separately shipped section and all necessary provisions shall be made to facilitate handling without damage. Front and rear doors shall be provided with locking arrangements with a master key for all cabinets. If width of a cabinet is equal or more than 800 mm, double doors shall be provided.

All panels shall be mounted on vibration dampers, which are secured to channels mounted on the floor. The channels shall be field welded to steel plates set into the concrete flooring. The steel plates shall be located such as to approximate the outline of panel bases. The exact mounting details shall be as approved by the owner during detailed engineering stage. All panels shall be provided with adequate ventilation and packaging density of components shall be restricted so as to limit the temperature rise above ambient to 10°C under the worst conditions. All panels shall have auto on/off switch for internal lighting. All the power supply circuit for control panels shall be provided with auto changeover circuitry.

Exhaust Fans with louvers & filters shall be provided on door's (front & Rear) upper side to remove hot air in all panels.

UPS, Feeder failure/ healthy indication shall be provided in each cabinet & remote indication shall be hooked up to DDCMIS/ annunciation & suitably grouped.

All the panels shall be equipped with Anti vibration pad of min. 15 mm size. Cable gland plate thickness shall be 3 mm

Doors shall be provided with neoprene/polyurethane gasket only.

All the cable entries shall be at the bottom of panels.

Protection class of panels shall be IP42 (min)

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1.09.00 AC DISTRIBUTION BOARDS PANEL

1.09.01 Each panel board shall be constructed for 2 wire, single- phase distribution with a solid neutral bar. Phase and neutral bars shall be of copper. Rating of the main lugs shall be equal to the rated continuous full load current of each inverter.

1.09.02 Each panel board shall have one fused disconnect switch & MCCB of adequate rating for incoming feeder for A C Bus and requisite double pole, suitably rated ampere fused, disconnect switch branch circuit devices (MCB). Fused switches shall be equipped with arc quenchers, visible blades, and quick-make quick-break operating mechanisms. Maximum size fuse which branch circuit fuse holders will accept shall be rated at 60 amperes. As each UPS fed load will be provided with two hot redundant 100% rated feeders. Main feeders to ACDB shall be provided with digital type Ammeter, Voltmeter, Frequency meter, PF meter, Watt meter & VA meter. One from ACDB-A and other from ACDB-B, boards with feeders shall be constructed in line. The number of feeders (WITH 20% spare feeders) and rating of each feeder shall be to suit the individual load keeping in view the fuse clearance capability of UPS system already stipulated and shall be as finalized during engineering. Each feeder shall have fast acting semi-conductor fuse, MCB & LED indication for ON status.

1.10.00 FACTORY TESTS

1.10.01 The UPS system shall be factory tested under various stages of manufacture and upon full completion as per Owner approved quality Assurance plan, the tests shall include, but shall not be limited to the following:

1.10.02 Type and Routine Tests

Type and routine tests for various components and sub-assemblies in accordance with IS and/or NEMA, TEE Test Standards.

1.10.03 Functional Tests

Functional tests to demonstrate compliance with all specified requirements and published specifications, such as frequency regulation, voltage regulation, current limiting, fuse clearing capability of inverters, demonstration of phase and frequency control of inverters for synchronization with range of adjustments; transfer and retransfer of static switches under influence of under voltage and over current, tests on chargers and other system components to confirm compliance with specification.



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1.10.03.1 UPS (Factory Acceptance Test)

- i) Power Efficiency (IEC 146-2, IEC 146) at 100% load, 50% load.
- ii) Load test (Approved Procedure)- load regulation test
- iii) Audible noise test (IEC 146-2)
- iv) Fuse clearing capability (Approved Procedure)
- v) Relative harmonic content (IEC 146-2)
- vi) Synchronous transfer & synchronization test (IEC 146-4)
- vii) Temperature rise test without redundant fans (IEC 146-2)
- viii) Input voltage variation test (Approved Procedure)
- ix) Overload test on inverter & charger (Approved Procedure)
- x) Insulation test (IEC 146)
- xi) Restart test (IEC 146-2)
- xii) Short circuit current capability (IEC 146-2 clause 5.10)
- xiii) Output voltage & frequency tolerance (IEC 146-2)
- xiv) Voltage current division (IEC 146-2)
- xv) Relative harmonic content (IEC 146-2)
- xvi) Parallel redundancy (* Simulation of Parallel redundant fault (IEC 146-4)
- xvii) Overload test (final acceptance test)
- xviii) Any other required as per national international standard or QAP

The above test shall be witness by owner/owner's representative.

1.10.04 Burn-in Tests and Temperature Rise Tests

Each component of UPS system shall undergo burn-in test for 50 hours continuously.

All equipment provided under this specification shall be operated under rated conditions and maximum ambient temperature for not less than 120 hours prior to release for shipment. In addition, static switches shall be subjected to not less than 1000 "Transfer/retransfer" cycles at full load.

During temperature rise test final rise in temperature of semiconductor and devices will be measured at rated conditions and the temperature shall be within stipulated limits for components. After manufacture, the system shall be subjected to routine tests as per standards. The bidder shall indicate all these routine tests in their offer. These shall include insulation resistance test, die-electric with stand test (by applying voltage of 2000 V for one minute) noise test, interference noise test, surge with stand capability.

1.10.05 Type test

Bidder shall submit following type test report along with final acceptance report.

- a) UPS Charger
 - i. IP degree
 - ii. Surge withstand capability (SWC)
 - iii. Dry heat test (IEC-68.2.2)
 - iv. Dump heat test (IEC-68.2.3)
 - v. Vibration test (IEC-68.2.8)
 - vi. EMC test (IEC-61000.4.2)

The above all type test shall be conducted at National / international laboratories only.



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1.10.06 Bidder shall submit following documents along with Factory Acceptance Test (FAT) report:

1. Internal test report along with heat run test report.
2. Calibration certificate of measuring instruments

7.14.07 Testing at site

Full load test shall be demonstrated after commissioning of UPS & 24 V DC charger with batteries at site for 72 Hrs.

7.15.00 AVAILABILITY REQUIREMENTS

A high degree of reliability & availability is required.

Following reliability targets are specified:-

S.No.	Equipment	MTBF in years
1)	Charger	10
2)	Inverter	3
3)	Static Switch	15



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**PROJECT : 1) NORTH CHENNAI TPS (1x800 MW)
2) UPPUR TPS (2x800 MW)**

CUSTOMER : 1) & 2) M/s TANGEDCO

**CONSULTANT : 1) M/s FICHTNER
2) M/s TRACTEBEL**

FEEDER LIST

REVISION:00

APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED

Sathish

SATHISH

ISSUED

416

DATE

06/06/2018

1 x 800 MW NORTH CHENNAI TPS TANGEDCO, 240V AC UPS FEEDER/LOAD LIST
MAIN PLANT UPS SYSTEM

A. SG PACKAGE

Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	FSSS UNIT & SADC-1,2,3 (CJF 06,07,08)	1	1	1.2	1.2	6A	10A
2	FSSS OIL AB, COAL-A-1,2,3,4 (CJF 11,12,13,14)	1	1	1.2	1.2	6A	10A
3	FSSS OIL BC, COAL-B&C-1,2,3,4 (CJF 16,17,18,19)	1	1	1.2	1.2	6A	10A
4	FSSS OIL DE, COAL-D&E-1,2,3,4 (CJF 21,22,23,24)	1	1	1.2	1.2	6A	10A
5	FSSS OIL FG, COAL-F&G-1,2,3,4 (CJF 26,27,28,29)	1	1	1.2	1.2	6A	10A
6	FSSS OIL HJ, COAL-H&J-1,2,3,4 (CJF 31,32,33,34)	1	1	1.2	1.2	6A	10A
7	FLAME SCANNER - 1 (CJF 49) (FLAME SCANNERS)	2	2	0.48	0.96	6A	10A
8	FLAME SCANNER - 2 (CJF 50) (SOLENOIDS & HEA IGNITORS)	2	2	1.44	2.88	10A	16A
9	SBC WB-1,2,3,4 (CJF 61,62,63,64)	1	1	1.44	1.44	6A	10A
10	SBC WB-5 (CJF 65)	1	1	0.48	0.48	6A	10A
11	SBC LR & AH-1,2,3,4,5 (CJF 67,68,69,70)	1	1	1.44	1.44	6A	10A
12	HPBP & APRDS-1,2,3 (CJF 97,98,99)	1	1	1.44	1.44	6A	10A
13	FOPH-1,2 (CJF 81,82)	1	1	0.96	0.96	6A	10A
14	AUX BLR-1,2,3 (CJF 91,92,93)	1	1	1.2	1.2	6A	10A
	SUB TOTAL	16	16		18		

B. TG PACKAGE

Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	ATRS-1 (SGC TURBINE/HPCF) (CCA01,02,03)	1	1	0.72	0.72	10A	16A
2	ATRS-2 (SGC OIL/C&E) (CCA04,05,06)	1	1	0.72	0.72	10A	16A
3	GAMP (CCA10,11)	1	1	0.72	0.72	10A	16A
4	LPBP, GSPC & LOPS (CJJ03,04,05)	1	1	0.72	0.72	10A	16A
5	LMU/AUTO SYN (CJJ08)	1	1	0.48	0.48	10A	16A
6	EHTC, CLCS, ATRS & TP FOR BFPDT-A (CJJ 20,21,22,23)	1	1	1.44	1.44	10A	16A
7	EHTC, CLCS, ATRS & TP FOR BFPDT-B (CJJ 30,31,32,33)	1	1	1.44	1.44	10A	16A
8	TSI FOR BFPDT A&B (CWW01)	1	1	1.44	1.44	10A	16A
9	UNIFIED HMI INTERFACE	1	1	0.72	0.72	10A	16A
10	TSI FOR MAIN TURBINE (CJJ41)	1	1	1.44	1.44	10A	16A
	SUB TOTAL	10	10		9.84		

C. BOP C&I PACKAGE

Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	IDF/FDF/SCPH-A,EP-ABC,MILL-AB,FUR PR (CRE 01,02,03,04)	1	1	1.2	1.2	6A	10A
2	IDF/FDF/SCPH-B,EP-DEF,MILL-CD,AF&FF (CRE 05,06,07,08)	1	1	1.2	1.2	6A	10A
3	PAF/AH-A,MILL-EF,PA HDR PR (CRE 09,10,11,12)	1	1	1.2	1.2	6A	10A
4	PAF/AH-B,MILL-GH (CRE 13,14,15,16)	1	1	1.2	1.2	6A	10A
5	MILL-J,CMC,FTP,RH PROT,BT,MTM(L) (CRE 17,18,19)	1	1	0.72	0.72	6A	10A
6	FW/SEPERATOR CONTROL,FDPT,BCP,MTM(R) (CRE 20,21,22,23)	1	1	1.2	1.2	6A	10A
7	SH/RH (CRE 24,25,26,27)	1	1	1.2	1.2	6A	10A
8	DEA/HOT WELL/GSC/BFP/SW&PW (CRE 28,29,30)	1	1	0.72	0.72	6A	10A
9	COLTCS & SCS (CRE31,32)	1	1	0.72	0.72	6A	10A
10	SWAS/O2 Dos/Chemical Dos (CRE 33,34,35)	1	1	0.72	0.72	6A	10A
11	MDBFP-C & AUX (CRE 36,37)	1	1	0.72	0.72	6A	10A
12	CEP/SG DMCWP/TG DMCWP-A,HP HEATERS (CRE 38,39,40)	1	1	0.72	0.72	6A	10A
13	CEP/SG DMCWP/TG DMCWP-B,LP HEATERS (CRE 41,42,43)	1	1	0.72	0.72	6A	10A
14	CEP/TG DMCWP-C (CRE 44,45)	1	1	0.72	0.72	6A	10A
15	ELECTRICAL (CRE 61,62,63,64)	1	1	1.2	1.2	6A	10A
16	ELECTRICAL (CRE 65,66,67,68)	1	1	1.2	1.2	6A	10A
17	ELECTRICAL (CRE 69,70,71,72)	1	1	1.2	1.2	6A	10A
18	ELECTRICAL (CRE 73,74,75,76)	1	1	1.2	1.2	6A	10A
19	INTERPOSING RELAY PANELS - SOV (CTE01)	1	1	1.2	1.2	6A	10A
20	PDB AT CWPH LOCATION WITH 20% SPARE MCB/FUSE	1	1	2.16	2.16	16A	20A
a	CWP/ACWP-1 (CRE 81,82)	1	1	0.72	0.72	6A	10A
b	CWP/ACWP-2 (CRE 83,84)	1	1	0.72	0.72	6A	10A
c	CWP-3/ELECTRICAL (CRE 85,86)	1	1	0.72	0.72	6A	10A
21	T & AVT PANEL (CFA 01)	1	1	1.2	1.2	10A	16A
	SUB TOTAL	24	24		24.48		

D. HMI PACKAGE							
Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	NETWORK PANEL DCS-1 (CNP 11)	1	0	2.4	2.4	16A	20A
		0	1	2.4	2.4	16A	20A
2	NETWORK PANEL DCS-2 (CNP 12)	1	0	2.4	2.4	16A	20A
		0	1	2.4	2.4	16A	20A
3	NETWORK PANEL CUM POWER DISTRIB (CNP 33)	1	0	14.4	14.4	80A MCCB	
		0	1	14.4	14.4	80A MCCB	
4	NETWORK PANEL STATION LAN-1 (CNP 51)	1	0	2.4	2.4	16A	20A
		0	1	2.4	2.4	16A	20A
SUB TOTAL		4	4		43.2		
E. MISCELLANEOUS							
Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	OXYGEN ANALYSER - LOW TEMPERATURE	0	4	0.3	1.2	4A	6A
		4	0	0.3	1.2	4A	6A
2	OXYGEN ANALYSER - HIGH TEMPERATURE	2	0	0.3	0.6	4A	6A
		0	2	0.3	0.6	4A	6A
3	OXYGEN ANALYSER (AUX BOILER)	0	1	0.3	0.3	4A	6A
4	CO AT APH INLET	1	0	0.5	0.5	4A	6A
		0	1	0.5	0.5	4A	6A
5	SWAS	1	1	3.275	3.275	20A	25A
6	FLUE GAS ANALYSER SO _x /NO _x /CO ₂ at CHIMNEY	1	1	0.5	0.5	4A	6A
7	CO AT CHIMNEY	1	1	0.5	0.5	4A	6A
8	OPACITY MONITOR AT CHIMNEY	1	1	1.3	1.3	10A	16A
9	CONDUCTIVITY TYPE LEVEL SWITCH	2	2	0.015	0.03	4A	6A
10	CAPACITANCE TYPE LEVEL SWITCH	2	0	0.015	0.03	4A	6A
		0	2	0.015	0.03	4A	6A
11	COAL BUNKER LEVEL MONITORING SYSTEM	1	0	0.5	0.5	4A	6A
		0	1	0.5	0.5	4A	6A
12	ELECTRONIC WATER LEVEL INDICATOR	3	3	0.25	0.5	4A	6A
13	VIBRATION MONITORING SYSTEM Panel at Main unit EER	1	1	3.2	3.2	20A	25A
14	VIBRATION MONITORING SYSTEM Panel at Main unit EER (for common loads)	1	1	0.4	0.4	4A	6A
15	C&I LAB	2	2	1	2	6A	10A
16	MERCURY ANALYSER	1	1	2.5	2.5	16A	20A
17	VMS Analysis server at CCR	1	1	0.3	0.3	4A	6A
18	HART MANAGEMENT SYSTEM	1	1	1.2	1.2	10A	16A
19	MASTER SLAVE CLOCK SYSTEM	1	1	0.96	0.96	6A	10A
20	UCP	1	1	1.44	1.44	10A	16A
21	CCTV PANEL	1	1	4.8	4.8	25A	32A
22	SCADA EDMS Panel	1	1	2.88	2.88	16A	20A
23	SCADA IEMS Panel	1	1	2.88	2.88	16A	20A
24	PADO	1	1	3	3	16A	20A
25	OPERATOR TRAINING SIMULATOR SYSTEM	1	1	15.3	15.3	80A MCCB	
26	DAVR	1	1	1	1	6A	10A
SUB TOTAL		34	35		53.925		
F. BHEL HARIDWAR							
Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	GEN END WDG. VIB SYSTEM (CXW01D)	1	1	0.48	0.48	10A	16A
2	GEN. INST. CABINET (CXW01B)	1	1	0.5	0.5	10A	16A
3	H2 GAS ANALYSER-1 (MKG31CQ001)	1	0	0.24	0.24	4A	6A
4	H2 GAS ANALYSER-2 (MKG32CQ001)	0	1	0.24	0.24	4A	6A
5	MOISTURE MEASURING EQUIPMENT (MKG69CM001)	1	1	0.24	0.24	4A	6A
6	OPTR ENG PC-1 (CRU03GJ201)	1	0	0.6	0.6	4A	6A
7	OPTR ENG PC-2 (CRU03GJ202)	0	1	0.6	0.6	4A	6A
8	OPTR ENG MON-1 (CRU03GK401A)	1	0	0.24	0.24	4A	6A
9	OPTR ENG MON-2 (CRU03GK401B)	0	1	0.24	0.24	4A	6A
10	PWR SUP CRY01 (CRY01GW021,22)	1	1	6	6	40A	50A
SUB TOTAL		7	7		9.38		

G. BHEL TRICHY							
Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	GRAVIMETRIC FEEDER REMOTE CONTROL CABINET	5	0	0.5	2.0	4A	6A
		0	4	0.5	1.5	4A	6A
2	BHEL SONIC TUBE LEAK DETECTION SYSTEM PANEL	0	1	0.5	0.5	4A	6A
3	FURNACE FLAME VIEWING SYSTEM- CAMERA LOCAL UNIT	2	0	0.25	0.50	4A	6A
		0	2	0.25	0.50	4A	6A
4	FURNACE & FLAME VIEWING SYSTEM-WALL MOUNTED CABINET IN CONTROL ROOM	1	0	0.5	0.5	4A	6A
5	MASS FLOW METER - LFO	0	1	0.05	0.05	4A	6A
6	MASS FLOW METER - HFO	1	0	0.05	0.05	4A	6A
7	MASS FLOW METER - HFO RETURN LINE	0	1	0.05	0.05	4A	6A
8	AH AIR MOTOR SOLENOID	1	0	0.02	0.02	4A	6A
		0	1	0.02	0.02	4A	6A
9	BOTTOM ASH HOPPER LOAD CELL SYSTEM	4	0	0.1	0.4	6A	10A
		0	4	0.1	0.4	6A	10A
10	HWL 1&2 AND MEF CONTROL VALVE PANEL-CONTROL SUPPLY	1	0	1.6	1.6	16A	20A
11	PDB FOR APH AND ECONOMISER ASH LEVEL SWITCHES (32 NOS FEEDERS FOR SWITCHES+ 4 NOS SPARE FEEDERS WILL BE PROVIDED IN PDB BY UPS MANUFACTURER)	1	1	0.48	0.48	4A	6A
SUB TOTAL		16	15		8.57		
H. BHEL HYDERABAD							
Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	ELECTRONIC POWER POSITIONER OF HYD COUPLING OF MDBFP	1	1	0.5	0.5	4A	6A
2	REVERSE ROTATION MONITOR SYSTEM (SUPPLIED ALONG WITH HYD COUP)	1	0	0.025	0.025	4A	6A
SUB TOTAL		2	1		0.525		
I. BHEL PEM							
Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	PC, PRINTER FOR ELECTRICAL SYSTEM	0	1	1.5	1.5	10A	16A
2	MDBFP WTR LEAKAGE DETECTOR	1	0	0.33	0.33	4A	6A
3	MDBFP WTR FLOW INDICATOR	0	1	0.33	0.33	4A	6A
4	ID FAN-A WTR LEAKAGE DETECTOR	1	0	0.33	0.33	4A	6A
5	ID FAN-B WTR LEAKAGE DETECTOR	0	1	0.33	0.33	4A	6A
6	ID FAN-A WTR FLOW INDICATOR	1	0	0.33	0.33	4A	6A
7	ID FAN-B WTR FLOW INDICATOR	0	1	0.33	0.33	4A	6A
8	LCP FOR COLTCS SYSTEM	1	1	0.5	0.5	4A	6A
9	CPU Service Vessel Area	1	1	2	2	16A	20A
10	PA System	1	1	7.68	7.68	40A	50A
SUB TOTAL		6	7		13.66		
J. BHEL RANIPET							
Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	IOS PC & PRINTER	1	0	1.5	1.5	10A	16A
2	OPACITY MONITOR	2	0	0.25	0.5	4A	6A
		0	2	0.25	0.5	4A	6A
SUB TOTAL		3	2		2.5		

K. BOP UPS LOADS							
Sl. No	Feeder Description	No of Feeders in ACDB-1	No of Feeders in ACDB-2	kVA Rating of each feeder	Total Load in kVA	MCB rating	FUSE rating
1	REDUNDANT HISTORIAN CUM OPC SERVER	2	2	0.5	1	4A	6A
2	AHP WORK STATION	0	1	0.5	0.5	4A	6A
3	OPERATOR WORK STATION FOR MFAP	1	1	0.5	0.5	4A	6A
4	DIAGNOSTIC STATION FOR VMAS	1	0	0.5	0.5	4A	6A
5	WORKSTATION FOR 3D ACOUSTIC WAVE TYPE LEVEL TRANSMITTER FOR COAL BUNKER	0	1	0.5	0.5	4A	6A
6	PLC NETWORK PANEL	1	1	0.5	0.5	4A	6A
7	MAIN FIRE ALARM PANEL (MFAP)	1	1	0.5	0.5	4A	6A
8	DATA ACQUISITION PANEL FOR VMAS & VMS PANEL	2	0	0.25	0.5	4A	6A
		0	2	0.25	0.5	4A	6A
SUB TOTAL		8	9		5		
Total UPS Load (For items A to J)		184.08					
Total UPS Load (For items A to J) + 20% Spare		220.896					
Total UPS Load (For items A to J) + 20% Spare + K. BOP Loads		225.896					
UPS Rating selected		230 kVA at 50 deg C					
ACDB DETAILS: -							
Sl. No	Feeder rating	ACDB-1	ACDB-2	With 20% Spare			
	MCB/ Fuse			ACDB-1	ACDB-2		
1	4A/6A	50	51	62	62		
2	6A/10A	41	41	50	50		
3	10A/16A	19	19	23	23		
4	16A/20A	10	9	12	12		
5	20A/25A	2	2	3	3		
6	25A/32A	1	1	2	2		
7	40A/50A	2	2	3	3		
Sl. No	Feeder rating	ACDB-1	ACDB-2	With 20% Spare			
	MCCB			ACDB-1	ACDB-2		
8	80A	2	2	3	3		
Total		127	127	158	158		

Note:

- 20% spare feeders of each rating are been provided in each ACDB further rounded off to 158 feeders cummulativey in ACDB-1 and ACDB-2 taking care of any exigency/contingency which may creep in later.
- UPS rating is 230 kVA at 50 deg C and each UPS System is being provided with 2 sets of Lead Acid Plante Type Battery considering 230 kVA load.
- UPS catalogs, Charger sizing calculation, Battery catalogs,graphs etc. will form part of Battery vendor specific datasheets/documentation and will be sent for approval separately after placement of order.



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CE/416/ APPENDIX-V /UPS/BSC

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**PROJECT : 1) NORTH CHENNAI TPS (1x800 MW)
2) UPPUR TPS (2x800 MW)**

CUSTOMER : 1) & 2) M/s TANGEDCO

**CONSULTANT : 1) M/s FICHTNER
2) M/s TRACTEBEL**

TYPICAL BATTERY SIZING CALCULATION FOR UPS

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CE/416/ APPENDIX-V /UPS/BSC

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Typical Battery sizing calcn. for NORTH CHENNAI (1x800 MW) project:

UPS full load considered = 230 kVA

Max. Output load on UPS in watts = 230 x 1000 x 0.8 (P.F)
= 184000 Watts

Inverter efficiency = **A** as per UPS Manufacturer

Type of Battery and Back up Time required = Lead Acid Plante, 100% load for 120 min

End cell voltage (ECV) = 1.8 Volts/cell.

Number of cells = **B** as per UPS Manufacturer

Ageing factor = 1.25

Design Margin = 1.20

Temperature correction factor (at 4 deg. C. based on IEEE 485: latest standard) = '**C**' say

Capacity Factor at ECV of 1.8V for above Back-up, K = '**D**' say

Then Battery Discharge Current required = $\frac{184000}{1.8 \times \mathbf{A} \times \mathbf{B}}$ = '**E**' say

AH required = '**E**' x '**D**' = '**F**' say

Total Discharge Current considering the factors such as temperature correction factor, design margin & ageing factor is

= '**F**' x '**C**' 1.25 x 1.2 = '**Z**' say

Battery AH to an End Cell Voltage of 1.8V/cell and suiting the above discharge current = '**Y**' say

Hence, Battery selected = '**B**' cells of '**Y**' "**H type Battery**" which can deliver '**Z**' for 100% load for 120 min back-up at ECV=1.8V/cell.

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CE/416/ APPENDIX-V /UPS/BSC

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Typical Battery sizing calcn. for UPPUR (2x800 MW) project:

UPS full load considered = 230 kVA

Max. Output load on UPS in watts = 230 x 1000 x 0.8 (P.F)

= 184000 Watts

Inverter efficiency = **A** as per UPS Manufacturer

Type of Battery and Back up Time required = Fibre Plate Ni-Cd, 100% load for 120 min

End cell voltage (ECV) = 1.14 Volts/cell.

Number of cells = **B** as per UPS Manufacturer

Ageing factor = 1.25

Design Margin = 1.20

Temperature correction factor (at 4 deg. C.) = '**C**' say

Capacity Factor at ECV of 1.14V for above Back-up, K = '**D**' say

Then Battery Discharge Current required = $\frac{184000}{1.14 \times A \times B}$ = '**E**' say

AH required = '**E**' x '**D**' = '**F**' say

Total Discharge Current considering the factors such as temperature correction factor, design margin & ageing factor is

= '**F**' x '**C**' 1.25 x 1.2 = '**Z**' say

Battery AH to an End Cell Voltage of 1.8V/cell and suiting the above discharge current = '**Y**' say

Hence, Battery selected = '**B**' cells of '**Y**' "**H type Battery**" which can deliver '**Z**' for 100% load for 120 min back-up at ECV=1.14V/cell.

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CE/416/ APPENDIX-V /UPS/SLD

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**PROJECT : 1) NORTH CHENNAI TPS (1x800 MW)
2) UPPUR TPS (2x800 MW)**

CUSTOMER : 1) & 2) M/s TANGEDCO

**CONSULTANT : 1) M/s FICHTNER
2) M/s TRACTEBEL**

SINGLE LINE DIAGRAM

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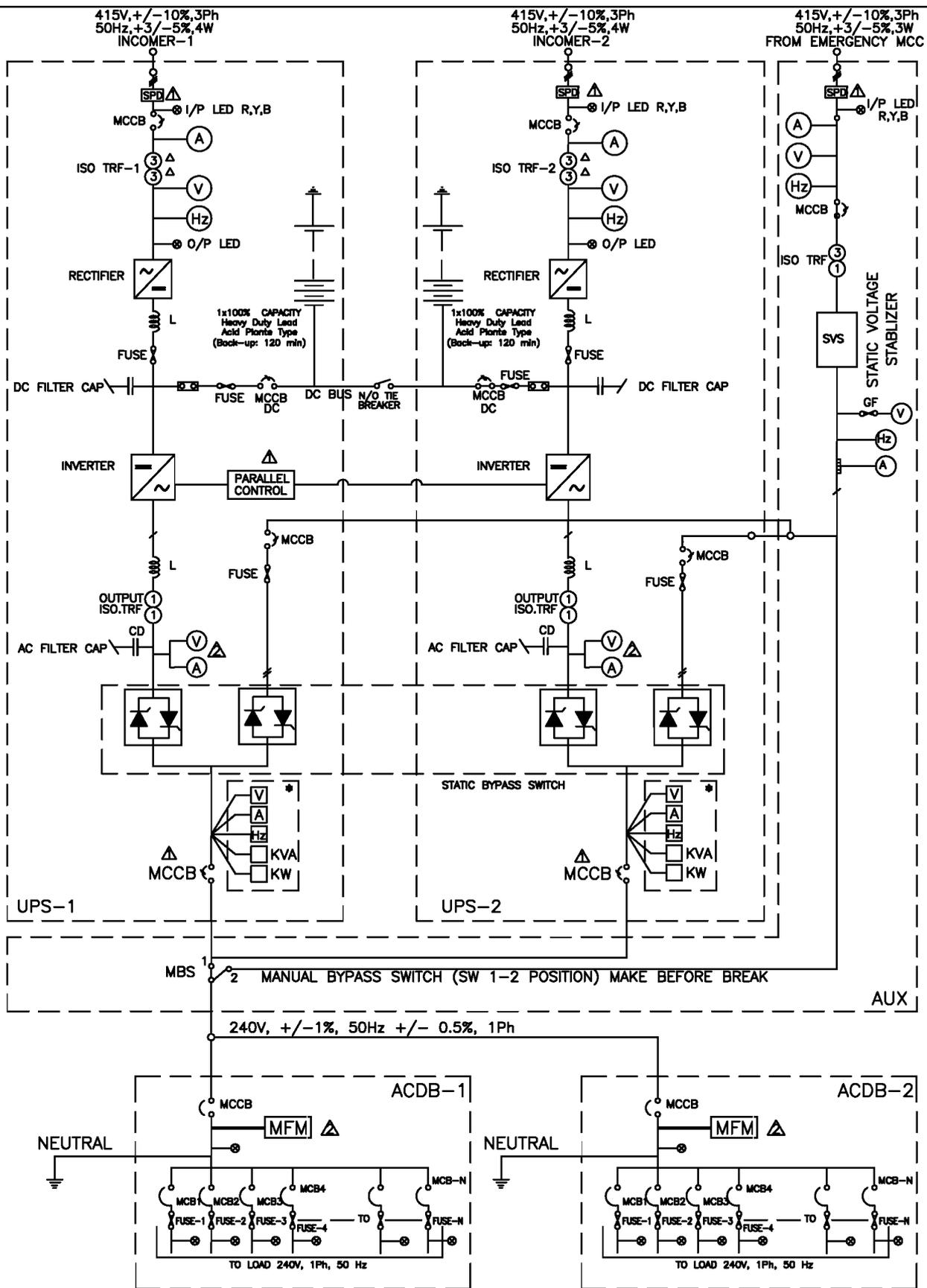
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△ MFM: MULTI FUNCTION METER
 SPD: SURGE PROTECTION DEVICE

* V, A, Hz, KVA, KW READINGS/VALUES SHALL BE READY ON THE MIMIC DISPLAY PROVIDED ON THE UPS PANEL FRONT DOOR.



PROJECT:- 1X800 MW TANGEDCO NORTH CHENNAI TPP
 STAGE III-BTG

TITLE:- UPS SCHEME
 FOR MAIN PLANT

DRG. No.	PE-DG-423-145-1004		
REV. No.	02	DATE	17.10.2016
SHEET	2	OF	3

GENERAL NOTES:

1. ACDB-1&2 NEUTRAL TO BE GROUNDED TO A DEDICATED GROUND.
2. ALL OUTPUT FEEDERS OF ACDB SHALL BE PROVIDED WITH AN LED AFTER THE FUSE FOR 'FEEDER ON' INDICATION WITH FEEDER DESCRIPTION.
3. REDUNDANT FEEDERS, WHEREVER APPLICABLE, SHALL BE LOCATED IN DIFFERENT ACDBs.
4. ONLINE BATTERY HEALTH MONITORING SYSTEM SHALL BE PROVIDED FOR MAIN PLANT.
5. SURGE PROTECTION DEVICE (SPD) SHALL BE PROVIDED AT INPUT SIDE OF EACH UPS & STATIC VOLTAGE STABILIZER.
6. BATTERY BANK STATUS SIGNAL BE AVAILABLE IN DCS.
7. MCCB ON, OFF & TRIP INDICATION SHALL BE PROVIDED.
8. LIST OF SIGNAL EXCHANGE:-
 - A. FOLLOWING P.F. CONTACTS TO BE PROVIDED FOR DCS
 1. Rectifier-1 Trip
 2. Inverter-1 Trip
 3. UPS Battery Low
 4. Rectifier-2 Trip
 5. Inverter-2 Trip
 6. Load on Static Bypass
 7. Static Bypass failure
 8. ACDB-1 Incomer tripped
 9. ACDB-2 Incomer tripped
 10. UPS-1 Fan tripped
 11. UPS-2 Fan tripped
 - B. 4-20mA ANALOG OUTPUT SHALL BE PROVIDED TO DCS FOR THE FOLLOWING SIGNALS
 This set of termination is for one set of UPS i.e. UPS-1.
 Similar termination is applicable for the other set of UPS i.e. UPS-2.
 1. UPS-1 OUTPUT VOLTAGE
 2. UPS-1 OUTPUT CURRENT
 3. UPS-1 OUTPUT FREQUENCY
 4. SVS OUTPUT VOLTAGE
 5. SVS OUTPUT CURRENT

LEGEND :

- | | | |
|---|-------------------------------------|---------------------------------|
|  | INDUCTOR | MCB - MINIATURE CIRCUIT BREAKER |
|  | FUSE | SVS- STATIC VOLTAGE STABILIZER |
|  | MCCB (MOULDED CASE CIRCUIT BREAKER) | ACDB- AC DISTRIBUTION BOARD |
|  | SELECTOR SWITCH | (V) - VOLTMETER |
|  | ISO.TRF | (A) - AMMETER |
|  | CAPACITOR | (Hz) - FREQUENCY METER |
|  | INVERTER | (LED) - LED |
|  | STATIC BYPASS SWITCH | (KVA) - KILOVOLT AMPERE METER |
| | | (KW) - KILOWATT METER |



PROJECT:- 1X800 MW TANGEDCO NORTH CHENNAI TPP
STAGE III-BTG

DRG.
No.

PE-DG-423-145-I004

TITLE:-

UPS SCHEME
NOTES & LEGEND

REV.
No.

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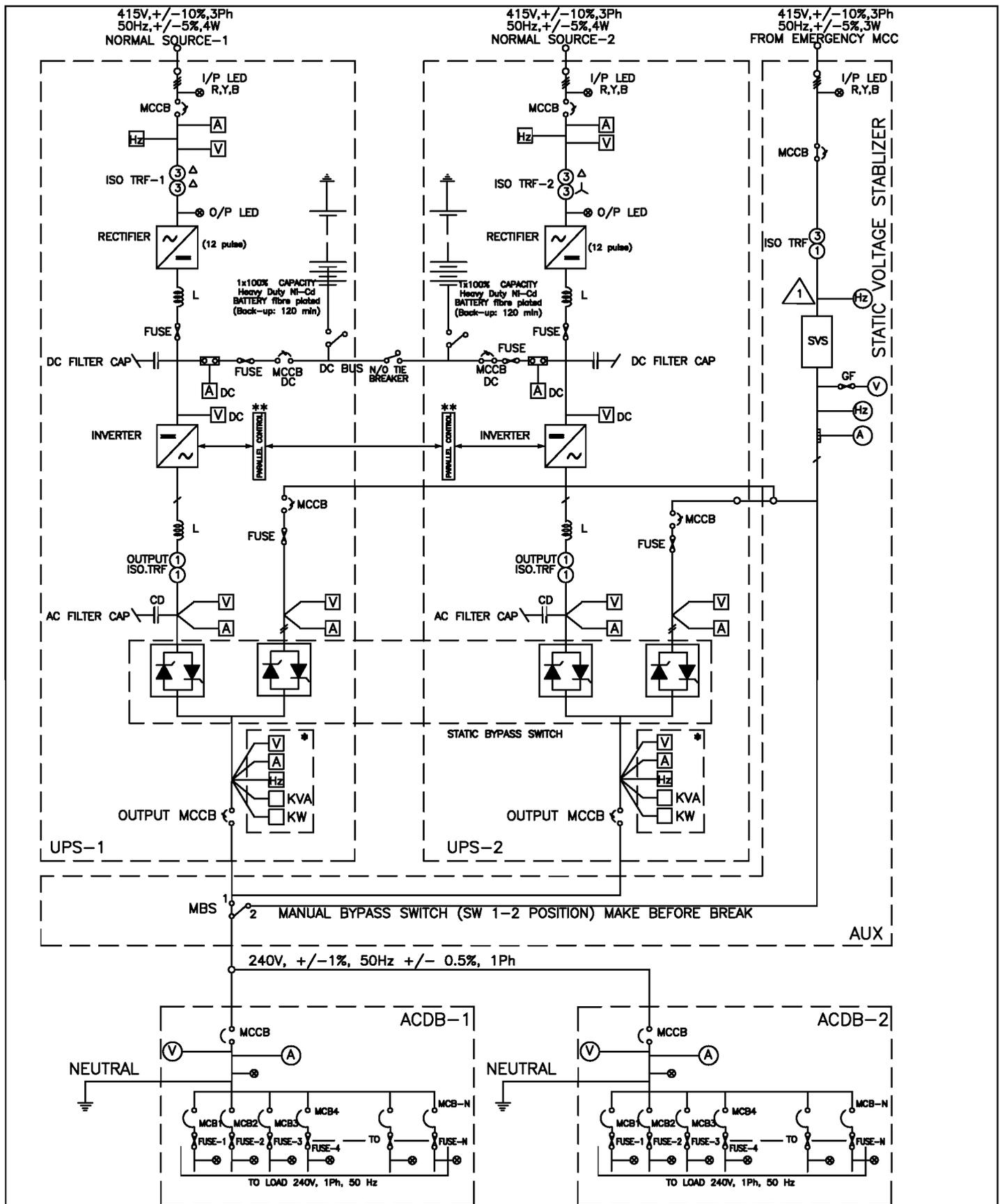
17.10.2016

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MFM SHALL BE PROVIDED FOR EACH ACDB.

- * V, A, Hz, KVA, KW READINGS/VALUES SHALL BE READY ON THE MIMIC DISPLAY PROVIDED ON THE UPS PANEL FRONT DOOR.
- ** DETAILED PARALLELING CIRCUIT FOR UPS WILL BE PROVIDED AS PART OF UPS DATA SHEET.



PROJECT:- 2X800MW UPPUR STPP (STAGE-I, UNIT#1&2)
IN RAMANATHAPURAM DISTRICT, TAMILNADU

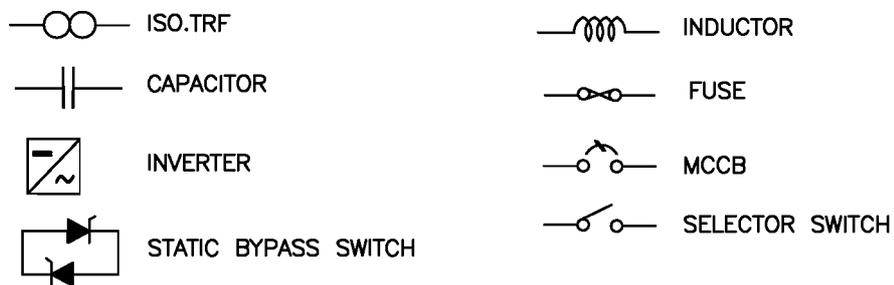
TITLE:-
**UPS SCHEME
FOR MAIN PLANT**

DRG. No.	PE-DG-425-145-1004		
REV. No.	01	DATE	07.12.2016
SHEET	2	OF	5

GENERAL NOTES:

1. ACDB-1&2 NEUTRAL TO BE GROUNDED TO A DEDICATED GROUND.
2. ALL OUTPUT FEEDERS OF ACDB SHALL BE PROVIDED WITH AN LED AFTER THE FUSE FOR 'FEEDER ON' INDICATION WITH FEEDER DESCRIPTION.
3. REDUNDANT FEEDERS SHALL BE PROVIDED FOR LOAD WHICH REQUIRES REDUNDANT POWER SUPPLY.
4. ONLINE BATTERY HEALTH MONITORING SYSTEM SHALL BE PROVIDED FOR MAIN PLANT & OFFSITE UPS.
5. FILTER CIRCUITS SHALL BE PROVIDED ON AC & DC SIDE AS REQUIRED.
6. UPS DB SHALL HAVE 1Ø 230V MCB OUTGOING FEEDER.
7. RECTIFIER SHALL HAVE FACILITY FOR BOOST CHARGING THE BATTERY.
8. TRANSDUCERS SHALL BE PROVIDED FOR GIVING 4-20mA ISOLATED SIGNALS FOR DDCMIS & PLC.
9. POTENTIAL FREE CONTACTS FOR ALARMS/FAULTS SHALL BE PROVIDED FOR USE IN DDCMIS & PLC.
10. BOTH STATIC TRANSFER SWITCHES SHALL BE SELECTED ON AUTO MODE FOR AUTOMATIC TRANSFER TO BACKUP SUPPLY.
11. UPS SYSTEM SHALL WORK IN "CRISS -CROSS REDUNDANCY" CONFIGURATION. HENCE THE UPS SYSTEM DESIGN SHALL ENSURE THAT IN CASE OF ONE OF THE CHARGER FAILURE, THE OTHER HEALTHY CHARGER, SHALL FEED TO ONE OF OR BOTH THE INVERTORS AS THE CASE MAY BE AND CONTINUE TO CHARGE THE COMMON/INDIVIDUAL DC BATTERY BANKS AT ALL LOAD CONDITIONS.
12. SURGE PROTECTION DEVICE (SPD) SHALL BE PROVIDED AT INPUT SIDE OF EACH UPS & STATIC VOLTAGE STABILIZER.
13. BATTERY JUNCTION BOXES SHALL BE AS PER CUSTOMER SPECIFICATION REQUIREMENT.
14. THE REQUIREMENT OF INDICATION OF ON, OFF & TRIP SHALL BE AS PER CUSTOMER SPECIFICATION.
15. FOR A.C. POWER DISTRIBUTION PANELS(INCLUDING 20% SPARE FEEDERS ON EACH PANEL WITH 2 Nos. MINIMUM SPARE FEEDER OF EACH RATING) AND DIGITAL TYPE AMMETER, VOLTMETER, FREQUENCY METER, PF METER, WATT METER & VA METER QTY OF UPS FOR BTG & FOR EACH INDIVIDUAL BOP PKG IS 2 SETS QTY OF FEEDERS SHALL BE AS ON REQUIRED BASIS.
16. ACDB IS OF COMPARTMENTALIZED TYPE 

LEGEND:



	PROJECT:- 2X800MW UPPUR STPP (STAGE-I, UNIT#1&2) IN RAMANATHAPURAM DISTRICT, TAMILNADU	DRG. No.	PE-DG-425-145-I004		
	TITLE:- UPS SCHEME	REV. No.	01	DATE	07.12.2016
	NOTES & LEGEND	SHEET	4	OF	5

UPS SIGNAL INTERFACING WITH DDCMIS/DCS & PLC

1. ALARMS AND STATUS INDICATIONS, CURRENT, VOLTAGE ,FREQUENCY, PF ETC SHALL BE PROVIDED THROUGH SERIAL LINK WITH MODBUS OR ANOTHER COMPATIBLE PROTOCOL .
2. LIST OF 4–20 mA SIGNALS TO DDCMIS/PLC :
 - I) INVERTER A & B OUTPUT VOLTAGES
 - II) INVERTER A & B OUTPUT CURRENTS
 - III) INVERTER A&B OUTPUT FREQUENCY
 - IV) STATIC STABILIZER VOLTAGE
 - V) STATIC STABILIZER CURRENT
3. LIST OF ALARMS (MIN.) TO DDCMIS THROUGH POTENTIAL FREE CONTACTS :-
 - I) RECTIFIER – 1 TRIP.
 - II) INVERTER – 1 TRIP.
 - III) a) UPS BATTERY–1 LOW. b) UPS BATTERY–2 LOW.
 - IV) RECTIFIER – 2 TRIP.
 - V) INVERTER – 2 TRIP.
 - VI) LOAD ON STATIC BYPASS.
 - VII) STATIC BYPASS FAILURE
 - VIII) ACDB – 1 INCOMER TRIPPED.
 - IX) ACDB – 2 INCOMER TRIPPED.
 - X) UPS – 1 FAN TRIPPED.
 - XI) UPS – 2 FAN TRIPPED.

	PROJECT:– 2X800MW UPPUR STPP (STAGE-I, UNIT#1&2) IN RAMANATHAPURAM DISTRICT, TAMILNADU	DRG. No.	PE-DG-425-145-I004		
	TITLE:– UPS SCHEME	REV. No.	01	DATE	07.12.2016
		SHEET	5	OF	5



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CE/416/APPENDIX-VI/UPS

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APPENDIX – VI TO ANNEXURE-A

**PROJECTS: 1) NSPCL ROURKELA (1x250 MW) OFFSITE PACKAGES
2) NTPC DADRI FGD PACKAGE (2x490 MW)**

CONSULTANT: M/s MECON for ROURKELA PROJECT

SPECIFICATION

FOR

UNINTERRUPTIBLE POWER SUPPLY SYSTEM(UPS)

PQR:

The equipment offered must have proven performance of working for minimum capacity of 30 kVA rating and have been running successfully for at least one year prior to the date of this RFQ's technical bid opening. Satisfactory Performance Certificate from End-user along with approved datasheet shall be submitted for review. Technical offers of vendor not complying with this PQR requirement will be rejected.

On meeting PQR requirement, the PQR documents submitted by bidder will be sent to end-user for review and approval. On receipt of end-user approval for supply of UPS System, bidder's offer will be considered for further evaluation

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CE/416/APPENDIX-VI/UPS

REV 00

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Sl. No.	Description	Reference.
1.	Scope of Supply	CE/416/APPENDIX-VI/UPS/SOS, Rev.00 Sheets 04
2.	Technical Requirements	CE/416/APPENDIX-VI/UPS/TR, Rev.00 Sheets 09
3.	Feeder List for Rourkela project	CE/416/ROUR/UPS/FL, Rev.00 Sheets 7
4.	Feeder List for North Karanpura project	CE/416/DADRI FGD/UPS/FL, Rev 00 Sheets 03
5.	Typical Battery Sizing Calculation	CE/416/APPENDIX-VI/UPS/BSC, Rev.00 Sheets 03
6.	Type & Routine Acceptance Test	CE/416/APPENDIX-VI/UPS/TRT, Rev 00 Sheets 05
7.	Single Line Diagram	CE/416/APPENDIX-VI/UPS/SLD, Rev 00 Sheets 02

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**PROJECTS: 1) NSPCL ROURKELA (1x250 MW) OFFSITE PACKAGES
2) NTPC DADRI FGD PACKAGE (2x490 MW)**

SCOPE OF SUPPLY

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APPROVED

K. Rajasekar.

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DATE

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SCOPE OF SUPPLY

Following UPS systems shall be as per Technical Requirement Ref: CE/416/APPENDIX-VI/UPS/TR and detailed Scope of Supply.

a) NTPC DADRI (2x490 MW) FGD PACKAGE:

UPS Configuration B: UPS System shall consist of 1x100% charger and inverter, 1x100% Ni Cd battery bank for one (1) hour *, Bypass line transformers & voltage stabilizer, static switch, manual bypass switch, 2x100% ACDB, 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS), Wall Mounted Static Switch Panel with 1 No 32 Amps Static Switch and other necessary protective devices and accessories.

S.NO	LOCATION	UPS RATING	ACDB-1 FEEDERS	ACDB-2 FEEDERS	QTY	E&C QTY
1	FGD UPS U-1	30 kVA	18 Nos	18 Nos	1 Set	1 Set
2	FGD UPS U-2	30 kVA	18 Nos	18 Nos	1 Set	1 Set

b) INTERCONNECTION CABLES BILL OF MATERIAL **

S · N O	LOCATION	UNINYVIN CABLE TYPE		NO OF RUNS/ POLE		METERS PER RUN		TOTAL QTY (mtrs)	TOTAL MODBUS CABLE QTY (mtrs)
		UPS to BATTERY	UPS to ACDB	UPS to BATTERY	UPS to ACDB	UPS to BATTERY	UPS to ACDB		
1	FGD UPS U-1	Size 00	Size 00	1	1	50	10	140	100
2	FGD UPS U-2	Size 00	Size 00	1	1	50	10	140	100

c) O&M COMMISSIONING SPARES for FGD Dadri (2x490 MW) project:

- | | | |
|----|--|--------------------|
| a) | Silicon Controlled thyristors, IGBT | 100% |
| b) | Capacitors | 1 Set |
| c) | Fuses of each type and rating | 200% |
| d) | MCB of each type and rating | 5% |
| e) | Electronic modules of each type | 10% |
| f) | Cooling Fans | 2 Nos of each type |
| g) | Digital/Analog panel meters/indicators | 1 No. of each type |

Mandatory AMC Visits by Bidder to confirm the healthiness of UPS System in both units for 10 years from year Jan 2020 to year Dec 2030 – **One Visit per year.**

In case of any issue arising in UPS System during this site visit, Bidder should rectify the same with spares / components available at site. If required spares are not available at Site, then separate PO will be issued by BHEL for required spares / components and bidder shall rectify the UPS System immediately.

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b) NSPCL ROURKELA (1x250 MW) OFFSITE PACKAGES:

UPS Configuration B: UPS System shall consist of 1x100% charger and inverter, 1x100% Ni Cd battery bank for one (1) hour *, Bypass line transformers & voltage stabilizer, static switch, manual bypass switch, 2x100% ACDB, 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS) and other necessary protective devices and accessories.

S.NO	LOCATION	UPS RATING	ACDB-1 FEEDERS	ACDB-2 FEEDERS	QTY	E&C QTY
1	RAW WATER INTAKE SYS	5 kVA	7 Nos	7 Nos	1 Set	1 Set
2	CWPH	5 kVA	6 Nos	6 Nos	1 Set	1 Set
3	CHP	7.5 kVA	7 Nos	7 Nos	1 Set	1 Set
4	PDB for CWT #	-	3 Nos		1 Set	-
5	PDB FOR ETP #	-	7 Nos		1 Set	-
5	PDB FOR DM PLANT #	-	21 Nos		1 Set	-

PDB shall be provided with contactor for auto changeover and this setup will be in Bidder scope.

INTERCONNECTION CABLES BILL OF MATERIAL **

S · N O	LOCATION	UNINYVIN CABLE TYPE		NO OF RUNS/ POLE		METERS PER RUN		TOTAL QTY (mtrs)	TOTAL MODBUS CABLE QTY (mtrs)
		UPS to BATTERY	UPS to ACDB	UPS to BATTERY	UPS to ACDB	UPS to BATTERY	UPS to ACDB		
1	RAW WATER INTAKE SYS	Size 8	Size 8	1	1	25	10	90	25
2	CWPH	Size 8	Size 8	1	1	25	10	90	25
3	CHP	Size 8	Size 8	1	1	25	10	90	25

Common TERMS for both projects:

* Battery being procured by BHEL separately. *(Battery AH rating for sizing Charger & Transformer shall be calculated as per Battery sizing methodology attached).*

** Please note that above mentioned BOQ of FRLS ST2 PVC Type C cable and MODBUS cable shall be supplied in a roll/drum (without cutting) as per maximum length required above & available with Cable Manufacturer

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1.0 GENERAL TECHNICAL REQUIREMENTS

- 1.1** Only the site-proven & type tested (in the last 4 years), electronic modules (in case of UPS System) & cell plates (in case of UPS Battery) will be acceptable unless otherwise decided by the purchaser in special circumstances.
- 1.2** For UPS, the type test shall be as per IEC-146, Degree of Protection test as per IS-2147 and the same are not to be specifically conducted for the projects if conducted on similar type/rating or similar type/ higher rating UPS. If type tests are not available with supplier, then type tests has to be conducted and reports has to be submitted without any price implication to BHEL.
- 1.3** Routine & Acceptance tests shall be done as per relevant standards. Temperature rise test is also to be done 100% for 6-8 hours duration each time (till temperature stabilizes).
- 1.4** Erection supervision & commissioning of Battery with overall integration of complete system is responsibility of UPS vendor.

2.0 DOCUMENTS TO BE FURNISHED

- 2.1. After Placement of order:** Vendor must submit soft copy of following documents for submission to Customer / Consultant.

A. Datasheet/Drawings:

- a) Covering Sheet
- b) Index Sheet
- c) Scope of Supply
- d) Charger & Transformer Sizing Calculation
- e) Technical datasheets of UPS, Stabilizer, ACDB, BHMS, PDB, etc.
- f) Heat Loss Calculation
- g) Bill of Material of UPS, Stabilizer, ACBD, BHMS, Cable Glands & Lugs, PDB, etc.
- h) Panel GA drawings including Internal View of UPS, Stabilizer, ACDB, BHMS, PDB, etc.
- i) Single Line Diagram
- j) Interconnection Drawing
- k) Earthing Drawing
- l) Power Circuit Drawing
- m) Analog & Binary Signal List (pdf & excel format)
- n) ACDB Termination drawing along with feeder termination details in Excel Sheet.
- o) UPS System Functional Description
- p) Catalog

B. Quality Assurance Plan

C. Type Test Reports

Note: If all above documents are not submitted within two weeks' time from receipt of Purchase Order vide e-mail, then the documents will be considered as incomplete and penalty (as mentioned in commercial terms and conditions) will be considered for delayed document submissions.



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- 2.2 **After placement of Purchase Order within 1 week:** For BHEL/CUSTOMER approval, vendor must send the datasheet/drawings & quality plan vide e-mail.
- 2.3 **Along with the materials being dispatched:** Vendor must send the following “As Built & Approved” status documents one (1) in soft copy & one (1) in hard copy.
- (a) Instruction/O&M Manual
 - (b) Bill of Material
 - (c) Data Sheets
 - (d) Technical literatures/Catalogs
 - (e) Drawings GA/layout/wiring/interconnection/schematic, etc.
- 2.4 **After dispatch of material within 1 week :** Vendor must send the following “As Built & Approved” status documents one (1) in soft copy to BHEL-EDN.
- (a) Instruction/O&M Manual
 - (b) Bill of Material
 - (c) Data Sheets
 - (d) Technical literatures/Catalogs
 - (e) Drawings GA/layout/wiring/interconnection/schematic, etc.

NOTE: One (01) set soft copy of Final document shall also be provided to BHEL. The soft copy shall be in CD-ROM media and shall in Acrobat (pdf) formats.



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**PROJECTS: 1) NSPCL ROURKELA (1x250 MW) OFFSITE PACKAGES
2) NTPC DADRI FGD PACKAGE (2x490 MW)**

TECHNICAL REQUIREMENTS

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Uninterruptible Power Supply (UPS) system including UPS Battery

GENERAL

The requirements of Electrical Power Supply system are specified herein on system basis. The bidder shall be responsible for engineering and furnishing a complete and operational system fully meeting the intent and requirements of this specification including tender drawings and owner approved drawings during detailed engineering. All equipment and accessories required for completeness of this system shall be furnished by the Bidder whether these are specifically mentioned herein or not. All the equipment's and sub systems offered shall be from reputed experienced manufacturers. All system cabinets, enclosures & distribution boards shall be manufactured, assembled, wired and fully tested as a complete assembly as per the requirements of this specification at the manufacturer's works.

The Bidder shall furnish all required equipment cubicles and wiring required for conversion and/or stabilization of the power sources provided by the owner to all other levels which may be necessary for meeting the individual requirement of equipment/system furnished by him including the panel/desk mounted equipment.

Bidder shall also provide local power supply distribution boxes on as required basis for sub-distribution of all 230V AC for various field mounted instruments/devices (e.g., Analyzers etc.). The power supply distribution box shall include necessary change over circuitry (as applicable), switch fuse units, MCB, terminal blocks, etc. suitable for the application. The sub distribution of feeders in a local power D.B shall be finalized during detailed engineering.

The UPS Power supply for various sub-systems shall consist of the following configuration.

Bidder shall clearly bring out in the proposal the redundancy feature along with configuration diagram, single line diagram and data sheets etc. & this shall be finalized subject to Owner's approval during detailed engineering.

The PDBs provided for distribution of UPS loads shall be as per following guidelines.

Each PDB shall be provided with input feeder monitoring through potential free contact wired to DCS.

The output feeders from the PDB shall be provided with separate fuse & MCB's. 10% spare feeders (min 1 No) with MCB & fuses for each rating shall be provided in Bidder's each PDB.

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Following general requirements shall be met for ensuring proper branch and circuit protection.

I. The feeder fuse ampere rating and feeder conductor capacity must be at least 100% of the non continuous load plus 125% of the continuous load as calculated per Article 220 (220-10G) of NEC code - 1984. The feeder conductor must be protected by a fuse not greater than the conductor capacity.

II. For circuit with transformers requirements for conductor protection articles 240 and 310 of NEC must be observed. If secondary fuse protection is not provided then the primary fuses must not be sized larger than 125% of the transformer primary full-load amperes.

If secondary fuses are sized not greater than 125% of transformer secondary current, individual transformer fuses are not required in the primary provided the primary feeder fuses are not larger than 250% of the transformer rated primary current.

The minimum capacity of the UPS at load factor of 0.8 lagging at 50 deg C.

The UPS System shall meet the following requirements as a minimum.

1.0 If UPS KVA rating is applicable at a lower ambient temperature than specified 50°C the bidder shall consider a derating factor of at least 1.5%/°C for arriving at the specified UPS capacity at 50 deg C ambient. The UPS shall have an over load capacity of 125% rated capacity for 10 minutes and 150% rated capacity for 10 seconds. The inverter shall have sufficient I²t capability to clear fault in the maximum rated branch circuit limited to 8 percent of finally selected UPS capacity.

2.0 Chargers

2.0.1 The chargers shall be self-regulating, solid state silicon controlled, full - wave rectifier type designed for single and parallel operation with battery and shall have automatic voltage regulators for a close voltage stability even when AC supply voltage fluctuates, effective current limiting features and filters to minimize harmonics. The charger should be capable to fully charge the required batteries as well as supply the full rated load through inverter. Furthermore the charger should be able to re-charge the fully discharged battery within 8 hours. The charger output regulation shall be ±1% from no load to full load with an input power supply variation of ±10% in voltage and ±5% in frequency. In addition to indications/display on charger panel, alarms along with relevant analog measurements shall also be provided by employing RS 485 Port Modbus Protocol / Ethernet TCP/IP Protocol for use in DDCMIS. The list of alarm output & 4-20 mA signals shall be as approved by owner during detailed engineering.

2.0.2 The charger shall be current limited for charger circuit protection of battery from overcharge shall also be provided. The current limit shall be continuously adjustable. The charger shall have a slow walk-in circuit which shall prevent application of full load DC current in less than 10 seconds after AC power is energized.



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2.0.3 The chargers shall be served from a 415V, 50 Hz, 3 phase 3 wire system. Charger design shall ensure that there is no component failure due to fluctuations of input supply or loss of supply and restoration.

2.0.4 The minimum full load efficiency at nominal input and output shall be 90%. The ripple content shall be limited to +/-2% of Charger Output Voltage.

2.0.5 The UPS shall be capable of operating without D.C battery in circuit under all conditions of load and the performance of various components of UPS like inverter, charger, static switch, etc. shall be guaranteed without the battery in circuit.

2.0.6 The UPS system design shall ensure that in case of failure of mains input power supply to one of the chargers, the charger whose mains input power supply is healthy, shall feed to one or both the inverters as the case may be as per manufacturer's standard practice & continue to charge the D.C battery at all load conditions. The Bidder should note that this situation should not in any way lead to the discharge of the D.C battery.

3.0 STATIC INVERTER

The static inverter shall be continuous duty, solid state type using proven pulse width modulation (PWM) / Quasi square wave /step wave technique. Ferro-resonant type inverters are not acceptable. The nominal voltage output shall be 230 Volts, single phase, 50 Hz. The inverter equipment shall include all necessary circuitry and devices to conform to requirements like voltage regulation, current limiting, wave shaping, transient recovery, automatic synchronization, etc. The steady state voltage regulation shall be $\pm 2\%$ and transient voltage regulation (on application/removal of 100% load) shall be $\pm 20\%$. Time to recover from transient to normal voltage shall not be more than 50 msec. Frequency regulation for all conditions of input supplies, loads and temperature occurring simultaneously or in any combination shall be better than 0.5% (automatically controlled). The total harmonic content shall be 5% maximum and content of any single harmonic shall be 3% maximum. The inverter efficiency shall be at least 85% on full load and 80% on 50% load. The synchronization limit for maintenance of synchronization between the inverter and stand by AC source shall be 48-52Hz, field adjustable in steps of 1Hz.

4.0 Static Switch and Manual bypass switch:

The static switch shall be provided to perform the function of transferring UPS loads automatically without any break from (i) faulty inverter to healthy inverter in case of failure of one of the two inverters and (ii) from faulty inverter to standby AC source in case of failure of both the inverters. The transfer time shall be $\frac{1}{4}$ cycle maximum in synchronous mode.

Manual bypass switch shall be employed for isolating the UPS during maintenance

Continuous and overload capacity of the switches shall be equal to 100% of the continuous and overload rating of each inverter. Peak capacity shall be 1000% of continuous rating for 5 cycles.



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5.0 STEP DOWN TRANSFORMER & VOLTAGE STABILIZER

One 415V three phase to 230V, single phase transformer along with associated voltage stabilizer shall be furnished with each UPS system. The transformer and stabilizer combination shall convert owner furnished 415V +/- 10% three phase plant auxiliary AC supply to 230V +/- 2%, single phase standby AC power supply source.

The transformer shall be of low impedance air-cooled type and its kVA rating and percentage impedance should be selected so that extremely fast fault clearance is achieved.

The overload capacity of the transformer/stabilizer shall not be less than 300% for 200 ms duration. The voltage stabilizer shall employ servo controlled circuitry and shall maintain the specified output voltage for 0-100% load with maximum input voltage variations as indicated above. The efficiency of the stabilizer shall be 95% or better.

6.0 AC Distribution Board (ACDB)

The details of the AC distribution board i.e., exact, rating and number of feeders, etc of 2x100% ACDB shall be as per attached feeder list.

7.0 BATTERIES

7.0.1 The batteries shall be heavy duty Nickel-cadmium type and shall be sized for one hour of full load operation during non-availability of AC supply/chargers. The Ni-Cd batteries shall conform to IS 10918: latest including all applicable official amendments and revisions as on date of opening of technical bid. For sizing calculation, an aging factor of 1.25 and temperature correction factor as per manufacturer's standard at 4 deg C electrolyte temperature (Based on temperature characteristics curve to be submitted by the contractor and at a temperature of 4 deg C). Capacity factor, float correction (if applicable) shall be taken into consideration. For further details, refer Battery sizing calculation format attached.

8.0 Auxiliary Equipment's

8.0.1 All required equipment's/materials shall be furnished with each rectifier bank, UPS & battery bank and shall include as a minimum various meters (AC/DC voltage/current, kVA, power factor, frequency meters etc.), circuit breakers, selector switches, push buttons indicating lights, ground detector system, battery accessories like (inter cell connectors, inter step connectors, battery racks, etc.). Isolated 4-20 mA signals for important parameters and potential free contacts for important alarms shall be provided for use in DCS.

Accessories and devices required for maintenance and testing of batteries shall be supplied by Battery Manufacturer.



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9.0 Battery Racks

Battery racks of mild steel construction in accordance with applicable codes and standard shall be provided. AISC specification shall apply in absence of another design specification.

10.0 CABINETS / ENCLOSURES

The construction details for power supply system Cabinets/ Enclosure / Racks shall conform to the requirements of the following paragraphs.\

- (1) Equipment enclosures shall match and line up in assemblies of freestanding floor mounted cabinets designed for indoor service.
- (2) Individual enclosure shall be ventilated switchboard type fabricated from not less than 1.6 mm thick sheet steel. Enclosures shall be furnished with concealed hinges. Front and rear doors shall be designed to permit easy access to all components for maintenance or replacement. The enclosures shall be reinforced with formed steel members as required to form a rigid self-supporting structure. Doors shall have three point latches.
- (3) Each assembly may be shipped in sections for ease of handling and field assembly. Terminal blocks shall be furnished as required adjacent to each shipping split to facilitate field assembly. Cable bundles cut to the required length and furnished with terminal lugs tagged for identification shall be provided for the wiring between shipping sections.
- (4) Adequate ventilating louvers and enclosure top panels shall be included. All vent openings shall be covered with corrosion resistant fine screen coverings.
- (5) The temperature rise inside all the cabinets/enclosures shall not exceed 10 deg C above ambient temperature. The cabinets shall be IP-22 protection class.
- (6) The color shade of panels exterior/interior shall be as per RAL 9002, end panel color shall be as per RAL 5012.

11.0 Cooling System

If the equipment supplied requires forced air cooling, the cooling system furnished shall meet the following requirements:

- (a) Reserve cooling equipment shall be furnished for each switch board assembly. Reserve fan capacity shall be equal to 100 percent of cooling fan requirements for full load operation with only one bank of inverter/rectifier in service at the specified maximum ambient temperature.
- (b) Completely independent duplicate wiring and control system shall be provided for the normal cooling fan system the reserve cooling fan system.
- (c) Each cooling fan shall normally run continuously and shall be powered from the output of the inverter whose enclosure it serves (for cubicle housing inverters). Each cooling fan supply circuit shall be separately fused.
- (d) Each cooling fan shall be equipped with an air low switch having an alarm contact that closes upon failure of air flow or rise of temperature.

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12.0 BATTERY HEALTH MONITORING SYSTEM

Make:

- 1) M/s Vertiv Energy, India 2) M/s Eltek, Gurgaon, M/s Hitachi-Hirel, Gandhinagar

BHMS, wherever applicable, shall include microprocessor based hardware and software to monitor the condition of each battery cell of UPS battery banks on-line. With BHMS it shall be possible to measure & analyze the minimum and maximum voltage values of each battery cell so that any damage to battery shall be prevented by pro-active maintenance. BHMS shall communicate with the DCS and provide necessary alarms.

OTHER POINTS:-

- a) 1 No Manual Discharge Resistor Bank shall be supplied for NSPCL Rourkela project considering the higher Battery Ah rating and suitable switch / MCB for lower battery Ah ratings also.
- b) 4-20 mA Transducers for Output Voltage, Current & Frequency Transducers shall be provided in each ACDB input for both NSPCL Rourkela & Dadri FGD projects.



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13.0 SITE TESTS

The Bidder shall also carry out the site tests on equipments/systems as specified below. However, these shall not be limited to this specification only and in case any other site test is required to be conducted as a standard practice of Bidder or deemed necessary by the owner and mutually agreed between bidder and owner, the same shall also be carried out.

Functional Test

On completion of installation and commissioning of the equipment the following tests/checks shall be carried out with the maximum available load, which does not exceed the rated continuous load. These tests/checks shall include but not limited to the tests as indicated below. The details of the tests are as indicated below:

1. Light Load Test

This test is carried out to verify that the UPS is correctly connected and all functions operate properly. The load applied is limited to some percent of rated value. The following points should be checked:

- (a) Output voltage, frequency and the correct operation of meters;
- (b) Operation of all control switches and other means to put units into operation.
- (c) Functioning of protective and warning devices.
- (d) Operation of remote signaling and remote control devices.

2. Checking of Auxiliary Devices

The functioning of auxiliary devices, such as lighting, cooling, pumps, fans annunciation, etc., should be checked, if convenient, in conjunction with the preliminary light load test.

3. Synchronization Test

If possible, frequency variation limits should be tested by use of a variable frequency generator, otherwise, by simulation of control circuit conditions. If applicable the rate of change of frequency during synchronization shall be measured.

4. A. C Input Failure Test

The test is performed with a fully charged battery and is carried out by tripping input circuit breakers or may be simulated by switching off all UPS rectifiers and bypass feeder as at the same time. Output voltage variations are to be checked for specified limits with an oscilloscope or equivalent. Frequency variation is defined as the steady state frequency of the UPS with and without AC input. The rate of change of frequency is measured by the time it takes to reach steady-state values.

5. A. C Input Return Test

AC input return test is performed by closing AC input circuit breakers, or is simulated by energizing rectifiers and bypass feeders.

Proper operation of rectifier starting and voltage and frequency variations are to be observed.

Note: This test is normally performed with a fully or partially charged battery.



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6. Simulation of Parallel Redundant UPS Fault

This test is applicable for UPS with parallel redundant connections. Faults of rectifier or inverter units may be carried out by simulation. Output transients are to be observed.

7. Transfer Test

This test is applicable for UPS with bypass, particularly in the case of an electronic bypass switch. Transients shall be measured during load transfer to bypass caused by a simulated fault and load retransfer after clearing of the fault.

8. Full load test

Load tests are performed by connecting the actual load to the UPS output. Large UPS in parallel connection may be load tested by testing the individual UPS units separately. Load tests are necessary for testing output voltage and frequency, rated stored energy, recharge time, ventilation, temperature rise and determination of efficiency. Load tests are performed to prove, transient voltage deviations specified under step load conditions.

9. Efficiency

Efficiency should be determined by the measurement of the active power at input and output.

10. Actual Load Test

Conditions under actual load may differ from those with a dummy load. Steady-state generation of current and voltage harmonics and transients at load switching conditions should be observed.

11. Current Division in Parallel -

Load sharing between the Modular DC power supply rectifier banks & UPS units shall be measured with actual load under conditions of parallel operation.

12. Rated Stored Energy Time (Battery Test)

This test is a load test to prove the actual possible time of battery operation. If rated load is not available in the case of large UPS, it is possible to apply a partial load to check the actual battery discharge characteristics and compare these with characteristics specified by the battery manufacturer Discharge time with rated load- shall then be calculated. The test shall be performed with a fully charged battery and also may be done under other battery conditions to be specified, if so agreed. Active power output of the UPS and the battery voltage shall be recorded during the test. Since new batteries often do not provide full capacity during a starting up period, the discharge test may be repeated after a reasonable recharge time if the original test has failed.

13. Rated Restored Energy Time

Restored energy depends on the charging capacity of the rectifiers and the battery characteristics. If a certain recharging rate is specified, it shall be provided by repeating the discharge test after the specified charging period.

14. Battery Ripple Current

If battery ripple currents are specified, then the ripple current which depends on UPS operation shall be checked under normal operating conditions. Rough measuring methods are sufficient.



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15. On Site Ventilation Test

The test is performed with the actual load. Temperatures conditions of all UPS cubicles are to be observed.

16. Overload Capability Test

Overload capability test is a load test. Specified values of short time overload or starting up sequences of actual load are to be applied for the time interval specified. Specified values of voltage and current are to be recorded.

17. Short Circuit Current Capability

If short-circuit current capability is specified, it may be tested by applicable of a short circuit to UPS output if necessary, via suitable fuse, short circuit is to be recorded.

18. Short Circuit Fuse Test

Fuse tripping capability of a UPS shall be tested, by short-circuiting the UPS output via a fuse of specified type.

The test shall be repeated to ensure against fuse non-uniformity and switching time during the cycle. The test is carried out at an appropriate UPS load, under normal operation, if not otherwise specified by Owner.

19. Restart

Automatic or other restart means are to be tested after a completed shut-down of UPS as specified.

20. Output over voltage

Output over voltage protection is to be checked.

21. Periodic Output Voltage Modulation

When this test is specified, it may be checked by voltage recording at different loads and operating conditions.

22. Harmonic Conditions

Harmonic components of output voltage shall be checked with the actual load. Methods of specification and checking shall be subject to Owner's approval.

23. Earth Fault Test

If the UPS output is isolated from earth, then an earth fault can be applied to any output terminal. UPS output transients (if any) shall be measured.

If the battery is isolated from earth, then an earth fault can be applied to any output terminals. UPS output transient (if any) shall be measured.



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CE/416/ROUR/UPS/FL

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PROJECT: NSPCL ROURKELA (1x250 MW) OFFSITE PACKAGES

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DATE

06/06/2018

RIVER WATER INTAKE SYSTEM CONTROL ROOM

S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	FEEDER RATING IN AMPS	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	OWS1 + MONITOR	1	0	0.98	0.2254	0.2254	4	6
2	OWS2 + MONITOR	0	1	0.98	0.2254	0.2254	4	6
3	Printer (A4)	0	1	2.45	0.5635	0.5635	4	6
4	CCTV SYSTEM	4	0	1.36	0.315	1.26	4	6
		0	4	1.36	0.315	1.26	4	6
		5	6			3.53	kVA	

a.) **Total Load = 3.53 kVA**
 b.) **Total Load + 10% spare = 3.89 kVA**
UPS Rating as per manufacturer catalog = 5 kVA ~ 5 kVA for Battery Sizing

S.NO	FEEDER RATING	TOTAL		CONSIDERING 10% SPARE		ROUNDED OFF-TO:-	
		ACDB-1	ACDB-2	ACDB-1	ACDB-2	ACDB-1	ACDB-2
1	4A/6A	5	6	6	7	7	7
	TOTAL	5	6	6	7	7	7

Note:

- 10% spare feeders of each rating are been provided in each ACDB further rounded off to 7 feeders cummulatively in ACDB-1 and ACDB-2 for any future exigencies which may creep in later.
- UPS rating is 5 kVA at 50 deg C and each UPS System is being provided with 1 Set of Ni-Cd Battery for 1 hr back-up suiting 5 kVA Load (this is UPS load at 50 deg C). Battery is temperature derated at 4 deg C.

COOLING WATER PUMP HOUSE CONTROL ROOM

S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	FEEDER RATING IN AMPS	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	OWS + MONITOR	1	0	0.8	0.184	0.184	4	6
2	RRMS (Reverse Rotation Monitoring System) OF CW PUMPS	0	1	0.21	0.05	0.8	4	6
3	Deposit Monitor, Biofouling monitor of CWT plant	1	0	0.43	0.1	0.1	4	6
		0	1	0.43	0.1	0.1	4	6
4	pH Analyser, ORP Meter of CWT plant	1	0	0.08	0.02	0.02	4	6
		0	1	0.08	0.02	0.02	4	6
5	PDB for LS of Cooling Tower (See Annexure-I)	1	1	0.43	0.1	0.1	6	10
		4	4			1.32	kVA	

a.) **Total Load(A+B) = 1.32 kVA**
 b.) **Total Load + 10% spare = 1.46 kVA**
UPS Rating as per manufacturer catalog = 5 kVA ~ 5 kVA for Battery Sizing

S.NO	FEEDER RATING	TOTAL		CONSIDERING 10% SPARE		ROUNDED OFF-TO:-	
	MCB / FUSE	ACDB-1	ACDB-2	ACDB-1	ACDB-2	ACDB-1	ACDB-2
1	4A/6A	3	3	4	4	4	4
2	6A/10A	1	1	2	2	2	2
	TOTAL	4	4	6	6	6	6

Note:

- 1.) 10% spare feeders of each rating are been provided in each ACDB further rounded off to 6 feeders cummulatively in ACDB-1 and ACDB-2 for any future exigencies which may creep in later
- 2.) UPS rating is 5 kVA at 50 deg C and each UPS System is being provided with 1 Set of Ni-Cd Battery for 1 hr back-up suiting 5 kVA Load (this is UPS load at 50 deg C). Battery is temperature derated at 4 deg C.

ANNEXURE-I
WALL MOUNTED PDB IN COOLING TOWER LOCATION (UPS POWER SUPPLY FROM CWPH UPS)

S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS	FEEDER RATING IN AMPS	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	LS of Cooling Tower	2	0.21	0.05	0.1	4	6
		2			0.10	kVA	

S.NO	MCB / FUSE RATING	TOTAL	CONSIDERING 10% SPARE	ROUNDED OFF-TO:-
	MCB / FUSE			
1	4A/6A	2	3	3
	TOTAL	2	3	3

COAL HANDLING PLANT CONTROL ROOM

S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	FEEDER RATING IN AMPS	KVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	OWS1 + MONITOR	1	0	0.98	0.2254	0.2254	4	6
2	OWS2 + MONITOR	0	1	0.98	0.2254	0.2254	4	6
3	LVS PC	1	0	0.98	0.2254	0.2254	4	6
4	LVS SCREEN	0	1	1.47	0.3381	0.3381	4	6
5	Printer (A4)	0	1	2.45	0.5635	0.5635	4	6
6	CCTV SYSTEM	3	0	2.27	0.5221	1.5663	4	6
		0	3	2.27	0.5221	1.5663	4	6
		5	6			4.71	kVA	

a.) **Total Load = 4.71 kVA**
 b.) **Total Load + 10% spare = 5.18 kVA**
UPS Rating as per manufacturer catalog = 7.5 kVA ~ 7.5 kVA for Battery Sizing

S.NO	FEEDER RATING	TOTAL		CONSIDERING 10% SPARE		ROUNDED OFF-TO:-	
	MCB / FUSE	ACDB-1	ACDB-2	ACDB-1	ACDB-2	ACDB-1	ACDB-2
1	4A/6A	5	6	6	7	7	7
	TOTAL	5	6	6	7	7	7

Note:

- 10% spare feeders of each rating are been provided in each ACDB further rounded off to 7 feeders cummulatively in ACDB-1 and ACDB-2 for any future exigencies which may creep in later.
- UPS rating is 7.5 kVA at 50 deg C and each UPS System is being provided with 1 Set of Ni-Cd Battery for 1 hr back-up suiting 7.5 kVA Load (this is UPS load at 50 deg C). Battery is temperature derated at 4 deg C.

ANNEXURE-II
WALL MOUNTED PDB IN EFFLUENT TREATMENT PLANT (UPS POWER SUPPLY FROM MAIN PLANT UPS)

S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS	FEEDER RATING IN AMPS	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	OWS + MONITOR	1	0.98	0.2254	0.2254	4	6
2	pH Analyser, Turbidity Meter, Conductivity Analyser, Electromagnetic Flow Meter	5	0.2	0.04	0.10	4	6
		6			0.33	kVA	

S.NO	FEEDER RATING	TOTAL	CONSIDERING 10% SPARE	ROUNDED OFF-TO:-
	MCB / FUSE			
1	4A/6A	6	7	7
	TOTAL	6	7	7

**ANNEXURE-III
FLOOR MOUNTED PDB IN DM PLANT (UPS POWER SUPPLY FROM MAIN PLANT UPS)**

S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	FEEDER RATING IN AMPS	KVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	OWS + MONITOR	1	0.98	0.2254	0.2254	4	6
2	Printer (A4)	1	2.45	0.5635	0.5635	4	6
3	pH Analyser, Conductivity Analyser, etc	15	0.02	0.6	0.6	4	6
4	Silica Analyser	2	0.1	0.1	0.1	4	6
		19			1.49	kVA	

S.NO	FEEDER RATING MCB / FUSE	TOTAL	CONSIDERING 10% SPARE	ROUNDED OFF-TO:-
1	4A/6A	19	21	21
	TOTAL	10	21	21



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CE/416/DADRI FGD/UPS/FL

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PAGE 01 OF 03

PROJECT: NTPC DADRI FGD PACKAGE (2x490 MW)

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FGD - NTPC DADRI (2x490 MW) UNIT-1

S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	FEEDER RATING IN AMPS	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	STATIC SWITCH (32 Amps) for HMI Network Enclosure (NWN01)							
a	ENGINEERING ACTIVITY STATION (EAS) + Monitor (P)	1	0	1.38	0.3174	0.3174	4	6
b	INFO / HISTORIAN STATION1 + Monitor (P)	1	0	1.38	0.3174	0.3174	4	6
c	INFO / HISTORIAN STATION2 + Monitor (P)	1	0	1.38	0.3174	0.3174	4	6
d	Operator Station-1 U-1	1	0	1	0.23	0.23	4	6
e	Operator Station-2 U-1	1	0	1	0.23	0.23	4	6
f	Operator Station-1 U-2	1	0	1	0.23	0.23	4	6
g	Operator Station-2 U-2	1	0	1	0.23	0.23	4	6
h	Operator Station - Common	1	0	1	0.23	0.23	4	6
i	Colour LaserJet Printer - Common	1	0	2.45	0.5635	0.5635	4	6
1	STATIC SWITCH (32 Amps) for HMI Network Enclosure (NWN01)	1	0	11.59	2.6657	2.6657	16	20
2	OXYGEN ANALYSER - LT	2	2	1.3	0.3	0.6	4	6
3	ELECTROMAGNETIC FLOW METER (Per Unit - 2 Nos, 1 No - Common) - Total 5 nos for project	1	0	0.08	0.01875	0.0375	4	6
		0	2	0.08	0.01875	0.01875	4	6
4	Flue Gas Analyser SOx /NOx/CO/CO ₂ at Chimney	1	1	8.69	2	2	16	20
5	Mercury Analyzer	1	1	15.21	3.5	3.5	20	25
6	SO2 Analyzer	2	2	8.69	2	4	16	20
7	Opacity Monitor (Extractive Type) at Chimney	1	1	15.21	3.5	3.5	20	25
8	PH Analyzer	0	1	0.1	0.025	0.025	4	6
		1	0	0.1	0.025	0.025	4	6
9	Spare feeders for LHP, GHP	1	1	10.86	2.5	2.5	16	20
		1	1	10.86	2.5	2.5	16	20
10	Operator WorkStation & Printer - Fire Detection System R1	0	1		1.875	1.875	16	20
	TOTAL LOAD	12	13			23.25		

Total Load = 23.25 kVA
Total Load + 10% spare = 25.57 kVA
UPS Rating = 30 kVA ~ 30 kVA for Battery Sizing

S.NO	FEEDER RATING	TOTAL		CONSIDERING 25% SPARE	
	MCB / FUSE	ACDB-1	ACDB-2	ACDB-1	ACDB-2
1	4A/6A	4	5	7	7
2	16A/20A	6	6	8	8
3	20A/25A	2	2	3	3
	TOTAL	12	13	18	18

Note:

- 25% spare feeders of each rating are been provided in each ACDB further rounded off to 18 feeders cummulatively in ACDB-1 and ACDB-2 considering employers load and for any future exigencies which may creep in later.
- UPS rating is 25 kVA at 50 deg C and each UPS System is being provided with 1 Set of Ni-Cd Battery for 1 hr back-up suiting 25 kVA Load (this is UPS load at 50 deg C). Battery is temperature derated at 4 deg C.

FGD - NTPC DADRI (2x490 MW) UNIT-2

S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	FEEDER RATING IN AMPS	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	STATIC SWITCH (32 Amps) for HMI Network Enclosure (NWEN01)							
a	ENGINEERING ACTIVITY STATION (EAS) + Monitor (P)	1	0	1.38	0.3174	0.3174	4	6
b	INFO / HISTORIAN STATION1 + Monitor (P)	1	0	1.38	0.3174	0.3174	4	6
c	INFO / HISTORIAN STATION2 + Monitor (P)	1	0	1.38	0.3174	0.3174	4	6
d	Operator Station-1 U-1	1	0	1	0.23	0.23	4	6
e	Operator Station-2 U-1	1	0	1	0.23	0.23	4	6
f	Operator Station-1 U-2	1	0	1	0.23	0.23	4	6
g	Operator Station-2 U-2	1	0	1	0.23	0.23	4	6
h	Operator Station - Common	1	0	1	0.23	0.23	4	6
i	Colour LaserJet Printer - Common	1	0	2.45	0.5635	0.5635	4	6
1	STATIC SWITCH (32 Amps) for HMI Network Enclosure (NWEN01)	1	0	11.59	2.6657	2.6657	16	20
2	OXYGEN ANALYSER - LT	2	2	1.3	0.3	0.6	4	6
3	ELECTROMAGNETIC FLOW METER	1	0	0.08	0.01875	0.0375	4	6
		0	1	0.08	0.01875	0.01875	4	6
4	Flue Gas Analyser SO _x /NO _x /CO/CO ₂ at Chimney	1	1	8.69	2	2	16	20
5	Mercury Analyzer	1	1	15.21	3.5	3.5	20	25
6	SO ₂ Analyzer	2	2	8.69	2	4	16	20
7	Opacity Monitor (Extractive Type) at Chimney	1	1	15.21	3.5	3.5	20	25
8	PH Analyzer	0	1	0.1	0.025	0.025	4	6
		1	0	0.1	0.025	0.025	4	6
9	Spare feeders for LHP, GHP	1	1	10.86	2.5	2.5	16	20
		1	1	10.86	2.5	2.5	16	20
10	Operator WorkStation & Printer - Fire Detection System R1	0	1	8.15	1.875	1.875	16	20
TOTAL LOAD		12	12			23.25		

Total Load = 23.25 kVA
Total Load + 10% spare = 25.57 kVA
UPS Rating = 30 kVA ~ 30 kVA for Battery Sizing

S.NO	FEEDER RATING	TOTAL		CONSIDERING 25% SPARE	
	MCB / FUSE	ACDB-1	ACDB-2	ACDB-1	ACDB-2
1	4A/6A	4	4	7	7
2	16A/20A	6	6	8	8
3	20A/25A	2	2	3	3
TOTAL		12	12	18	18

Note:

- 25% spare feeders of each rating are been provided in each ACDB further rounded off to 18 feeders cummulative in ACDB-1 and ACDB-2 considering employers load and for any future exigencies which may creep in later.
- UPS rating is 25 kVA at 50 deg C and each UPS System is being provided with 1 Set of Ni-Cd Battery for 1 hr back-up suiting 25 kVA Load (this is UPS load at 50 deg C). Battery is temperature derated at 4 deg C.



A4-10

CE/416/APPENDIX-VI/UPS/BSC

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PAGE 01 OF 02

**PROJECTS: 1) NSPCL ROURKELA (1x250 MW) OFFSITE PACKAGES
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TYPICAL BATTERY SIZING CALCULATION FOR UPS

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Typical Battery sizing calculation:

UPS full load considered = 'A' kVA

Max. Output load on UPS in watts = 'A' x 1000 x 0.8 (P.F)
= 'B' Watts

Inverter efficiency = 90% = 0.9

Type of Battery and Back up Time required = Ni-Cd,
1 hour backup at 100% load for Dadri FGD project
30 mins backup at 100% load for Rourkela project

End cell voltage (ECV) = 1.1 Volts/cell.

Number of cells = 180 cells

Ageing factor = 1.25

Design Margin = 1.0 (10% spare already considered in UPS sizing)

Temperature correction factor (at 4 deg. C. electrolyte temp.) = 'E' say

Based on manufacturer's curves, state of charge factor for H-type Battery for 8 hour Charging at maximum per cell boost voltage 1.68V (considering upper voltage window of inverter) = 1.0

Float charge correction factor at ECV of 1.1V for 1 Hr. Back-up = 'F' say

Then Battery Discharge Current required = $\frac{B}{1.1 \times C \times D}$ = 'X' say

I_{DC} with float charge correction factors, temperature correction factor, ageing factor, State of charge factor & design margin is
= $\frac{'X' \times 1.25 \times 1.0 \times 1.0}{E \times F}$ = 'Z' say

'Z' is Discharge Current (minimum) which is to be fitted in to High Discharge H-Type Battery.

Battery AH to an end cell voltage of 1.1 volts/ cell and = 'Y' say.

Suiting the above discharge current

Hence, Battery selected = 'D' cells 'Y' "H type Battery" which can deliver 'Z' for 1 Hr. back-up at ECV=1.1V



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CE/416/APPENDIX-VI/UPS/TRT

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PAGE 01 OF 05

**PROJECTS: 1) NSPCL ROURKELA (1x250 MW) OFFSITE PACKAGES
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TYPE & ROUTINE ACCEPTANCE TEST

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06/06/2018

SUBJECT NO.	TECHNICAL REQUIREMENTS
	TYPE TEST REQUIREMENTS
1.00.00	TYPE TEST REQUIREMENTS
1.01.00	General Requirements
1.01.01	<p>The Contractor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard.</p> <p>(a) Out of the tests listed, the Bidder/ sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests.</p> <p>(b) For the rest, submission of type test results and certificate shall be acceptable provided.</p> <ol style="list-style-type: none"> i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment. ii. There has been no change in the components from the offered equipment & tested equipment. iii. The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening. <p>(c) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Employer on this account.</p>
1.01.02	As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Employer.
1.01.03	The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.
1.01.04	For the type tests to be conducted, Contractor shall submit detailed test procedure for approval by Employer. This shall clearly specify test setup, instruments to be used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording precautions to be taken etc. for the tests to be carried out.
1.01.05	The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project.

The cost shall only be payable after conduction of the respective type test in presence of authorize representative of Employer. If a test is waived off, then the cost shall not be payable.

2.00.00

SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS

2.01.00

The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&I systems shall be as indicated below:

i) Surge Withstand Capability (SWC) for Solid State Equipments/ Systems

All solid state systems/ equipments shall be able to withstand the electrical noise and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Hence, all front end cards which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to above, suitable class of EN 61000-4-12 which is equivalent to ANSI 37.90.1/ IEEE-472 may also be adopted for SWC test.

ii) Dry Heat test as per IEC-68-2-2 or equivalent.

iii) Damp Heat test as per IEC-68-2-3 or equivalent.

iv) Vibration test as per IEC-68-2-6 or equivalent.

v) Electrostatic discharge tests as per EN 61000-4-2 or equivalent.

vi) Radio frequency immunity test as per EN 61000-4-6 or equivalent.

vii) Electromagnetic Field immunity as per EN 61000-4-3 or equivalent.

Test listed at item no. v, vi, vii, above are applicable for electronic cards only as defined under item (i) above.

TECHNICAL REQUIREMENTS					
S. NO.	ITEM	TYPE TEST REQUIREMENT	STANDARD	TEST TO BE SPECIFICALLY CONDUCTED	NTPC'S APPROVAL REQD. ON TEST CERTIFICATE
1	Battery	As per Standard	IS-10918	NO	YES
2	UPS(Applicable for each model and rating)	Degree of Protection Test	IS-2147	NO	YES
		Power Efficiency	IEC 146-2, IEC 146	NO	YES
		Load test	Approved Procedure	YES	YES
		Audible Noise Test	IEC 146- 2	NO	YES
		Fuse Cleaning Capability	Approved Procedure	YES	YES
		Relative harmonic content	Approved Procedure	NO	YES
		Radio interference	IEC 146 - 4	NO	YES
		Synchronous transfer test	IEC 146 - 4	NO	YES
		Temperature rise test without redundant fans	Approved Procedure	NO	YES
		Input voltage variation test	Approved Procedure	NO	YES
		Over load Test	Approved Procedure	NO	YES
		Insulation test	IEC 146	NO	YES
		Restart Test	IEC 146 - 2	NO	YES
		Short circuit current capability	IEC 146 - 2	NO	YES
		Output voltage & frequency Tolerance	IEC 146 - 2	NO	YES
		Voltage/current Division	IEC 146 - 2	NO	YES
Relative Harmonic Content	IEC 146 - 2	NO	YES		

QUALITY ASSURANCE

POWER SUPPLY SYSTEM																			
ITEMS	TESTS	Visual/dimension/rating/ Paint Adhesion/ Thickness (R)	General arrangement/BOM/make of components /Mimic ®	Efficiency ,regulation(R)	Input voltage variation (A)	Out put voltage and frequency adj.range(A)	Premilinary light test(R)	Load transfer retransfer test (R) *	AC input failiure and return test (R)	Parralel operation and current divison(R)	Relative harmonic content(R)	Restart with PRI A.C and battery (separately)(R)	System transfer and retransfer (R)*	Asynchronous transfer(R)	Ripple content(R)	Load limiter operation (R)	IR/HV(R)	Tests as per standard &specification (R)&(A)	
		UPS/CONVERTER (IEC-146 PT-4)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VOLTAGE STABILISER	Y	Y	Y	Y	Y						Y		Y				Y		
LEAD ACID BATTERY(TUBLAR)-IS-1651																		Y	
LEAD ACID BATTERY (PLANTE)-IS-1652																		Y	
NICKEL CADMIUM BATTERY(IS-10918/IEC-623)																		Y	
R-Routine Test		A- Acceptance Test						Y – Test applicable											
* Transfer time and Over shoot /under shoot during load & system transfer shall be recorded .																			
Note: 1) Detailed procedure of Burn-in and Elevated Temperature test shall be as per Quality Assurance Programme in General Technical Conditions																			
2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.																			



A4-10

CE/416/APPENDIX-VI/UPS/SLD

REV 00

PAGE 01 OF 02

**PROJECTS: 1) NSPCL ROURKELA (1x250 MW) OFFSITE PACKAGES
2) NTPC DADRI FGD PACKAGE (2x490 MW)**

SINGLE LINE DIAGRAM

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REVISION:00

APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED

ISSUED

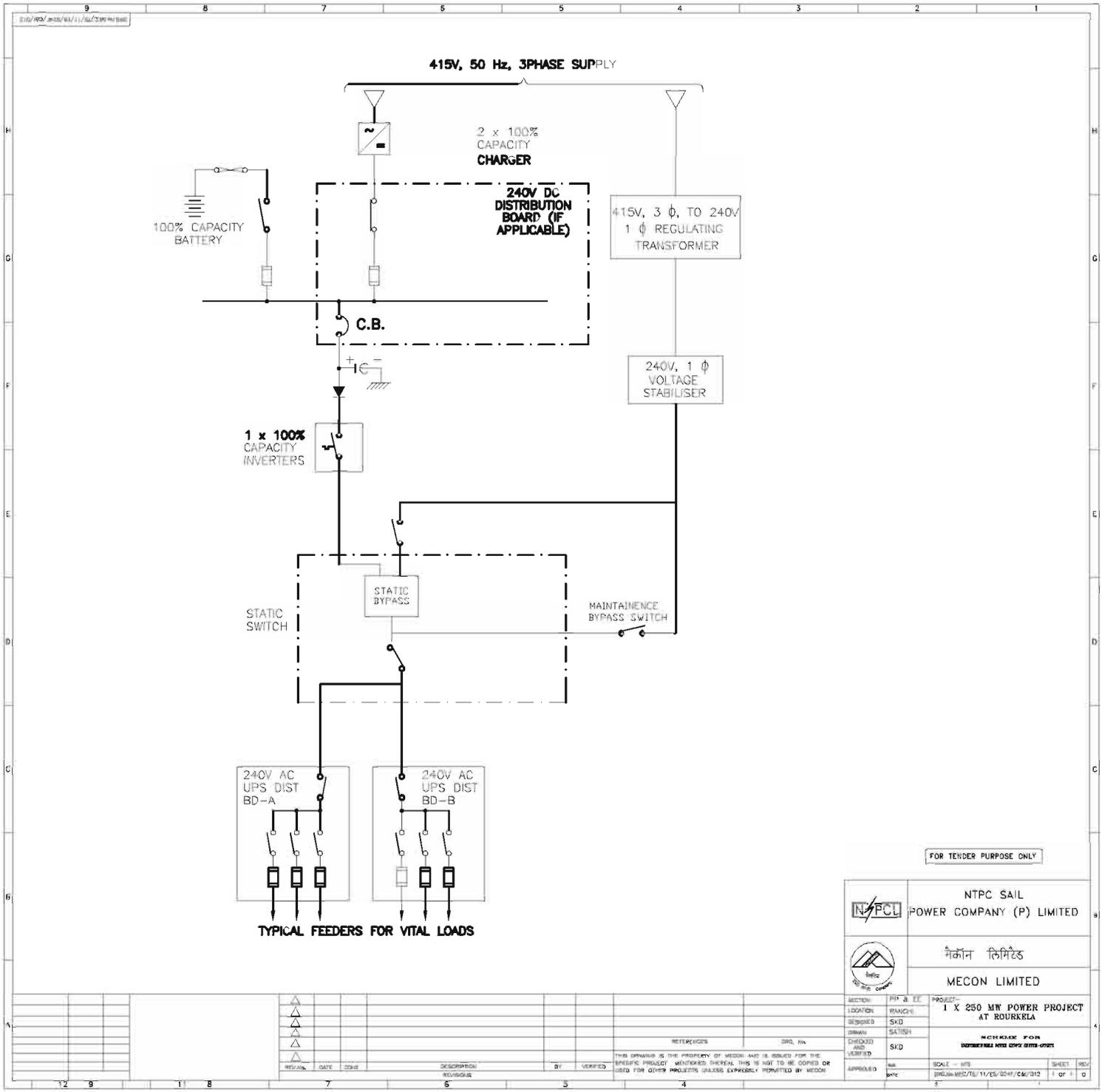
DATE

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06/06/2018

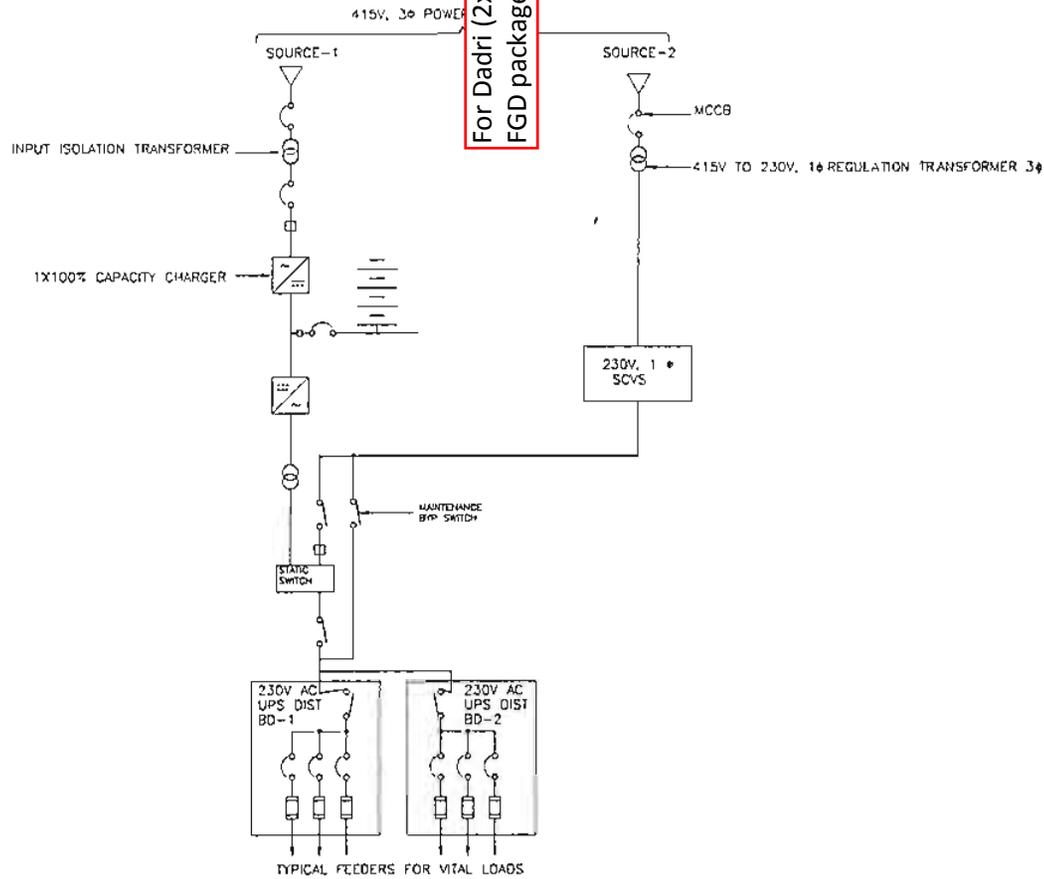


FOR TENDER PURPOSE ONLY

 	NTPC SAIL POWER COMPANY (P) LIMITED
	मैकॉन लिमिटेड MECON LIMITED
PROJECT- 1 X 250 MW POWER PROJECT AT ROURKELA	NTPC/SAIL FOR TENDER PURPOSE ONLY
ACTION: PIP & I.T. LOCATION: RANCHI DESIGNED: SKD DRAWN: SATISH CHECKED AND VERIFIED: SKD	SCALE: - MTS (INDIA) MS/276/11/05/0547/CM/012
No. APPROVED: [Signature] Date: [Blank]	SHEET NO: 1 of 1

REVISION	DATE	CODE	DESCRIPTION	BY	VERIFIED	REFERENCES	DRG. No.

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For Dadri (2x490 MW)
FGD package

LEGENDS -

	CIRCUIT BREAKER
	TRANSFORMER
	FUSE
	BATTERY BANK
	CONTACTOR / SWITCH

FOR TENDER PURPOSE ONLY

NOTE :- ABOVE INDICATED IS A TYPICAL SCHEME OF CONFIGURATION-B UPS SYSTEM. ANY ADDITIONAL COMPONENT, DEVICE AS REQUIRED BY THE BIDDER AS PER HIS PROVEN SCHEME CAN BE OFFERED OVER & ABOVE THE SCHEME INDICATED ABOVE.

 नेशनल थर्मल पावर कॉर्पोरेशन लिमिटेड <i>National Thermal Power Corporation Ltd.</i> (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION	
PROJECT TYPICAL THERMAL POWER PROJECT C&I	
TITLE SCHEME FOR UNINTERRUPTIBLE POWER SUPPLY SYSTEM- CONFIGURATION-B	
REV. NO.	REV. NO.
A	A
DRG. NO.	0000-999-POI-A-019C
SCALE	N.T.S.
SIZE	A3
(SHEET 2 OF 2)	

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE	MJ	AM	AKA					RK		21.08.17
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