



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

Page 1 of 5

PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 003- Rev 00

SPECIAL COMMERCIAL CONDITIONS OF CONTRACT

Reference is brought to BHEL's Instructions to Bidders (Document Ref: CE: PR: 001- Rev 00) and General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 00). These documents along with required annexures are available in our website: _____ . 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: **PKN0000150**

RFQ Date: xx.xx.2015

Due Date: **XX.XX.2015**

Project: NTPC GADARAWARA(2X800) & N TPC UNCHAHAR(1X500)

Item Description: UPS WITH ACDB

~~Purchase Executives:~~ In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand, the offers are to be handed over to either of the following Purchase Officers: ~~NAGARAJ P K/Sr.ENGINEER/CE-MM-PR(09483591488) or Ponnuguru Packiam G/Sr.DGM/CE-MM-PR~~

~~E-mail IDs:~~ In case offers are sent through E-mail, please send the offers to both of the following email IDs: ~~nagaraipk@bheledn.co.in & ponnuguru@bheledn.co.in~~

E-tendering: **Applicable** *(Please refer below note)

Type of Bid: Three Part Bid (Refer ITB for details)

Reverse Auction: ~~Not Applicable~~ / Will be intimated during commercial clarifications to technically acceptable vendors. 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.

~~Splitting of tendered quantity to MSE vendors:~~ The tendered quantity will /will not be split to MSE vendors subject to submission of relevant documents by vendors. ~~Refer clause H of Instructions to Bidders for conditions applicable and for information on documents to be submitted.~~

Destination: Items are to be directly despatched to BHEL's Site Office or Stores/Customer's Stores located at/near **NTPC GADARAWARA, MP State & NTPC Unchahar, Allahabad, UP state** .Road Permit, if applicable, will be issued by BHEL along with Despatch Clearance. For Import portion **port of discharge will be Chennai sea port, port of delivery shall be ICD, Bangalore**

Project Benefits

Indigenous scope of supply:

- ~~Project is Mega Power Project or Ultra Mega Power Project: Eligible for "NIL" Excise Duty. Necessary documents for availing Excise Duty exemption by suppliers will be furnished by BHEL. This is applicable for Gadarawara project only.~~
- ~~Physical Export project: Eligible for complete exemption of Excise Duty & Sales Tax. Necessary documents for availing such benefits will be furnished by BHEL to suppliers.~~
- ~~Nuclear Power Project under a special category: Eligible for claiming Terminal Excise Duty benefit from DGFT as per present EXIM policy. Confirm submission of following in original:
 - ~~○ Disclaimer Certificate (Annexure -XI)~~
 - ~~○ Copy of Excise Invoice attested by Suptd of Central Excise authorities with signature and seal, in blue ink, to enable BHEL to claim terminal Excise duty benefit from DGFT.~~~~

Imported scope of supply:

- ~~Project is Mega Power Project or Ultra Mega Power Project: Eligible for "NIL" Customs Duty. This is applicable for Gadarawara project only.~~
- ~~Physical Export project: Eligible for complete exemption of Customs Duty.~~
- ~~Project Imports: Eligible for concessional duty~~

Terms of Delivery:

Indicate station of despatch: _____

Indicate place of manufacturing (wherever applicable): _____

- **Indigenous scope of supply:** Ex works (including Packing & Forwarding but excluding Taxes & Duties): _____
- **Imported scope of supply:** ~~C.I.F/Bangalore (for air consignments) /C.I.F/Cheennai.~~ (for sea consignments) (Including Packing, Forwarding, Handling, Ancillary charges like processing of Sight Draft/ Letter of Credit, negotiation of bank documents, Export declaration, Country of Origin etc): _____

S.N O.	TERMS	BHEL ACCEPTABLE TERM	BIDDER'S CONFIRMATION	DEVIATION IF ANY
01	Validity	The offer will be valid for a period of 120 days from the date of technical bid opening.	AGREE	
02	Excise Duty & Cess	<p>If applicable, indicate current rate of Excise Duty and maximum rate of Excise Duty (against proof of Excise Invoice).</p> <p>However, for calculation purpose and arriving at "Total Cost to BHEL" maximum rate of Excise Duty will be considered. In case Excise Duty remains firm throughout the contract, the same shall be specifically indicated. Otherwise, maximum Excise Duty will be considered for arriving at lowest bidder.</p> <p>However, reimbursement of Excise Duty shall be at actuals against proof of Excise Invoice only. (Within contractual delivery).</p> <p>Physical export contract eligible for complete exemption of Excise duty against submission of necessary documents by BHEL like ARE 1/CT 1 form.</p>	<p>APPLICABLE / NOT APPLICABLE</p> <p>Present rate of Excise Duty with CESS%</p> <p>Maximum rate of Excise Duty with CESS%</p>	
03	Central Sales Tax (CST)	<p>If applicable, indicate current rate of sales tax against form "C".</p> <p>For issue of original form "C", vendor has to furnish "E1/E2" form. To enable vendor give E1/E2 form, photocopy of C form will be issued by BHEL.</p> <p>Please confirm submission of "E1/E2 Sale form".</p> <p>For physical export project, Sales Tax is exempted against necessary documents furnished by BHEL.</p>	<p>APPLICABLE / NOT APPLICABLE</p> <p>Present Sales Tax rate against form "C" %</p> <p>CONFIRMED</p>	
04	Value Added Tax (VAT)	<p>If applicable, indicate current rate of VAT.</p> <p>When VAT is applicable, BHEL ROD's/ Nodal Agency's Name, TIN No. and address to be indicated in invoice. (Note that two original invoice and one tax invoice should be submitted to BHEL).</p>	<p>APPLICABLE / NOT APPLICABLE</p> <p>VAT rate at present %</p> <p>NOTED</p>	
05	Octroi	If applicable, indicate current rate of octroi.	<p>AGREE</p> <p>Present Octroi rate%</p>	
06	Freight Charges (for indigenous scope of supply)	<p>Freight charges shall be to vendor's account.</p> <p>Quote lumpsum reasonable Freight charges separately in priced offer, plus service tax if any.</p> <p>Vendor's offer will be evaluated on "Total cost basis" including freight charges.</p> <p>Vendor shall book the consignment through their approved Road carriers on "Freight pre-paid" and door delivery consignee copy attached basis. Freight charges to be claimed from BHEL along with POD (Proof of Delivery) on original L/R.</p>	<p>AGREED</p> <p>and quoted as lumpsum amount in price bid.</p> <p>Service Tax ____% (extra /inclusive in freight charges)</p>	
07	Service Tax on E&C and Training Charges	<p>If applicable, indicate current rate of Service Tax _____%</p> <p>Service Tax Regn. No. _____</p> <p>Confirmation that Service Tax register is maintained.</p>	<p>APPLICABLE / NOT APPLICABLE</p> <p>CONFIRMED</p>	

16	Despatch Documents	<p>Complete set of despatch documents (original + 1 photocopy set) as per Purchase Order shall be forwarded to BHEL directly.</p> <p>Depending upon the project/customer demands, despatch documents may include one or more documents from the following: Commercial Invoice, Excise Invoice (if ED is applicable), Lorry Receipt (L/R), Packing List, Air Way Bill (AWB), Country of origin certificate, Warranty Certificate, Insurance Intimation letter, NIL Short Shipment Certificate, Original Performance Bank Guarantee (directly from issuing bank to BHEL), POD (Proof of Delivery) on original L/R, Disclaimer Certificate (as per BHEL format attached as Annexure XI) along with ER-1 form & attested excise invoice (as per project demands like Nuclear Power plant) etc.</p> <p>The precise list of despatch documents needed for a particular project will be specified in the Purchase Order.</p> <p>One set of Invoice, Packing List and L/R or AWB shall be e-mailed/faxed immediately to BHEL-EDN after despatch.</p>	AGREE	
17	O & M Manuals	<p>As built Drawings, O & M Manuals and other approved documents shall be furnished in required no. of sets as per Specification/Purchase Order.</p> <p>Note: Supply of above documents (O&M) in required no. of sets along with material shall be indicated in packing list. If not mentioned BHEL may insist for submission in required sets once again.</p>	AGREE	
18	Quantity Tolerance	<p>If applicable, indicate Quantity tolerance for each of the line item.</p> <p>For Impulse/seamless/ GI pipes one random length applicable for each variety of pipes.</p>	CONFIRMED	Quantity Tolerance % Per Variety
19	Evaluation criteria for tendered item	<p>Items will be split on project wise lowest offer.</p> <p>Splitting of tendered quantity to MSE vendors (if any) is applicable.</p> <p>_____OR_____</p> <p>Items will not be split on item wise lowest offer. Items to be evaluated and procured as a package.</p>	AGREE	
20	Integrity Commitment	<p>Integrity commitment will be applicable in the tender process and execution of contracts as mentioned in clause "1" of Instructions to Bidders.</p>	AGREE	

With this, it is inferred that vendor has understood and accepts all terms & conditions as indicated in Instructions to Bidders (Document Ref: CE: PR: 001- Rev 00) & General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 00).

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. If no deviations are brought, it will be treated as if all terms and conditions of this enquiry are accepted by vendor without any deviation.

Important Note:

***.Delivery shall be as mentioned below.**

For Imported portion: Within 12(Twelve) weeks from the date of issue of approved documents or manufacturing clearance by BHEL, whichever is later. 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 and for penalty calculation date of BOL copy will be considered as proof of delivery.

For Indigenous Portion: Within 12(Twelve) weeks from the date of issue of approved documents or manufacturing clearance by BHEL, whichever is later.

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.

PACKAGE PURCHASE: Project wise evaluation will be carried out to evaluate L1 (Lowest bidder), who is technically and commercially meeting BHEL requirements and whose offer is economical to BHEL.

All the above projects are having Customer approved vendors. If the successful bidder (L1 bidder), is not approved by ultimate Customer for any of their projects, such bidder will be referred to customer with credentials for their approval. All out efforts will be made with Customer to get the approval. In case the customer does not approve a bidder for a project, then the successful bidder's (L1) offer will not be considered for opening of price bid.

Offers of customer approved vendor only will be evaluated and will be processed further. Priced offers of vendors, not approved by customer will not be opened

E-Tendering:

The contact details of the service provider & is given below:

SL	NAME	e-Mail ID	Mobile No	ROLE
1	Saumendu Neogi	saumendu.neogi@mjunction.in	(+91) 9163348205	PROJECT MANAGER
2	R. Vishwanathan	r.vishwanathan@mjunction.in	(+91) 9163348242	Business Analyst
3	Panneer Dhanaraj	panneer.dhanaraj@mjunction.in	(+91) 9282403700	Customer Relationship Mgr.
4	Nagaraj P.K	nagarajpk@bheledn.co.in	9483501488	Sr.Engineer,BHEL-EDN

1. Registration of Suppliers and Flow.

Unregistered Supplier: Supplier visits EPS at <https://bheleps.buyjunction.in>

- a. Supplier visits EPS at <https://bheleps.buyjunction.in>
- b. Clicks "REGISTER" for registration
- c. Fills up the Registration Page form
- d. MJ will ensure Authentication of Registration ¹
- e. Supplier logs in with the ID and password
- f. Supplier Maps the signing Certificate
- g. MJ will ensure the authentication the signing certificate ¹.
- h. Supplier Logs in to the system again and views the RFQ
- i. Supplier Attaches himself to the RFQ by clicking the Interested button
- j. Supplier fills the bid template and makes necessary attachments
- k. Supplier submits his bid by clicking CONFIRM.

NB:-

¹ -- BHEL Administrator or user will have no role for approving Registration and Open Tenders and DSC for Any supplier who has registered himself from the front END which is in case of OT.

For registered Supplier:

- Supplier visits EPS home page
- Supplier signs in with his/her user id and password
- Selects the RFQ Code and views it.
- Attaches himself to the RFQ by clicking the Interested button
- Supplier fills the bid template and makes necessary attachments
- Supplier submits his bid by clicking CONFIRM.

2. Open Tender Process For all units with data transfer Mechanism – Template based Bid submission mechanism

BID SUBMISSION

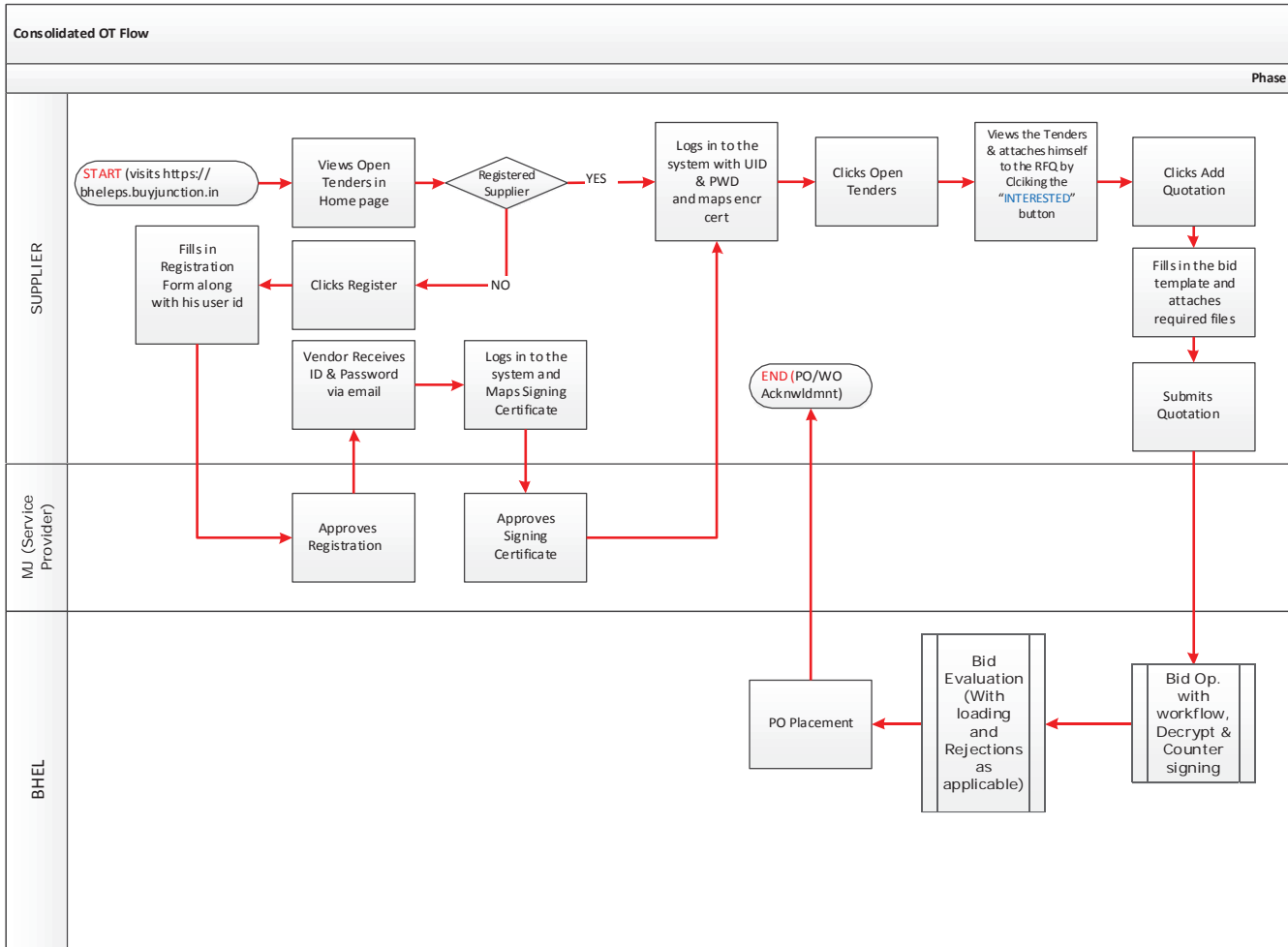
Supplier Login - Select RFQ & view it - Show INTEREST to participate - Respond to RFQ - Add Quotation – Upload proof of TENDER FEE & EMD with the valid document proof (as attachment) – Uploads Pre-qualification docs, Fills Techno-commercial & Price template – Submits Quotation.

NB:

² - ADD Intimation is mechanism by which RFQ owner adds Supplier/Contractor i.e known sources' email ids for intimation that an OT has been Issued. This is for information sake only. This does not mean that unintimated supplier cannot participate in OTs. Intimations can be issued by RFQ owner only, both during Tender publication in draft mode and after tender publication till the tender is still live and is viewable by RFQ owner and Approvers only in View Intimation list link in RFQ. This is not to be printed in any report, including chronological report

EPS will only trigger intimation email to all the email ids in the Intimation list.

3. Consolidated Flow Diagram of OT process





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

PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 001- Rev 00

INSTRUCTIONS TO BIDDERS (Common for all RFQs)

Bidder is requested to read the instructions carefully and submit their quotation covering 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 00), General Conditions of Contract (document reference: CE: PR: 002 - Rev 00) 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. Bidders (also includes the term suppliers / contractors wherever used in this document) are instructed to quote their most competitive price and best delivery, etc. in the offer. Prices should be indicated in both figures & words. **(Please also refer clause 11 under section B)**
4. Regret letter (either through post or by mail) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender. If a bidder fails to respond against 3 consecutive tenders for the same item, he will be liable for removal as a registered vendor of BHEL.
5. Procurement directly from the manufacturers shall be 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. In case bids are received from the manufacturer / supplier and his agent, bid received from the agent shall be ignored.
6. 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.
7. If an Indian representative / associate / liaison office quotes on behalf of a foreign based bidder, such representative shall furnish compulsorily 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 system is commissioned and handed over to customer will be the sole responsibility of the Indian representative / associates / agent / liaison office.
 - d. Refer **Annexure X** on “Guidelines for Indian Agents”.
8. 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 recovered from the supplier's bill. All offers for imported scope of supply must be made from any of the gateway ports (within the country) indicated. **(Refer Annexure I)**

9. 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: **www.bhel.com**
10. 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.

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 super scribed 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 super scribed 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 super scribe 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. Xerox copy will not be accepted.
4. 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.
5. 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.
6. 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.
7. "Price Bid" shall be complete in all respects containing price break-up of all components along with all

applicable taxes and duties, packing & forwarding charges (if applicable), 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.

8. In addition, bidder shall also quote for erection & commissioning charges (E&C charges), documentation charges, service charges, testing Charges (type & routine), training charges, service tax, etc. wherever applicable. The price summary must indicate all the elements clearly.
9. Vendors should indicate "lump sum" charges (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for Supervision of Erection, Commissioning and handing over to customer. The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist and service tax (if any).
10. Wherever bidders require PAC (Project Authority Certificate) for import of raw materials, components required for Mega 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.
11. All quotations shall be free from corrections /overwriting. Corrections if any should be authenticated with signature and seal. Any typographical error, totaling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure II** "Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid". BHEL decision will be final.

C. GUIDELINES FOR OFFER SUBMISSION:

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. **(This clause will not be applicable for e-tenders)**
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 of the tender. (Refer to SCC document of tender)
3. 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 officers whose names are mentioned in the RFQ. (Refer to SCC document of tender)
4. 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. In case of e-procurement, bidders can see tender results till seven days after due date and time.
5. Vendor 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.
 - e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, etc. will be the sole responsibility of the vendor. Wherever assistance is

needed for submission of e-tenders, help line numbers and executives of service provider of BHEL may be contacted.

Service provider: M-junction

Website address: <https://bheleps.buyjunction.in/>

Helpline no.: 033-66106426/6217/6013/6046/6176 (9:30 am to 5:30 pm)

9163348283/9163348284/9163348285/9163348286/8584008116 (5:30 pm to 8:30 pm)

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

D. PROCESSING 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.
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 vendors, 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 EDN reserves the right to adopt Reverse Auction or standard Price Bid Opening procedure for price evaluation, at its discretion. This will be decided after completion of technical evaluation of tender. **(Refer Annexure III for Guidelines for Reverse Auction).**
6. Un-opened bids (including price bids) will be returned to the respective bidders after release of PO and receipt of order acknowledgement from the successful bidder.
7. After receipt of Purchase Order, supplier should submit required documents like 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 EDN 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 duties, freight charges, insurance, service tax for services, any other cost indicated by vendor 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 Mega Projects, Physical Imports or such 100% exemptions (statutory benefits), customer reimbursements of statutory duties (like Excise Duty, CST, VAT) will also be taken into account at the time of tender evaluation. (wherever applicable and as indicated in SCC document of tender)

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 suppliers 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. (Applicable for Indian vendors only).
Foreign vendors shall submit relevant details of their bankers like Swift Code, Banker's Name & Address etc.
4. Vendors must submit bills & invoices along with required supporting documents in time. Incomplete documentation / delayed submission of invoice / documents will result in corresponding delay in payment.

F. STANDARD PAYMENT TERMS OF BHEL-EDN

Purchase Orders for indigenous procurement

(a) SUPPLY WITH E&C:

- 1) 85% of basic value (excluding E&C charges) + 100% of taxes, duties 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.
- 2) 15% of basic value (retention money), (excluding E&C charges) will be paid in 15 days from the date of submission of documents against supplementary invoice with proof of completion of E&C along with E & C charges (if any)

(b) SUPPLY WITH SUPERVISION OF E&C:

- 1) 90% basic value (excluding E&C charges) + 100% of taxes, duties 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.
- 2) 10% of basic value (retention money), (excluding E&C charges) will be paid in 15 days from the date of completion of erection and commissioning against supplementary invoice with proof of completion of E&C along with supervision charges (if any)

(c) SUPPLY ONLY:

- 1) 100% of PO value with taxes, duties 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.

Purchase orders for import procurement:

(d) SUPPLY WITH E&C:

- 1) 85% of the basic value (excluding E&C charges) will be paid in 45 days, against usance draft of 45 days, from the date of AWB/BOL on submission of complete set of documents.
- 2) 15% of basic value (retention money), (excluding E&C charges) will be paid in 15 days from the date of completion of E&C along with E & C charges against supplementary invoice with proof of completion of E&C (if any).

(e) SUPPLY WITH SUPERVISION OF E&C:

- 1) 90% of the value of the order 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.
- 2) 10% of basic value (retention money) will be paid in 15 days from the date of completion of erection and commissioning against supplementary invoice with proof of completion of E&C along with supervision charges (if any).

(f) SUPPLY ONLY:

- 1) 100% of PO value will be paid against usance draft of 45 days from the date of dispatch or 15 days from the date of submission of complete set of documents whichever is later.

LOADING FACTORS FOR PAYMENT TERMS:

- 1) For offers received with requests for negotiation of documents through bank loading will be 15% of basic value (all bank charges to be borne by the seller).
(This loading factor is applicable only for purchase orders for indigenous supply).
- 2) In all cases where credit period is 30 days but not in line with the above mentioned standard payment terms offered loading applicable will be 5% of basic value.
(This loading factor is applicable only for purchase orders for indigenous supply).
- 3) For offers received with Letter of Credit payment term in place of sight draft payment term, loading applicable will be 5% of basic value. Additional loading of 5% will be applicable for payment terms as Letter of Credit with usance of less than 45 days.
(This loading factor is applicable only for purchase orders for imported supply).
- 4) For offers received with Sight Draft payment terms with usance of less than 45 days, loading of 5% will be applicable.
(This loading factor is applicable only for purchase orders for imported supply).
- 5) All payment terms with credit period of less than 30 days for indigenous supply and any other variation of payment terms are liable for rejection.
- 6) Standard payment terms indicated in para F (a), (b), (c), (d), (e) and (f) 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 and E&C charges (wherever applicable).

Wherever the Purchase Order is split into import portion and indigenous portion of supply the retention money will be 15% or 10% (as applicable) 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 may consider releasing the retention money to the supplier against Bank Guarantee for equivalent value valid for an initial period of one year.*

G. Bank guarantee (BG) / Performance bank guarantee (PBG):

1. Bank guarantee (BG) / Performance bank guarantee (PBG) will be applicable as called in the tender documents. Such PBG shall be valid for a period of 36 months + claim period of 6 months for a value equal to 10 % of the basic value of the purchase order. No deviation for the duration of PBG / BG will be permitted.
 - a. PBG shall be from any of the BHEL consortium of bankers (**refer Annexure VI**).
 - b. PBGs from nationalized banks are also acceptable.
 - c. 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. PBG should be in the format indicated. (**Refer annexures VII & VIII respectively**). No deviation to these formats will be allowed.
 - d. Confirmation from any of the BHEL consortium of banks or any of the Indian Public Sector Banks is essential for the acceptance of PBGs issued by foreign banks (located outside India).
 - e. Expired BGs / PBGs will be returned only after expiry of the claim period or on completion of the contractual obligation.
 - f. **Non acceptance for submission of PBG will attract loading as indicated below**
 - i. Loading will be equal to the percentage of value for which BG / PBG is not provided. (Ex: if PBG / BG is given for 3 % of the basic value against 10% specified, loading applicable will be 7% (10 – 3 = 7 %). This value will be added to the quoted price while evaluating the lowest offer.

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

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 cover to avail the applicable benefits.

- a. Valid NSIC certificate or
- b. Entrepreneur's Memorandum part II (EM II) certificate (deemed valid for 2 years).
- c. EM II certificate with CA certificate (**in the prescribed format given in Annexure IX**) applicable for the year certifying that the investment in plant and machinery of the vendor is within permissible limits as per the MSME Act 2006 for relevant status where the deemed validity is over.
- d. Documents submitted for establishing the credentials of MSE vendors must be valid as on the date of part I / technical bid opening for the vendors to be eligible for the benefits applicable for MSE vendors. Documents submitted after the Part I / Technical bid opening date will not be considered for this tender.

PURCHASE PREFERENCE FOR MSE VENDORS:

- e. 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 nearest 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 will be indicated in the SCC.

I. 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.

PURCHASE EXECUTIVE

ANNEXURE - I
LIST OF INTERNATIONAL GATEWAY AIRPORTS

For airbased consignment, terms of delivery will be on FCA basis from following listed airports only. This list is valid from 01.03.2013 to 28.02.2015. Vendors are requested to verify this list for use after 28.02.2015.

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 – II
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-III
GUIDELINES FOR REVERSE AUCTION PROCEDURE

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to “REVERSE AUCTION PROCEDURE” i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit “online sealed bid” in the Reverse Auction. Non-submission of “online sealed bid” by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at “Total Cost to BHEL” like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL’s standard practice.
12. Bidders shall be required to read the “Terms and Conditions” section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the “Business Rules of Reverse Auction”, which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action as per extant BHEL guidelines, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

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

Please fill in **CAPITAL LETTERS** only
 P R one R A AN

Beneficiary Name
 Permenance PAN
 Address

City PIN D A

--

Beneficiary's
 Telephone No
 Address

Bank Name
 Bank Address

Bank Telephone No
 Bank A/c No
 5 A/c No as per
 6 Dg code of Bank and branch

Branch Name
 Branch Address
 Branch Telephone No
 Branch A/c No
 Branch Dg code

Indian National Code

A I hereby authorize the undersigned to receive and collect and
 to act as a representative of the beneficiary, Bangalore office, DN,
 Bangalore office only deposed by the beneficiary.

B I warrant that the above information is true and correct and
 that the beneficiary is not a minor, idiot, lunatic, bankrupt, insolvent,
 or otherwise disqualified from receiving or holding property.

D I have read the above and agree to the terms and conditions of the
 above information.

Date

Authorized Signatory
 Designation Telephone No D code

Beneficiary

Bank Certificate

I hereby certify that the above information is true and correct and
 that the beneficiary is not a minor, idiot, lunatic, bankrupt, insolvent,
 or otherwise disqualified from receiving or holding property.

Date (.....)
 Place Signature

Please return the filled form **along with a blank cancelled cheque or photocopy** of the form to

Branch Name, Address,

Branch

Branch Name, Address, Mysore Road,

BAN A/R 560 026

In case of any query, please call on the number 080 255 55 55

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.
- The date of the stamp paper should be prior to the Air Way Bill / Bill of Lading date.
- 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	The Royal Bank of Scotland N.V.
10	Punjab National Bank	26	J P Morgan
11	Punjab & Sindh Bank		Private Banks
12	State Bank of India	27	Axis Bank
13	State Bank of Hyderabad	28	The Federal Bank Limited
14	Syndicate Bank	29	HDFC Bank
15	State Bank of Travancore	30	Kotak Mahindra Bank Ltd
16	UCO Bank	31	ICICI Bank
17	Union Bank of India	32	IndusInd Bank
18	United Bank of India	33	Yes Bank

Note:

- All BGs must be issued from BHEL consortium banks listed above.
- BHEL may accept BG from other Nationalised Banks also which are not listed above.
- BG will not be accepted from Scheduled Banks and Co-operative Banks.
- In case BG is issued from a bank located outside Indian territory and is issued in foreign currency, the BG must be routed through and confirmed by any one of the above mentioned consortium banks or any of the Indian Public Sector Banks.
- This list is subject to changes. Hence vendors are requested to check this list every time before issuing BGs.

ANNEXURE-VII
PROFORMA OF PERFORMANCE BANK GUARANTEE
(For Bank Guarantees issued in Indian Rupees by Banks in India)

Note:

- To be executed in Rs. 100/- Non-Judicial stamp paper.
- To be submitted by issuing bank to Purchase Dept. directly. Please give BHEL address to banker.
- Do not enclose with Bank document.
- Modifications and additions/deletions to this BG format are not permitted.

PERFORMANCE GUARANTEE (PROFORMA OF BANK GUARANTEE)

Ref no: (BG No.) _____

THIS DEED OF GUARANTEE made and executed on the _____ day of _____ (month & year), by the _____ (Bank), registered under the Companies Act 1956/Nationalised Bank constituted under the Banking Companies (acquisition and transfer of undertakings) Act constituted under the **State Bank of India Act / Subsidiary Banks Act**, having its registered / head office at _____ represented herein by its Branch Manager / authorised representatives Sri. _____ & Sri. _____ (Hereinafter called 'guarantor' which term shall mean and include its successors and assigns)

IN FAVOUR OF BHARAT HEAVY ELECTRICALS LIMITED

_____ (Buyer's Name), a company registered under the companies Act, 1956 having its registered office at BHEL House at Siri Fort, New Delhi-110 049 and its Electronics Division at Mysore Road, Bangalore - 26 (hereinafter referred to as the 'Company' Which term shall include its successors and assigns):

Whereas the company has placed an order on _____ (State the name of the company / firm and its address) (hereinafter referred to as the 'Supplier' which term shall mean and include its liquidators, successors and assign) for the supply of system under order / Contract No _____ Dtd _____.

AND WHEREAS the supplier has agreed to supply the materials and carryout the works as detailed and in accordance with the terms set out in the said order / contract.

AND WHEREAS the company is not required to pay to the supplier a sum of Rupees _____ being the 10% of the value of the goods supplied / Works performed / Services rendered under the said order / contract between the supplier and the company, till the company is satisfied with the mechanical Warranties and the performance standards stipulated in the said order / contract between the company and the supplier has been duly fulfilled, except, against a Bank Guarantee for the said sum of Rs. _____ in favour of the company by reputed Bank, in which case the company has agreed to make payment to the supplier of the said sum of Rupees _____ being (10%) of the value of the goods supplied / Works performed / Services rendered under the agreement between the supplier and the company and the Guarantor has at the request of the supplier, agreed to furnish this Guarantee subject to the terms and conditions stated below :

NOW THIS DEED WITNESSES THAT IN pursuance of the above said agreement, the guarantor hereby agrees and covenants with company is as follows:

- 1) That during the period this contract of Guarantee remains effectual, the guarantor shall be liable in respect of the amount due and owing to the company in respect of the payments to the extent of Rs _____ (in words) _____ against any loss or damage caused to or suffered by the company by reasons of any breach of the terms of the said order / contract / Agreement by the supplier
- 2) The Guarantor hereby undertakes to pay the amounts and payable under this guarantee without any demur, merely on demand from the company intimating that the amount claimed is due by way of loss or damage caused to or suffered or would be caused or suffered by any terms contained in the said order/contract. Any such demand made on the guarantor shall be conclusive as regards the amount due and payable by the Guarantor irrespective of the fact whether the contractor/supplier admits or denies.
- 3) The Guarantor further agrees that the agreement herein contained shall remain in force and effect till all supplies to be made /works to be performed / services to be rendered under the said order /contract /agreement are completed to the entire satisfaction of the company or till company certifies that the terms and conditions of the said order / contract agreement have been fully and

properly carried out by the said supplier and accordingly discharges the Guarantee. Unless a demand or claim under this guarantee is made on the guarantor in writing on or before the expiry of claim period indicated in clause 6 below, the guarantor shall be discharged from all the liability under this guarantee thereafter.

- 4) The guarantor further agrees with the company that the company shall have the fullest liberty without the consent of the guarantor and without effecting in any manner the obligations of the guarantor hereunder to vary any of the terms of the said order / contract / agreement or extend the time of performance by the said supplier from time to time or refrain from exercising the power exercisable by the company against the said supplier or to forebear or omit to enforce any of the terms and conditions relating to the said order / contract / agreement, and the guarantor shall not be relieved of its liability in whole or in part, by reason of any act, commission or forbearance on the part of the company or by reason of any such variation, or extension being granted to the said supplier or by reason of any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving the guarantor.
- 5) The guarantor undertakes not to revoke this guarantee during its currency except with the previous consent of the company in writing.
- 6) Notwithstanding anything herein above obtained, the liability of the guarantor under these presents is restricted to Rs._____. The guarantee shall be in force till its expiry on _____ unless a demand is made on the guarantor within SIX months from the date of expiry, all the liability of the guarantor under this guarantee shall stand fully discharged. The decision of the claimant in regard to breach of contract is final and binding on the Bank.

IN WITNESS whereof, the guarantor, acting through its authorised representative has executed this deed of Guarantee on the day, month and year first above written.

(Seal of the Bank to be affixed)
For & On behalf of _____ Bank
Signature of authorized person with
seal & designation

WITNESS:

- 1.
- 2.

ANNEXURE-VIII
PROFORMA OF PERFORMANCE BANK GUARANTEE
(For Bank Guarantees issued in Foreign Currency by Banks located outside India)

BANK NAME AND ADDRESS

Electronics Division
Bharat Heavy Electrical Limited (B.H.E.L.),
Mysore Road, P.B. No. 2606,
Bangalore- 560 026

Dear Sir,

Sub : CONTRACT PERFORMANCE GUARANTEE Ref no. Dtd.....

WHEREAS you have entered into a contract reference No & PO NO. _____
Date _____ with M/s _____ having its registered office at
_____ for the supply of _____ as detailed in your purchase
order No. _____ which is hereinafter referred to as "the said contract" and WHEREAS M/s
_____ has undertaken to produce a Bank Guarantee for 10% (Ten Percent)
of the contract price amounting to _____
(_____) to secure its obligations to Electronics Division, BHEL
having its registered office at New Delhi for the performance of the contract including the warranty of the
equipment supplied, We _____ Bank,
_____ hereby expressly, irrevocably and unreservedly undertake and
guarantee as principal obligors on behalf of M/s _____ that in the event Bharat
Heavy Electricals Ltd. (B.H.E.L.) declares to us in writing that M/s _____
has not fulfilled any obligors according to the contractual obligation of the said contract, to pay you on
demand and without demur to Bharat Heavy Electricals Ltd., Electronics Division, Mysore Road, P.B.No.
2606, Bangalore - 560 026., India an amount of _____
(in words _____) subject to
as may be determined below :

1. Notwithstanding any right M/s. _____ may have directly against or any
disputes raised by M/s. _____,
_____, Your written demand shall be conclusive
evidence to us that repayment is due under the terms of the said contract and shall be binding on
us.

2. We shall not be discharged or released from this undertaking and Guarantee by any arrangements, variations made between you and M/s. _____ with or without our consent and knowledge or by any alteration in the obligations of M/s. _____ by any forbearance whether as to payment, time, performance or otherwise.
3. This guarantee shall remain valid until the end of six months after the close of the warranty period or until the same is reported by BHEL to us whichever is earlier.
4. We agree and undertake not to revoke this guarantee during its validity unless discharged in writing by you subject to the provision of clause (7) below :
5. This guarantee shall be a continuing guarantee subject to the foregoing and shall not be discharged by any change in the constitution of the Bank or M/s. _____ .
6. This guarantee shall be governed by and constructed in accordance with the Laws of India.
7. At any time _____ Bank may render this guarantee null and void by paying to Bharat Heavy Electricals Ltd. the full amount being _____ (in words _____)
_____)

**For and On behalf of Bank
By its Authorised Signatory**

Annexure - IX
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-II dtd
Category: (Micro/Small). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as
on date..... **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 Industries vide its notification No.S.O.1722 (E) dated October 5, 2006:

- 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.

Date:

(Signature)

Name -

Membership Number -

Seal of Chartered Accountant

Guidelines for Indian Agents
ANNEXURE - X

- 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---

endor s ignature it eal

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/ retainerhip 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.

Disclaimer Certificate For Deemed Export Benefits

I, (Name & Designation)on behalf of M/s. (Name and address of the supplier) hereby certify that we have supplied the following goods to M/s..... (Name and address of the recipient):

S.No.	Inv. No. & date	Description of goods	Unit	Qty.	Value

1. We are the manufacturer exporters/suppliers and are registered/not registered with Central Excise and have not availed and will not avail CENVAT facility in respect of the input/components used in aforesaid supplies. We have also not availed and will not avail rebate on the inputs/components used in aforesaid supplies.

OR

We are the suppliers and our supporting manufacturer(s) is/are registered/not registered with Central Excise and have not availed and will not avail CENVAT facility in respect of the inputs/components used in aforesaid supplies.

2. We also certify that we have not been issued any Advance Authorization/Duty Free Import Authorization in respect of the aforesaid supplied goods and have not availed any benefit thereon.

3. We further state that we have not drawn nor will draw any benefit for deemed export and we have no objection if M/s..... (Name and address of the recipient) draws the deemed export benefits on the supplies mentioned above. (Required to be given in case benefits are claimed by recipient of goods).

OR

We have not given disclaimer certificate to M/s..... (Name and address of the recipient) and will not give disclaimer certificate, in future, in respect of these supplies for claiming deemed export benefits (Required to be given in case benefits are claimed by DTA suppliers).



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(A Government of India undertaking)

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Mysore Road Bangalore | India

CE: PR: 002- Rev 00

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT

These 'General Commercial Conditions for Contract for Purchase' hereinafter 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.

- '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.
- '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.
- '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.
- 'Parties to the Contract' shall mean the 'The Vendor' and the Purchaser as named in the main body of the Purchase Order.

Interpretation:

In the contract, except where the context requires otherwise:

- words indicating one gender include all genders;
- words indicating the singular also include the plural and words indicating the plural also include the singular;
- provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
- "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 unless otherwise such variations / escalations are provided for and agreed by BHEL in writing in the purchase order.
2. **Validity:** The offer will be valid for a period of 120 days from the date of technical bid opening date. Validity beyond 120 days, if required, will be specified in the SCC (special conditions of contract).
3. **Ordering and confirmation of Order:** Vendor shall send the order acceptance on their company letter head within two weeks from the date 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 two weeks (or the time limit as specified / agreed by BHEL) from the date of the purchase order.
4. **Documentation:** After receipt of Purchase Order, vendor should submit required documents like 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.
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.
5. **Penalty:**
For delay in documentation: In the event of delay in submission of complete set of 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 three weeks (or as agreed/indicated in the Purchase Order) from the date of Purchase Order, 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.

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 document approval by customer / BHEL or date of issue of manufacturing clearance, whichever is later. 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 documentation/delayed delivery, if applicable, shall be deducted at the time of first 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.
6. **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 applied to 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.

7. Reverse Auction: BHEL reserves the right to follow REVERSE AUCTION PROCEDURE (ONLINE BIDDING ON NETWORK) before finalising the Purchase order on technically competent bidders, as per the guidelines given in Annexure III. 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.
8. 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.
9. 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.
10. 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.
11. 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 (L x B x H) 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.
Separate packing & identification of items should be as follows.
 1. Main Scope - All items must be tagged with part no. & item description.
 2. Commissioning spares - All items must be tagged with part no. & item description.
 3. Mandatory spares - All items must be tagged with part no. & item description.

12. 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.
13. 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.
14. 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 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.
15. 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.
16. 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.
17. Shortages: In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages shall be made good within a reasonable time that BHEL may allow from such intimation and free of cost. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will have to be reimbursed by the Supplier.
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.
18. 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.
19. 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.

20. Product Information, Drawings and Documents: 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.

21. 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.

22. 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.

23. Guarantee / Warranty: Wherever required, and so provided in the specifications / Purchaser Order, the Seller shall guarantee that the stores supplied shall comply with the specifications laid down, for materials, workmanship and performance. Unless otherwise specified, guarantee / warranty period shall be 30 months after the date of delivery of goods or 24 months from the date of commissioning of goods whichever is earlier. The guarantee / 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 guarantee / warranty period.

24. 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.

25. Liability during guarantee / warranty: Vendor shall arrange replacement / repair of all the defective materials / services under its obligation under the guarantee / 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 first time commissioning or use, vendor shall be responsible for replacement / repair of the goods as required by BHEL at vendor's cost. In all such cases expiry of guarantee / warranty will not be applicable.
26. Liability after guarantee / warranty period: At the end of the guarantee / warranty, the Vendor's liability ceases except for latent defects (latent defects are defects / performance issues notices after the guarantee / warranty has expired). The Contractor's liability for latent defects warranty for the plant and equipment including spares shall be limited to a period of six months from the end of the guarantee / warranty period of the respective plant and equipment including spares or first time commissioning whichever is later but not later than 3 (three) years from the date of shipment.
27. 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.
28. 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).
29. Arbitration Clause: In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred by either party to the sole arbitration of an Arbitrator appointed by the Executive Director/ General Manager of the purchasing unit/ region/ division of BHEL. Vendor shall have no objection even if the Arbitrator so appointed is an employee of BHEL or has ever dealt/ had to deal with any matter relating to this Contract.
Subject as aforesaid the provisions of the Arbitration and Conciliation Act, 1996 of India or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. It is a term of contract that the party initiating arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute. The venue for the arbitration shall be Bangalore, India. The award of the arbitrator shall be a speaking award and shall be final, conclusive and binding on all parties to this contract.
The cost of arbitration shall be borne equally by the parties. Notwithstanding the existence of any dispute or difference or any reference for the arbitration, the vendor shall proceed with and continue without hindrance the performance of the work under the contract with due diligence and expedition in a professional manner.
30. 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.

31. 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.



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**PROJECTS : 1.) GADARWARA STPP STAGE-I (2x800 MW) Station C&I
2.) FGUTPP-IV UNCHAHR (1x500 MW) EPC Package**

CUSTOMER : M/s NTPC

**UPS SYSTEM WITH ACDB
(3 Ph Input, 1 Ph Output)**

**SECTION-A
GENERAL INSTRUCTION TO BIDDERS**

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THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

- 1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.
- 2.0 **Introduction:** Bidders are required to offer Three Phase Input, Single Phase Output UPS Systems as per BHEL Technical Specifications
- 3.0 In order to accept the Technical offers/ proposals from Bidders mentioned in BHEL Technical Specification, certain Pre-qualification criteria are required to be met by Bidder.
- 4.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL’s acceptance.
- 5.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder’s Technical offers will not be evaluated.
- 6.0 **Evaluation methodology:** BHEL shall initially open Bidder’s PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder’s Technical offer as per CI 2.0 of above for evaluation. In the event of acceptance of Bidder’s technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.
- 7.0 **Bidders are required to submit offers as detailed below:**
 - aa. Documents pertaining to Pre-Qualification requirement (Cl. AA of section B) shall be in a separate cover with reference no. “CE/416/UPS/PQR/CI AA of section B” marked on it.
 - bb. Documents pertaining to Pre- Qualification requirement (Cl. BB of Section B) shall be in a separate cover with reference no. “CE/416/UPS/PQR/CI BB of section B” marked on it.
 - cc. Technical offers/proposals for requirements mentioned in BHEL Technical Specifications shall be submitted with Project Name & reference marked on it.
- 8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.
- 9.0 Please note that Batteries for these UPS Systems will be procured by BHEL Separately. Hence, Batteries shall not be considered in Bidder’s offer.



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PROJECT : SURATGARH THERMAL POWER STATION STG-V 2x660 MW

CUSTOMER : M/s RRVUNL

CONSULTANT : M/s TCE, BANGALORE

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

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AA. Pre-Qualification Requirements (PQR) of Bidders for UPS System (Three Phase Input, Single Phase Output), as a part of offer:

- 1.0 Submit Reference List of Projects where in offered UPS System is supplied & commissioned along with details of performance and Year of Commissioning of the UPS System specified in BHEL Technical Specifications.
- 2.0 Bidder should have manufactured and supplied atleast one (1) numbers of minimum 105 kVA or above, 3 Phase Input, 1 Phase Output UPS Systems in at-least one (1) different industrial installations, which should be in successful operation for atleast one(1) year as on June 2013. This satisfactory performance certificate shall be from End-User only.
- 3.0 Submit List of Projects for which Erection & Commissioning has been carried out by subsidiary / Authorized Indian representative for last two years.
- 4.0 Submit duly- filled Source Request form (SRF), which shall be filled online by Bidder in our website www.bhel.com and print-out shall be submitted.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

- 1.0 Technical literature/Manuals & Catalogs of offered UPS System.
- 2.0 Un-priced Purchase Order copies
- 3.0 Reports of successful erection & commissioning Protocols & Minutes of the meetings.
- 4.0 Name & registered address of the Indian branch office or Indian representative for support of Erection & Commissioning and after sales service with Organization chart.
- 5.0 Details of Manufacturing, testing & inspection facility.
- 6.0 Bidder shall have facility in India for Engineering activities, preparation of Documents, servicing of offered UPS Systems, Stocking of Spares, etc. submit these details.
- 7.0 Bidders shall submit following Type test reports for offered UPS Systems as per IEC 62040-3: latest /equivalent standard.
- 8.0 Routine & Acceptance Tests shall be conducted as per IEC 62040-3: latest /equivalent standard considering sample of cells pertaining to a lot.
- 9.0 If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, Supply, Erection, Commissioning and Servicing of the offered UPS Systems. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of the agreement.

Importantly note: - In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily Rejected and Bidder's Technical offers/proposals will not be Evaluated. Please read carefully the General instructions in Section A of this specification.



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PROJECT: GADARWARA STPP STAGE-I (2x800 MW) STATION C&I

CUSTOMER : M/s NTPC

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SPECIFICATION
FOR
UNINTERRUPTIBLE POWER SUPPLY SYSTEM(UPS)
Including UPS BATTERY

REVISION:00

APPROVED

RAJASEKAR K

PREPARED

SATHISH

ISSUED

416

DATE

30/06/2015



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CONTENTS

Sl. No.	Description	Reference.
1.	Scope of Supply	CE/416/GADARWARA/UPS/SOS, Rev.00 Sheets 06
2.	Technical Requirements	CE/416/GADARWARA/UPS/TR, Rev.00 Sheets 16
3.	Feeder List	CE/416/GADARWARA/UPS/TR, Rev.00 Sheets 02
4.	Typical Battery Sizing Calculation	CE/416/GADARWARA/UPS/BSC, Rev.00 Sheets 02
5.	Type & Routine Acceptance Test	CE/416/GADARWARA/UPS/TAT, Rev 00 Sheets 05
6.	Quality Plan Format	CE/416/GADARWARA/UPS/QP, Rev 00 Sheets 02

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PROJECT: GADARWARA STPP STAGE-I (2x800 MW) STATION C&I

CUSTOMER : M/s NTPC

SCOPE OF SUPPLY

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REVISION:00

APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED

ISSUED

DATE

Sathish

SATHISH

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30/06/2015



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SCOPE OF SUPPLY

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

- A. GADARWARA STPP STAGE-I (2x800 MW) STATION C&I** → **2 SETS**
150 kVA, Single-phase 0.8 p.f lagging 230V AC, 50Hz parallel redundant UPS guaranteed at 50 deg. C as per manufacturer catalog. If any manufacturer doesn't have UPS guaranteed at 50 deg C, the vendor shall offer as per their manufacturing standards at 40/45 deg C.
- B. Each UPS system comprises** →
- | | |
|-----------------------------------------------------------------------------------------------------------------------|----------|
| 01. 100% Capacity Static Inverters | 2 Nos. |
| 02. 100% Capacity Static Switches | 2 Sets |
| 03. Manual Bypass Switch. | 1 Set |
| 04. Input Isolation Transformers | 2 Nos. |
| 05. 100% Capacity float cum boost chargers | 2 Nos. |
| 06. UPS Battery (Ni-Cd Battery with accessories for 1 hr. duty cycle at 100 % load) | 1 Set ** |
| 07. Battery Health Monitoring System | 1 Set |
| 08. Step down transformer 415V, 3 Ph. to 230V, 1 Ph. | 1 No. |
| 09. Servo Controlled Voltage Stabilizer. | 1 No. |
| 10. AC power Distribution boards | 2 Nos. |
| 11. Battery isolation box(housed in UPS panel) | 1 Set* |
| 12. Accessories of UPS system, in line with specification including suitable interconnection cables, cable lugs, etc. | 1 Set |
- C. 2 Sets of Static Switch Panel comprising of 10 Nos Auto Transfer Switch for loads covered in SI.No A of Feeder List attached.**

Note: The interconnection cables shall be from Battery to UPS, between UPS, between UPS to ACDB (to be offered on per meter basis). The cable quantity from Battery to UPS shall be 100 metres per run and from UPS to ACDB shall be 25 metres per run.

MODBUS cable of 100 meters per run is to be provided per charger / inverter combination for DCS connection. Therefore since each UPS system has redundant charger/inverter, this cable shall be 200 mtrs under each UPS system.

*** Battery being procured by BHEL separately.*

- C. Erection supervision, complete commissioning & handing over.** → **2 Sets**

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1.1.1 MANDATORY SPARES: (Common for the complete project)

- | | |
|--------------------------------------------------------------------------|---------------------------|
| a) Silicon Controlled thyristors, diodes and Power Transistors | 100% |
| b) Capacitors | 1 Set |
| c) CT's, CVT's, VT's, chokes, AC/DC isolators contactors, timers, relays | 10% of each type & rating |
| d) Fuses of each type and rating | 200% |
| e) Fuse free circuit breakers | 5% |
| f) Electronic modules of each type | 10% |
| g) Lamp holder with series resistor, if any | 10% |
| h) Cooling Fans | 2 Nos of each type |
| i) Digital/Analog panel meters/indicators | 1 No. of each type |
| j) Relay of all types including overload relays | 10% |
| k) Indication Lamps | 100% |

1.1.2 In addition to above spare miscellaneous parts for inverters, chargers, distribution panel's batteries, etc., shall be furnished in accordance with manufacturer's standards. Bidder shall indicate list of such spares in his offer under miscellaneous spares. Also, please note that fuses and circuit breakers mentioned under mandatory spares shall be provided against ACDB requirement also, apart from requirement under complete charger/inverter combinations.



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2.0 GENERAL TERMS & CONDITIONS

- 2.1 Since the projects, are bunched together based on commonality of some aspects such as specifications, vendors, customers, etc., will be technically evaluated as a package, the participating vendors should quote for all the items.
- 2.2 Considering possibilities of change in requirement i.e. increase/decrease of loads & feeder quantities for individual project feeder list after system design finalization at a later date, **the vendor must clearly quote for the UPS model with the most suitable kVA rating (150 kVA) and next higher kVA rating (160 kVA) and next lower kVA rating (140 kVA) ones in the same offer.** If any vendor does not have the mentioned UPS rating, still the vendor is eligible for offering as the rating may get increased during detailed engineering.
- 2.3 **As battery is to be sized after the finalization of UPS kVA rating, the vendor shall quote for all the mentioned loads in the typical battery sizing calculation sheet.**
- 2.4 Similarly, the vendor must clearly quote for unit price as well as lot price for all the selected UPS & UPS battery models including accessories and cables (for UPS System only) for indisputable calculations of lot prices in case of revised quantities later.
- 2.5 The type tests are as listed as part of the specification & if the type tests are not specifically conducted, then same are to be offered with unit rates in offer. However, in either case, the type tests reports are to be submitted for BHEL/ Customer approval in case of order.

3.0 GENERAL TECHNICAL REQUIREMENTS

- 3.1 The output voltage, current and frequency transducers (4-20mA DC) are to be provided (total 3 numbers) per each ACDB as a standard for remote monitoring. Apart from this, transducers related to input voltage and current at charger limbs and SCVS are to be provided (total 6 Nos. per UPS), transducers for Battery Voltage and Current. All these transducers are remote monitoring wired to UPS. All above analog signals are apart from Binary potential free contacts provided as meaningful information to DCS.
- 3.2 Mandatory spares may be finally applicable for the projects which will be informed to participating vendors during technical evaluation. Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by the Bidder shall be the specified percentage (%) of the total population required to meet specification requirements for 500 MW projects. In case, the quantity of mandatory spares so calculated happens to be a fraction, the same shall be rounded off to the next higher whole number.
- 3.3 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.
- 3.4 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.
- 3.5 Routine & Acceptance tests shall be done as per relevant standards. Temperature rise test is also to be done 100% for 10-12 hours duration each time (till temperature stabilizes).



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3.6 Considering the fact, separate quotations are being sent for UPS vendors and UPS battery vendors separately. Battery will be sized corresponding to the UPS manufacturer and accordingly UPS & Battery orders will be placed. Battery order will be placed after determining the UPS vendor and UPS rating. However, both UPS and battery vendors have to offer lumpsum unit rates for erection supervision & commissioning of UPS, erection supervision & commissioning of Battery with overall integration of complete system being responsibility of UPS vendor.

3.8 Protection class of all UPS, Voltage Stabilizer and ACDB panels shall be IP22 as per IS2147.

3.9 Material Thickness = All sides are 1.6 mm CRCA, Mounting plate 3mm, Gland plate = 3mm. Also please note that panel construction shall be with base/bottom frame of approximate height as 100mm (3mm thick) and anti-vibration pad as 15mm thick-all details as per manufacturer standard. Enclosures shall be furnished with concealed hinges. Front and Rear doors shall be designed to permit easy access to all components for maintenance and 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.

3.10 Adequate ventilating louvers and enclosure top panels shall be indicated. All vent openings shall be covered with corrosion resistant fine screen coverings.

3.11 The colour shade of panels exterior/interior shall be as per RAL9002, end panel cover shall be as per RAL 5012.

4.1. DOCUMENTS TO BE FURNISHED

4.1.0. Following documents shall be furnished to BHEL as a minimum, apart from any other documents required to be submitted as called for elsewhere or as deemed necessary.

4.1.1. **Along with the Technical offer:** For technical evaluation, vendor must send one (01) set of the following documents in hard copy, without which your offer is liable to be rejected.

01. Single line diagram
02. GA drawings
03. Circuit diagrams
04. Fault co-ordination details
05. Charger/Inverter rating calculation
06. Battery sizing calculation (as per IEEE or Equivalent Standard)
07. Battery curves
08. Technical write-up
09. Technical literature / Catalog of each component
10. Data sheet of complete system/subsystem
11. Wiring diagram/interconnecting arrangement details
12. Complete Bill of Material with make & Model
13. Mandatory spares list.



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13. Clause-wise deviation list

NOTE: - Later no explanation on noncompliance or deviation, stated or observed, may be acceptable. Incomplete offers (without documents / not relevant documents as mentioned above) will be technically rejected without any notice.

4.1.2 **After placement of Purchase Order within 1 week:** For BHEL/CUSTOMER approval, vendor must send One (1) set of the following documents in hard copy & soft copy.

- a) All documents Sl. No 01 ~ 13 as above.
- b) Interfacing diagram & cable type details used or suggested.
- c) Quality Plan format enclosed as part of the specification.

4.1.3. **After Type Test but before Inspection :** For BHEL/CUSTOMER approval, vendor must send eight (8) Sets of the following documents in hard copy.

- 01. Type test reports/Certificates as per specification/approved QP

4.1.4. **After Inspection but 1 week before dispatch:** For BHEL/CUSTOMER approval, vendor must send two (2) sets of the following documents one in hard copy & one in soft copy.

- 01. Preliminary Instruction /O&M Manual

4.1.5. **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.)

4.1.6. **After despatch of material within 1 week :** Vendor must send two (2) set of the following **"As Built & Approved"** status documents one (1) in hard copy & one (1) in soft copy directly to the project site.

- (a) Instruction/O&M Manual

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 compatible with Windows-95/98/NT/2000 with drawing/documents in AutoCad-14/MS-Word/MS-Excel/Acrobat formats. Soft copy to be supplied for datasheet/document/ drawings at approval stage also.

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PROJECT: GADARWARA STPP STAGE-I (2x800 MW) STATION C&I

CUSTOMER : M/s NTPC

TECHNICAL REQUIREMENTS

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REVISION:00

APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED

ISSUED

DATE

Sathish

SATHISH

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30/06/2015



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This specification covers the requirement of an Uninterruptible Power Supply (UPS) System comprising of static inverters, static switch, manual bypass switch, chargers, battery banks and DC & AC distribution boards.

The equipment covered under this specification shall meet the requirements of latest edition of all applicable codes and standards like ANSI, NEMA, IEEE, and IEC. NEC & IS. The UPS equipment and the complete system shall have surge withstand capability (SWC) to meet the requirements of ANSI C37. 90a, IEEE Standard 472. 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 BHEL/CUSTOMER approved drawings. All equipment and accessories required for completeness of this system shall be furnished by the Bidder within the quoted price whether these are specifically mentioned herein or not.

All non interrupting components of UPS system shall be capable of withstanding all available short circuit currents without damage. Additionally, all circuits interrupting components shall be capable of withstanding and interrupting all encountered short circuit currents without damage.

UPS provided with fuse free circuit breaker shall be preferred. However In case, it is the standard practice of manufacturer to use fast current limiting fuses at inverter output etc. to protect its power semiconductors devices, the same shall be acceptable. However, in AC distribution board either fuse-free circuit breakers shall be employed same shall be of HRC type only. In any case selective fuse(fuse free circuit breaker) coordination shall be provided by Bidder to ensure that only the fuse (fuse free circuit breaker) nearest to the fault will open and isolate the faulted circuit. Other branches of the distribution system will be unaffected and the fault will not cause more than one fuse to open. Further it will be the sole responsibility of the UPS supplier to Engineer/design this system keeping in view the basic guideline as indicated elsewhere in specification like selectivity ratios etc.

The selection and selective coordination of all the protecting devices including fuse free circuit breakers / fuses shall conform to the requirements of National Electric Code (NEC) 1984 and other applicable standards. The selectivity ratios of the fuses (fuse free breakers) shall be such that there is a sufficient margin between the total electric energy of the downstream fuse and the total melting energy of the upstream fuse. The selective ratio shall be as finalized during detailed engineering stage but the same shall be not less than 2:1 in any case.



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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 UPS system shall have 2x100% parallel redundant chargers and inverters. 1x100% battery bank, bypass line transformers and voltage stabilizer, static switch, manual bypass switch, AC/DC distribution boards, other necessary protective devices and accessories and shall meet the following requirements as a minimum.

1.1 The KVA rating of UPS arrived at shall be guaranteed at 50°C ambient. 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 applicable ambient temperature. 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. The sizing of UPS shall be based on the power factor of loads being led subject to maximum of 0.8.

2.0 Each of the redundant chargers & batteries shall meet the specification requirements are as follows :

2.1 Float cum boost chargers

2.1.1 Each of the two sets of 2X100% redundant chargers shall be sized to meet the 100 % load requirements of the control system plus recharge the fully discharged battery within 8 Hours.



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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 output regulation shall be $\pm 1\%$ from no load to full load with an input power supply variation of $\pm 10\%$ in voltage and $\pm 5\%$ 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. Further isolated 4-20mA signals shall be provided for important parameters like charger voltage, etc.

2.1.2 The Bidder shall furnish the charger rating calculations to the BHEL/NTPC/ to satisfy that this requirement is met. The charger shall be furnished as per rating approved by the BHEL/NTPC/ during engineering stage without any price repercussions whatsoever. Typical calculation for sizing the capacity of the chargers to be followed by the Bidder is enclosed as part of the specification and the Bidder must adhere to the same strictly while sizing the capacity of the chargers to be offered by him.

2.1.3 The chargers shall be served from a 415V, 50 Hz, 3 phase 3 wire system. The chargers shall maintain the output voltage within $\pm 1.0\%$ from no load to full load with an input power supply deviation in voltage level of $\pm 10\%$ and input power supply deviation in frequency of $\pm 5\%$ and with both deviations present in any combination.

2.1.4 In addition to supply DC power for inverters, the chargers shall be designed to charge a fully discharged battery 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.

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

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

2.1.7 Suitable devices/hardware shall be provided to alarm charger output voltage higher than adjustable present limit. Further, charger shall be tripped automatically on charger output voltage high-high (adjustable). This aspect shall be further discussed during detailed engineering.

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



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2.1.9 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.

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

2.2.0 BATTERY CHARGER AUXILIARY EQUIPMENT

In addition to the battery charger specified herein, auxiliary equipment shall be furnished with each charger as follows :

2.2.1 Equipment and materials furnished, mounted and wired on the front panel of the charger enclosures:-

ITEM	QUANTITY
a) AC voltmeter, indicating at input with required scale range and 2%accuracy	1 No.
b) DC voltmeter, indicating output with required scale range and 2%accuracy	1 No.
c) DC Ammeter, indicating output Amperes with required scale range and 2% accuracy	1 No.
d) Charger ON-OFF push buttons	2 Nos.
e) Potentiometers, one "Float voltage adjust" and" one Equalizing voltage adjust " both with manual adjustment knobs. The settings of these knobs shall be independent of each other.	2 Nos.
f) Selector switch of selecting "float charge" or "Equalizing charge "	1 No.
g) Charging rate setter	1 No.
h) Selector switch & lights for ground fault detector	1 Set
i) Equalizing charge timer(0-72 hrs.) with manual reset	1 No.



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2.2.2 Indicating light listed below with proper actuating devices, circuitry and legend shall be furnished on the front of UPS panels. One set of electrically independent potential free contacts shall be wired to the "Integrated Distributed Digital Control Monitoring and Information System". The following indications shall be furnished as minimum :-

- a) Failure of input AC supply to the charger.
- b) Charger failure.
- c) System on battery operation.
- e) Inverter Failure
- f) Bypass failure
- g) Load on Bypass
- h) Low Battery

3.0 BATTERIES

3.1.0 The batteries shall be heavy duty Nickel-cadmium type and shall be sized for an hour of full load operation. Ni-Cd batteries shall conform to IS: 10918. For sizing calculation, an aging factor of 0.8 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.

3.1.1 Bidder shall furnish battery sizing calculations, supporting curves/data etc. with the proposal to demonstrate to BHEL/NTPC/ that the proposed battery capacity meets the above specification requirements at maximum temperature as well as minimum ambient temperature condition of 4°C.

3.1.2 Cells shall be Ni-Cd, sealed type assembled in heat resistance; shock absorbent, poly propylene type containers with cover fused or cemented in place to form a permanent leak-proof seal. Each cover shall be fitted with vent plugs.

3.1.3 The plate structure shall be provided with adequate separators, suspensions and supports so that all plates are permanently aligned and protected from breakage.

3.1.4 Sufficient sediment space shall be provided below the plates to eliminate the necessity of sediment removal during normal battery life.

3.1.5 Each cell container shall be clearly marked for low and high electrolyte level limits on all four sides.

3.1.6 Vent plug shall be of such a design to allow escape of gases but not of acid spray and shall be explosion proof.



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3.1.7 All cell terminals shall have adequate current carrying capacity and shall be lead alloy or approved equal material.

3.1.8 Cell terminals posts shall be suitable for bolted connection and shall be equipped with complete connector bolts and nuts. Cell posts shall be sealed against creepage of electrolyte either by burned ring seals or by lead alloy seal nuts or equivalent.

3.1.9 Cells shall be arranged on two step battery rack so that the edges of the plate are conveniently visible.

3.1.10 Racks shall be of mild steel construction in accordance with applicable codes and standards. AISC specification shall apply in the absence of another applicable design specification.

3.1.11 Each cell shall be assigned an identification number. Identification numbers shall be clearly and permanently marked on the front of the rack structure so that individual cells are easily identifiable. In addition, the polarity markers shall be furnished for the end cells.

3.1.12 The UPS Battery shall have sufficient amp-hour capacity to supply 100% full load current of UPS for 60 minutes. For this, the UPS capacity to be considered as the finally selected UPS rating, irrespective of the actual load on UPS. A drop of 4V from battery room to inverter input shall be considered for design.

3.2.0 BATTERY ACCESSORIES

Each battery shall be complete including the following equipment and material:

01 Nickel coated copper inter-cell connector to provide not less than 1.27 cm between cells.

02 Nickel coated copper inter-step connectors to connect between the rows of cells on the two steps of the battery rack.

03 Connector bolts with acid resistance nuts.

04 Cell lifting facility. – 1 Set.

05 Spanners. – 2 nos

06 Vent plug hydrometer. – 2 nos

07 Set of hydrometer syringes suitable for vent holes in different cells – 2 nos

08 Vent plug thermometer for measuring electrolyte Temp. – 2 nos

09 Wall mounting type holder made of teak wood for hydrometer & thermometer – 2 nos

10 Cell testing voltmeter (3-0-3V) – 3 nos

11 Alkali mixing jar – 2 nos



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- 12 Rubber apron – 5 nos
- 13 Pair of rubber gloves – 5 nos
- 14 Set of spanners – 5 nos
- 15 No smoking notice for each battery room – 2 nos
- 16 Goggles (Industrial) – 2 nos.
- 17 Instruction card -- 5 nos.
- 18 Temperature Indicator – 1 no
- 19 Discharge resistance – 1 set.
- 20 Electrolyte level check & fill equipments – 1 No.
- 21 Corrosion preventive grease – 1 Set.
- 22 One set of numerals (one numeral per cell) suitable for permanent attachment to cells.

NOTE:

- 1.) Accessories for Ni-Cd battery shall be offered as per above which are subject to BHEL/Customer approval.
- 2.) Suitable termination with isolation/DCDB shall be provided at battery set output for proper isolation of battery set at battery end. This Battery isolating switch shall be wall-mounting type in IP55 enclosure.

4.0 The UPS system shall be capable of operating without DC 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.

4.1 The UPS system design shall ensure that in case of failure of line input power supply to one of the chargers, the other 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 DC battery at all load conditions. The bidder should note that this situation should not in any way lead to the discharge of the DC Battery.

4.2 Both the inverters/chargers shall not be housed in single cubicle. One inverter one charger can be housed in one common cubicle i.e. there will be two such cubicles per UPS system if the same is standard and proven practice of the bidder.

**4.3 BATTERY HEALTH MONITORING SYSTEM:
(Make : M/s Eltek (or) M/s Emerson (or) M/s Hitachi-Hirel**

BHMS shall include microprocessor based hardware and software to monitor the condition of each battery cell of UPS Battery on-line. With BHMS it shall be possible to measure & analyse 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 DDCMIS and provide necessary alarms for protection of battery cells.



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5.0 STATIC INVERTER

i. 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 static 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 atleast 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 48-52 Hz, field adjustable in steps of 1 Hz. Each inverter shall have an overload capacity of 125% rated capacity for 10% minutes and 150% rated capacity for 10 seconds.

ii OVER LOAD, SHORT CIRCUIT AND LOAD LOSS

The inverter shall be provided with suitable HRC fuses at the input and output which will permit proper coordination with other protective devices and at the same time protect the inverter against damage due to internal faults. However, if the bidder's system design does not use fuses then the fuse free circuit breaker may also be permitted provided it meets the specification requirements. All necessary equipment shall be provided to protect the inverter against overload, short circuit & 100 % loss of load. The inverter shall be self protecting against damage if energized with full load connected.

iii Inverter equipment shall include all solid state circuitry and devices including stable oscillator etc to enable inverters to operate satisfactorily in parallel sharing mode each inverter taking 50 % load during normal operation.

In case of failure of either inverter, 100% load shall automatically be transferred to healthy inverter without any break and degradation in the quality of UPS output and disconnecting the faulty inverter automatically.

iv The inverter failure shall be alarmed and the healthy inverter shall get synchronizing signal from the standby AC source and remain synchronized within the set limits. The limits for the synchronization between healthy inverter and standby AC source shall be field adjustable.

v On failure of both inverters, the loads shall be transferred to standby AC power without a break if within synchronization limits. Provision of asynchronous transfer with a break in case of inverter being out of synchronization limits shall also be there with standby source.

6.0 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 inverter and

(ii) from faulty inverter to stand by AC source in case of failure of both inverter.

The transfer time shall be $\frac{1}{4}$ cycle maximum in synchronous mode.



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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.

7.0 STEP DOWN TRANSFORMER & VOLTAGE STABILIZER

7.1 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.

7.2 AUXILIARY EQUIPMENT

All required auxiliary equipment / materials as finalized during detailed engineering shall be furnished with each charger / inverter / 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/ lamps, ground detector system) battery accessories like (inter cell connectors, inter step connectors battery racks etc) further, isolated 4 -20mA signals for important parameters and potential free contacts for important alarms shall be provided for use in DDCMIS.

7.3 Each inverter shall have the necessary control switches, push buttons and indicating lamps on the front panel door for its independent start up and shut down. It should be possible to isolate each inverter on the input as well as the output side by means of DC and AC MCCBs.

7.4 Indicating lights listed below with proper actuating devices, circuitry and legend shall be furnished on front of UPS panels. For these abnormal conditions which could be of a momentary nature, the indicating lights shall remain energized and the Contact remain closed until cleared by a reset push button furnished on the panel. The indicating lights shall be of make subject to BHEL/NTPC/ 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) DC input loss to the inverter : High
- d) Inverter A output voltage : High
- e) Inverter B output voltage : High
Avoid unnecessary alarm due to low voltage on load in rush etc).
- f) Inverter A output voltage low. - With a time delay.
- g) Inverter B output voltage low. - With a time delay.
- h) Inverter A failure.
- i) Inverter B failure.
- j) Inverter fuse failure.
- k) Redundant fan failure and temperature high (if provided)
- l) Standby AC source failure
- m) Inverter A/Inverter B not synchronized with stand-by AC source
in case of failure of inverter B/inverter A respectively.

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- n) Automatic transfer to stand by AC source & Inverter A/Inverter B feeding 100% UPS load.
- o) Stand by source feeding 100% UPS loads.
- p) Inverter A overload Trip.
- q) Inverter B overload Trip.

7.5 In addition to the above lamps one potential free change over contact shall be made available (wired up to the terminal block) for each of the above conditions to be connected to other systems.

7.6 The following meters shall be provided as minimum, mounted on front of inverter panels for each inverter :-

- i) DC input voltmeter.
- ii) DC input Ammeter.
- iii) AC output voltmeter.
- iv) AC output Ammeter.
- v) Frequency meter.
- vi) Output KVA meter.
- vii) Power factor meter.

7.7 The above listed instruments shall be of $\pm 1\%$ accuracy class. Inverter ON/OFF switch & Alarm reset Push Button shall also be provided for each inverter.

7.8 Bidder shall furnish the power supply distribution scheme, single line diagram, all calculation such as charger/inverter rating calculations, battery sizing calculation etc. during offer stage itself and during detailed engineering stage for owner's review and approval.

7.9 ACDB

7.9.1 AC distribution panel of CRCA sheet steel construction shall be supplied for 2 wire AC single phase distribution with a solid neutral bar.

7.9.2 The phase and neutral bars shall be of copper.

7.9.3 Rating of the main lugs shall be equal to the rated continuous full load current of each inverter.

7.9.4 The panel boards shall be rated for 600V AC. All outgoing switches shall be load breaker, air break type provided with quick make breaker manual operating mechanism.

7.9.5 Each UPS load shall be fed from redundant feeder from AC distribution board "A" and other AC distribution board "B" ie all the UPS loads shall be fed from both the distribution boards A & B. Each AC distribution panel board shall have all the required HRC slow acting fuses, switches and other devices. The exact nos and rating etc. of HRC slow acting fuses, switches shall be as finalized during detailed engineering without any price repercussions. BHEL/NTPC/ decision shall be final in case there is any disagreement in Bidder's opinion and BHEL/NTPC/ view.



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8.0 Factory Tests:

8.1 The complete UPS system, including all instruments and devices shall be subjected to standard factory tests (i.e. Type Tests and Routine Tests) as per IS, NEMA, IEEE, IEC-146 standards wherever applicable.

8.2 The following Type tests shall be conducted as a minimum requirement as per IEC-146 Standard.

- i) Frequency regulation test.
 - ii) Voltage regulation test.
 - iii) Current limiting test.
 - iv) Transfer time test.
 - v) Short circuit test.
 - vi) Efficiency test.
 - vii) Transient response test.
 - viii) Meter accuracy test.
 - ix) Harmonic content measuring test.
 - x) Temp. Rise Test.
 - xi) Restart Test.
 - xii) Voltage Rise & Voltage Dip Test.
 - xiii) Load Test.
 - xiv) Audible Noise Test.
 - xv) Synchronization Test.
 - xvi) Radio Frequency Interference.
 - xvi) Simulation of Parallel Redundant UPS fault.
 - xvii) Hold-off Interval.
 - xix) Checklist of Auxiliary Devices.
 - xx) Insulation Test.
- Also refer scope of supply.

8.3 Routine Test:

- i.) Temperature rise test
- ii) Tests in accordance with IEC -146 Clause 491, IEC-146-2 Clause 5.2.2 and IEC -146-4 Clause 7.3.1

8.4 Type & Routine Test of Battery

Type & Routine Tests on battery are to be done in accordance with relevant IS Standard or any other approved Standard. All shop tests shall be performed prior to shipment and BHEL/NTPC/ shall be notified 15 days before the scheduled dates to give an opportunity to witness the test.

Tests on other equipment's viz, step down transformer, voltage stabilizer, cables etc. Shall be conducted in accordance with relevant IS or any other approved standard.
Also refer scope of supply.



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8.5 SITE TESTS

The Contractor 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 BHEL or deemed necessary by the Employer and mutually agreed between BHEL and NTPC/, the same shall also be carried out.

Uninterruptible Power Supply System

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. 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 of 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 a load switching conditions should be observed.

11. Current Division in Parallel -

Load sharing between the Modular DC power supply rectifier banks & UPE 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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14. On Site Ventilation Test

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

15. 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.

16. 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.

17. 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.

18. Restart

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

19. Output over voltage

Output over voltage protection is to be checked.

20. Periodic Output Voltage Modulation

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

21. 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.

22. 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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9.0 RELIABILITY & AVAILABILITY:-

Each component and system offered by the Bidder shall be of established reliability. The minimum target reliability of each piece of equipment like each electronic module/card, Power supply, peripherals, etc. shall be established by the Bidder, considering its failure rate / mean time between failures (MTBF), meantime to repair (MTTR), such that the availability of the complete C&I system is assured for 99.7%.

Further the Bidder shall ensure that all equipment/Part of its system shall have normal life expectancy exceeding the expected life of the plant i.e. thirty years.

9.1 In order to ensure the target reliability the Bidder shall ensure selection of proper materials, control manufacturing process, use quality controlled components and parts, take adequate design margins & derating of electronic components and parts and carry out necessary tests, etc.

9.2 The equipment shall employ latest state of the art technology to guard against obsolescence. In any case, Bidder shall be required to ensure supply of spare parts for life time of the plant. In case, it is felt by the Bidder that certain equipment/component is likely to become obsolete the bidder shall clearly bring out the same in his offer and indicate steps proposed to deal with such obsolescence.

10.0 THERMAL DESIGN OF UPS SYSTEM PANELS

The UPS panels shall be preferably designed for natural cooling and shall be fabricated from not less than 1.6mm thick sheet steel. When the inverter is in operation the temperature rise in the panel shall not be more than 10 Deg. C above ambient for all operating conditions. All components like transistors, SCRs, ICs, capacitors, resistors etc. Shall be properly chosen and derated such that failure rate is reduced to absolute minimum.

10.1 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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PROJECT: GADARWARA STPP STAGE-I (2x800 MW) STATION C&I

CUSTOMER : M/s NTPC

FEEDER LIST

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REVISION:00

APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED

ISSUED

DATE

Sathish

SATHISH

416

30/06/2015

230V UPS FEEDER LIST - NTPC GADARWARA C&I (2x800 MW)

A) HMI PACKAGE-I								
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	POWER DISTBN PNL (PDNL01) (Refer Note.6)	1	1	8	1.84	1.84	10	16
		1	1	10	2.3	2.3	16	20
		1	1	6	1.38	1.38	10	16
		1	1	5	1.15	1.15	10	16
		1	1	36	8.28	8.28	50	63
		1	1	15	3.45	3.45	20	25
		1	1	15	3.45	3.45	20	25
2	CCTV PANEL (Refer Note.4)	1	1	8.7	2	2	16	20
		1	1	8.7	2	2	16	20
TOTAL		10	10			29.3	kVA	

B) BOP-OTHER LOADS								
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	Low Temp. Oxygen Analyser	7	0	1.3	0.3	0.6	4	6
		0	7	1.3	0.3	0.6	4	6
2	High Temp. Oxygen Analyser	1	0	1.3	0.3	0.3	4	6
		0	1	1.3	0.3	0.3	4	6
3	Flue Gas Analyser (SoX/NoX/CO2)	1	1	13	3	3	20	25
4	CO/CO2 Analyser	1	1	4.3	1	1	6	10
5	Opacity Monitor	1	1	5.6	1.3	1.3	6	10
6	SWAS	1	1	19.5	4.5	4.5	25	32
7	Conductivity Type Level Switch	1	0	0.06	0.015	0.015	4	6
		0	1	0.06	0.015	0.05	4	6
8	Capacitance Type Level Switch	2	0	0.02	0.006	0.012	4	6
		0	2	0.02	0.006	0.012	4	6
9	HART Management System	1	1	4.3	1	1	6	10
10	Master Slave Clock System	1	1	4.3	1	1	6	10
11	Vibration Monitoring System	1	1	4.3	1	1	6	10
12	Coal Bunker Level monitoring System	1	1	2.1	0.5	0.5	4	6
13	AVR	1	1	4.3	1	1	6	10
14	ECP	1	1	6	1.38	1.38	10	16
15	PA System	1	1	10	2.3	2.3	16	20
TOTAL		22	22			19.869	kVA	

C) HMI PACKAGE-II								
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS	NO. OF FEEDERS	FEEDER RATING IN AMPS	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	Network Panel Station LAN - AC (NWPS01) (Refer Note.6) (Refer Annexure-II Sheet 02 of 02)	1	0	10	2.3	2.3	16	20
2	Network Panel Station LAN - AC (NWPS02) (Refer Note.6) (Refer Annexure-II Sheet 02 of 02)	0	1	10	2.3	2.3	16	20
TOTAL		1	1			4.6	kVA	

- a.) Total Load (for items A to C) = 53.77 kVA
 b.) Total Load (for items A to C) + 10% spare = 59.15 kVA
 c.) Employer's Load as per Annexure-I = 85 kVA
 d.) a.) + b.) + c.) = 144.15 kVA
 e.) UPS Rating as per manufacturer catalog = 150 kVA ~ 150 kVA for Battery Sizing

S.NO	FEEDER RATING MCB / FUSE	TOTAL		CONSIDERING 25% SPARE		ROUNDED OFF-TO:-	
		ACDB-1	ACDB-2	ACDB-1	ACDB-2	ACDB-1	ACDB-2
1	4A/6A	12	12	15	15	16	16
2	6A/10A	6	6	8	8	9	9
3	10A/16A	4	4	5	5	6	6
4	16A/20A	10	10	13	13	14	14
5	20A/25A	4	4	5	5	6	6
6	25A/32A	1	1	2	2	3	3
7	32A/36A	5	5	7	7	8	8
8	40A/50A	3	3	4	4	4	4
9	50A/63A	4	4	5	5	6	6
TOTAL		49	49	59	59	72	72

Note:

- 25% spare feeders of each rating are been provided in each ACDB further rounded off to 72 feeders cummulatively in ACDB-1 and ACDB-2 for any future exigencies which may creep in later.
- UPS rating is 150 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 150 kVA Load(this is UPS load at 50 deg C). Battery is temperature derated at 4 deg C.



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CE/416/GADARWARA/UPS/BSC

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PROJECT: GADARWARA STPP STAGE-I (2x800 MW) STATION C&I

CUSTOMER : M/s NTPC

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TYPICAL BATTERY SIZING CALCULATION FOR UPS

REVISION:00

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CE/416/GADARWARA/UPS/BSC

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UPS full load considered = 'A' kVA

Let A shall be 140, 150, 160 say.

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

Inverter efficiency = 'C' say

Type of Battery and Back up Time required = Ni-Cd, 1 hour backup at 100% load.

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

Number of cells = 'D' say

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 1.6V

(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

Note: Inverter efficiency is to be taken as 91% with number of cells as 295 & 90% with number of cells as 270 in two separate options to be offered for Batteries.



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CE/416/GADARWARA/UPS/TAT

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PROJECT: GADARWARA STPP STAGE-I (2x800 MW) STATION C&I

CUSTOMER : M/s NTPC

TYPE & ROUTINE ACCEPTANCE TEST

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TYPE TEST REQUIREMENTS

1.00.00 TYPE TEST REQUIREMENTS

1.01.00 General Requirements

1.01.01 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. If the bidder proposes a different standard/code from that indicated at table 3.00.00, same is acceptable provided the equivalence of the proposed standard is established by the bidder. 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.

- (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.
- (b) For the rest, submission of type test results and certificate shall be acceptable provided.
 - 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 along with amendments as on the date of Bid opening.
- (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.

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, and data links shall be provided with protections that meet 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		

POWER SUPPLY FOR C&I SYSTEMS (UPS/BATTERY/BATTERY CHARGER/ACDB/DCDB)

ITEMS	TESTS																	
	Visual/dimension/rating/ (R)	Paint Adhesion/ Thickness	General arrangement/BOM/make of components /Mimic ®	Efficiency ,regulation(R)	Input voltage variation (A)	Out put voltage and frequency adj.range(A)	Premilinary light load 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	Y
VOLTAGE STABILISER	Y	Y	Y	Y	Y					Y		Y					Y	
LEAD ACID BATTERY(TUBULAR)-IS-1651																		Y
LEAD ACID BATTERY (PLANTE)-IS-1652																		Y
NICKEL CADMIUM BATTERY(IS-10918/IEC-623)																		Y
SMF BATTERY																		Y
ACDB/DCDB	Y	Y															Y	Y
BATTERY CHARGER	Y	Y	Y	Y	Y				Y					Y	Y	Y	Y	Y

R-Routine Test A- Acceptance Test Y – Test applicable

* Transfer time and Over shoot /under shoot during load & system transfer shall be recorded.



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CE/416/GADARWARA/UPS/QP

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PROJECT: GADARWARA STPP STAGE-I (2x800 MW) STATION C&I

CUSTOMER : M/s NTPC

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QUALITY PLAN FORMAT

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30/06/2015



A4-10

CE/416/UNCHAHAHAR/UPS

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PROJECT: 1 x 500 MW FGUTPP UNCHAHAHAR

CUSTOMER : M/s NTPC

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SPECIFICATION
FOR
UNINTERRUPTIBLE POWER SUPPLY SYSTEM(UPS)
Including UPS BATTERY

REVISION:00

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30/06/2015



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CE/416/UNCHAHAHAR/UPS

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Sl. No.	Description	Reference.
1.	Scope of Supply	CE/416/UNCHAHAHAR/UPS/SOS, Rev.00 Sheets 06
2.	Technical Requirements	CE/416/UNCHAHAHAR/UPS/TR, Rev.00 Sheets 16
3.	Feeder List	CE/416/UNCHAHAHAR/UPS/TR, Rev.00 Sheets 04
4.	Typical Battery Sizing Calculation	CE/416/UNCHAHAHAR/UPS/BSC, Rev.00 Sheets 02
5.	Type & Routine Acceptance Test	CE/416/UNCHAHAHAR/UPS/TAT, Rev 00 Sheets 05
6.	Quality Plan Format	CE/416/UNCHAHAHAR/UPS/QP, Rev 00 Sheets 02

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CE/416/UNCHAHAR/UPS/SOS

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PROJECT: 1 x 500 MW FGUTPP UNCHAHAR

CUSTOMER : M/s NTPC

SCOPE OF SUPPLY

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CE/416/UNCHAHAHAR/UPS/SOS

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SCOPE OF SUPPLY

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

A. 1 x 500 MW FGUTPP UNCHAHAHAR → 1 SET

120 kVA, Single-phase 0.8 p.f lagging 230V AC, 50Hz parallel redundant UPS guaranteed at 50 deg. C as per manufacturer catalog. If any manufacturer doesn't have UPS guaranteed at 50 deg C, the vendor shall offer as per their manufacturing standards at 40/45 deg C.

B. Each UPS system comprises →

- | | |
|-----------------------------------------------------------------------------------------------------------------------|----------|
| 01. 100% Capacity Static Inverters | 2 Nos. |
| 02. 100% Capacity Static Switches | 2 Sets |
| 03. Manual Bypass Switch. | 1 Set |
| 04. Input Isolation Transformers | 2 Nos. |
| 05. 100% Capacity float cum boost chargers | 2 Nos. |
| 06. UPS Battery (Ni-Cd Battery with accessories for 1 hr. duty cycle at 100 % load) | 1 Set ** |
| 07. Battery Health Monitoring System | 1 Set |
| 08. Step down transformer 415V, 3 Ph. to 230V, 1 Ph. | 1 No. |
| 09. Servo Controlled Voltage Stabilizer. | 1 No. |
| 10. AC power Distribution boards | 2 Nos. |
| 11. Battery isolation box(housed in UPS panel) | 1 Set* |
| 12. Accessories of UPS system, in line with specification including suitable interconnection cables, cable lugs, etc. | 1 Set |

Note: The interconnection cables shall be from Battery to UPS, between UPS, between UPS to ACDB (to be offered on per meter basis). The cable quantity from Battery to UPS shall be 100 metres per run and from UPS to ACDB shall be 25 metres per run.

MODBUS cable of 100 meters per run is to be provided per charger / inverter combination for DCS connection. Therefore since each UPS system has redundant charger/inverter, this cable shall be 200 mtrs under each UPS system.

*** Battery being procured by BHEL separately.*

C. Erection supervision, complete commissioning & handing over. → 1 Set

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1.1.1 MANDATORY SPARES: (Common for the complete project)

- | | |
|--------------------------------------------------------------------------|---------------------------|
| a) Silicon Controlled thyristors, diodes and Power Transistors | 100% |
| b) Capacitors | 1 Set |
| c) CT's, CVT's, VT's, chokes, AC/DC isolators contactors, timers, relays | 10% of each type & rating |
| d) Fuses of each type and rating | 200% |
| e) Fuse free circuit breakers | 5% |
| f) Electronic modules of each type | 10% |
| g) Lamp holder with series resistor, if any | 10% |
| h) Cooling Fans | 2 Nos of each type |
| i) Digital/Analog panel meters/indicators | 1 No. of each type |
| j) Relay of all types including overload relays | 10% |
| k) Indication Lamps | 100% |

1.1.2 In addition to above spare miscellaneous parts for inverters, chargers, distribution panel's batteries, etc., shall be furnished in accordance with manufacturer's standards. Bidder shall indicate list of such spares in his offer under miscellaneous spares. Also, please note that fuses and circuit breakers mentioned under mandatory spares shall be provided against ACDB requirement also, apart from requirement under complete charger/inverter combinations.



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2.0 GENERAL TERMS & CONDITIONS

- 2.1 Since the projects, are bunched together based on commonality of some aspects such as specifications, vendors, customers, etc., will be technically evaluated as a package, the participating vendors should quote for all the items.
- 2.2 Considering possibilities of change in requirement i.e. increase/decrease of loads & feeder quantities for individual project feeder list after system design finalization at a later date, **the vendor must clearly quote for the UPS model with the most suitable kVA rating (120 kVA) and next higher kVA rating (130 kVA) and next lower kVA rating (110 kVA) ones in the same offer.** If any vendor does not have the mentioned UPS rating, still the vendor is eligible for offering as the rating may get increased during detailed engineering.
- 2.3 **As battery is to be sized after the finalization of UPS kVA rating, the vendor shall quote for all the mentioned loads in the typical battery sizing calculation sheet.**
- 2.4 Similarly, the vendor must clearly quote for unit price as well as lot price for all the selected UPS & UPS battery models including accessories and cables (for UPS System only) for indisputable calculations of lot prices in case of revised quantities later.
- 2.5 The type tests are as listed as part of the specification & if the type tests are not specifically conducted, then same are to be offered with unit rates in offer. However, in either case, the type tests reports are to be submitted for BHEL/ Customer approval in case of order.

3.0 GENERAL TECHNICAL REQUIREMENTS

- 3.1 The output voltage, current and frequency transducers (4-20mA DC) are to be provided (total 3 numbers) per each ACDB as a standard for remote monitoring. Apart from this, transducers related to input voltage and current at charger limbs and SCVS are to be provided (total 6 Nos. per UPS), transducers for Battery Voltage and Current. All these transducers are remote monitoring wired to UPS. All above analog signals are apart from Binary potential free contacts provided as meaningful information to DCS.
- 3.2 Mandatory spares may be finally applicable for the projects which will be informed to participating vendors during technical evaluation. Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by the Bidder shall be the specified percentage (%) of the total population required to meet specification requirements for 500 MW projects. In case, the quantity of mandatory spares so calculated happens to be a fraction, the same shall be rounded off to the next higher whole number.
- 3.3 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.
- 3.4 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.
- 3.5 Routine & Acceptance tests shall be done as per relevant standards. Temperature rise test is also to be done 100% for 10-12 hours duration each time (till temperature stabilizes).



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3.6 Considering the fact, separate quotations are being sent for UPS vendors and UPS battery vendors separately. Battery will be sized corresponding to the UPS manufacturer and accordingly UPS & Battery orders will be placed. Battery order will be placed after determining the UPS vendor and UPS rating. However, both UPS and battery vendors have to offer lumpsum unit rates for erection supervision & commissioning of UPS, erection supervision & commissioning of Battery with overall integration of complete system being responsibility of UPS vendor.

3.8 Protection class of all UPS, Voltage Stabilizer and ACDB panels shall be IP22 as per IS2147.

3.9 Material Thickness = All sides are 1.6 mm CRCA, Mounting plate 3mm, Gland plate = 3mm. Also please note that panel construction shall be with base/bottom frame of approximate height as 100mm (3mm thick) and anti-vibration pad as 15mm thick-all details as per manufacturer standard. Enclosures shall be furnished with concealed hinges. Front and Rear doors shall be designed to permit easy access to all components for maintenance and 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.

3.10 Adequate ventilating louvers and enclosure top panels shall be indicated. All vent openings shall be covered with corrosion resistant fine screen coverings.

3.11 The colour shade of panels exterior/interior shall be as per RAL9002, end panel cover shall be as per RAL 5012.

4.1. DOCUMENTS TO BE FURNISHED

4.1.0. Following documents shall be furnished to BHEL as a minimum, apart from any other documents required to be submitted as called for elsewhere or as deemed necessary.

4.1.1. **Along with the Technical offer:** For technical evaluation, vendor must send one (01) set of the following documents in hard copy, without which your offer is liable to be rejected.

01. Single line diagram
02. GA drawings
03. Circuit diagrams
04. Fault co-ordination details
05. Charger/Inverter rating calculation
06. Battery sizing calculation (as per IEEE or Equivalent Standard)
07. Battery curves
08. Technical write-up
09. Technical literature / Catalog of each component
10. Data sheet of complete system/subsystem
11. Wiring diagram/interconnecting arrangement details
12. Complete Bill of Material with make & Model
13. Mandatory spares list.



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CE/416/UNCHAHAR/UPS/TR

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13. Clause-wise deviation list

NOTE: - Later no explanation on noncompliance or deviation, stated or observed, may be acceptable. Incomplete offers (without documents / not relevant documents as mentioned above) will be technically rejected without any notice.

4.1.2 **After placement of Purchase Order within 1 week:** For BHEL/CUSTOMER approval, vendor must send One (1) set of the following documents in hard copy & soft copy.

- a) All documents Sl. No 01 ~ 13 as above.
- b) Interfacing diagram & cable type details used or suggested.
- c) Quality Plan format enclosed as part of the specification.

4.1.3. **After Type Test but before Inspection :** For BHEL/CUSTOMER approval, vendor must send eight (8) Sets of the following documents in hard copy.

- 01. Type test reports/Certificates as per specification/approved QP

4.1.4. **After Inspection but 1 week before dispatch:** For BHEL/CUSTOMER approval, vendor must send two (2) sets of the following documents one in hard copy & one in soft copy.

- 01. Preliminary Instruction /O&M Manual

4.1.5. **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.)

4.1.6. **After despatch of material within 1 week :** Vendor must send two (2) set of the following **"As Built & Approved"** status documents one (1) in hard copy & one (1) in soft copy directly to the project site.

- (a) Instruction/O&M Manual

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 compatible with Windows-95/98/NT/2000 with drawing/documents in AutoCad-14/MS-Word/MS-Excel/Acrobat formats. Soft copy to be supplied for datasheet/document/ drawings at approval stage also.

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CE/416/UNCHAHAR/UPS/TR

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PROJECT: 1 x 500 MW FGUTPP UNCHAHAR

CUSTOMER : M/s NTPC

TECHNICAL REQUIREMENTS

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REVISION:00

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Uninterruptible Power Supply (UPS) system including UPS Battery

1.0 GENERAL REQUIREMENTS

This specification covers the requirement of an Uninterruptible Power Supply (UPS) System comprising of static inverters, static switch, manual bypass switch, chargers, battery banks and DC & AC distribution boards.

The equipment covered under this specification shall meet the requirements of latest edition of all applicable codes and standards like ANSI, NEMA, IEEE, and IEC. NEC & IS. The UPS equipment and the complete system shall have surge withstand capability (SWC) to meet the requirements of ANSI C37. 90a, IEEE Standard 472. 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 BHEL/CUSTOMER approved drawings. All equipment and accessories required for completeness of this system shall be furnished by the Bidder within the quoted price whether these are specifically mentioned herein or not.

All non interrupting components of UPS system shall be capable of withstanding all available short circuit currents without damage. Additionally, all circuits interrupting components shall be capable of withstanding and interrupting all encountered short circuit currents without damage.

UPS provided with fuse free circuit breaker shall be preferred. However In case, it is the standard practice of manufacturer to use fast current limiting fuses at inverter output etc. to protect its power semiconductors devices, the same shall be acceptable. However, in AC distribution board either fuse-free circuit breakers shall be employed same shall be of HRC type only. In any case selective fuse(fuse free circuit breaker) coordination shall be provided by Bidder to ensure that only the fuse (fuse free circuit breaker) nearest to the fault will open and isolate the faulted circuit. Other branches of the distribution system will be unaffected and the fault will not cause more than one fuse to open . Further it will be the sole responsibility of the UPS supplier to Engineer/design this system keeping in view the basic guideline as indicated elsewhere in specification like selectivity ratios etc.

The selection and selective coordination of all the protecting devices including fuse free circuit breakers / fuses shall conform to the requirements of National Electric Code (NEC) 1984 and other applicable standards. The selectivity ratios of the fuses (fuse free breakers) shall be such that there is a sufficient margin between the total electric energy of the downstream fuse and the total melting energy of the upstream fuse. The selective ratio shall be as finalized during detailed engineering stage but the same shall be not less than 2:1 in any case.

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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 UPS system shall have 2x100% parallel redundant chargers and inverters. 1x100% battery bank, bypass line transformers and voltage stabilizer, static switch, manual bypass switch, AC/DC distribution boards, other necessary protective devices and accessories and shall meet the following requirements as a minimum.

1.1 The KVA rating of UPS arrived at shall be guaranteed at 50°C ambient. 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 applicable ambient temperature. 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. The sizing of UPS shall be based on the power factor of loads being led subject to maximum of 0.8.

2.0 Each of the redundant chargers & batteries shall meet the specification requirements are as follows :

2.1 Float cum boost chargers

2.1.1 Each of the two sets of 2X100% redundant chargers shall be sized to meet the 100 % load requirements of the control system plus recharge the fully discharged battery within 8 Hours.



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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 output regulation shall be $\pm 1\%$ from no load to full load with an input power supply variation of $\pm 10\%$ in voltage and $\pm 5\%$ 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. Further isolated 4-20mA signals shall be provided for important parameters like charger voltage, etc.

2.1.2 The Bidder shall furnish the charger rating calculations to the BHEL/NTPC/ to satisfy that this requirement is met. The charger shall be furnished as per rating approved by the BHEL/NTPC/ during engineering stage without any price repercussions whatsoever. Typical calculation for sizing the capacity of the chargers to be followed by the Bidder is enclosed as part of the specification and the Bidder must adhere to the same strictly while sizing the capacity of the chargers to be offered by him.

2.1.3 The chargers shall be served from a 415V, 50 Hz, 3 phase 3 wire system. The chargers shall maintain the output voltage within $\pm 1.0\%$ from no load to full load with an input power supply deviation in voltage level of $\pm 10\%$ and input power supply deviation in frequency of $\pm 5\%$ and with both deviations present in any combination.

2.1.4 In addition to supply DC power for inverters, the chargers shall be designed to charge a fully discharged battery 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.

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

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

2.1.7 Suitable devices/hardware shall be provided to alarm charger output voltage higher than adjustable present limit. Further, charger shall be tripped automatically on charger output voltage high-high (adjustable). This aspect shall be further discussed during detailed engineering.

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



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2.1.9 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.

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

2.2.0 BATTERY CHARGER AUXILIARY EQUIPMENT

In addition to the battery charger specified herein, auxiliary equipment shall be furnished with each charger as follows :

2.2.1 Equipment and materials furnished, mounted and wired on the front panel of the charger enclosures:-

ITEM	QUANTITY
a) AC voltmeter, indicating at input with required scale range and 2%accuracy	1 No.
b) DC voltmeter, indicating output with required scale range and 2%accuracy	1 No.
c) DC Ammeter, indicating output Amperes with required scale range and 2% accuracy	1 No.
d) Charger ON-OFF push buttons	2 Nos.
e) Potentiometers, one "Float voltage adjust" and" one Equalizing voltage adjust " both with manual adjustment knobs. The settings of these knobs shall be independent of each other.	2 Nos.
f) Selector switch of selecting "float charge" or "Equalizing charge "	1 No.
g) Charging rate setter	1 No.
h) Selector switch & lights for ground fault detector	1 Set
i) Equalizing charge timer(0-72 hrs.) with manual reset	1 No.



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2.2.2 Indicating light listed below with proper actuating devices, circuitry and legend shall be furnished on the front of UPS panels. One set of electrically independent potential free contacts shall be wired to the "Integrated Distributed Digital Control Monitoring and Information System". The following indications shall be furnished as minimum :-

- a) Failure of input AC supply to the charger.
- b) Charger failure.
- c) System on battery operation.
- e) Inverter Failure
- f) Bypass failure
- g) Load on Bypass
- h) Low Battery

3.0 BATTERIES

3.1.0 The batteries shall be heavy duty Nickel-cadmium type and shall be sized for an hour of full load operation. Ni-Cd batteries shall conform to IS: 10918. For sizing calculation, an aging factor of 0.8 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.

3.1.1 Bidder shall furnish battery sizing calculations, supporting curves/data etc. with the proposal to demonstrate to BHEL/NTPC/ that the proposed battery capacity meets the above specification requirements at maximum temperature as well as minimum ambient temperature condition of 4°C.

3.1.2 Cells shall be Ni-Cd, sealed type assembled in heat resistance; shock absorbent, poly propylene type containers with cover fused or cemented in place to form a permanent leak-proof seal. Each cover shall be fitted with vent plugs.

3.1.3 The plate structure shall be provided with adequate separators, suspensions and supports so that all plates are permanently aligned and protected from breakage.

3.1.4 Sufficient sediment space shall be provided below the plates to eliminate the necessity of sediment removal during normal battery life.

3.1.5 Each cell container shall be clearly marked for low and high electrolyte level limits on all four sides.

3.1.6 Vent plug shall be of such a design to allow escape of gases but not of acid spray and shall be explosion proof.



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3.1.7 All cell terminals shall have adequate current carrying capacity and shall be lead alloy or approved equal material.

3.1.8 Cell terminals posts shall be suitable for bolted connection and shall be equipped with complete connector bolts and nuts. Cell posts shall be sealed against creepage of electrolyte either by burned ring seals or by lead alloy seal nuts or equivalent.

3.1.9 Cells shall be arranged on two step battery rack so that the edges of the plate are conveniently visible.

3.1.10 Racks shall be of mild steel construction in accordance with applicable codes and standards. AISC specification shall apply in the absence of another applicable design specification.

3.1.11 Each cell shall be assigned an identification number. Identification numbers shall be clearly and permanently marked on the front of the rack structure so that individual cells are easily identifiable. In addition, the polarity markers shall be furnished for the end cells.

3.1.12 The UPS Battery shall have sufficient amp-hour capacity to supply 100% full load current of UPS for 60 minutes. For this, the UPS capacity to be considered as the finally selected UPS rating, irrespective of the actual load on UPS. A drop of 4V from battery room to inverter input shall be considered for design.

3.2.0 BATTERY ACCESSORIES

Each battery shall be complete including the following equipment and material:

01 Nickel coated copper inter-cell connector to provide not less than 1.27 cm between cells.

02 Nickel coated copper inter-step connectors to connect between the rows of cells on the two steps of the battery rack.

03 Connector bolts with acid resistance nuts.

04 Cell lifting facility. – 1 Set.

05 Spanners. – 2 nos

06 Vent plug hydrometer. – 2 nos

07 Set of hydrometer syringes suitable for vent holes in different cells – 2 nos

08 Vent plug thermometer for measuring electrolyte Temp. – 2 nos

09 Wall mounting type holder made of teak wood for hydrometer & thermometer – 2 nos

10 Cell testing voltmeter (3-0-3V) – 3 nos

11 Alkali mixing jar – 2 nos



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- 12 Rubber apron – 5 nos
- 13 Pair of rubber gloves – 5 nos
- 14 Set of spanners – 5 nos
- 15 No smoking notice for each battery room – 2 nos
- 16 Goggles (Industrial) – 2 nos.
- 17 Instruction card -- 5 nos.
- 18 Temperature Indicator – 1 no
- 19 Discharge resistance – 1 set.
- 20 Electrolyte level check & fill equipments – 1 No.
- 21 Corrosion preventive grease – 1 Set.
- 22 One set of numerals (one numeral per cell) suitable for permanent attachment to cells.

NOTE:

- 1.) Accessories for Ni-Cd battery shall be offered as per above which are subject to BHEL/Customer approval.
- 2.) Suitable termination with isolation/DCDB shall be provided at battery set output for proper isolation of battery set at battery end. This Battery isolating switch shall be wall-mounting type in IP55 enclosure.

4.0 The UPS system shall be capable of operating without DC 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.

4.1 The UPS system design shall ensure that in case of failure of line input power supply to one of the chargers, the other 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 DC battery at all load conditions. The bidder should note that this situation should not in any way lead to the discharge of the DC Battery.

4.2 Both the inverters/chargers shall not be housed in single cubicle. One inverter one charger can be housed in one common cubicle i.e. there will be two such cubicles per UPS system if the same is standard and proven practice of the bidder.

4.3 BATTERY HEALTH MONITORING SYSTEM:

(Make : M/s Eltek (or) M/s Emerson (or) M/s Hitachi-Hirel

BHMS shall include microprocessor based hardware and software to monitor the condition of each battery cell of UPS Battery on-line. With BHMS it shall be possible to measure & analyse 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 DDCMIS and provide necessary alarms for protection of battery cells.



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5.0 STATIC INVERTER

i. 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 static inverter equipment shall include all necessary circuitry and devices to confirm 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 atleast 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 48-52 Hz, field adjustable in steps of 1 Hz. Each inverter shall have an overload capacity of 125% rated capacity for 10% minutes and 150% rated capacity for 10 seconds.

ii OVER LOAD, SHORT CIRCUIT AND LOAD LOSS

The inverter shall be provided with suitable HRC fuses at the input and output which will permit proper coordination with other protective devices and at the same time protect the inverter against damage due to internal faults. However, if the bidder's system design does not use fuses then the fuse free circuit breaker may also be permitted provided it meets the specification requirements. All necessary equipment shall be provided to protect the inverter against overload, short circuit & 100 % loss of load. The inverter shall be self protecting against damage if energized with full load connected.

iii Inverter equipment shall include all solid state circuitry and devices including stable oscillator etc to enable inverters to operate satisfactorily in parallel sharing mode each inverter taking 50 % load during normal operation.

In case of failure of either inverter, 100% load shall automatically be transferred to healthy inverter without any break and degradation in the quality of UPS output and disconnecting the faulty inverter automatically.

iv The inverter failure shall be alarmed and the healthy inverter shall get synchronizing signal from the standby AC source and remain synchronized within the set limits. The limits for the synchronization between healthy inverter and standby AC source shall be field adjustable.

v On failure of both inverters, the loads shall be transferred to standby AC power without a break if within synchronization limits. Provision of asynchronous transfer with a break in case of inverter being out of synchronization limits shall also be there with standby source.

6.0 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 inverter and

(ii) from faulty inverter to stand by AC source in case of failure of both inverter.

The transfer time shall be $\frac{1}{4}$ cycle maximum in synchronous mode.



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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.

7.0 STEP DOWN TRANSFORMER & VOLTAGE STABILIZER

7.1 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.

7.2 AUXILIARY EQUIPMENT

All required auxiliary equipment / materials as finalized during detailed engineering shall be furnished with each charger / inverter / 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/ lamps, ground detector system) battery accessories like (inter cell connectors, inter step connectors battery racks etc) further, isolated 4 -20mA signals for important parameters and potential free contacts for important alarms shall be provided for use in DDCMIS.

7.3 Each inverter shall have the necessary control switches, push buttons and indicating lamps on the front panel door for its independent start up and shut down. It should be possible to isolate each inverter on the input as well as the output side by means of DC and AC MCCBs.

7.4 Indicating lights listed below with proper actuating devices, circuitry and legend shall be furnished on front of UPS panels. For these abnormal conditions which could be of a momentary nature, the indicating lights shall remain energized and the Contact remain closed until cleared by a reset push button furnished on the panel. The indicating lights shall be of make subject to BHEL/NTPC/ 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) DC input loss to the inverter : High
- d) Inverter A output voltage : High
- e) Inverter B output voltage : High
Avoid unnecessary alarm due to low voltage on load in rush etc).
- f) Inverter A output voltage low. - With a time delay.
- g) Inverter B output voltage low. - With a time delay.
- h) Inverter A failure.
- i) Inverter B failure.
- j) Inverter fuse failure.
- k) Redundant fan failure and temperature high (if provided)
- l) Standby AC source failure
- m) Inverter A/Inverter B not synchronized with stand-by AC source
in case of failure of inverter B/inverter A respectively.

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- n) Automatic transfer to stand by AC source & Inverter A/Inverter B feeding 100% UPS load.
- o) Stand by source feeding 100% UPS loads.
- p) Inverter A overload Trip.
- q) Inverter B overload Trip.

7.5 In addition to the above lamps one potential free change over contact shall be made available (wired up to the terminal block) for each of the above conditions to be connected to other systems.

7.6 The following meters shall be provided as minimum, mounted on front of inverter panels for each inverter :-

- i) DC input voltmeter.
- ii) DC input Ammeter.
- iii) AC output voltmeter.
- iv) AC output Ammeter.
- v) Frequency meter.
- vi) Output KVA meter.
- vii) Power factor meter.

7.7 The above listed instruments shall be of $\pm 1\%$ accuracy class. Inverter ON/OFF switch & Alarm reset Push Button shall also be provided for each inverter.

7.8 Bidder shall furnish the power supply distribution scheme, single line diagram, all calculation such as charger/inverter rating calculations, battery sizing calculation etc. during offer stage itself and during detailed engineering stage for owner's review and approval.

7.9 ACDB

7.9.1 AC distribution panel of CRCA sheet steel construction shall be supplied for 2 wire AC single phase distribution with a solid neutral bar.

7.9.2 The phase and neutral bars shall be of copper.

7.9.3 Rating of the main lugs shall be equal to the rated continuous full load current of each inverter.

7.9.4 The panel boards shall be rated for 600V AC. All outgoing switches shall be load breaker, air break type provided with quick make breaker manual operating mechanism.

7.9.5 Each UPS load shall be fed from redundant feeder from AC distribution board "A" and other AC distribution board "B" ie all the UPS loads shall be fed from both the distribution boards A & B. Each AC distribution panel board shall have all the required HRC slow acting fuses, switches and other devices. The exact nos and rating etc. of HRC slow acting fuses, switches shall be as finalized during detailed engineering without any price repercussions. BHEL/NTPC/ decision shall be final in case there is any disagreement in Bidder's opinion and BHEL/NTPC/ view.



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8.0 Factory Tests:

8.1 The complete UPS system, including all instruments and devices shall be subjected to standard factory tests (i.e. Type Tests and Routine Tests) as per IS, NEMA, IEEE, IEC-146 standards wherever applicable.

8.2 The following Type tests shall be conducted as a minimum requirement as per IEC-146 Standard.

- i) Frequency regulation test.
 - ii) Voltage regulation test.
 - iii) Current limiting test.
 - iv) Transfer time test.
 - v) Short circuit test.
 - vi) Efficiency test.
 - vii) Transient response test.
 - viii) Meter accuracy test.
 - ix) Harmonic content measuring test.
 - x) Temp. Rise Test.
 - xi) Restart Test.
 - xii) Voltage Rise & Voltage Dip Test.
 - xiii) Load Test.
 - xiv) Audible Noise Test.
 - xv) Synchronization Test.
 - xvi) Radio Frequency Interference.
 - xvi) Simulation of Parallel Redundant UPS fault.
 - xvii) Hold-off Interval.
 - xix) Checklist of Auxiliary Devices.
 - xx) Insulation Test.
- Also refer scope of supply.

8.3 Routine Test:

- i.) Temperature rise test
- ii) Tests in accordance with IEC -146 Clause 491, IEC-146-2 Clause 5.2.2 and IEC -146-4 Clause 7.3.1

8.4 Type & Routine Test of Battery

Type & Routine Tests on battery are to be done in accordance with relevant IS Standard or any other approved Standard. All shop tests shall be performed prior to shipment and BHEL/NTPC/ shall be notified 15 days before the scheduled dates to give an opportunity to witness the test.

Tests on other equipment's viz, step down transformer, voltage stabilizer, cables etc. Shall be conducted in accordance with relevant IS or any other approved standard.
Also refer scope of supply.



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8.5 SITE TESTS

The Contractor 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 BHEL or deemed necessary by the Employer and mutually agreed between BHEL and NTPC/, the same shall also be carried out.

Uninterruptible Power Supply System

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. 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 of 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 a load switching conditions should be observed.

11. Current Division in Parallel -

Load sharing between the Modular DC power supply rectifier banks & UPE 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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14. On Site Ventilation Test

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

15. 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.

16. 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.

17. 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.

18. Restart

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

19. Output over voltage

Output over voltage protection is to be checked.

20. Periodic Output Voltage Modulation

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

21. 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.

22. 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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9.0 RELIABILITY & AVAILABILITY:-

Each component and system offered by the Bidder shall be of established reliability. The minimum target reliability of each piece of equipment like each electronic module/card, Power supply, peripherals, etc. shall be established by the Bidder, considering its failure rate / mean time between failures (MTBF), meantime to repair (MTTR), such that the availability of the complete C&I system is assured for 99.7%.

Further the Bidder shall ensure that all equipment/Part of its system shall have normal life expectancy exceeding the expected life of the plant i.e. thirty years.

9.1 In order to ensure the target reliability the Bidder shall ensure selection of proper materials, control manufacturing process, use quality controlled components and parts, take adequate design margins & derating of electronic components and parts and carry out necessary tests, etc.

9.2 The equipment shall employ latest state of the art technology to guard against obsolescence. In any case, Bidder shall be required to ensure supply of spare parts for life time of the plant. In case, it is felt by the Bidder that certain equipment/component is likely to become obsolete the bidder shall clearly bring out the same in his offer and indicate steps proposed to deal with such obsolescence.

10.0 THERMAL DESIGN OF UPS SYSTEM PANELS

The UPS panels shall be preferably designed for natural cooling and shall be fabricated from not less than 1.6mm thick sheet steel. When the inverter is in operation the temperature rise in the panel shall not be more than 10 Deg. C above ambient for all operating conditions. All components like transistors, SCRs, ICs, capacitors, resistors etc. Shall be properly chosen and derated such that failure rate is reduced to absolute minimum.

10.1 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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PROJECT: 1 x 500 MW FGUTPP UNCHAHAHAR

CUSTOMER : M/s NTPC

FEEDER LIST

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APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED

ISSUED

DATE

Sathish

SATHISH

416

30/06/2015

240V AC UPS FEEDER / LOAD LIST - UNCHAHR (1x500 MW)

A) TG C&I PACKAGE							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	TSI FOR BFPDT - A/B (CWW01, CWW51)	1	1	2.40	2.40	16	20
2	TSI FOR MAIN TURBINE (BOUGHT OUT PANEL) (CJJ 41, CJJ 42, CJJ91)	1	1	2.40	2.40	16	20
3	INTERFACE PANEL FOR CWP VIB BUFFERED SIGNAL (BOUGHT-OUT PANEL) CJJ43	1	1	2.40	2.40	16	20
TOTAL		3	3		7.20	kVA	
B) SG C&I PACKAGE							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	FLAME SCANNER-1 (RTP) (CJF75)	1	1	1.20	1.20	10	16
2	FLAME SCANNER-2 (RTP) (CJF76)	1	1	1.20	1.20	10	16
TOTAL		2	2		2.40	kVA	
C) HMI PACKAGE							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	Network Panel HMI - A&B (AC) (NWPA03)	1	1	1.2	1.2	10	16
2	Power Distribution Panel (PDPH01)	1	0	6.9	6.9	40	50
		0	1	6.9	6.9	40	50
3	Network Panel Station LAN-AC(A) (NWPS01)	1	1	2.4	2.4	16	20
4	Network Panel Station LAN-AC(B) (NWPS02)	1	1	2.4	2.4	16	20
TOTAL		4	4		19.8	kVA	
D) BOP-OTHER LOADS							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	Low Temperature Oxygen Analyser	2	0	0.3	0.6	4	6
		0	2	0.3	0.6	4	6
2	High Temperature Oxygen Analyser	1	0	0.3	0.3	4	6
		0	1	0.3	0.3	4	6
3	CO Analyser	1	1	1	1	6	10
4	Opacity Monitor	1	1	1.3	1.3	10	16
5	Flue Gas Analyser SOX/NOX/CO2	1	1	3	3	16	20
6	SWAS	1	1	4.5	4.5	25	32
7	Level Switch Conductivity type	1	0	0.015	0.015	4	6
		0	1	0.015	0.015	4	6
8	Level Switch Capacitance type	1	0	0.006	0.006	4	6
		0	1	0.006	0.006	4	6
9	Vibration Monitoring System	1	1	1	1	10	16
10	Coal Bunker Level Monitoring System	1	1	0.5	0.5	4	6
11	HART Management System	1	1	0.96	0.96	6	10
12	Master Slave clock system	1	1	0.96	0.96	6	10
13	VFD Controls for ID Fans	2	0	1.92	3.84	10	16
		0	2	1.92	3.84	10	16
14	VFD Controls for MMI System	1	0	0.96	0.96	6	10
14	DAVR	1	1	1	1.00	6	10
15	UCP	1	1	1.2	1.2	10	16
16	ECP	1	1	1.2	1.2	10	16
17	TRANSDUCER & AVT PANEL	1	1	1.2	1.2	10	16
TOTAL		20	19		28.302	kVA	

E) BHEL-TRICHY							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	AH-Air Motor Solenoid Valve	2	0	0.04	0.08	4	6
		0	2	0.04	0.08	4	6
2	Furnace Flame Viewing Cameras (Front, Rear, Left, Right Walls)	2	0	0.50	1.00	4	6
		0	2	0.50	1.00	4	6
3	Local Drum Level Gauges (Left & Right)	1	0	0.50	0.50	4	6
		0	1	0.50	0.50	4	6
4	Air Heater Rotor Speed Switches	2	0	0.025	0.05	4	6
		0	2	0.025	0.05	4	6
5	HEA Ignitor Box	10	0	0.30	3.00	4	6
		0	10	0.30	3.00	4	6
6	HFO Flow Meter	1	0	0.05	0.05	4	6
7	LFO Flow Meter	0	1	0.05	0.05	4	6
8	Steam Tube Leak Detection System	1	0	0.3	0.30	4	6
9	Steam Tube Leak Detection System Workstation	0	1	0.3	0.30	4	6
10	Acoustic Pyrometer	1	0	3	3.00	16	20
		0	1	3	3.00	16	20
11	Acoustic Pyrometer Workstation	1	0	1	1.00	6	10
12	Boiler Maintenance Workstation	0	1	1	1.00	6	10
13	Furnace and Flame viewing system Camera	0	1	2.5	2.50	16	20
14	Furnace and Flame viewing system Camera in CER	1	0	0.6	0.60	4	6
15	Furnace and Flame viewing system Camera in UCR	0	1	0.35	0.35	4	6
16	Tube Life Assessment System	1	0	0.5	0.50	4	6
17	Boiler remaining life assessment	0	1	1	1.00	6	10
18	Air Heater Hopper Ash Level Switches	4	0	0.015	0.06	4	6
		0	4	0.015	0.06	4	6
19	Economiser Hopper Ash Level Switches	2	0	0.015	0.03	4	6
		0	2	0.015	0.03	4	6
20	Gravimetric Feeder Remote Power Cabinet Power Supply	5	0	0.5	2.50	4	6
		0	4	0.5	2.00	4	6
TOTAL		34	34		27.59	kVA	
F) BHEL-HARIDWAR							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	Gen. Inst. Cabinet (CXW01B)	1	0	0.60	0.60	4	6
		0	1	0.60	0.60	4	6
2	H ₂ Gas Analyser Cabinet (CXW01C)	0	1	0.60	0.60	4	6
3	H ₂ Gas Analyser Cabinet (CXW01D)	0	1	0.60	0.60	4	6
4	Gen. End Wdg. VMS CXW01E	1	0	0.60	0.60	4	6
		0	1	0.60	0.60	4	6
5	Alkaliser Dosing Pump	0	1	0.025	0.025	4	6
6	Moisture Measuring Equipment	1	0	0.06	0.06	4	6
7	Grounding Brush Monitor	0	1	0.6	0.60	4	6
TOTAL		3	6		4.29	kVA	
G) BHEL-BHOPAL							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	Water Leak Detector for MDBFP	1	0	0.01875	0.01875	4	6
2	HT MOTORS SPEED SWITCH	1	0	0.13	0.13	4	6
		0	1	0.13	0.13	4	6
3	CW PUMP & HT MOTOR SPEED SWITCH	1	0	0.01	0.01	4	6
		0	2	0.01	0.02	4	6
TOTAL		3	3		0.30875	kVA	
H) BHEL-RANIPET							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	IOS PC, Data Logger & Printer	1	0	2.00	2.00	16	20
2	Opacity Monitor	2	0	0.25	0.50	4	6
		0	2	0.25	0.50	4	6
TOTAL		3	2		3.00	kVA	

I) BHEL-PEM							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	PC, Printer for Electrical System, Data Concentrator, etc	1	0	1.20	1.20	10	16
		0	1	1.20	1.20	10	16
2	Condensate Polishing Unit (Transmitters, Analyzers, etc)	1	0	0.50	0.50	4	6
		0	1	0.50	0.50	4	6
3	Compressed Air System	2	0	0.50	1.00	4	6
		0	1	0.50	0.50	4	6
4	PA System	1	1	3.00	3.00	16	20
5	Fire Alarm System	1	1	0.50	0.50	4	6
TOTAL		6	5		8.40	kVA	

J) BHEL-HYDERABAD							
S.NO	FEEDER DESCRIPTION	NO. OF FEEDERS ACDB-1	NO. OF FEEDERS ACDB-2	kVA RATING OF EACH FEEDER	TOTAL KVA	MCB RATING (in Amps)	FUSE RATING (in Amps)
1	Electronic Power Positioner MDBFP HYD Coupling	1	0	0.20	0.20	4	6
2	TSI Monitoring System	1	1	0.50	0.50	4	6
3	Reverse Rotation Indicator	0	1	0.01875	0.01875	4	6
TOTAL		2	2		0.71875	kVA	

Total UPS Load (for items A to J) = 102.00 kVA
Total UPS Load (for items A to K) + 10% spare = 112.20 kVA at 50 deg C
UPS Rating Selected = 120 kVA at 50 deg C

S.NO	FEEDER RATING	TOTAL		CONSIDERING 25% SPARE		ROUNDED OFF-TO:-	
	MCB / FUSE	ACDB-1	ACDB-2	ACDB-1	ACDB-2	ACDB-1	ACDB-2
1	4A/6A	52	52	65	65	67	67
2	6A/10A	6	6	8	8	9	9
3	10A/16A	11	11	14	14	15	15
4	16A/20A	9	9	12	12	13	13
6	25A/32A	1	1	2	2	3	3
7	40A/50A	1	1	2	2	3	3
TOTAL		80	80	103	103	110	110

Note:

- 1.) 25% spare feeders of each rating are been provided in each ACDB further rounded off to 110 feeders cummulatively in ACDB-1 & ACDB-2 for any future exigencies which may creep in later.
- 2.) UPS rating is 120 kVA at 50 deg C and each UPS System is being provided with 1 set of Ni-Cd Battery for one hour full load back-up suiting 120 kVA full Load(this is total load at 50 deg C). Battery is temperature derated at 4 deg C. (Refer Battery Sizing Calculation in Page 05 of 05).
- 3.) 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 order placement.



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PROJECT: 1 x 500 MW FGUTPP UNCHAHAR

CUSTOMER : M/s NTPC

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TYPICAL BATTERY SIZING CALCULATION FOR UPS

REVISION:00

APPROVED

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30/06/2015



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Typical Battery sizing calculation:

UPS full load considered = 'A' kVA

Let A shall be 110, 120, 130 say.

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

Inverter efficiency = 'C' say

Type of Battery and Back up Time required = Ni-Cd, 1 hour backup at 100% load.

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

Number of cells = 'D' say

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 1.6V (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

Note: Inverter efficiency is to be taken as 91% with number of cells as 295 & 90% with number of cells as 270 in two separate options to be offered for Batteries.



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PROJECT: 1 x 500 MW FGUTPP UNCHAHAR

CUSTOMER : M/s NTPC

TYPE & ROUTINE ACCEPTANCE TEST

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DATE

30/06/2015

TYPE TEST REQUIREMENTS

1.00.00 TYPE TEST REQUIREMENTS

1.01.00 General Requirements

1.01.01 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. If the bidder proposes a different standard/code from that indicated at table 3.00.00, same is acceptable provided the equivalence of the proposed standard is established by the bidder. 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.

- (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.
- (b) For the rest, submission of type test results and certificate shall be acceptable provided.
 - 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 along with amendments as on the date of Bid opening.
- (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.

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, and data links shall be provided with protections that meet 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		

POWER SUPPLY FOR C&I SYSTEMS (UPS/BATTERY/BATTERY CHARGER/ACDB/DCDB)

ITEMS	TESTS																	
	Visual/dimension/rating/ (R)	Paint Adhesion/ Thickness	General arrangement/BOM/make of components /Mirmic ®	Efficiency ,regulation(R)	Input voltage variation (A)	Out put voltage and frequency adj.range(A)	Premilinary light load 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	Y
VOLTAGE STABILISER	Y	Y	Y	Y	Y					Y		Y					Y	
LEAD ACID BATTERY(TUBULAR)-IS-1651																		Y
LEAD ACID BATTERY (PLANTE)-IS-1652																		Y
NICKEL CADMIUM BATTERY(IS-10918/IEC-623)																		Y
SMF BATTERY																		Y
ACDB/DCDB	Y	Y															Y	Y
BATTERY CHARGER	Y	Y	Y	Y	Y				Y					Y	Y	Y	Y	Y

R-Routine Test A- Acceptance Test Y – Test applicable
 * Transfer time and Over shoot /under shoot during load & system transfer shall be recorded.



A4-10

CE/416/UNCHAHAR/UPS/QP

REV 00

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PROJECT: 1 x 500 MW FGUTPP UNCHAHAR

CUSTOMER : M/s NTPC

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QUALITY PLAN FORMAT

REVISION:00

APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED

ISSUED

DATE

Sathish

SATHISH

416

30/06/2015

