



BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
 HIGH PRESSURE BOILER PLANT
 PURCHASE DEPARTMENT - FOSSIL BOILERS
 THIRUCHIRAPALLI - 620014
 TAMILNADU (INDIA)

PHONE :0431-2574111
 GRAMS : BHARATELEC
 FAX NO: 0431-2520719
 E-mail:
 Web:

Page
1/6

Enquiry No	Enquiry Date	Due Date for Quotation
1701701662	18.08.2017	18.09.2017
Please quote Enquiry No, Date and due date in all correspondences. This is only a request for quotation and not an order. Bid should be submitted in two parts. 1.Techno-commercial bid (Part-I) and 2.Price bid(Part-II) in a separate sealed cover and both covers must be placed in a third cover and sealed. Our Enquiry No., Enq. date & Enq. Due date must be written on all three covers.		

Item	Description	Unit	Quantity	Delivery Quantity	Schedule Date
10	A172019708401001 CARBON IN ASH ANALYSER SYSTEM CARBON IN ASH ANALYSER SYSTEM CARBON IN ASH ANALYSER SYSTEM & ACCESSORIES AS PER TECHNICAL SPECIFICATION TDC:TCI:334 REV. 00	SET	3.000	3.00	24.02.18

General Note:

1. This requirement is for North Karanpura 660MW - 1 to 3(1720-1722) projects requirement.

2. SUPPLY OF ONLINE CARBON IN ASH ANALYSER SYSTEM AS PER SPECIFICATION TDC:TCI:334/Rev00.

3. Instruction for Indigenous Vendors:

a). Offer must be on three part basis and needs to be submitted on FOR/ North Karanpura 660MW - 1 to 3(1720-1722) projects Site basis inclusive of packing & forwarding and freight charges. Insurance charges shall be BHEL scope.

b). Part 1 consists of PQR, Part 2 is technical Bid and Part 3 is Price Bid in separate sealed covers. All three sealed covers shall then be put in a fourth sealed cover. Our Enquiry No, Enquiry date, Enquiry due date must be written on all four covers. (Refer Annexure - C)

c) Indicate clearly the GST percentage of each item.

d) Indicate clearly your GSTIN Number and HSN Code and Applicable GST percentage.

4. Instruction for Foreign Vendors:

a). Offer must be on three part basis for FOB/nearest gateway airport basis inclusive of packing & forwarding. (Schedule - F is attached for gateway airport details)

b) Materials are to be despatched to Manager/Matl.services, ROD/BHEL

The offers should reach us 30 minutes before the time of opening of tenders. The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening.Late and delayed offers are liable to be rejected.

Yours faithfully,
For BHARAT HEAVY ELECTRICALS LIMITED

G. MURUGESAN
 MANAGER / PURCHASE
 (FOSSIL BOILERS)
 Materials Management / BOI
 BHEL, TRICHY - 620 014.



429-002/A

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
 HIGH PRESSURE BOILER PLANT
 PURCHASE DEPARTMENT - FOSSIL BOILERS
 THIRUCHIRAPALLI - 620014
 TAMILNADU (INDIA)

Page
2/6

PHONE :0431-2574111
 GRAMS : BHARATELEC
 FAX NO: 0431-2520719
 E-mail:
 Web:

1701701662 / 18.08.2017

23505

,165, Thambu Chetty Street, Chennai-600001, Tamilnadu, India.

c). It is mandatory to indicate the import portion weight in Kgs for actual material weight and material weight along with packing in your offer. Part 1 consists of PQR, Part 2 is technical Bid and Part 3 is Price Bid in separate sealed covers. All three sealed covers shall then be put in a fourth sealed cover. Our Enquiry No, Enquiry date, Enquiry due date must be written on all four covers. (Refer Annexure - C)

d). Indicate clearly all the applicable extra Charges such as FOB, P & F, Inspection etc. with exact percentage.

5. Common points for all Vendors:

a). Quote should confirm our specifications, enclosed commercial terms & conditions along with MSE clause, Loading Criteria (Annexure-B). Point wise confirmation are to be submitted along with your quote duly signed, stamped to enable BHEL to ensure technical suitability. Any deviation should be specified without fail clearly in the no deviation format and the failure to comply with the same may make your quotation liable for rejection.

b). Vendor to submit their own quality plan for ONLINE CARBON IN ASH ANALYSER SYSTEM along with the offer for BHEL/End Customer's approval. VQP will be subject to BHEL approval after placement of order.

c). In addition prices for complete erection & Commissioning of Online Carbon in Ash Analyser system at site including necessary Manpower and Material at site shall be mentioned separately and clearly in the offer.

d). Suitable Erection support materials to be supplied by vendor.

e). The enquiry deviation form shall be submitted after filling up all the references and deviations if any duly signed and stamped.

f). The BHEL standard enquiry terms and conditions (Annexure - B & Annexure - D) shall be duly filled, signed & stamped and sent along with the offer.

g). Entire project requirement will be considered as a single package for evaluation purpose and L1 finalization. L1 finalization will be done based on total cost BHEL basis and it includes the supervision of erection and commissioning charges, Commissioning spares and Training Charges.

h). Inspection shall be carried out by respective BHEL approved third

The offers should reach us 30 minutes before the time of opening of tenders. The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening. Late and delayed offers are liable to be rejected.

Yours faithfully,
 For BHARAT HEAVY ELECTRICALS LIMITED

h. Murugesan
 21/8/17
 MANAGER, PURCHASE
 (FOSSIL BOILERS)
 Sr. Engineer
 Yours faithfully,
 Materials Management / BO,
 BHEL, TRICHY - 620 014.



429-002/A

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
 HIGH PRESSURE BOILER PLANT
 PURCHASE DEPARTMENT - FOSSIL BOILERS
 THIRUCHIRAPALLI - 620014
 TAMILNADU (INDIA)

PHONE :0431-2574111
 GRAMS : BHARATELEC
 FAX NO: 0431-2520719
 E-mail:
 Web:

Page
 3/6

1701701662 / 18.08.2017

23505

party inspection agency for indigenous vendors and the customer itself as per applicability. Foreign vendors need to submit all the necessary test certificates to obtain BHEL clearance before dispatch.

i). Applicable Testing and Certification charges if any shall be indicated clearly and separately in the quotation. GST% applicable on the Testing and certification charges should be clearly indicated in the quotation. If the same is found to be missing then it would be taken as inclusive in the quoted amount.

j). Two sets of O & M Manual consisting of approved drawings in PDF format (soft copy) in CDs are to be submitted to the buyer along with dispatch documents. No hard copy is warranted. Please note.

k). The delivery dates indicated above are tentative and the exact delivery date will be indicated in the purchase order.

l). In addition to technical and commercial conditions, vendors should note and follow the following conditions (01 and 03).

Condition - 1 for customer approved "A- category" vendors who are not in BHEL PMD under permanent vendor code:

"Vendor shall submit the filled in Supplier Registration Forms (available in www.bhel.com) along with their offer and parallel activity shall be taken for registering their firm with permanent category (Code) with BHEL".

Condition - 2 for customer approved "DR - category" vendors who are not in BHEL PMD under permanent vendor code:

Vendor should follow Condition - 1 and also, the filled in NTPC Questionnaire shall be submitted along with offer. On receipt of the same, it will be forwarded to BHEL/QA to take up with NTPC for their review/approval. Vendor shall get qualified into "A" category, based on the documents submitted by the vendor before price bid opening. If NTPC regrets to change the category of approval from "DR" to "A", the offer submitted by the vendor shall not be considered further for this tender and hence their offer is liable for rejection.

Condition - 3 for New Vendors:

If new vendor is responding to this open tender who is not approved by customer under "A - Category", should get approved by customer before price bid opening. If vendor is not approved by customer under "A - Category" before price bid opening, their offer will be rejected.

The offers should reach us 30 minutes before the time of opening of tenders. The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening. Late and delayed offers are liable to be rejected.

Yours faithfully,
 For BHARAT HEAVY ELECTRICALS LIMITED

G. Murugesan
 G. MURUGESAN
 MANAGER, PURCHASE
 (FOSSIL BOILERS)
 Materials Management / BO,
 BHEL, TRICHY - 620 014



429-002/A

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
 HIGH PRESSURE BOILER PLANT
 PURCHASE DEPARTMENT - FOSSIL BOILERS
 THIRUCHIRAPALLI - 620014
 TAMILNADU (INDIA)

PHONE :0431-2574111
 GRAMS : BHARATELEC
 FAX NO: 0431-2520719
 E-mail:
 Web:

Page
4/6

1701701662 / 18.08.2017

23505

The vendor, should submit the filled in "Supplier Registration Forms" (available in www.bhel.com) along with their offer and parallel activity shall be taken for registering their firm with permanent category (Code) with BHEL.

m). Important note for MSE clause:

All vendors are requested to note the Annexure X -Special clauses for Micro and Small Enterprises (MSE) suppliers.

If L1 vendor is an MSE vendor entire project package will be ordered on L1 vendor. If a Non MSE vendor is coming as L1, then L1 prices will be counteroffered on MSE vendor who is quoting price within the price band L1+15% and if they are agreeing purchase order will be awarded for full/complete supply of total tendered value to MSE. If more than one MSE vendors are available in the L1+15% price band then lowest of the MSE vendor will be selected for counteroffering. If lowest MSE vendor is not accepting it will be counteroffered to the next MSE vendor in the price band and so on. Finally if any of the MSE vendor in the price band is not accepting it will be ordered on L1 non MSE vendor. MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of documents as mentioned in the Annexure X. Since the complete enquiry requirement is being considered as a single package for tender evaluation purpose, therefore, MSE clause will not be applicable to those indigenous vendors who are quoting only for a part of the enquiry in partnership with a foreign vendor. MSE clause can be used only by an indigenous vendor who is quoting for the full enquiry requirement on its own. All the MSE related current and valid documents must be provided along with the offer without fail.

n). This tender has been published on BHEL & NIC website http://www.bhel.com/tender/tender_home.php & <http://tenders.gov.in> and also in leading national dailies (All editions of 1. Business Line 2. Business Standard (English & Hindi) and 3. All editions of Financial Times (UK) Global Tender with ref no NIT_XXXXX. All corrigendum will be published on BHEL & NIC websites only, vendors are requested to visit these websites regularly.

o). No representative is allowed to attend tender opening without authorisation letter from competent authority of the firm.

p). VENDOR SHALL SUBMIT UNPRICED BID FORMAT (ANNEXURE - D) & FILLED STANDARD ENQUIRY TERMS & CONDITIONS(ANNEXURE -B) ALONG WITH TECHNO-COMMERCIAL OFFER with duly signed, stamped. IF NOT, THEIR OFFER IS LIABLE FOR REJECTION. Also the filled Annexure - D shall be

The offers should reach us 30 minutes before the time of opening of tenders. The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening. Late and delayed offers are liable to be rejected.

Yours faithfully,
For BHARAT HEAVY ELECTRICALS LIMITED

G. MURUGESAN
 MANAGER / PURCHASE
 Sr. Engineer
 (FOSSIL BOILERS)
 Materials Management / 89
 BHEL, TRICHY - 620 014



429-002/A

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FOSSIL BOILERS
THIRUCHIRAPALLI - 620014
TAMILNADU (INDIA)

PHONE :0431-2574111
GRAMS : BHARATELEC
FAX NO: 0431-2520719
E-mail:
Web:

Page
5/6

1701701662 / 18.08.2017

23505

attached with PRICE BID with duly signed and stamped.

q). If there is any clarifications, you are requested to contact: Sri.G.
Murugesan, Sr.Engineer/MM/BOI, BHEL, Trichy-620014. Ph.:+91 431 2577072;
e-mail: qmuru@bheltry.co.in

All the tenders may be addressed to the following address:

The Tender Opening Cell / MM
Room No: 26, Building 24, Ground Floor
Bharat Heavy Electricals Limited
TIRUCHIRAPALLI 620014

In case personal delivery of the offer, it shall be dropped into the respective box kept in Room No: 26, after duly entering the data in the system.

Offers will be accepted only up to 14.00 Hrs on the due date. Therefore, vendors shall ensure to submit the offers well before this time. All due date extension requirements should be addressed to the respective Purchase mail IDs. All the due date extension requests from vendors will be considered only up to 48 hours before the due date and time.

Vendors are requested to avoid submission of offers through e mail / fax. In case of any unavoidable situation, offers shall be sent through e mail to the following mail ID only
tender_cell@bheltry.co.in.

As tenders are being opened by Common Tender Opening Cell, offer covers should be sealed with tenderer's distinctive seal and super scribed with correct Tender No. item of supply and due date of opening.

The offers will be opened at 14.30 hrs on the due date of the tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening. Late and delayed offers are liable to be rejected.

The bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL fraud prevention policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL management about any fraud or suspected fraud as soon as it comes to their notice.

The supplier shall submit EI/EII forms to BHEL time to time as indicated by the BHEL and in case of inordinate delay in issuing EI/EII forms, then BHEL reserves the right to deduct 5% of the value of the supplied items against which EI/EII forms pending to be issued

Enclosures:

- 1) SPECIFICATION: TDC:TCI:334/Rev00.
- 2) Annexure - B for indigenous vendor (Commercial terms and conditions along with MSE clause & Loading Criteria).

The offers should reach us 30 minutes before the time of opening of tenders.
The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening. Late and delayed offers are liable to be rejected.

Yours faithfully,
For BHARAT HEAVY ELECTRICALS LIMITED

G. MURUGESAN
MANAGER, PURCHASE
(FOSSIL BOILERS)
Materials Management / BO
BHEL, TRICHY - 620 014



429-002/A

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FOSSIL BOILERS
THIRUCHIRAPALLI - 620014
TAMILNADU (INDIA)

PHONE :0431-2574111
GRAMS : BHARATELEC
FAX NO: 0431-2520719
E-mail:
Web:

Page
6/6

1701701662 / 18.08.2017

23505

- 3) Annexure - B for import vendor (Commercial terms and conditions along with MSE clause & Loading Criteria).
- 4) Annexure - X for MSE clause.
- 5) Annexure - C for Special Terms & Condition (Three part details & SRF formalities).
- 6) No deviation format (Enquiry deviation).
- 7) Schedule F for details of Gateway Airport.
- 8) ANNEXURE - D, UNPRICED & PRICED BID FORMAT FOR INDIGENOUS VENDORS
- 9) ANNEXURE - D, UNPRICED & PRICED BID FORMAT FOR IMPORT VENDORS

"LD clause has to be confirmed without fail."

The offers should reach us 30 minutes before the time of opening of tenders. The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening. Late and delayed offers are liable to be rejected.

Yours faithfully,
For BHARAT HEAVY ELECTRICALS LIMITED


M. Nagarajan
(FOSSIL BOILERS)
Sr. Engineer
Materials Management
BHEL, TRICHY - 620 014



An ISO 9001
Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant)
Tiruchirappalli-620 014, Tamil Nadu, India
Dept: MATERIALS MANAGEMENT/BOI

ANNEXURE - B (For Foreign vendors)

ACCEPTANCE OF TECHNO - COMMERCIAL TERMS AND CONDITIONS BY THE BIDDERS

Description of the Equipment:		Online Carbon in Ash Analyser System
BHEL Tender No. & Date		
SI N	Terms and conditions	Vendor's confirmation
1	Technical : This requirement is for North Karanpura 660MW – 1 to 3 (1720 to 1722) project. Supply of Field mounted Online Carbon in Ash Analyser System as per specification: TDC:TCI:334/00 Compliance to PQR (Annexure – 1) to be furnished with the offer along with the supporting document Vendor shall submit their own Quality Plan for BHEL approval	
2	Firm Price: The quoted / finalised rates shall be Firm till execution of the supplies. Offer with PVC clause will not be considered.	
3	The quotes shall be on FOB/Nearest GATE WAY Airport basis. (Schedule – F attached)	
4 (a)	<u>Payment Terms:</u> The payment for items supplied for the first unit will be processed by BHEL only after proving the system at site and on acceptance of the system by M/s NTPC. In case of dissatisfaction, the bills for the system for the first unit will not be processed for payment. In case of failure of the system for the first unit, vendor will reimburse the customs duty (if applicable) paid by BHEL while importing the item. <u>General payment Term:</u> 15.1) 85% of the basic value (excluding E&C charges) will be paid on CAD Basis after 45 days from the date of receipt of complete set of documents, at BHEL Bank. 15.2) 15% of basic value (retention money), (excluding E&C charges) will be paid with 15 days credit from the date of completion of E&C along with E&C charges against supplementary invoice with proof of completion of E&C. All bank charges outside India to beneficiary's account. Income Tax on E&C is to vendor's account. Hence, all the required documents will be furnished to BHEL by vendor. Income Tax on E&C will not be paid to vendor by BHEL. The quoted lump sum charges for E&C is inclusive of To & Fro Fare, Boarding, Lodging, Local Conveyance, etc.	
		Page 01 of 04

4 (b)	1.Loading Criteria for Payment Terms: Any deviation in the above payment term will attract loading as mentioned below. “Base rate of SBI (as applicable on the date of bid opening. Techno-commercial bid opening in case of two part bids) + 6% shall be considered for loading for the period of relaxation sought by bidders.	
4 (c)	1. In the case of Usage LCs the loading will be considered @ 1.5% on the offered Value. 2. For LC at sight the loading will be considered @ 3.5% on the offered Value. 3. Normally CAD at sight and Confirmed LCs are liable for rejection.	
5 (a)	Liquidated damages: Delivery of the goods specified in the purchase order should be made within the time prescribed. Failure to dispatch the materials in the time as per the delivery quoted in our Purchase Order would make the supplier liable to an un-conditional LD at the rate of ½% of the total order value per week or part thereof subject ot maximum of 10% of the total order value. For staggered delivery schedule, LD shall be 0.5% of the undelivered portion per week of the delay or part thereof, subject to a maximum of 10% of the total order value.	
5 (b)	Loading Criteria LD / Penalty: Any deviation of the above LD/Penalty clause, loading will be applied to the extent to which it is not agreed by the bidder (at offered value).	
6 (a)	Guarantee / Warranty Period Guarantee clause 18months from the date of supply or 12 months from the date of actual put in use, whichever is earlier.	
6 (b)	Loading Criteria Guarantee / Warranty Period: No Deviation is permitted. If still vendor offered any deviation on the Guarantee / warranty period it may leads to rejection of offer.	
7(a)	Performance Bank guarantee: 10% of material value as PBG shall be offered.	
7(b)	Loading Criteria Performance Bank guarantee: No Deviation is permitted and the deviated offers are liable for rejection.	
8	Taxes & Duties: All Taxes, Duties, Service Taxes etc. payable as extra to the quoted price should be specifically stated in offers along with CST & TIN No / Tariff No. etc., failing which the purchaser will not be liable for payment of such Taxes and Duties.	
9	Risk purchase: If the supplier fails to deliver the goods within the delivery specified in the Purchase Order, BHEL will be entitled to terminate the contract and to Purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or despatch within the delivery period mentioned in the Purchase Order.	
		Page 02 of 04

10	Delivery Period: Our delivery term shall be 8 weeks from the date of Data Sheet approval.	
11	Validity: 120 days from Technical Bid opening. Non-compliance of the same will result in offer being liable for rejection.	
12	General Condition: Kindly submit the 'No deviation format' with clear indication of Data Sheet No / Specification ref, Drawing, and Quality plan.	
13	Reverse Auction: Reverse Auction is not applicable for this tender.	
14	BHEL will consider the ranking after the loading is applied as referred above wherever deviations are observed.	
15	DOCUMENT SUBMISSION In case of PO, documents (drawings, data sheets and quality plan in triplicate) shall be submitted within 15 days from the date of receipt of po and the revised documents shall be submitted within 1 week from the date of receipt of engineering / quality comments	
16	QUANTITY OF TENDERED QTY BHEL reserves the right to increase or decrease the tendered quantity	
17	PRE QUALIFICATION REQUIREMENT - The offered system shall be of proven design and shall be in successful operation for a period of 1 year in utility boiler of similar rating and type of fuel. - Bidder to provide performance certificates / authentication letters in favour of OEM from each end user certifying the same. The manufacturer (OEM) shall be an approved vendor of NTPC Limited. - Commissioning and service support for the offered system shall be available in India. The above pre-qualification requirement is mandatory for technical offer evaluation. Pre-Qualification requirement shall be furnished by the vendor during offer submission as per the format given in annexure I. Offers qualifying on the above requirement will only be considered for further processing. Offers without above PRE QUALIFICATION REQUIREMENT & COMPLIANCE will be treated as incomplete and shall be liable for rejection	
		Page 03 of 04

18	MSE Clause: All vendors are requested to note the Annexure X –Special clauses for Micro and Small Enterprises (MSE) suppliers. If L1 vendor is an MSE vendor entire project package will be ordered on L1 vendor. If a Non MSE vendor is coming as L1, then L1 prices will be counteroffered on MSE vendor who is quoting price within the price band L1+15% and if they are agreeing purchase order will be awarded for full/complete supply of total tendered value to MSE. If more than one MSE vendors are available in the L1+15% price band then lowest of the MSE vendor will be selected for counteroffering. If lowest MSE vendor is not accepting it will be counteroffered to the next MSE vendor in the price band and so on. Finally if any of the MSE vendor in the price band is not accepting it will be ordered on L1 non MSE vendor. MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of documents as mentioned in the Annexure X. Vendor to confirm. The MSE clause will only be applicable to the Indian vendors who are quoting for the complete NIT requirement on their own in INR. Quotations should not be in collaboration with any foreign vendor i.e. part quotation in INR and part quotation in foreign currency if the vendor want to avail MSE clause.							
19	Erection and Commissioning support Charges: Lump sum charges of Erection and Commissioning support with exact Man days for the system with applicable extra Taxes and Duties etc. in detail, To & Fro charges, Boarding and Lodging should be quoted separately in ANNEXURE – D Non-compliance of the same will result in offer being liable for rejection.							
20	Weight of the components: a) Component Net Weight b) Component weight with packing							
21	ANNEXURE – D Vendor shall submit unpriced bid in the Annexure - B along with techno-commercial offer. if not, their offer is liable for rejection. Also the filled Annexure - D shall be attached with PRICE BID with duly signed and stamped.							
22	Fraud prevention policy The bidder along with its associate / collaborators / sub-contractors / sub-vendors / consultants / service providers shall strictly adhere to BHEL fraud prevention policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL management about any fraud or suspected fraud as soon as it comes to their notice.							
23	COST EVALUATION Evaluation shall be on the basis of delivered cost (i.e. “total cost to BHEL”). For evaluation, the exchange rate (TT selling rate of SBI) shall be taken as under: <table><tr><td>Single part bids</td><td>Date of tender opening</td></tr><tr><td>Two/three part bids</td><td>Date of Part-I bid opening</td></tr><tr><td>Reverse Auction</td><td>Date of Part-I bid opening</td></tr></table> If the relevant day happens to be a bank holiday, then the forex rate as on the previous bank (SBI) working day shall be taken.	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	
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							
		Page 04 of 04						

ANNEXURE-B (For Indigenous vendor)

ACCEPTANCE OF TECHNO - COMMERCIAL TERMS AND CONDITIONS BY THE BIDDERS

Description of the Equipment:		Online Carbon in Ash Analyser System
BHEL Tender No. & Date		
SI No.	Terms and conditions	Vendor's confirmation
1	Technical : Supply of Field mounted Online Carbon in Ash Analyser System as per specification: TDC:TCI:334/00 Compliance to PQR (Annexure – 1) to be furnished with the offer along with the supporting document Vendor shall submit their own Quality Plan for BHEL approval	
2	Firm Price: The quoted / finalised rates shall be Firm till execution of the supplies. Offer with PVC clause will not be considered.	
3	FOR Basis: The quote shall be on North Karanpura 660MW – 1 to 3 (1720 to 1722) project basis as indicated in enquiry, inclusive of Packing and forwarding charges. Freight charges shall be vendor's scope.	
3 (a)	Freight charges: (Freight charges shall be vendor's scope).	To be included with basic price
3 (b)	Insurance charges: BHEL Scope (Offer will be loaded 0.13% of (basic material value + Freight + forwarding & packing).	BHEL SCOPE
4 (a)	<u>Payment terms:</u> The payment for items supplied for the first unit will be processed by BHEL only after proving the system at site and on acceptance of the system by M/s NTPC. In case of dissatisfaction, the bills for the system for the first unit will not be processed for payment. <u>General payment Term:</u> 15.1) 85% of the basic value (excluding E&C charges) will be direct payment after 45 days from the date of dispatch against site acknowledgement. 15.2) 15% of basic value (retention money), (excluding E&C charges) will be paid with 15 days credit from the date of completion of E&C along with E&C charges against supplementary invoice with proof of completion of E&C. Income Tax on E&C is to vendor's account. Hence, all the required documents will be furnished to BHEL by vendor. Income Tax on E&C will not be paid to vendor by BHEL. The quoted lump sum charges for E&C is inclusive of To & Fro Fare, Boarding, Lodging, Local Conveyance, etc.	

4 (b)	1.Loading Criteria for Payment Terms: Any deviation in the above BHEL payment terms as indicated in 4.a will attract loading as per below. “Base rate of SBI (As applicable on the date of bid opening. Techno-commercial bid opening in case of two part bids) + 6% shall be considered for loading for the period of relaxation sought by bidders”. 2. For option 4.a- option 2, a loading of 2% on the 90% of the offered value shall be made. 3. Payment through bank is not preferred. In this case, loading will be 3% on the offered value. In case of Direct to site, only 90% through bank will be considered. LC/advance payment will not be operated for Indigenous vendors. Offers with payment terms as LC from indigenous vendors will be rejected.	
5 (a)	Liquidated damages: Delivery of the goods specified in the purchase order should be made within the time prescribed. Failure to dispatch the materials in the time as per the delivery quoted in our Purchase Order would make the supplier liable to an un-conditional LD at the rate of ½% of the total order value per week or part thereof subject to maximum of 10% of the total order value. For staggered delivery schedule, LD shall be 0.5% of the undelivered portion per week of the delay or part thereof, subject to a maximum of 10% of the total order value.	
5 (b)	Loading Criteria LD / Penalty: Any deviation of the above LD/Penalty clause, loading will be applied to the extent to which it is not agreed by the bidder (at offered value).	
6 (a)	Guarantee / Warranty Period Guarantee clause 18months from the date of supply or 12 months from the date of actual put in use, whichever is earlier.	
6 (b)	Loading Criteria Guarantee / Warranty Period: No Deviation is permitted. If still vendor offered any deviation on the Guarantee / warranty period it may leads to rejection of offer.	
7 (a)	Performance Bank guarantee: 10% of material value as PBG shall be offered.	
7 (b)	Loading Criteria Performance Bank guarantee: No Deviation is permitted and the deviated offers are liable for rejection.	
8 (a)	Please mention your GSTIN Number and HSN Code GSTIN Number: HSN Code:	
8 (b)	Applicable GST percentage:	

Implementation of GST

For supplies after implementation of GST i.e. after 30.06.2017, the following conditions will apply and supplier shall fully comply to the below points.

Indigenous suppliers:

1. Response to Tenders for Indigenous supplier will be entertained only if the vendor has a valid GST registration no which should clearly mentioned in the offer. If any specific exemption is available, a declaration with due supporting documents need to be furnished for considering the offer..
2. Supplier shall mention their GSTN registration number in all their invoices and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain Invoice number (in case of multiple numbering system is being followed for billing like SAP invoice no, commercial invoice no etc., then the Invoice No which is linked/uploaded in GSTN network shall be clearly indicated), item description as per PO, Quantity, Rate, Value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC Code, etc.
3. All invoices shall bear the HSN Code for each item separately (Harmonized System of Nomenclature)/ SAC code (Services Accounting Code).
4. A declaration to the effect that all invoice particulars are/were uploaded in the GSTN network/ portal & all tax liability as per GST rules and regulations have been and will be discharged, shall be mentioned in the invoice. If not mentioned in the invoice, a separate declaration shall be submitted as per the requirement of BHEL.
5. All documents like Mill Test Certificate, LR copy, Guarantee/Warranty certificate, work completion certificate, any other document mentioned in PO, shall be sent along with the vehicle/consignment. For all consignments received within the calendar month, input credit will be availed within that month in line with monthly returns filing cycle. In case of any discrepancy in the document or non-submission of documents mentioned in the PO, then BHEL will not be able to accept or account the material, in such case availing of tax credit will be deferred to next month or so.
6. In case of discrepancy in the data uploaded by supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note (details to be uploaded in GSTN portal) for the shortages or rejections in the suppliers, within the calendar month notified by BHEL.
7. For any such delay in availing of tax credit for reasons attributable to supplier (as mentioned above), interest (calculated @ SBI Base Rate + 6%) along with penalty if any will be deducted for the delayed period i.e. from the month of receipt till the month tax credit is availed, from the running bills.
8. Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers/contractors. Hence applicable GST shall also be recoverable from suppliers/contractors on LD amount. For this Debit note will be issued by BHEL indicating the respective supply invoice number.

9	Risk purchase: If the supplier fails to deliver the goods within the delivery specified in the Purchase Order, BHEL will be entitled to terminate the contract and to Purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or despatch within the delivery period mentioned in the Purchase Order.	
10	DELIVERY PERIOD: Our delivery term shall be 8 weeks from the date of data sheet approval.	
11	Validity: 120 days from Technical Bid opening. Non-compliance of the same will result in offer being liable for rejection	
12	GENERAL CONDITION: Kindly submit the 'no deviation format' with clear indication of data sheet no / specification ref, drawing, and quality plan.	
13	Reverse Auction: Reverse Auction is not applicable for this tender.	
14	BHEL will consider the ranking after the loading is applied as referred above wherever deviations are observed.	
15	DOCUMENT SUBMISSION In case of PO, documents (drawings, data sheets and quality plan in triplicate) shall be submitted within 15 days from the date of receipt of po and the revised documents shall be submitted within 1 week from the date of receipt of engineering / quality comments	
16	QUANTITY OF TENDERED QTY BHEL reserves the right to increase or decrease the tendered quantity	
17	PRE QUALIFICATION REQUIREMENT - The offered system shall be of proven design and shall be in successful operation for a period of 1 year in utility boiler of similar rating and type of fuel. - Bidder to provide performance certificates / authentication letters in favour of OEM from each end user certifying the same. The manufacturer (OEM) shall be an approved vendor of NTPC Limited. - Commissioning and service support for the offered system shall be available in India. The above pre-qualification requirement is mandatory for technical offer evaluation. Pre-Qualification requirement shall be furnished by the vendor during offer submission as per the format given in annexure I. Offers qualifying on the above requirement will only be considered for further processing. Offers without above PRE QUALIFICATION REQUIREMENT & COMPLIANCE will be treated as incomplete and shall be liable for rejection	

18 (a)	MSE Clause: All vendors are requested to note the Annexure X –Special clauses for Micro and Small Enterprises (MSE) suppliers. If L1 vendor is an MSE vendor entire project package will be ordered on L1 vendor. If a Non MSE vendor is coming as L1, then L1 prices will be counteroffered on MSE vendor who is quoting price within the price band L1+15% and if they are agreeing purchase order will be awarded for full/complete supply of total tendered value to MSE. If more than one MSE vendors are available in the L1+15% price band then lowest of the MSE vendor will be selected for counteroffering. If lowest MSE vendor is not accepting it will be counteroffered to the next MSE vendor in the price band and so on. Finally if any of the MSE vendor in the price band is not accepting it will be ordered on L1 non MSE vendor. MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of documents as mentioned in the Annexure X. Vendor to confirm. The MSE clause will only be applicable to the Indian vendors who are quoting for the complete NIT requirement on their own in INR. Quotations should not be in collaboration with any foreign vendor i.e. part quotation in INR and part quotation in foreign currency if the vendor want to avail MSE clause.	
18 (b)	IF MSE VENDOR MSME CERTIFICATE	Attached/ Not Attached
18 (c)	MSE- VALIDITY DATE	From: To:
18 (d)	CA CERTIFICATE	Attached/ Not Attached
18 (e)	CA - VALIDITY DATE	From: To:
19	Erection and Commissioning support Charges: Lump sum charges of Erection and Commissioning support with exact Man days for the system with applicable extra Taxes (Service Tax-GST) in detail should be quoted separately. (Mandatory to quote the same value in Annexure - D) Non-compliance of the same will result in offer being liable for rejection.	
20	Service Taxes for Erection and Commissioning Support Charges: Indicate the applicable GST percentage	
21	ANNEXURE – D Vendor shall submit unpriced bid in the Annexure - D along with techno-commercial offer. if not, their offer is liable for rejection. Also the filled Annexure - D shall be attached with PRICE BID with duly signed and stamped.	
22	Fraud prevention policy The bidder along with its associate / collaborators / sub-contractors / sub-vendors / consultants / service providers shall strictly adhere to BHEL fraud prevention policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL management about any fraud or suspected fraud as soon as it comes to their notice.	

ANNEXURE - D (FOR INDIGENOUS VENDORS)									
PRICE BID FORMAT									
VENDOR SHALL SUBMIT UNPRICED BID IN THIS FORMAT ALONG WITH TECHNO-COMMERCIAL OFFER. ALSO THE FILLED ANNEXURE - D SHALL BE ATTACHED WITH PRICE BID PART WITH DULY SIGNED AND STAMPED. IF NOT, THEIR OFFER IS LIABLE FOR REJECTION									
ENQUIRY NO.: 1701701662			ENQUIRY DATE: 18/08/2017				PROJECT: North Karanpura 660MW - 1 to 3 (1720 to 1722)		
ENQ. SL. NO.	MATERIAL CODE	MATERIAL DESCRIPTION	QTY	UNIT	BASIC UNIT PRICE INCLUSIVE OF PACKING & FORWARDING AND FREIGHT		TOTAL PRICE (UNIT PRICE x QTY.)	GST %	OTHER COST IF ANY IN %
10	A172019708401001	Carbon in Ash Analyser System	3	Set					
OTHER CHARGES		DESCRIPTION	Lumpsum charges for Boiler - (1720)	Lumpsum charges for Boiler - (1721)	Lumpsum charges for Boiler - (1722)	Total charges for all 03 boilers	Total Man Days required/Boiler	GST % for Calibration Charges	OTHER COST IF ANY IN %
Erection and Commissioning support Charges		Lump sum charges of Erection and Commissioning support with exact Man days for the system with applicable GST%							
Freight charges in Rs. Up to site		To be included with basic price	To be included with basic price						
Insurance charges		BHEL Scope	BHEL Scope						
VENDOR NAME:		VENDOR WORKS ADDRESS:					SIGN AND SEAL OF AUTHORIZED PERSON		

Annexure – C

MM/BOI/BHEL TRICHY

SPECIAL TERMS AND CONDITIONS

1. This tender is for the supply of **Online Carbon in Ash Analyser System** as per specs, size and quantities mentioned in the attached enquiry.
2. The vendor shall have adequate experience in manufacturing and supply similar type of equipment.
3. The tender is in three parts as follows:

A) Part – I Pre-Qualification requirement:

- a) The offered system shall be of proven design and shall be in successful operation for a period of 1 year in utility boiler of similar rating and type of fuel.
- b) Bidder to provide performance certificates / authentication letters in favour of OEM from each end user certifying the same. The manufacturer (OEM) shall be an approved vendor of NTPC Limited.
- c) Commissioning and service support for the offered system shall be available in India.

The above pre-qualification requirement is mandatory for technical offer evaluation. Pre-Qualification requirement shall be furnished by the vendor during offer submission as per the format given in annexure I.

Offers qualifying on the above requirement will only be considered for further processing.

B) Part – II Techno-commercial bid:

Techno commercial bid will be consisting technical offer with complete set of supporting documents and commercial bid without indicating the price.

Offers found suitable on technical and commercial grounds only, will be considered for further processing.

C) Part - III – Price Bid:

It will be consisting of price details:

All three bids are to be submitted in separate sealed covers, duly indicating the type of bid and enquiry number in each cover. These three envelopes will be sent in single cover duly superscribing the Enquiry Number.

In addition to the above mentioned three parts bid, vendors who qualify on Pre-Qualification Requirement and Techno-commercially and are not registered vendor of BHEL-Trichy has to submit the filled in "Supplier Registration Forms" (available at www.bheltry.co.in - Online Supplier Registration – Material Management or <http://vis.bheltry.co.in/olsa/>).

Part – I Pre-qualification bid will be opened on due date:

The techno-commercial bid of the qualified vendors will be opened on a suitable date with due intimation. Based on the acceptance of techno-commercial bid and vendor evaluation, the price bid of the qualified vendors will be opened on a suitable date with due intimation.

Annexure – C
MM/BOI/BHEL TRICHY
SPECIAL TERMS AND CONDITIONS

4. Following will be the criteria for vendors to qualify:

- a. Vendor should have been approved by customer.
- b. Vendor should submit the following documents along with offer:
 - i. Duly filled-in Supplier Registration Forms.
 - ii. Availability of minimum manufacturing, handling, testing and measuring facilities as detailed in the Supplier Registration Form.
 - iii. BHEL will have the right for spot assessment of the facilities for assessment.
 - iv. Qualifying to our techno commercial requirements of the Enquiry.

Supplier Registration Form (SRF) has to be duly filled up online and send one copy with all the documents as mentioned in SRF & if vendors have already submitted SRF & hard copy is sent to BHEL, can mention SRF Number (Application Number).

URL for online Registration form is as below

<http://vis.bheltry.co.in/olsa/>

For any help regarding filling of SRF, you may contact following

Mrs. Nalini Subramanian (Purchase Officer- Supplier Development Cell)
Ph:0431/2577301
Email ID: nalini@bheltry.co.in

Mrs.P.L. Pramila (DGM- Supplier Development Cell)
Ph:0431/2574737
Email ID: pramila@bheltry.co.in

Systems / BHEL /TRICHY

Ph:System SDC:0431/2577121,ljp@bheltry.co.in

Ph:System ERP:0431/2577522,erpsubcon@bheltry.co.in

For any queries regarding tender you may contact

1) Mr. G.MURUGESAN,
SrEngineer/MM/BOI
BHEL Trichy
0431-2577072
gmuru@bheltry.co.in

2) Mr. S. SENTHIL KUMAR
MGR/MM/BOI
BHEL Trichy
0431-2578201
senthilk@bheltry.co.in

Annexure – C
MM/BOI/BHEL TRICHY
SPECIAL TERMS AND CONDITIONS

5. BHEL reserves the right to increase or decrease the tendered quantity and split the tendered quantity among more than one tenderer and place orders accordingly in any proportion based on commitment, requirement and supplier's capability in terms of delivery and quality as assessed by BHEL.
6. BHEL reserves the right to negotiate the L1 rate.
7. BHEL reserves the right to re-float the tender opened, if L1 price is not the lowest acceptable price to BHEL inter-alia other reasons.
8. BHEL reserves the right to order on more than one vendor at the lowest acceptable price to BHEL.
9. Vendors have to confirm to the Commercial Terms and Special Terms & Conditions attached.
10. BHEL standard LD condition is **½% of the total order value per week or part thereof subject to maximum of 10% of the total order value**
11. Please indicate the exact location of WORKS / FACTORY.
12. The vendor who are not registered in BHEL PMD as permanent vendors must ensure that they complete the supplier registration formalities and get registered with BHEL Trichy as permanent PMD vendors.
13. Vendor who are not approved by customer already, they shall get approved by customer before price bid opening. If customer regrets to approve before price bid opening of this tender, the offer submitted by the vendor shall not be considered further for this tender and hence their offer is liable for rejection.
14. If new vendor is responding to this open tender who is not approved by customer, should get qualified by customer before price bid opening. If vendor is not fulfilling the above criteria, offer will be rejected. Also Supplier Registration Form (SRF) has to be duly filled up online and send one copy with all the documents as mentioned in SRF.
15. Vendor shall submit the filled in "Supplier Registration Forms" (available in www.bhel.com) along with their offer as mentioned in point No 04 this annexure - C.
16. Techno-commercial bid will be opened on the due date as indicated in enquiry. Vendor's offer will only be considered, provided they are approved by customer, before price bid opening. If vendor is not fulfilling the above criteria, offer will be rejected.

ANNEXURE I

Pre-Qualification
requirement Format

PRE QUALIFICATION REQUIREMENT

Item Description	ONLINE CARBON IN ASH ANALYSER SYSTEM
-------------------------	---

Plant No.

- | | | |
|-------|---|--------|
| (i) | Make/Model/Version | |
| (ii) | Client Name & Address | |
| (iii) | Name of Industry (Power plant) | |
| (iv) | Number of measurement system | |
| (v) | Whether above offered system has at-least One (1) year satisfactory operation as on date of techno-commercial bid opening in large industrial set up viz power plant. | yes/no |
| (vi) | Client's certificate Attached | yes/no |

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

ANNEXURE II

Quality Plan Format

[illegible]

ANNEXURE III

Power & Instrumentation Cable Specification

SUB-SECTION-III:E3

LT POWER CABLES

MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) /
NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) /
RAGHUNATHPUR TPP PHASE-II (2 x 660MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2

CLAUSE NO.	TECHNICAL REQUIREMENTS			एन टी पी सी NTPC
	LT POWER CABLES			
1.00.00	CODES & STANDARDS			
1.01.00	All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS : codes, standards, etc.) referred to herein, the former shall prevail. All the cables shall conform to the requirements of the following standards and codes: IS :1554 - I PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V. IS : 3961 Recommended current ratings for cables IS : 3975 Low carbon galvanised steel wires, formed wires and tapes for armouring of cables. IS : 4905 Methods for random sampling. IS : 5831 PVC insulation and sheath of electrical cables. IS:7098(Part-I) Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V. IS : 8130 Conductors for insulated electrical cables and flexible cords. IS : 10418 Specification for drums for electric cables. IS : 10810 Methods of tests for cables. ASTM-D-2843 Standard test method for density of smoke from the burning or decomposition of plastics. IEC-754(Part-I) Test on gases evolved during combustion of electric cables. IEC -332 Tests on Electric cables under fire conditions. Part-3 : Tests on bunched wires or cables (category -B)			
2.00.00	TECHNICAL REQUIREMENTS			
2.01.00	The cables shall be suitable for laying on racks, in ducts, trenches, conduits and under ground buried installation with chances of flooding by water.			
2.02.00	Cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses develop under steady state and transient operating conditions as specified elsewhere in this specification.			
2.03.00	Aluminum conductor used in power cables shall have tensile strength of more than 100 N/ sq.mm. Conductors shall be multi stranded.			
2.04.00	XLPE insulation shall be suitable for a continuous conductor temperature of 90 deg. C and short circuit conductor temperature of 250 deg.C. PVC insulation shall be suitable for continuous conductor temperature of 70 deg C and short circuit conductor temperature of 160 deg.C.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART-B SUB SECTION-III:E3 (LT POWER CABLES)
PAGE 1 OF 6				

CLAUSE NO.	TECHNICAL REQUIREMENTS		एन टी पी सी NTPC	
2.05.00	The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath. All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath of black color as per IS : 5831.			
2.06.00	For single core armoured cables, armouring shall be of aluminum wires/formed wires. For multicore armoured cables armouring shall be of galvanised steel as follows : -			
	Calculated nominal dia of cable under armour		Size and Type of armour	
	i) Upto 13 mm		1.4mm dia GS wire	
	ii) Above 13 & upto 25mm		0.8 mm thick GS formed wire / 1.6 mm dia GS wire	
	iii) Above 25 & upto 40 mm		0.8 mm thick GS formed wire / 2.0 mm dia GS wire	
	iv) Above 40 & upto 55mm		1.4 mm thick GS formed wire / 2.5 mm dia GS wire	
	v) Above 55 & upto 70 mm		1.4 mm thick GS formed wire / 3.15 mm dia GS wire	
	vi) Above 70mm		1.4 mm thick GS formed wire / 4.0 mm dia GS wire	
2.06.01	The aluminum used for armouring shall be of H4 grade as per IS:8130 with maximum resistivity of .028264 ohms mm² per meter at 20 deg C. Aluminum armouring shall be same as indicated above for galvanized steel.			
2.06.02	The gap between armour wires / formed wires shall not exceed one armour wire / formed wire space and there shall be no cross over / over-riding of armour wire / formed wire. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire / formed wire. Zinc rich paint shall be applied on armour joint surface, of GS wire/formed wire.			
2.07.00	Outer sheath shall be of PVC(of suitable grade) & black in colour. In addition to meeting all the requirements of Indian standards referred to, outer sheath of all the cables shall have the following FRLS properties.			
	(a)	Oxygen index of min. 29 (As per IS:10810(Part-58))		
	(b)	Acid gas emission of max. 20% (As per IEC-754-I).		
	(c)	Smoke density rating shall not be more than 60% during Smoke Density Test as per ASTMD-2843.		
2.08.00	Cores of the cables shall be identified by colouring of insulation. Following colour scheme shall be adopted:			
	1 core	-	Red, Black, Yellow or Blue	
	2 core	-	Red & Black	
	3 core	-	Red, Yellow & Blue	
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART-B SUB SECTION-III:E3 (LT POWER CABLES)
PAGE 2 OF 6				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	4 core	-	Red, Yellow, Blue and Black	
2.09.00	For reduced neutral conductors the core shall be black.			
2.10.00	In addition to manufacturer's identification on cables as per IS, following marking shall also be provided over outer sheath.			
	(a)	Cable size and voltage grade - To be embossed		
	(b)	Word 'FRLS' at every 5 meter - To be embossed		
	(c)	Sequential marking of length of the cable in meters at every one meter-To be embossed / printed.		
		The embossing shall be progressive, automatic, in line and marking shall be legible and indelible.		
2.11.00	All cables shall meet the fire resistance requirement as per Category-B of IEC 332 Part -3.			
2.12.00	Allowable tolerances on the overall diameter of the cables shall be $\pm$ 2mm maximum over the declared value in the technical data sheets.			
2.13.00	In plant repairs to the cables shall not be accepted. Pimples, fish eye, blow holes etc.are not acceptable.			
2.14.00	Cable selection & sizing			
2.14.01	Cables shall be sized based on the following considerations:			
	(a)	Rated current of the equipment		
	(b)	The voltage drop in the cable, during motor starting condition, shall be limited to 10% and during full load running condition, shall be limited to 3% of the rated voltage		
	(c)	Short circuit withstand capability		
		This will depend on the feeder type. For a fuse protected circuit, cable should be sized to withstand the let-out energy of the fuse. For breaker controlled feeder, cable shall be capable of withstanding the system fault current level for total breaker tripping time inclusive of relay pickup time.		
	(d)	The minimum conductor size shall be 6 sq.mm for Al conductor cables & 2.5 sq.mm for copper conductor cables. The constructional details of copper conductor cables shall be same as indicated for copper control cables.		
2.14.02	Derating Factors			
	Derating factors for various conditions of installations including the following shall be considered while selecting the cable sizes:			
	a)	Variation in ambient temperature for cables laid in air		
	b)	Grouping of cables		
	c)	Variation in ground temperature and soil resistivity for buried cables.		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART-B SUB SECTION-III:E3 (LT POWER CABLES)
PAGE 3 OF 6				

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
2.14.03	Cable lengths shall be considered in such a way that straight through cable joints are avoided.		
2.14.04	Cables shall be armoured type if laid in switchyard area, coal handling area or directly buried.		
2.14.05	All LT power cables of sizes more than 120 sq.mm. shall be XLPE insulated and preferable sizes are 1Cx150, 1Cx300, 1Cx630, 3Cx150 & 3Cx240 sq.mm.		
3.00.00	CONSTRUCTIONAL FEATURES		
3.01.00	1.1 KV Grade Power Cables		
	(a) 1.1KV grade XLPE power cables shall have compacted aluminum conductor, XLPE insulated, PVC inner-sheathed (as applicable), armoured/ unarmoured, PVC outer-sheathed conforming to IS:7098. (Part-I).		
	(b) 1.1KV grade PVC power cables shall have aluminum conductor(compact type for sizes above 10 sq.mm), PVC Insulated, PVC inner sheathed (as applicable) armoured/ unarmoured, PVC outer-sheathed conforming to IS:1554 (Part-I).		
	(c) 1.1KV grade Trailing cables shall have tinned copper(class 5)conductor, insulated with heat resistant elastomeric compound based on Ethylene Propylene Rubber (EPR) suitable for withstanding 90 deg.C continuous conductor temperature and 250 deg.C during short circuit, inner-sheathed with heat resistant elastomeric compound, nylon cord reinforced, outer-sheathed with heat resistant, oil resistant and flame retardant heavy duty elastomeric compound conforming to IS 9968		
3.02.00	Cable Drums		
	(a) Cables shall be supplied in non returnable wooden or steel drums of heavy construction. The surface of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS : 10418.		
	(b) Each drum shall carry manufacturer's name, purchaser's name, address and contract number, item number and type, size and length of cable and net gross weight stencilled on both sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.		
4.00.00	TESTS		
4.01.00	GENERAL		
	(a) All equipment to be supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Employer's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client..		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART-B SUB SECTION-III:E3 (LT POWER CABLES)
			PAGE 4 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	(b) However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval. (c) All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price. (d) The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.			
4.02.00	Type Tests :			
4.02.01	The reports for the following type tests shall be submitted on one size each of PVC/XLPE LT Power cables of each make:			
	S.No.	Type Tests	Remarks	
	a)	For Conductor		
	1.	Resistance test		
	b)	For Armour Wires/ Formed Wires		
	2.	Measurement of Dimensions		
	3.	Tensile Test		
	4.	Elongation test		
	5.	Torsion test	For round wires only	
	6.	Winding test	For Formed wires only	
	7.	Resistance test		
	8.	a) Zinc Coating test	For G.S. Formed wires /wires only.	
		b) Wrapping test	For aluminum wires/formed wires only.	
	c)	For PVC/XLPE insulation & PVC Sheath		
	9.	Test for thickness		
	10.	Tensile strength & elongation tests before ageing and after ageing		
	11.	Ageing in air oven		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2 PART-B SUB SECTION-III:E3 (LT POWER CABLES) PAGE 5 OF 6				

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC	
	12.	Loss of mass test	For PVC insulation and sheath only	
	13.	Hot deformation test	For PVC insulation and sheath only	
	14.	Heat shock test	For PVC insulation and sheath only	
	15.	Shrinkage test		
	16.	Thermal stability test	For PVC insulation and sheath only	
	17.	Hot set test	For XLPE insulation only	
	18.	Water absorption test	For XLPE insulation only	
	19.	Oxygen index test	For outer sheath only	
	20.	Smoke density test	For outer sheath only	
	21.	Acid gas generation test	For outer sheath only	
	d)	For completed cables		
	22.	Insulation resistance test (Volume resistivity method)		
	23.	High voltage test		
	24.	Flammability test as per IEC - 332 Part-3 (Category -B)		
4.03.00	Acceptance Tests: As per QA table			
4.04.00	Routine Tests : As per QA table			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART-B SUB SECTION-III:E3 (LT POWER CABLES)
PAGE 6 OF 6				

SUB-SECTION-III:E4

LT CONTROL CABLES

MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) /
NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) /
RAGHUNATHPUR TPP PHASE-II (2 x 660MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2

CLAUSE NO.	TECHNICAL REQUIREMENTS एनटीपीसी NTPC
	LT CONTROL CABLES 1.00.00 1.01.00 1.01.00 All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS : codes, standards, etc.) referred to herein, the former shall prevail. All the cables shall conform to the requirements of the following standards and codes : IS :1554 - I PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V. IS : 3961 Recommended current ratings for cables IS : 3975 Low carbon galvanised steel wires, formed wires and tapes for armouring of cables. IS : 4905 Methods for random sampling. IS : 5831 PVC insulation and sheath of electrical cables. IS : 8130 Conductors for insulated electrical cables and flexible cords. IS : 10418 Specification for drums for electric cables. IS : 10810 Methods of tests for cables. ASTM-D-2843 Standard test method for density of smoke from the burning or decomposition of plastics. IEC-754 (Part-I) Test on gases evolved during combustion of electric cables. IEC -332 Tests on Electric cables under fire conditions Part-3 : Tests on bunched wires or cables (category -B) 2.00.00 2.01.00 2.02.00 2.03.00 2.04.00 2.05.00 2.00.00 TECHNICAL REQUIREMENTS 2.01.00 The cables shall be suitable for laying on racks, in ducts, trenches, conduits and under ground buried installation with chances of flooding by water. 2.02.00 Cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses develop under steady state and transient operating conditions as specified elsewhere in this specification. 2.03.00 Conductor of control cables shall be made of multi stranded, plain annealed copper. 2.04.00 PVC insulation shall be suitable for continuous conductor temperature of 70 deg C and short circuit conductor temperature of 160 deg. C. 2.05.00 The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath. All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath of black color as per IS : 5831.
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2 PART-B SUB SECTION-III:E4 (LT CONTROL CABLES) PAGE 1 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC	
2.06.00	For multicore armoured cables, the armouring shall be of galvanised steel as follows:-			
	Calculated nominal dia of cable under armour	Size and Type of armour		
	1) Upto 13 mm	1.4mm dia GS wire		
	2) Above 13 upto 25 mm	0.8 mm thick GS formed wire / 1.6 mm dia GS wire		
	3) Above 25 upto 40 mm	0.8mm thick GS formed wire / 2.0mm dia GS wire		
	4) Above 40 upto 55mm	1.4 mm thick GS formed wire/ 2.5mm dia GS wire		
	5) Above 55 upto 70 mm	1.4mm thick GS formed wire / 3.15mm dia GS wire		
	6) Above 70mm	1.4 mm thick GS formed wire / 4.0 mm dia GS wire		
	The gap between armour wire / formed wire shall not exceed one armour wire / formed wire space and there shall be no cross over / over-riding of armour wire / formed wire. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire / formed wire. Zinc rich paint shall be applied on armour joint surface.			
2.07.00	Outer sheath shall be of PVC(grade as applicable) and grey in colour . In addition to meeting all the requirements of Indian standards referred to, outer sheath of all the cables shall have the following FRLS properties.			
	(a) Oxygen index of min. 29 (As per IS:10810(Part-58))			
	(b) Acid gas emission of max. 20% (As per IEC-754-I).			
	(c) Smoke density rating shall not be more than 60% during Smoke Density Test as per ASTMD-2843.			
2.08.00	Cores of the cables of upto 5 cores shall be identified by coloring of insulation. Following color scheme shall be adopted.			
	1 core	-	Red, Black, Yellow or Blue	
	2 core	-	Red & Black	
	3 core	-	Red, Yellow & Blue	
	4 core	-	Red, Yellow, Blue and Black	
	5 core	-	Red, Yellow, Blue, Black and Grey	
2.09.00	For cables having more than 5 cores, core identification shall be done by numbering the insulation of cores sequentially, starting by number 1 in the inner layer (e.g. say for 10 core cable, core numbering shall be from 1 to 10). The number shall be printed in Hindu-Arabic numerals on the outer surfaces of the cores. All the numbers shall be of the same colour, which shall contrast with the color of insulation. The color of insulation for all the cores shall			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART-B SUB SECTION-III:E4 (LT CONTROL CABLES)
PAGE 2 OF 6				

CLAUSE NO.	TECHNICAL REQUIREMENTS 
2.10.00 2.11.00 2.12.00 2.13.00 2.14.00 2.14.01 2.14.02	be grey only. The numerals shall be legible and indelible. The numbers shall be repeated at regular intervals along the core, consecutive numbers being inverted in relation to each other. When the number is a single numeral, a dash shall be placed underneath it. If the number consists of two numerals, these shall be disposed one below the other and a dash placed below the lower numeral. The spacing between consecutive numbers shall not exceed 50 mm. In addition to manufacturer's identification on cables as per IS, following marking shall also be provided over outer sheath : (a) Cable size and voltage grade - To be embossed (b) Word 'FRLS' at every 5 meter - To be embossed (c) Sequential marking of length of the cable in meters at every one meter. - To be embossed / printed. The embossing / printing shall be progressive, automatic, in line and marking shall be legible and indelible. All cables shall meet the fire resistance requirement as per Category-B of IEC 332 Part -3. Allowable tolerances on the overall diameter of the cables shall be ± 2 mm maximum over the declared value in the technical data sheets. In plant repairs to the cables shall not be accepted. Pimples, fish eye, blow holes etc. are not acceptable. Cable selection & sizing (a) Rated current of the equipment (b) The voltage drop in the cable, during motor starting condition, shall be limited to 10% and during full load running condition, shall be limited to 3% of the rated voltage (c) Short circuit withstand capability This will depend on the feeder type. For a fuse protected circuit, cable should be sized to withstand the letout energy of the fuse. For breaker controlled feeder, cable shall be capable of withstanding the system fault current level for total breaker tripping time inclusive of relay pickup time. (d) The minimum size of conductor shall be 1.5 sq.mm. Derating Factors Derating factors for various conditions of installations including the following shall be considered while selecting the cable sizes: a) Variation in ambient temperature for cables laid in air b) Grouping of cables c) Variation in ground temperature and soil resistivity for buried cables. Cable lengths shall be considered in such a way that straight through cable joints are avoided.
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2 PART-B SUB SECTION-III:E4 (LT CONTROL CABLES) PAGE 3 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
2.14.03	Cables shall be armoured type if laid in switchyard area, coal handling area or directly buried.			
3.00.00	CONSTRUCTIONAL FEATURES			
3.01.00	1.1 KV Grade Control Cables			
	Control Cables shall have stranded copper conductor multicore PVC insulated, PVC inner-sheathed ,armoured / unarmoured, PVC outer-sheathed conforming to IS:1554. (Part-I).			
3.02.00	Cable Drums			
	(a) Cables shall be supplied in non returnable wooden or steel drums of heavy construction. The surface of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS : 10418.			
	(b) Each drum shall carry manufacturer's name, purchaser's name, address and contract number, item number and type, size and length of cable and net gross weight stencilled on both the sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.			
4.00.00	TESTS			
4.01.00	GENERAL			
	(a) All equipment to be supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Employer's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.			
	(b) However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.			
	(c) All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.			
	(d) The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART-B SUB SECTION-III:E4 (LT CONTROL CABLES)	PAGE 4 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC	
4.02.00	Type Tests:			
4.02.01	The Type tests reports for the following shall be submitted for one size each of LT control cable of each make :			
	S. No.	Type Test	Remarks	
	a)	For Conductor		
	1.	Resistance test		
	b)	For Armour Wires / Formed Wires		
	2.	Measurement of Dimensions		
	3.	Tensile Test		
	4.	Elongation test		
	5.	Torsion test	For round wire only	
	6.	Winding test	For Formed wires only	
	7.	Resistance test		
	8.	Zinc Coating test	For G.S. conductors only.	
	c)	For PVC insulation & PVC Sheath		
	9.	Test for thickness		
	10.	Tensile strength and elongation test before ageing and after ageing		
	11.	Ageing in air oven		
	12.	Loss of mass test	For PVC insulation and sheath only	
	13.	Hot deformation test	For PVC insulation and sheath only	
	14.	Heat shock test	For PVC insulation and sheath only	
	15.	Shrinkage test		
	16.	Thermal stability test	For PVC insulation and sheath only	
	17.	Oxygen index test	For outer sheath only	
	18.	Smoke density test	For outer sheath only	
	19.	Acid gas generation test	For outer sheath only	
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2 PART-B SUB SECTION-III:E4 (LT CONTROL CABLES) PAGE 5 OF 6				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
4.03.00 4.04.00	d) For completed cables 20. Insulation resistance test (Volume resistivity method) 21. High voltage test 22. Flammability test as per IEC - 332 Part-3 (Category-B) Acceptance Tests: As per QA Table Routine Tests :As per QA Table			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART-B SUB SECTION-III:E4 (LT CONTROL CABLES)	PAGE 6 OF 6	

SUB-SECTION-IV: I7

INSTRUMENTATION AND POWER SUPPLY CABLE

MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) /
NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) /
RAGHUNATHPUR TPP PHASE-II (2 x660MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2

CLAUSE NO.	TECHNICAL REQUIREMENTS																		
	INSTRUMENTATION AND POWER SUPPLY CABLE																		
1.00.00	INSTRUMENTATION CABLE, POWER SUPPLY CABLE, INTERNAL WIRING AND ELECTRICAL FIELD CONSTRUCTION MATERIAL																		
1.01.00	General Requirements																		
1.01.01	All cables including special cables, internal wiring and electrical field construction material shall conform to this specification, Employer approved detail engineering drawings & documents and the latest edition of the relevant standards & guidelines. The Bidder shall furnish all material and services required for the completeness of the work identified in his scope as per this specification.																		
1.01.01	The Contractor shall supply, erect, terminate and test all instrumentation cables for control and instrumentation equipment/devices/systems included under Contractor's scope as illustrated in the enclosed Drg. No. 0000-101/102-POI-A-021 and ensuring completeness of the control system.																		
1.01.02	Any other application where it is felt that instrumentation cables are required due to system/operating condition requirements, are also to be provided by Contractor.																		
1.01.03	Other type of cables like fiber optic/co-axial cables for system bus, cables for connection of peripherals etc. (under Contractor's scope) are also to be furnished by the Contractor.																		
1.01.04	Contractor shall supply all cable erection and laying hardware from the main trunk routes like branch cable trays/sub-trays, supports, flexible conduits, cable glands, lugs, pull boxes etc. on as required basis for all the systems covered under this specification.																		
1.01.05	Wherever the quantity has been defined as on as required basis, the same are to be furnished by contractor on as required basis within his quoted lump sump price without any further cost implication to the Employer.																		
2.00.00	Specification of Instrumentation cable																		
2.01.00	Common Requirements																		
	<table><thead><tr><th>S. No.</th><th>Property</th><th>Requirement</th></tr></thead><tbody><tr><td>1</td><td>Voltage grade</td><td>225 V (peak value)</td></tr><tr><td>2.</td><td>Codes and standard</td><td>All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IS-8784, IS-10810 (latest editions) and their amendments read along with this specification.</td></tr><tr><td>3.</td><td>Continuous operation suitability</td><td>At 70 deg. C for all types of cables, while 205 Deg C for Type-C cables.</td></tr><tr><td>4.</td><td>Progressive automatic on-line sequential marking of length in meters</td><td>To be provided at every one meter on outer sheath.</td></tr></tbody></table>			S. No.	Property	Requirement	1	Voltage grade	225 V (peak value)	2.	Codes and standard	All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IS-8784, IS-10810 (latest editions) and their amendments read along with this specification.	3.	Continuous operation suitability	At 70 deg. C for all types of cables, while 205 Deg C for Type-C cables.	4.	Progressive automatic on-line sequential marking of length in meters	To be provided at every one meter on outer sheath.	
S. No.	Property	Requirement																	
1	Voltage grade	225 V (peak value)																	
2.	Codes and standard	All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IS-8784, IS-10810 (latest editions) and their amendments read along with this specification.																	
3.	Continuous operation suitability	At 70 deg. C for all types of cables, while 205 Deg C for Type-C cables.																	
4.	Progressive automatic on-line sequential marking of length in meters	To be provided at every one meter on outer sheath.																	
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 1 OF 14															

CLAUSE NO.	TECHNICAL REQUIREMENTS				
2.02.00	5.	Marking to read 'FRLS'	To be provided at every 5 meters on outer sheath except for Type-C cable.		
	6.	Allowable Tolerance on overall diameter	+/- 2 mm (maximum) over the declared value in data sheet		
	7.	Variation in diameter	Not more than 1.0 mm throughout the length of cable.		
	8	Ovality at any cross-section	Not more than 1.0 mm		
	9	Others	a) Durable marking at intervals not exceeding 625 mm shall include manufacturer's name, insulation material, conductor's size, number of pairs, voltage rating, type of cable, year of manufacturer to be provided.		
				b) Cables shall be suitable for laying in conduits, ducts, trenches, racks and underground-buried installation	
				c) Repaired cables shall not be acceptable.	
	Specific Requirements				
Specification Requirements		Type-A cable	Type-B cable	Type F & G cable	Type-C cable
A. Conductors					
Cross section area		(Same as T/C)		0.5 sq. mm	0.5 sq. mm.
Conductor material		ANSI type KX	ANSI type SX	High conductivity Annealed bare copper	ANSI type KX
Colour code		Yellow-Red	Black-Red	As per VDE-815	Yellow-Red
Conductor Grade		As per ANSI MC 96.1		Electrolytic	As per ANSI MC 96.1
No & dia of strands		7x0.3 mm (nom)			
No. of Pairs		2	2	2,4,8,12,16,24,48	2
Max. conductor resistance per Km (in ohm) at 20 deg. C		As per ANSI MC 96.1		73.4 (loop)	As per ANSI MC 96.1
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 2 OF 14

CLAUSE NO.	 TECHNICAL REQUIREMENTS			
	Reference Standard As per ANSI MC 96.1 VDE 0815 As per ANSI MC 96.1 B. Insulation Material PVC type YI 3 Teflon (i.e. extruded FEP) Thickness in mm (Min/Nom/Max) 0.25/0.3/0.35 0.4/0.50 Volume Resistivity (Min) in ohm-cm 1 x 10¹⁴ at 20 deg. C & 1x10¹¹ at 70 deg. C. --- Voltage Rating 225 V peak operating voltage Reference Standard VDE 0207 Part 4 VDE 0207 Part 6 & ASTM D 2116. Core diameter above insulation Suitable for cage clamp connector C. Pairing & Twisting Max. lay of pairs (mm) 50 Single layer of polyester numbered tape on each pair provided Yes Unit formation of four pairs with printing of no. of Unit provided N.A. Yes N.A. Conductor /pair identification as per VDE0815 N.A. To be provided (color coding attached). N.A. D. Shielding Type of shielding ← ----- Al-Mylar tape ----- → Individual pair shielding No To be provided for F-type cable No Minimum thickness of Individual pair shielding No 28 micron No			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 3 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS 			
	Overall cable assembly shielding To be provided Minimum thickness of Overall cable assembly shielding 55 micron Shielding coverage 100% with at least 20% overlap Drain wire provided for individual shield N.A. Yes (for F-type) 7-strand 20 AWG (0.51 mm²) annealed Tin coated copper N.A. Drain wire provided for overall shield Yes. 7-strand 20 AWG (0.51 mm²) annealed Tin coated copper E. FILLERS Non-hygroscopic, flame retardant To be provided F. Outer Sheath Material <--- Extruded PVC compound YM1 with---> FRLS properties Teflon (i.e. extruded FRP) Minimum Thickness at any point 1.8 mm 0.4 mm Nominal Thickness at any point >1.8 mm 0.5 mm Color Blue Resistant to water, fungus, termite & rodent attack Required Oxygen index as per ASTM D-2863 not less than 29% N.A. Temperature index as per ASTM D-2863 not less than 250 deg.C N.A. Acid gas generation by weight as per IEC-60754-1 Maximum 20% N.A.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 4 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS				
	Smoke Density Rating as per ASTMD-2843	Maximum 60% (defined as the average area under the curve when the results of smoke density test plotted on a curve indicating light absorption vs. time as per ASTMD-2843)		N.A.	
	Reference standard	VDE207 Part 5		VDE207 Part 6 & ASTM D2116	
	G. Electrical Parameters				
	Mutual Capacitance Between Conductors At 0.8 KHz (Max.)	200 nF/km	120 nF/km for F type 100 nF/km for G-type	200 nF/km	
	Insulation Resistance (Min.)	100 M Ohm/Km			
	Cross Talk Figure (Min.) At 0.8 KHz	60 dB	60 dB	N.A.	
	Characteristic Impedance (Max) At 1 KHz	N.A.	320 OHM FOR F-TYPE 340 OHM FOR G-TYPE	N.A.	
	Attenuation Figure at 1 KHz (Max)	N.A.	1.2 db/km	N.A.	
	H. Complete Cable				
	Complete Cable assembly	Shall pass Swedish Chimney test as per SEN-SS 4241475 class F3.		N.A.	
	Flammability	Shall pass flammability as per IEEE-383 read in conjunction to this specification		N.A.	
	I. Accessories				
	Cable accessories of flame retardant quality.	Yes. (Accessories such as harnessing components, markers, bedding, cable jointer, binding tape etc.)			
	J. Tests				
	Routine & Acceptance tests	Refer sub-section IIIE			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 5 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Type tests Submission of type test results and certificate shall be acceptable provided the test has been conducted within last 5 years from the date of bid opening. In case the test is not conducted within last 5 years or spec requirements are not met, the same shall be conducted by contractor free of cost to Employer. Also, refer sub-section-IV:19 TYPE TEST REQUIREMENTS FOR C&I. K Cable Drum Type Non-returnable wooden drum (wooden drum to be constructed from seasoned wood free from defects with wood preservative applied to the entire drum) or steel drum. Outermost layer covered with waterproof paper Yes Painting Entire surface to be painted Length 1000 m + 5% for up to & including 12 pairs 500 m + 5% for above 12 pairs			
3.00.00	SPECIFICATION OF OPTICAL FIBER CABLES (OFC)			
3.01.00	Optic Fiber cable shall be 4/8/12 core, galvanised corrugated steel taped armoured, fully water blocked with dielectric central member for outdoor/indoor application so as to prevent any physical damage. The cable shall have multiple single-mode or multi mode fibers on as required basis so as to avoid the usage of any repeaters. The core and cladding diameter shall be 9 +/- 1 micrometer and 125 +/- 1 micrometer respectively. The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacturer, progressive automatic sequential on-line marking of length in meters at every meter on outer sheath.			
3.02.00	The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling viz. Steel central member, Loose buffer tube design, 4 fibers per buffer tube (minimum), Interstices and buffer tubes duly filled with Thixotropic jelly etc. The cable shall be suitable for a maximum tensile force of 2000 N during installation, and once installed, a tensile force of 1000 N minimum. The compressive strength of cable shall be 3000 N minimum & crush resistance 4000 N minimum. The operating temperature shall be - 20 deg. C to 70 deg. C			
3.03.00	All testing of the fiber optic cable being supplied shall be as per the relevant IEC, EIA and other international standards.			
3.04.00	Bidder to ensure that minimum 100% cores are kept as spares in all types of optical fibre cables.			
3.05.00	Cables shall be suitable for laying in conduits, ducts, trenches, racks and under ground buried installation.			
3.06.00	Spliced / Repaired cables are not acceptable.			
3.07.00	Penetration of water resistance and impact resistance shall be as per IEC standard.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 6 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS																																																															
4.00.00	SPECIFICATION OF POWER SUPPLY CABLES For technical specification, testing requirements etc, refer relevant subsections of this specification.																																																															
5.00.00	INSTRUMENTATION CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY The cable interconnection philosophy to be adopted shall be such that extensive grouping of signals by large scale use of field mounted Group Junction Boxes (JBs) at strategic locations (where large concentration of signals are available, e.g. valves limit & torque switches, switchgear) is done and consequently cable with higher number of pairs are extensively used. The details of termination to be followed are mentioned in the given Table A. TABLE A: CABLE TERMINATION TO BE FOLLOWED <table><tr><th colspan="2">Application</th><th colspan="2">Type Of Termination</th><th>Type Of</th><th rowspan="2">Cable</th></tr><tr><th>FROM (A)</th><th>TO (B)</th><th>END A</th><th>END B</th><th>END B</th></tr><tr><td>Valves/dampers drives (Integral Junction box)</td><td>Marshalling cubicle/ Marshalling cum termination Cubicle/local group JB</td><td>Plug in connector</td><td>Posts mount cage clamp type.</td><td></td><td>G</td></tr><tr><td>Transmitters, Process Actuated switches mounted in LIE/LIR</td><td>Integral Junction box of LIE/LIR</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td></td><td>F,G</td></tr><tr><td>RTD heads</td><td>Local junction box</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td></td><td>F</td></tr><tr><td>Thermocouple</td><td>CJC Box (if applicable)</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td></td><td>A,B,C*</td></tr><tr><td>Other Field Mounted Instrument</td><td>Local JB/Group JB</td><td>Plug in connector</td><td>Screwed, Cage clamp (Rail mount) type</td><td></td><td>F,G</td></tr><tr><td>RTD</td><td>Temperature transmitter</td><td>Plug in connector</td><td>Screwed, Cage clamp type</td><td></td><td>F</td></tr><tr><td>Thermocouple</td><td>Temperature transmitter</td><td>Plug in connector</td><td>Screwed, Cage clamp type</td><td></td><td>A,B,C*</td></tr><tr><td>Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR</td><td>Group JB</td><td>Cage clamp (Rail mount) type.</td><td>Cage clamp (Rail mount) type.</td><td></td><td>F,G</td></tr></table>					Application		Type Of Termination		Type Of	Cable	FROM (A)	TO (B)	END A	END B	END B	Valves/dampers drives (Integral Junction box)	Marshalling cubicle/ Marshalling cum termination Cubicle/local group JB	Plug in connector	Posts mount cage clamp type.		G	Transmitters, Process Actuated switches mounted in LIE/LIR	Integral Junction box of LIE/LIR	Plug in connector	Cage clamp (Rail mount) type.		F,G	RTD heads	Local junction box	Plug in connector	Cage clamp (Rail mount) type.		F	Thermocouple	CJC Box (if applicable)	Plug in connector	Cage clamp (Rail mount) type.		A,B,C*	Other Field Mounted Instrument	Local JB/Group JB	Plug in connector	Screwed, Cage clamp (Rail mount) type		F,G	RTD	Temperature transmitter	Plug in connector	Screwed, Cage clamp type		F	Thermocouple	Temperature transmitter	Plug in connector	Screwed, Cage clamp type		A,B,C*	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.		F,G
Application		Type Of Termination		Type Of	Cable																																																											
FROM (A)	TO (B)	END A	END B	END B																																																												
Valves/dampers drives (Integral Junction box)	Marshalling cubicle/ Marshalling cum termination Cubicle/local group JB	Plug in connector	Posts mount cage clamp type.		G																																																											
Transmitters, Process Actuated switches mounted in LIE/LIR	Integral Junction box of LIE/LIR	Plug in connector	Cage clamp (Rail mount) type.		F,G																																																											
RTD heads	Local junction box	Plug in connector	Cage clamp (Rail mount) type.		F																																																											
Thermocouple	CJC Box (if applicable)	Plug in connector	Cage clamp (Rail mount) type.		A,B,C*																																																											
Other Field Mounted Instrument	Local JB/Group JB	Plug in connector	Screwed, Cage clamp (Rail mount) type		F,G																																																											
RTD	Temperature transmitter	Plug in connector	Screwed, Cage clamp type		F																																																											
Thermocouple	Temperature transmitter	Plug in connector	Screwed, Cage clamp type		A,B,C*																																																											
Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.		F,G																																																											
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 7 OF 14																																																											

CLAUSE NO.	TECHNICAL REQUIREMENTS																																		
	----- <table><tr><th colspan="2">Application</th><th colspan="2">Type Of Termination</th><th>Type Of</th><th rowspan="2">Cable</th></tr><tr><th>FROM (A)</th><th>TO (B)</th><th>END A</th><th>END B</th></tr></table> ----- <table><tr><td>Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR</td><td>Marshalling Cubicle/ Marshalling cum Termination Cabinet</td><td>Cage clamp (Rail mount) type.</td><td>Posts mount cage clamp type.</td><td>F,G</td></tr><tr><td>Marshalling cubicle/ Termination Cabinet</td><td>Electronic system cabinet</td><td>Cage clamp Post mounted type.</td><td>Plug in connector/ Other System as per manufacturer's Standard</td><td>Internal wiring</td></tr><tr><td>Marshalling/ Termination System Cabinets</td><td>UCD mounted equipments</td><td>Post mount cage clamp type.</td><td>Plug in connector/ Cage clamp type (rail mounted).</td><td>F,G (with plug-in connector at one end)</td></tr><tr><td>DDCMIS/PLC cabinets</td><td>PC, Printers etc.</td><td>Plug in connector</td><td>Plug in connector</td><td>Mfr.'s Standard</td></tr></table> -----					Application		Type Of Termination		Type Of	Cable	FROM (A)	TO (B)	END A	END B	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR	Marshalling Cubicle/ Marshalling cum Termination Cabinet	Cage clamp (Rail mount) type.	Posts mount cage clamp type.	F,G	Marshalling cubicle/ Termination Cabinet	Electronic system cabinet	Cage clamp Post mounted type.	Plug in connector/ Other System as per manufacturer's Standard	Internal wiring	Marshalling/ Termination System Cabinets	UCD mounted equipments	Post mount cage clamp type.	Plug in connector/ Cage clamp type (rail mounted).	F,G (with plug-in connector at one end)	DDCMIS/PLC cabinets	PC, Printers etc.	Plug in connector	Plug in connector	Mfr.'s Standard
	Application		Type Of Termination		Type Of	Cable																													
	FROM (A)	TO (B)	END A	END B																															
	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR	Marshalling Cubicle/ Marshalling cum Termination Cabinet	Cage clamp (Rail mount) type.	Posts mount cage clamp type.	F,G																														
	Marshalling cubicle/ Termination Cabinet	Electronic system cabinet	Cage clamp Post mounted type.	Plug in connector/ Other System as per manufacturer's Standard	Internal wiring																														
	Marshalling/ Termination System Cabinets	UCD mounted equipments	Post mount cage clamp type.	Plug in connector/ Cage clamp type (rail mounted).	F,G (with plug-in connector at one end)																														
DDCMIS/PLC cabinets	PC, Printers etc.	Plug in connector	Plug in connector	Mfr.'s Standard																															
Notes	1. Normally 10% spare cores shall be provided when the numbers of pairs of cables are more than four pairs except for pre-fabricated cables which shall be as per manufacturer's standard. 2. For analog signals, individual pair shielding & overall shielding & for Binary signals, only overall shielding of instrumentation cables shall be provided. 3. Also refer Drg. 0000-101/102-POI-A-021. 4. *For high temperature applications only. 5. Instrument Cabling for instruments/equipments covered under subsection-IV:13 (MAIN EQP INST SYS) shall be as per manufacturer's standard .																																		
6.00.00	TERMINAL BLOCKS																																		
6.01.00	All terminal blocks shall be rail mounted/post mounted, cage clamp type with high quality non-flammable insulating material of melamine suitable for working temperature of 105 deg.C. The terminal blocks in field mounted junction boxes, temperature transmitters, instrument enclosures/racks, etc., shall be suitable for cage clamp connections. The terminal blocks in Control Equipment Room logic/termination/marshalling cubicles shall be suitable for post mounted cage clamp connection at the field input end. The terminal blocks for DDCMIS input/output connections from/to SWGR/MCC, Actuators with Integral Starter (for coupling																																		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 8 OF 14																														

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	relays and check back signals of 11 kV and 3.3 kV auxiliaries, LT drives/valves & dampers/solenoids, CT & VT, etc.) shall be provided with built in test and disconnect facilities complete with plug, slide clamp, test socket etc. The exact type of terminal blocks to be provided by the Bidder and the technical details of the same including width etc. shall be subject to Employer's approval.		
6.02.00	All the terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, partitions, small partitions, test plug bolts and test plug (as specified above for SWGR connections) transparent covers, support brackets, distance sleeves, warning label, marking, etc.		
6.03.00	The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc. All terminal blocks shall be numbered for identification and grouped according to the function. Engraved labels shall be provided on the terminal blocks.		
6.04.00	For terminating each process actuated switches, drive actuators, control valves, Thermocouple, RTD, etc. in Local Junction Boxes, etc, refer Drg no. 0000-999-POI-A-065.		
6.05.00	The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.		
6.06.00	For ensuring proper connections, Bidder shall provide suitable accessories, along with insulation sleeves. The exact connecting accessory shall be finalized as per application during detail engineering stage subject to Employer's approval without any cost repercussions.		
6.07.00	Internal wiring in factory pre-wired electronic equipment cabinets may be installed according to the Bidder's standard as to wire size and method of termination or internal equipment. Terminal blocks for connection of external circuits into factory prewired electronic equipment cabinets shall meet all the requirements as specified above.		
7.00.00	INTERNAL PANELS/ SYSTEM CABINETS WIRING		
7.01.00	Internal panel/cabinet wiring shall be of multi-stranded copper conductor with FRLS PVC insulation without shield and outer sheath meeting the requirements of VDE 0815.		
7.02.00	Wiring to door mounted devices shall be done by 19 strand copper wire provided with adequate loop lengths of hinge wire so that multiple door opening shall not cause fatigue breaking of the conductor.		
7.03.00	All internal wires shall be provided with tag and identification nos. etched on tightly fitted ferules at both ends in Employer's approved format. All wires directly connected to trip devices shall be distinguished by one additional red color ferrule.		
7.04.00	All external connection shall be made with one wire per termination point. Wires shall not be tapped or spliced between terminal points.		
7.05.00	All floor slots of desk/panels/cabinets used for cable entrance shall be provided with removable gasketed gland plates and sealing material. Split type grommets shall be used for prefabricated cables.		
7.06.00	All the special tools as may be required for solder less connections shall be provided by Bidder.		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)
			PAGE 9 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS			
7.07.00	Wire sizes to be utilized for internal wiring.			
	(i)	Current (4-20 mA), low voltage signals (48V); Ammeter/Voltmeter circuit, control switches etc. for electrical system.	0.5 Sq.mm.	
	(ii)	Power supply and internal illumination.	2.5Sq.mm. minimum (shall be as per load requirement.)	
8.00.00	INSTRUMENTATION CABLE INSTALLATION AND ROUTING			
8.01.00	All cables assigned to a particular duct/conduit shall be grouped and pulled in simultaneously using cable grips and suitable lubricants. Cables removed from one duct/conduit shall not be reused without approval of Employer.			
8.02.00	Cables shall be segregated as per IEEE Std.-422. In vertically stacked trays, the higher voltage cable shall be in higher position and instrumentation cable shall be in bottom tier of the tray stack. The distance between instrumentation cables and those of other system shall be as follows:			
	From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm	
	From 415V tray system	-	610 mm	
	From control cable tray system	-	305 mm	
8.03.00	Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed. Fire proof sealing (to prevent ingress of dust entry and propagation of fire) shall be provided for all floor slots used for cable entrance. Compression cable glands (double for armoured and single for other cables) shall be provided.			
8.04.00	All cables shall be identified by tag. Nos. provided in Employer's approved format at both the ends as well as at an interval of 5 meters.			
8.05.00	Line voltage drop due to high resistance splices, terminal contacts, insulation resistance at terminal block, very long transmission line etc. shall be reduced as far as practicable.			
8.06.00	The cables emanating from redundant equipment/devices shall be routed through different paths. The above segregation of cables & wiring for redundant equipments/devices shall be in accordance with IEEE-Std-422.			
9.00.00	CABLE LAYING AND ACCESSORIES			
9.01.00	CABLE LAYING			
	1	Cables shall be laid strictly in line with cable schedule.		
	2	Identification tags for cables.		
		Indelible tags to be provided at all terminations, on both sides of wall or floor crossing, on each conduit/duct/pipe entry/exit, and at every 20 m in cable trench/tray.		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)
PAGE 10 OF 14				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
9.02.00	3	Cable tray numbering and marking.		
		To be provided at every 10m and at each end of cable way & branch connection.		
	4	Joints for less than 250 Meters run of cable shall not be permitted.		
	5	Buried cable protection		
		With concrete slabs; Route markers at every 20 Meters along the route & at every bend.		
	6	Road Crossings		
		Cables to pass through buried high density PE pipes encased in PCC. At least 300 mm clearance shall be provided between		
		- HT power & LT power cables,		
		- LT power & LT control cables		
		- LT control & instrumentation cables,		
	Spacing between cables of same voltage grade shall be in accordance with the de-rating criteria adopted for cable sizing.			
	7	Segregation (physical isolation to prevent fire jumping)		
	a	All cable associated with the unit shall be segregated from cables of other Units.		
	b	Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire.		
	8	Cable clamping		
		All cables laid on trays shall be neatly dressed up & suitably clamped/tied to the tray. For cables in trefoil formation, trefoil clamps shall be provided.		
	9	Optical fiber cables inside conduit shall be laid on cable trays wherever available and feasible. In areas where the same are required to be buried, the same shall be buried in separate trench approx.1.6 meter depth, to be laid in 2" GI/rodent proof HDPE conduits covered with sand, brick and soil along the pipe line route;		
		While crossing roads - to be laid in GI/rodent proof HDPE conduits with sand filling at bottom and sand, soil filling at top with cement concrete;		
		While crossing canals/river- to be laid in GI/rodent proof HDPE conduits within hume pipe.		
	Bidder shall supply and install all cable accessories and fittings like Light Interface Units, Surge suppressors, Opto isolators, Interface Converters, Fibre Optic Card Cage, Fibre Optic Line Driver, Repeater / Modem (for Optical Fibre Cables), cable glands, grommets, lugs, termination kits etc. on as required basis.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 11 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC																																		
9.03.00	Bidder shall furnish two completely new sets of cable termination kits like Crimping tools, etc., which are required for maintenance of the system as per the type of termination used.																																			
9.04.00	Cables, which terminate in cabinets of draw out sections shall have sufficient cable coiled in the bottom of the cabinet to permit full withdrawal of draw out sections without disconnecting the cables. When prefabricated cables with factory connectors on both ends are longer than required, the excess cable shall be coiled in the bottom of one or both termination cabinets.																																			
9.05.00	No splices shall be made in conductors for instrument and control circuits except where required at connections to devices equipped with factory installed pigtails. Such splices shall be made only in approved splicing boxes of fitting with removable cover. The splices shall be made with sufficient slack left in the wires to permit withdrawal of the splice from the splicing box for ease of future disconnection of the splices. All exposed conductor or connector surfaces shall be covered with a minimum of three half-lapped layers of all weather vinyl plastic electrical tape. Taping shall extend a minimum of two cable diameters over the cable jacket and a similar distance over the other insulation or connections requiring insulation.																																			
9.06.00	The Bidder shall be responsible for proper grounding of all equipment under C&I package. Further, proper termination of cable shields shall be verified and the grounding of the same shall be coordinated so as to achieve grounding of all instrumentation cable shields at same potential. This shall be completed prior to system tests. All the cables etc. required for grounding of all equipments supplied under this package are to be supplied by the Bidder.																																			
9.07.00	The Contractor shall take full care while laying / installing cables as recommended by cable manufacturers regarding pulling tensions and cable bends. Cables damaged in any way during installation shall be replaced at the expense of the Contractor.																																			
10.00.00	FIELD MOUNTED LOCAL JUNCTION BOXES <table><tr><td>(i)</td><td>No. of ways</td><td colspan="2">12/24/36/48/64/72/96/128 with 20% spares terminals.</td></tr><tr><td>(ii)</td><td>Material and Thickness</td><td colspan="2">4mm thick Fiberglass Reinforced Polyester (FRP).</td></tr><tr><td>(iii)</td><td>Type</td><td colspan="2">Door gasket shall be of synthetic rubber.</td></tr><tr><td>(iv)</td><td>Mounting clamps and accessories</td><td colspan="2">Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands and lugs required for erection shall be of brass, included in Bidders scope of supply.</td></tr><tr><td>(v)</td><td>Type of terminal blocks</td><td colspan="2">Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm². A M6 earthing stud shall be provided.</td></tr><tr><td>(vi)</td><td>Protection Class</td><td colspan="2">IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.</td></tr><tr><td>(vii)</td><td>Grounding</td><td colspan="2">To be provided.</td></tr><tr><td>(viii)</td><td>Color</td><td colspan="2">To be decided during detailed engineering & subject to Employer's approval.</td></tr></table>				(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.		(ii)	Material and Thickness	4mm thick Fiberglass Reinforced Polyester (FRP).		(iii)	Type	Door gasket shall be of synthetic rubber.		(iv)	Mounting clamps and accessories	Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands and lugs required for erection shall be of brass, included in Bidders scope of supply.		(v)	Type of terminal blocks	Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm ² . A M6 earthing stud shall be provided.		(vi)	Protection Class	IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.		(vii)	Grounding	To be provided.		(viii)	Color	To be decided during detailed engineering & subject to Employer's approval.	
(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.																																		
(ii)	Material and Thickness	4mm thick Fiberglass Reinforced Polyester (FRP).																																		
(iii)	Type	Door gasket shall be of synthetic rubber.																																		
(iv)	Mounting clamps and accessories	Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands and lugs required for erection shall be of brass, included in Bidders scope of supply.																																		
(v)	Type of terminal blocks	Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm ² . A M6 earthing stud shall be provided.																																		
(vi)	Protection Class	IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.																																		
(vii)	Grounding	To be provided.																																		
(viii)	Color	To be decided during detailed engineering & subject to Employer's approval.																																		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 12 OF 14																															

CLAUSE NO.	TECHNICAL REQUIREMENTS			
11.00.00	CONDUITS			
11.01.00	Conduits shall be generally used for interconnecting cables from field instruments to Local JB's. All rigid conduits, couplings and elbows shall be hot dipped galvanized rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduit shall be heat resistant lead coated steel, The temperature rating of flexible conduit shall be suitable for the following areas: (i) Mills (ii) Drum (iii) Main steam, RH steam (iv) Air Heaters (v) Furnace, BFPDTs For the remaining applications, water leak, fire and rust proof flexible GI conduits shall be provided.			
11.02.00	The Bidder shall install conduits according to the general routing as approved by Employer and shall coordinate conduit locations with other works.			
11.03.00	All grounding bushings within all enclosures shall be wired together and connected internally to the enclosure grounding lug or grounding bus with 8 AWG bare copper conductor. Conduit runs to individually mounted equipment shall be grounded to the Employer's cable tray grounding conductor with 12 AEG bare copper conductor. All grounding bushings, clamps and connectors shall be subject to approval of the Employer.			
11.04.00	All rigid conduit fittings shall conform to the requirements of IS: 2667, 1976. Galvanized steel fitting shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fittings shall be compatible with the flexible conduit supplied.			
11.05.00	All individually mounted equipment and devices shall be connected to the supply conduit, using not more than one meter of flexible conduit adjacent to the equipment or device. Flexible conduit shall be installed in all conduit runs, which are supported by both building steel and structures subject to vibration or thermal expansion. This shall include locations where conduit supported by building steel enters or becomes supported by the turbine generator foundation and where conduit supported by building steel or foundation becomes supported by steam generator framing.			
11.06.00	Special areas, such as control rooms in which external noise is to be minimized, shall have flexible conduit in conduit runs where the runs cross from the main building framing to the control room framing.			
11.07.00	Conduit supports shall be furnished and installed in accordance with these specifications. Support material shall comply with the following requirements. i) Hanger rods shall be 12 mm diameter galvanized threaded steel rods. ii) Single conduit supports shall be one-hole cast metal straps and clamp backs unless other types are acceptable to the Employer. Multiple conduit bank supports shall be constructed of special galvanized support channels with associated conduit clips.			
11.08.00	Conduit sealing, explosion proof, dust proof and other types of special fittings shall be provided as required by these specifications and shall be consistent with the area and equipment with which they are installed. Fittings installed outdoors and in damp locations			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2		PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)
PAGE 13 OF 14				

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	shall be sealed and gasketed. Hazardous area fittings and conduits sealing shall conform to NEC requirements for the area classification.			
11.09.00	Contractor shall provide double locknuts on all conduit terminations not provided with threaded hubs and couplings. Water tight conduit unions and rain tight conduit hubs shall be utilized for all the application which shall be exposed to weather. Moisture pockets shall be eliminated from conduits.			
11.10.00	Conduits shall be securely fastened to all boxes and cabinets.			
12.00.00	CABLE SUB-TRAY & SUPPORT			
12.01.00	The cable sub-trays and the supporting system, to be generally used between Local/Group JBs and the main cable trays and the same shall be furnished and installed by the Contractor. It is the assembly of sections and associated fittings forming a rigid structural system used to support the cable from the equipment or instrument enclosure upto the main cable trays (trunk route).			
12.02.00	The covers on the cable sub-trays shall be used for protection of cables in areas where damage may occur from falling objects, welding spark, corrosive environment, etc. & shall be electrically continuous and solidly grounded. The cable trays shall not have sharp edges, burrs or projections injurious to the insulation or outer sheath of the cables.			
12.03.00	The supporting arrangement of cable tray system shall be able to withstand the weight of the cable and cable tray system. The supporting interval shall not be more than the recommended span for the above loading for the type of cable tray selected. The tray shall not overhang by more than one meter from the support at the dead end. As far as practicable the cable sub-tray system shall be supported from one side only, in order to facilitate installation and maintenance of cables.			
12.04.00	The Bidder shall furnish and install the estimated quantities and sizes of sub trays/troughs including all required fittings and adaptors on as required basis.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 14 OF 14