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**TENDER SPECIFICATIONS**

**TENDER NO. BHEL: NR (SCT): BAWANA: ELECT-CNI: 649**

**FOR**

**Erection, testing, commissioning, post commissioning, trial operations and handing over of all Electrical and C&I Equipments, Power Transformers, Isolated Phase Busduct for 1500 MW Pragati-III CCPP of Pragati Power Corporation at Bawana, Delhi**

**PART I – TECHNICAL BID**



**Bharat Heavy Electricals Limited  
(A Govt. Of India Undertaking)  
Power Sector – Northern Region,  
Plot No. 25 , Sector - 16A ,  
Distt. Gautam Budh Nagar, NOIDA – 201 301 (INDIA)**



**ISO 9001, ISO 14001  
and OHSAS 18001  
certified company  
SubContract and  
Purchase Deptt.**

**Bharat Heavy Electricals Limited  
(A Govt. Of India Undertaking)  
Power Sector – Northern Region,  
Plot No. 25 , Sector - 16A ,  
Distt. Gautam Budh Nagar, NOIDA – 201 301(INDIA)  
Phone: 0091-0120-2515476 / 2515464 / 2515479  
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Email: [sku@bhelnsr.co.in](mailto:sku@bhelnsr.co.in) / [pshiv@bhelnsr.co.in](mailto:pshiv@bhelnsr.co.in)**

**TENDER NO. BHEL: NR (SCT): BAWANA: ELECT-CNI: 649**

**IMPORTANT NOTE**

PURCHASER OF THIS TENDER DOCUMENT IS ADVISED TO CHECK AND ENSURE COMPLETION OF ALL PAGES OF TENDER DOCUMENT AND REPORT ANY DISCREPANCY TIMELY FOR CORRECTIVE ACTION, IF ANY, TO THE ISSUING AUTHORITY BEFORE THE BIDS ARE SUBMITTED. ORIGINAL COPY OF TENDER DOCUMENT COMPLETE IN ALL RESPECTS MUST BE SUBMITTED BACK AS PART OF THE BID WITHOUT WHICH THE SAME IS LIABLE TO BE REJECTED BY BHEL.

THIS TENDER SPECIFICATION ISSUED TO:

M/S-----

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ISO 9001-2000, ISO 14001  
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### **TENDER NOTICE**

**Sealed tenders are invited from the contractors fulfilling qualifying requirements for the work of “Erection, testing, commissioning, post commissioning, trial operations and handing over of all Electrical and C&I Equipments, Power Transformers, Isolated Phase Busduct for 1500 MW Pragati-III CCPP of Pragati Power Corporation at Bawana, Delhi.”**

### **TENDER NO. BHEL: NR (SCT): BAWANA: ELECT-CNI: 649**

#### **QUALIFYING REQUIREMENTS:**

- 1.1 Bidders should have executed similar nature electrical works consisting of 6.6 kV or higher rating switch gear, HT Transformers of 132 kV/150 MVA or higher rating & Isolated Phase Bus duct in Power/ Nuclear/ Industrial Projects with single unit rating of 67.5 MW or above during last seven years reckoned as on the date of bid opening.  
‘AND’
- 1.2 Bidders should have executed similar nature C&I works consisting of Boiler and Turbine Control panels and related field instrumentation works in Power/ Nuclear/ Industrial Projects with single unit rating of 67.5 MW or above during last seven years reckoned as on the date of bid opening.  
‘AND’
- 2.0 Tenderer should also have an average annual turnover of minimum of Rs.600 Lacs (Rupees Six hundred Lacs only) during preceding three years (2005-06, 2006-07 & 2007-08). Tenderer shall submit audited balance sheet in support of same.
- 3.0 Tie-Up Arrangement
- 3.1 Tenderers not having experience as per QR at SI No. 1.1 or QR SI No. 1.2 are allowed to have tie up arrangement for the work not

executed by them. The tenderer shall submit legal documents of tie-up arrangement for the same. The composition of the Tie-up arrangement and role and responsibility of each constituent for execution of work in their respective area must be well defined. The tenderer who submit the bid, should clearly indicate in the document that he is the Lead partner in the Tie-up arrangement. The Tenderer shall give an undertaking that the responsibility of execution of entire work shall lie with him and also that in case of dissolution of Tie up, the Lead Partner shall be liable for completing the work as per the terms of contract without any additional cost to BHEL or without affecting project schedule and they will immediately arrange necessary alternate tie up arrangements with another party meeting the QR requirement of this NIT (Subject to BHEL's approval) and that in case the same is not arranged, BHEL will be free to get the work done through alternate sources at their (Contractor's) risk and cost.

Legal documents of tie-up agreement, signed by both the partners, shall be submitted as a part of technical bid. Power of Attorney issued by Authorised person of the company in favour of Each Signatory for signing the agreement shall also be submitted.

3.2 For the purpose of qualifying requirements as given at SL No. 2.0 above, Collective Financial Turnover of both the partners shall be considered. However, audited balance sheets of both the partners shall be submitted individually.

'AND'

4.0 Bidders selection is subject to approval of BHEL's customer i.e. M/s PPCL for this work.

**NOTES:**

- (i) The Tender Documents comprise of following;
  - (a) Special Conditions of Contract (SCC), Tender Notice, Project Synopsis, etc.
  - (b) Rate Schedule
  - (c) GCC
- (ii) Tender Documents with complete details are hosted on BHEL's web page [www.bhel.com](http://www.bhel.com). Bidder(s) intending to participate may download the tender document from the web site. Bidder(s) downloading the tender documents from the web site, shall remit Rs.1000/- (Rupees One thousand only) in the form of crossed demand draft (non-refundable), in favour of BHEL, NOIDA along with their offer
- (iii) Bidder(s) can also purchase hard copy of tender documents from this office. Tender documents (non transferable) will be issued on all working days between 09.30 Hrs. to 12.30 Hrs within the sale period i.e **upto 25.09.2009** on payment of Rs.1,000/- (non-refundable) either in cash or by crossed demand draft in favour of BHEL, NOIDA. Request for issue of tender document should clearly indicate Tender No. and work.

- (iv) Tenders must be submitted to the undersigned 'OR' to Shri Kailash Arora, Sr. Asstt. 'OR' to Smt. Usha Kochhar, Sr. Asstt. in Room No. 104, PSNR, NOIDA latest by **15:00 Hrs. on 25.09.2009**. Technical bids shall be opened at **15.30 Hrs. on 25.09.2009**. Tenders received after the due date & time shall be liable to be summarily rejected.
- (v) Earnest Money Deposit (EMD): Refundable, Non-interest bearing **EMD of Rs 2,00,000/-** shall be deposited by Account Payee Pay Order 'OR' Demand Draft in favour of " Bharat Heavy Electricals Limited" payable at Delhi/NOIDA . Those bidders who have already deposited ' One Time 'EMD' of Rs. 2,00,000/- with BHEL, PSNR, NOIDA need not submit EMD with the present tender.
- (vi) Tenders not accompanied with Full Earnest Money Deposit, as indicated above, may not be considered.
- (vii) All corrigenda, addenda, amendments and clarifications to this Tender will be hosted in this web page and not in the newspaper. Bidders shall keep themselves updated with all such amendments.
- (viii) BHEL reserves the right to accept or reject any or all tenders without assigning any reason whatsoever.
- (ix) BHEL takes no responsibility for any delay/loss of documents or correspondences sent by courier/post.
- (x) Unsolicited rebate/discount shall not be accepted after bid opening.
- (xi) Purchase Preference will be given to CPSUs as per Govt. Guidelines.
- (xii) BHEL reserves the right to go for a Reverse Auction instead of Opening the submitted sealed bid, which will be decided after technical evaluation. As such, the bidders should submit their best prices in the 'Sealed Price Bid'. However, bidders are required to confirm their acceptance of "General terms and conditions" governing RA specifically in their technical bid. The "General terms and conditions" governing RA are given in the SCC of the NIT. Bidders are also required to furnish following details in their techno-commercial bid, for this purpose (RA).

Authorization of representative who will participate in the on line Reverse Auction Process;

- a. Name and Designation of official
- b. Postal Address (Complete)
- c. Telephone Nos. (Land line & Mobile both)
- d. FAX No.
- e. E-mail address
- f. Name of Place/ State/ Country, wherefrom he will participate in the RA.

**AGM/SCP**



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**TENDER NOTICE - NEWSPAPER**

LAST DATE OF SALE : **25.09.2009**  
DUE DATE OF SUBMISSION : **25.09.2009 (15:00 Hrs.)**

NIT NO. / NAME OF WORK
<p><b>TENDER NO. BHEL: NR (SCT): BAWANA: ELECT-CNI: 649</b></p> <p>Sealed tenders are invited from the contractors fulfilling qualifying requirements for the work of “Erection, testing, commissioning, post commissioning, trial operations and handing over of all Electrical and C&amp;I Equipments, Power Transformers, Isolated Phase Busduct for 1500 MW Pragati-III CCPP of Pragati Power Corporation at Bawana, Delhi”.</p>

**NOTES:-**

1. Purchase Preference will be given to CPSU as per Govt. Guidelines.
2. Please visit our website at [www.bhel.com](http://www.bhel.com) for complete details of the tender.
3. All corrigenda, addenda, amendments and clarifications to this Tender will be hosted in this web page and not in the newspaper. Bidders shall keep themselves updated with all such amendments.

**AGM/SCP**

**Bharat Heavy Electricals Limited**  
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**PROCEDURE FOR SUBMISSION OF SEALED TENDERS:**

The tenderers must submit their tenders as required in **two parts** in separate sealed covers **prominently superscribed as Part-I Technical bid and Part-II ,Price bid** also indicating on each of the cover tender specification no., date and time as mentioned in tender notice. **Price bids for Part-A and Part-B of Works must be in separate sealed covers indicating clearly the respective “Part of Work “ and tender specification no. etc. on their covers.**

**TECHNICAL BID (COVER-I)**

Except **Price bid Part-II**, complete set of tender document consisting of General conditions of Contract, “Technical specification & Special terms and condition” ( Part-I) issued by BHEL shall be enclosed in **Part I Technical Bid only**. All schedules, data sheets and details called for in the specification shall also be submitted along with technical bid. All details / Data / Schedules including offer letter duly signed and stamped are to be **submitted in duplicate**.

**PRICE BID (COVER-II)**

Tenderers may please note that price bid is **to be submitted only in original copy** of Tender i.e. Price bid (Part-II) issued by BHEL and no duplicate copy of same is required. **Price bids for Part-A and Part-B of Works must be in separate sealed covers indicating clearly the respective “PART OF Work” and tender specification no. etc. on their covers**. As such, if Tender quote for both Part-A as well as for Part- B , the Cover-II ( Price Bid Cover ) will contain two sealed covers of price bids indicating clearly the respective “ Part of Work “ and tender specification no. etc. on these covers.

These Two separate covers i.e. cover I & II shall together be enclosed in a **third envelope (Cover-III)** and this sealed cover shall be superscribed with tender specification No., due date, time and submitted to officer inviting tender as indicated in tender notice on or before due date as indicated.

**PROJECT SYNOPSIS**

Name of the Owner : **Pragati Power Corporation Limited**

Address : Pragati III CCPP Bawana Delhi

Installed capacity : New project

New Installation : 1500 MW (Nominal)

Nearest Railway station : Delhi

Nearest City : Delhi

Nearest Airport : Delhi

Maximum Temperature : 48 Deg C

Minimum temperature : Appx 2 Deg C

**SECTION-III  
(PART-A)**

**SPECIAL CONDITIONS OF CONTRACT**

**INDEX**

Clause	Description
34.0	General
35.0	Civil works, foundation and grouting
36.0	Consumables
37.0	Tools & Plants/ IMTE's
38.0	Supervisory staff & workmen
39.0	Material handling and storage
40.0	Preservation of components
41.0	Welding and NDT
42.0	Progress reporting
43.0	Drawings & documents
44.0	Income tax, Service Tax & Sales tax etc.
45.0	Extra work
46.0	Price variation
47.0	Rate schedule
48.0	Instructions to tenderer
49.0	Liquidated Damages (LD)
50.0	Security Deposit
51.0	Others

**SECTION - III `A'**

**SPECIAL CONDITIONS OF CONTRACT**

**34.0 GENERAL**

- 34.1** The intent of this specification is to provide services for execution of project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve the contractor of the responsibility of providing such services / facilities to complete the work or portion of work awarded to him. The quoted / accepted rates / lump sum price shall deem to be inclusive of all such contingencies.
- 34.2** The contractor shall carry out the work in accordance with standard practices / codes / instructions / drawings / documents / specification supplied by BHEL/NTPC/PPCL from time to time.
- 34.3** The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during execution. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost failing which the job will be carried out by BHEL by engaging other agencies / departmentally and recoveries will be affected from contractor's bills towards expenditure incurred including BHEL's usual overhead charges.
- 34.4** Following shall be the responsibility of contractor and have to be provided within finally accepted rates / prices.
- A** Provision as required of all types of labour, supervisors, engineers, watch and ward, tools & tackles, calibrated inspection, measuring and test equipment as specified and otherwise required for the work, consumables for erection, testing and commissioning including material handling.
  - B** Proper out-turn as per BHEL's plan and commitment
  - C** Completion of work as per BHEL Schedule.
  - D** Good quality and accurate workmanship for proper performances of equipment.
  - E** Repair, rectification and modification in electrical circuits/wiring involving removal of connections & redoing as per modification.
  - F** Preservation / Re-conservation of all components during storage / erection till handing over.

### 34.5 Health, Safety & Environment management (HSE)

**34.5.1 BHEL-Power Sector (NR) is ISO 9001, ISO 14001, OHSAS 18001, ISO 27001 and SA-8000 certified company. Quality of work, to customer's satisfaction and system requirements is the essence of these certifications. The contractor in all respects will organize his work, systems, environment, process control documentation, tools, plant, inspection, measuring and testing equipments etc. as per instructions of BHEL engineer.**

**The contractor shall also comply with applicable legislation and regulations with regards to Health, Safety and Environmental aspects for minimizing risk arising from occupational health & safety hazards, controlling pollution and wastage. The Contractor will be responsible for Health, Safety & Environment management (HSE) at site for the construction activities to be carried out by them in accordance with requirements given under section I (a) of GCC and elsewhere in this tender document. The contractor, who is awarded the work, shall have to sign an MOU w.r.t implementation of HSE conditions with BHEL (Safe Work Practices).**

**34.5.2** Besides provision with regard to SAFETY under Clause 27 of GCC, the contractor will be responsible for Health, Safety & Environment management at site for the construction activities to be carried out by them in accordance with requirements given **under section I(a) of GCC of this document**. The contractor shall continuously take special care to ensure the safety and prevention of human and equipment accidents and maintain good sanitary conditions in and around the site. All the construction work and plant operation must be carried out in the safest possible manner. The Engineer reserves the right to stop any process which, in the Engineer's opinion, is being performed dangerously. In this case the contractor must immediately adhere the requisite safety precautions and any delays attributed to the work stoppage on this account shall not affect the agreed contractual finishing dates.

The contractor shall appoint dedicated full-time Qualified Safety Officers who shall have full authority to ensure that all necessary safety precautions are observed by the Contractor's employees and sub-contractors. These appointees shall have full responsibility for the safety of all personnel within the contractor's area of the works.

**34.5.3** Some of the common safety rules to be followed during working are as follows:-

- No body is allowed to enter at construction site without Safety Shoe.
- Never enter work area without Safety helmet & chin strap in place.
- No climbing/working allowed without proper safety belt above 2 m. height.
- Do not exceed the speed limit 25 Kmph within premises.
- No debris obstacles allowed on the roads & passages.
- Do not walk on pipelines or false ceiling.
- Maintain good Housekeeping at work site.

- No photography/ Videography allowed without permission
- All Site supervisors & engineers (including subcontractor's) must be imparted structured training on construction safety before start of the job & record to be maintained.
- Availability of qualified & trained Site Engineer at site during all working hours.
- Site Safety training to be imparted to all workers & plan to be made to cover every worker.
- Tools box talk (5-15 minutes) by supervisor prior to commencement of any job.
- All accident / incidents(Near Miss) to be reported & investigated.(formats & procedure should be finalized)
- Daily Safety Checking by Each Site Engineer along with Safety engineer.
- Weekly co-ordination meeting of all Safety engineers with BHEL safety officer.
- Monthly safety meeting with Site In-charges.
- All Safety equipment must be ISI marked & checked by Safety officer before use.
- Tag system for erection & use of scaffoldings.
- Bamboo/wooden Scaffolding material not allowed.
- LPG cylinders not allowed for gas cutting.
- Good House keeping. Separate waste bins to be used for flammable & non flammable material.
- Safety awareness programs for workers by display of boards, posters, competitions, talks etc.
- Deployment of Safety Supervisors for every 250 workers and part there of at work site.
- Display of List of First Aid trained persons.
- Testing certificates for lifting tools & tackle.
- Provision & maintenance of fire extinguishers at construction site & material stores.
- Display of emergency telephone numbers at various locations.
- For work in confined space use 24 V lamp fitting & use tools with air motors or electric tools with max. 24 V.
- For confined space entry Gas test must be done before & at regular intervals.
- Checking & tag of equipment like grinding machine, welding machine, gas cutting set etc. by supervisors before use.

**Further, the contractor is required to provide proper Safety Net System wherever the hazard of fall from height is present as per instructions of BHEL Engineer at site. The safety net shall be fire resistant, duly tested and shall be of ISI mark and the nets shall be located as per site requirement to arrest or to reduce the consequences of a possible fall of persons working at different heights.**

#### **34.5.4 Contractor shall ensure following:**

1. Contractor has to maintain contact with local hospital having ambulance facility, scanning & other ultra modern medical facilities required during emergency.
2. Contractor has to ensure pre employment medical check for all staff & workers.

3. Contractor has to ensure that adequate First Aid facilities with trained nurse are available at work site for emergency purpose. This emergency set-up should include, but not limited to, following
- Male nurse (in shifts)
  - Oxygen set up
  - Breathing apparatus
  - Eye wash facility
  - Stretcher
  - Trauma blanket
  - Medicines.

In addition to above, BHEL (through its other contractor) has arranged ambulance at work site for emergency purpose, which can be utilized by contractor in case of emergency. The charges for the same will be decided mutually at site. In case, under unavoidable circumstances, if the ambulance is not available, the contractor will have to arrange for the same as [under clause 34.5.4 \(1\)](#).

- 34.5.5** The Contractor shall be fully responsible for accidents caused due to him or his agents or workmen's negligence or carelessness in regard to the observance of the safety requirements and shall be liable to pay compensation for injuries. **It may be noted that non-compliance to HSE requirements will result in penal action. In case of violations of safety requirements, the Contractor shall be liable for a penalty of Rs. 200/- for the first violation and Rs. 500/- for the subsequent violations. For serious lapses, as decided by BHEL Engineer/NTPC/PPCL, fines upto Rs. 5000/- at a time can be imposed.**

The amount towards penalties as above will be deducted from running bills of the Contractor. The amount so collected above will be utilized for supporting the safety activities at site. The decision of BHEL on above will be final and binding on the Contractor.

**[In addition, Safety Code/Practices of M/S PPCL \(BHEL's customer\) shall also be applicable.](#)**

**34.5.6 The contractor shall comply with following towards Social Accountability;**

- (a) The contractor shall not employ any employee less than 15 years of age in pursuant to ILO convention. If any child labour were found to have been engaged , the Contractor shall be levied with expenses of bearing his education expenditure which will include stipend to substantiate appropriate education or employ any other member of family enabling to bear the child education expenditure.
- (b) The contractor shall not engage Forced/Bonded Labour and shall abide by abolition of Bonded Labour System(Abolition) Act, 1976.
- (c) The contractor shall maintain Health & safety requirement as stipulated in the Contract and Contract Labour( Regulation & Abolition) Act,1970.
- (d) The Contractor shall abide by UN convention w.r.t Human Rights and shall be liable for Discrimination/Corporal punishment for failure in meeting with relevant requirements.

- (e) The Contractor shall abide the requirement of Contract Labour(Regulation & Abolition) Act,1970 for working hours.
- (f) The Contractor shall abide by the statutory requirement of Minimum Wages Act 1948, payment of Wages Act 1936.
- (g) The Contractor shall arrange potable drinking water to its employees & workers.

**34.5.7** In order to meet the environmental concerns it is expected that the contractor shall plant at least **100** (one hundred) trees and maintain them throughout the period of Contract in the vicinity of the project as per the available space and as per advise of Engineers.In case no area is earmarked for tree plantation, the contractor may take up any other equivalent environment related project after due approval of the BHEL Engineer.

## **35.0 CIVIL WORKS, FOUNDATIONS AND GROUTING.**

- 35.1** BHEL shall provide all equipment foundations. The contractor for their correctness, as per drawings, shall check the dimensions & locations of the foundations, pockets, anchor-bolt pitch. Further, top elevation of foundations shall be checked with respect to benchmark. All minor adjustments of foundation level, dressing and chipping of foundation surfaces up to 50 mm, enlarging the pockets in foundations etc., as may be required for the erection of equipment / plants shall be carried out by the contractor.
- 35.2** While on the job, care is essential to avoid too much chipping and resultant lowering of level. In case of excess chipping, contractor has to arrange additional packing plates as per requirements provided BHEL Engineer allows it. When required by manufacturers, the embedded sub-sole plates shall be scraped and checked with Prussian blue to get the required contact with frames.
- 35.3** The contractor shall ensure perfect matching of packer plates including machining, scraping and blue matching with foundation by dressing the foundation, as well as perfect matching between the packer plates and the base plate of equipment to the satisfaction of BHEL Engineer. If required the packer plates may have to aligned and fixed on the foundations using Special high strength, non-shrinking and quick setting grouts. The minimum thickness below the packer plate should be maintained as per instruction of BHEL. The material required for this has to be arranged for by the contractor at his cost.
- 35.4** Entire grouting work of foundation bolt grouting, base plate grouting etc. including materials will be carried out by another agency carrying out Civil work for BHEL. Contractor for subject work has to offer neat & clean foundations to the Civil Contractor to ensure perfect grouting.
- 35.5** While grouting will be carried out by BHEL's Civil contractor, contractor shall keep all the matching joints, which are not to be grouted, free from the grouting mixture by applying tape or any other alternative method approved by Engineer.

**35.6** Besides grouting as above, any civil works required for safe and efficient operation of tools and tackles like grouting / excavation/ casting of foundation / anchor points for derricks, winches, guy ropes fastening etc / foundations required for any temporary works shall also be the contractor's responsibility. For these civil works all materials including cement and required facilities will have to be arranged by contractor at his own cost.

### **36.0 CONSUMABLES**

- 36.1 The contractor shall provide within finally accepted rates, all consumables like, gland packing, all welding electrodes (including alloy steel, Aluminum, stainless steel), Aluminum filler wires , tig wires , all inert / welding gases, soldering material, dye penetrants, other erection consumables such as tapes, jointing compound , grease, mobile oil, M-seal, Araldite , Parmali wood, petrol , CTC / other cleaning agents, petroleum jelly, insulation tape, PVC sealing compound, sleeves , cable ties , gaskets and shims , wooden, sleepers, steel required for temporary works such as supports, packing hardware items, sealing compound required for completion of work except those which are specifically supplied by manufacturing unit.
- 36.2 It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of consumables. Non availability of any consumable materials or equivalent suggested by BHEL cannot be considered as reason for not attaining the required progress or for additional claim.
- 36.3 It shall be the responsibility of the contractor to obtain prior approval of BHEL/NTPC/PPCL, regarding suppliers, type of electrodes etc. before procurement of welding electrodes / TIG wires. On receipt of electrodes at site these shall be subjected to inspection and approval by BHEL/NTPC/PPCL. The contractor shall inform BHEL details regarding type of electrodes, batch No. date of expiry etc. and produce test certificate for each lot / batch with correlation of batch / lot no. with respective test certificate. No electrode will be allowed to be used without valid test certificate.
- 36.4 BHEL reserves the right to reject the use of any consumable including electrodes, gases, lubricants / special consumables if it is not found to be of the required standard / make / purity or when shelf life has expired. Contractor shall ensure display of shelf life on consumable wherever required & records maintained.
- 36.5 Storage of all consumables including welding electrodes shall be done as per requirement / instruction of the Engineer by the contractor at his cost.
- 36.6 In case of improper arrangement for procurement of any consumable, BHEL reserves the right to procure the same from any source and recover the cost from the Contractor's first subsequent bill at market value plus the departmental charges of BHEL from time to time (30% at present). Postponement of such recovery is normally not permitted. The decision of Engineer in this regard shall be final and binding on the contractor.
- 36.7 All lubricants and chemicals required for testing , pre-commissioning, commissioning, preservation and lubricants for trial runs of the equipment

shall be supplied by BHEL /BHEL's client. All services including labour and T&Ps will be provided by the contractor for handling, filling, emptying, refilling etc. The consumption of lubricants / chemicals shall be properly accounted for. Surplus material if any shall be properly stacked and returned to stores.

- 36.8 Transportation of Oil Drums from stores, centrifuging and first filling of Oil, subsequent topping / makeup till the unit is commissioned and handed over to the customer is included in the scope of this contract . The contractor shall have to return all the empty drums to BHEL / BHEL client's store at no extra cost. Any damage / loss of above drums shall be to the contractor's account.
- 36.9 All charges on account of Octroi, terminal or sales tax and other duties on materials obtained for the works from any source shall be borne by the contractor.

### 37.0 TOOLS AND PLANTS / IMTE's

- 37.1 **T&Ps being provided by BHEL to sub-contractor free of hire charges as per Annexure-I** shall be shared by other sub contractors working for BHEL at site and the allotment done by BHEL Engineer shall be final and binding.
- 37.2 Besides the T&Ps and IMTEs being made available to contractor free of hire charges by BHEL, all other T&Ps and IMTEs which are required for successful and timely execution of the work covered within the scope of this tender, shall be arranged and provided by the contractor (**As per Annexure-II & III**) at his own cost in working condition. In the event of the failure of contractor to bring necessary and sufficient T&Ps and IMTEs , BHEL will be at liberty to arrange the same at the risk and cost of contractor and hire charges as applicable shall be deducted from contractor's bill. Decision of BHEL in this regard shall be final and binding on contractor.
- 37.3 All distribution boards, connecting cables / welding cables, wire ropes, hoses etc. including temporary air/water / electrical connections etc. shall have to be arranged by the contractor at his own cost.
- 37.4 In case of non-availability of the T&Ps to be provided by BHEL due to breakdown, major overhauls, distribution pattern or any other reason, the contractor shall plan / amend / alter his activities to meet erection / commissioning targets in consultation with BHEL.
- 37.5 The operation of all BHEL's cranes (**Except for 200/250 MT cranes**) being provided free of hire charges shall be in the scope of the contractor. The contractor shall arrange, at his own cost, trained operators and fuel and other minor consumables (i. e. cotton cloth / cotton waste etc.) for their operation. (Operator only for 200/250 MT cranes will be provided by BHEL). Further, Helpers and fuel for operation of all BHEL cranes shall be provided by contractor within the final accepted rates).
- All Lubricants for the BHEL cranes such as mobil oil, gear oil, brake oil, hydraulic oil, torque converter oil and grease will be provided by BHEL free of cost. The contractor will give the requirement well in advance.
- 37.6 The contractor shall engage trained and experienced operators for the operation of BHEL's T&Ps. Their skill / performance will be checked by BHEL Engineer before they are allowed to operate the same. However checking of

skills by BHEL does not absolve contractor of his responsibilities for proper and safe handling of equipment, consistent good performance and regular performance evaluation of operators.

37.7 The day to day operation and routine maintenance of BHEL's T&Ps (**Other than cranes**) should be carried out by contractor as per manufacturer's / BHEL's maintenance schedule at his cost. These shall be maintained in good working condition during the entire period of use. T&Ps in defective / damaged condition shall be rectified promptly to the full satisfaction of BHEL engineer. Contractor shall maintain records for maintenance of major T&Ps which shall be made available for inspection whenever required. In case of any lapses on the part of the contractor BHEL at its own discretion get the servicing / repair of equipment done at the risk and cost of the contractor with BHEL overheads.

37.8 Maintenance of BHEL cranes (100 MT and above), will be carried out by a separate agency appointed by BHEL. However, the helpers for day today maintenance and fuel for these cranes shall be in the scope of this contract.

For Maintenance of BHEL cranes (less than 100 MT), while these shall be covered under AMC awarded by BHEL, the contractor at his own cost shall arrange all supervision and labour required for routine / day-day maintenance of cranes. For attending breakdowns of these cranes, the contractor shall arrange for labour. A separate maintenance group to be formed by the contractor for the day today maintenance of all the T & P,s working at site. However specialist's supervision, for attending breakdowns shall be arranged by BHEL as assessed by BHEL Engineer. Repair of self and dynamo shall be the responsibility of the contractor. The cranes shall be fitted with a set of new batteries at the time of initial issue from the stores. However, the charges of the replacement of the other damaged / worn out parts of BHEL cranes will be borne by BHEL, provided the damage is not due to the negligence of the contractor.

All the spares & lubricants (except for diesel) for the cranes (BHEL's Cranes) shall be supplied by BHEL. For all BHEL cranes, if there are breakdowns / damages due to negligence of the contractor, the complete service / repair charges and cost of all the spares damaged with BHEL overheads shall be recovered from contractor's RA bills.

The contractor shall arrange at his cost all spares needed for upkeep of all T&Ps other than cranes supplied by BHEL. For cranes, repair / replacement of filter, batteries, self, dynamo, gaskets, hoses, oil seals and rubber parts shall be the responsibility of the contractor. However, the charges of the replacement of the other damaged/worn out parts of BHEL cranes will be borne by BHEL provided the damage is not due to the negligence of the contractor. However, if there are breakdowns / damages due to negligence of the contractor, the complete service / repair charges and cost of all the spares damaged with BHEL overheads shall be to the account of contractor and shall be recovered from his RA bills.

37.9 All supervision and labour required for maintenance and attending breakdowns shall be arranged by the contractor at his own cost. Specialist supervision shall be arranged by BHEL as assessed by BHEL Engineer.

- 37.10 Increasing / shortening of the crane boom to suit work requirements shall have to be arranged by the indenting contractor at his cost. All necessary manpower, tools, support, consumables, illumination etc. will have to be arranged by contractor at his cost.
- 37.11 Consolidation of ground and arrangement of sleepers / sand bag filling etc. for safe operation/ movement of equipment including cranes / trailers etc. shall be the responsibility of the contractor at his cost.
- 37.12 In the event of contractor not using and maintaining BHEL T&Ps and IMTEs according to BHEL's instructions, BHEL will have the right to withdraw such item without any notice and no claim in this regard shall be entertained and contractor shall be responsible for delay in execution on this account.
- 37.13 Any loss / damage to any part of BHEL T&Ps and IMTEs shall be to the contractor's account and any expenditure on these accounts by BHEL will be recovered from the contractor's bill in case the contractor fails to make good the loss.
- 37.14 It shall be responsibility of the contractor to take delivery of T&Ps and IMTEs from stores or place of use by other contractor at project site, transport the same to site and return the same to BHEL store/ place as intimated by BHEL Engineer in project site in good working conditions after use.
- 37.15 The contractor shall return BHEL T&Ps and IMTEs issued to him in good working condition as and when desired by BHEL (on completion or reduction of work load). If return of T&P and IMTE is delayed by contractor, hire charges as applicable shall be levied by BHEL from time, it was requisitioned till the time of actual return. Hire charges shall also be charged on the T&Ps and IMTEs returned in damaged / unserviced condition to BHEL till its satisfactory repair. T&Ps & IMTEs returned in damaged / unserviced condition shall be got repaired by BHEL at its own discretion and entire cost of repair with BHEL overheads shall be recovered from the contractor.
- 37.16 Replacement cost including BHEL overheads in respect of irreparable / completely damaged / non return of T&Ps and IMTEs shall be recovered from the contractor's running bills.
- 37.17 Contractor shall ensure deployment of serviced and healthy T&Ps including cranes, lifting tackles, wire ropes, Manila ropes, winches and slings etc. History card and maintenance records for major T&Ps will be maintained by the contractor and will be made available to BHEL Engineer for inspection as and when required. Identification for such T&Ps will be done as per BHEL Engineer's advice.
- 37.18 Contractor shall ensure deployment of reliable and calibrated IMTEs (Inspection measuring and Test equipment). The IMTEs shall have test/ calibration certificates from authorized / Govt. Approved / accredited agencies traceable to National / International standards. Each IMTE shall have a label indicating calibration status i.e. date of calibration, calibration agency and due date for calibration. A list of such instruments deployed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.
- 37.19 Retesting/ re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer with in the contract price.

The contractor will also have alternate arrangements for such IMTE so that work does not suffer when the particular instrument is sent for calibration. Also if any IMTEs not found fit for use, BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall i.e. repeat the readings taken by that instrument, failing which BHEL may deploy IMTEs and retake the readings at contractor's cost.

- 37.20 BHEL shall have lien on all T&Ps, IMTEs & other equipment of the Contractor brought to the site for the purpose of erection, testing and commissioning. BHEL shall continue to hold the lien on all such items throughout the period of Contract. No material brought to the site shall be removed from the site by the Contractor and/or his Sub-contractors without the prior written approval of the Engineer.
- 37.21 **The month wise T&P deployment plan to be submitted as per format (at Annexure-D to General Conditions of Contract)** is only to assess the capability as well as understanding of the contractor to execute the work. It shall be the contractor's responsibility to deploy the required T&Ps, for timely and successful completion of the job, to any extent over and above those indicated in the above deployment plan (including those which are not covered in the plan submitted) without any compensation on this account.
- 37.22 Regular utilisation report of the BHEL T&Ps and IMTEs as per requirement of BHEL shall be furnished by the contractor.

### **38.0 SUPERVISORY STAFF AND WORKMEN**

- 38.1 The contractor shall deploy all the skilled workmen like mill wright fitters, welders, gas cutter, riggers, sarangs, masons, carpenters, electricians, instrument technician etc., in addition to other skilled, semi-skilled and unskilled workmen required for all the works of handling and transporting from site storage to erection site, erection, testing and commissioning as contemplated under these specification. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserves the right to decide on the suitability of the workers and other personnel who will be deployed by the contractor. BHEL reserves the right to ask for removal of any employee workman of the contractor at any time, if they find him unsuitable and the contractor shall forthwith remove him.
- 38.2 The supervisory staff including qualified Engineers deployed by the contractor shall ensure proper out-turn of work and discipline on the part of the labour put on the job by the contractor and in general see that the works are carried out in a safe and proper manner and in coordination with other labour and staff deployed directly by BHEL or other contractors of BHEL or BHEL's client / other agency.
- 38.3 The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with other personnel / contractor, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

- 38.4 The contractor's supervisory staff shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. The contractor shall be responsible to ensure that assembly and workmanship conform to the dimensions and tolerances given in the drawings /documents/ instructions given by BHEL Engineer from time to time.
- 38.5 The contractor shall deploy the necessary number of qualified and approved full time electricians at his cost to maintain his temporary electrical installation till the completion of work.
- 38.6 During the course of erection, if the progress is found unsatisfactory or if the target dates fixed from time to time for every mile stones are to be advanced or in the opinion of BHEL, if it is found that the skilled workmen like fitters, Electricians, operators, technicians etc. deployed are not sufficient, BHEL after giving reasonable opportunity to the contractor will induct on the work the required workmen in addition to contractor's workmen to improve the progress and recover from the contractor's bills any charges incurred for engaging the additional workmen with overheads.
- 38.7 It is the responsibility of the contractor to engage his workmen in shifts or on overtime basis for achieving the targets set by BHEL and also during the period of commissioning and testing of unit. The contractor's finally accepted rates / prices shall include all these contingencies.
- If the contractor or his workmen or employees shall break, deface, injure or destroy any part of a building, road kerb, fence, enclosure, water pipes, cables, drains, electric or telephone posts or wire, trees or any other property or to any part of erected components etc., the contractor shall make the same good at his own expense or in default, BHEL may cause the same to be made good by other workmen or by other means and deduct the expenses (of which BHEL's decision is final) from any money due to the contractor.
- 38.9 **The month-wise manpower deployment plan to be submitted as per format (at Annexure-C to General Conditions of Contract)** is only to assess the capability as well as understanding of the contractor to execute the work. It shall be the contractor's responsibility to deploy the required man power, for timely and successful completion of the job, to any extent over and above those indicated in the above deployment plan (including those which are not covered in the plan submitted) without any compensation on this account. Separate persons shall be identified at site for quality control and safety by the contractor.
- 38.10 Though every endeavor shall be made to ensure that all plant materials are supplied as per schedule. However in a job of this kind it is possible that some materials may be delayed. In order to achieve the ultimate targets, the contractor may have to augment his manpower and resources. No compensation on this account shall be admissible

**39.0 MATERIAL HANDLING AND STORAGE**

- 39.1 All the equipment and material furnished under this contract (except those which are mentioned specifically in the scope of work) shall be received from the project stores, sheds/storage yards (any place within site) and transported to be pre-assembly area/ erection site and stored in the storage spaces in a manner so that they are easily retrievable till they are erected by the contractor. While drawings/ lifting material from BHEL/ customer stores, contractor shall ensure that the balance / other materials are stacked back immediately.
- 39.2 While BHEL will endeavour to store/ stack/ identify materials properly in their open / close / semi closed / tarpaulins covered storage yard/ shed, it shall be contractors responsibility to assist BHEL in identifying materials well in time for erection, taking delivery of the same, following the procedure indicated by BHEL and transport the material safely to pre-assembly yard/ erection site in time, according to programme.
- 39.3 The contractor shall take delivery of components, equipment / consumables from storage area after getting the approval of BHEL Engineer on standard indent forms.
- 39.4 The contractor shall identify and deploy necessary Engineers/ supervisors / workmen for the above work in sufficient number as may be needed by BHEL, for areas covering their scope.
- 39.5 All the equipment shall be handled very carefully to prevent any damage or loss. No untested wire ropes/ slings etc. shall be used for unloading / handling. The equipment shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the stores shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.
- 39.6 Contractor shall ensure that while lifting slings shall be put over the points indicated on the equipment or as indicated in the manufacturer's drawings. Slings/ shackles of proper size shall be used for all lifting and rigging purposes. All care shall be taken to safe guard the equipment against any damage. In no case piping should be dragged. In case of any damage, the cost shall be covered from the contractor.
- 39.7 Approach road conditions from the stores / yards to the erection site may not be equipped and ideal for smooth transportation of the equipment. Contractor may have to be adequately prepared to transport the materials under the above circumstances without any extra cost to BHEL.
- 39.8 Contractor shall be responsible for examining all the plant and material issued to him and notify the Engineer immediately of any damage, shortage, discrepancy etc. before they are moved out of the stores / storage area. The contractor shall submit to the Engineer every week, a report detailing all the receipts during the week. However, the contractor shall be solely responsible for any shortages or damages in transit, handling, storage and erection of the equipment once received by him. As the erection work will be spread in different areas / locations of the project, contractor has to arrange sufficient no. of watch/ward personal to avoid any pilferage of material. In case any

- equipment / material is lost / damaged while in the custody of the contractor, the cost of repair / replacement if any to bring back the equipment in original order shall be deducted from the contractor's bill. BHEL's decision in this regard shall be final and binding on the contractor.
- 39.9 The contractor shall maintain an accurate and exhaustive record detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the engineer at any time.
- 39.10 All the material in the custody of contractor and stored in the open or dusty locations must be covered with suitable weather proof / fire retardant covering material wherever applicable and shall be blocked up on raised level above ground. All covering materials including blocks and sleeper shall be arranged by the contractor at his cost.
- 39.11 All electrical panels, control gear, motors and such other devices shall be properly dried by heating before they are installed and energised. Exposed parts those required special protection such as bearings, slip rings, commutators shall be protected against moisture ingress and corrosion during storage and are periodically inspected. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion due to prolonged storage.
- 39.12 If the material belonging to the contractor are stored in area other than those earmarked for his operation the engineer will have the right to get it moved to the area earmarked for the contractor at the contractors risk and cost.
- 39.13 The contractor shall ensure that all the packing materials and protective devices used for various equipment during transit and storage are removed before the equipment are installed.
- 39.14 The contractor shall be responsible for making suitable indoor storage facilities to store all equipment (drawn by the contractor from BHEL / customer stores) which require indoor storage till the time of their installation. The Engineer will direct the contractor in this regard, which item in his opinion will require indoor storage and the contractor shall comply with Engineer's decision
- 39.15 **The contractor shall ensure that all surplus / damaged / scrap / unused material, packing wood / containers/ special transporting frames etc. are returned to BHEL at a place in project area identified by the Engineer.** An account will be maintained by the contractor for all such items received and returned to BHEL and duly reconciled before closing of the contract.
- 39.16 The contractor shall hand over all parts / materials remaining extra over the normal requirement with proper identification tags to the concerned BHEL / Customer or at a place in project area as directed by BHEL Engineer.
- 39.17 Power Transformer tanks shall be dispatched from BHEL / Suppliers manufacturing units directly to site by road on trailers. It may be unloaded near foundations by other agency. The contractor shall be required to place these on foundation by dragging, jacking, rigging or lifting by crane on the foundation.
- 39.18 While Transformer main tanks will be delivered near the foundation, the accessories and oil will be issued to the contractor from BHEL stores / place of

stacking for installation. All arrangements for receiving, transporting & handling of such accessories, transformer oil drums etc. are to be made by the contractor except those spelt out else where in the contract.

- 39.19 Till the start of erection of respective transformers, supplied oil / Gas filled, it will be contractor's responsibility to maintain the gas pressure and replace/ reactivate silica gel. Silica gel will be arranged by contractor within the accepted rates. However the N2 gas, if required, will be provided by BHEL free of cost & filling etc. will be arranged by the contractor with in the accepted rates for transformer erection & commissioning.

#### **40.0 PRESERVATION OF COMPONENTS**

- 40.1 After taking delivery from BHEL / customer's stores, plant materials storage shall be subjected to the following protection besides other provisions indicated in these specifications elsewhere.

Items stored outdoors shall be stored in such a way that item is at least six inches (6") above the ground.

Motors, valves, electrical equipment, control equipment and instruments etc. shall be stored indoors in warehouse provided by contractor. Motor windings shall be kept dry by use of external heat or space heaters.

Bearings and other wearing surfaces of plant materials shall be protected against corrosion and kept clean.

- 40.2 It shall be the responsibility of the contractor to apply preservatives / touch up paints (primer) on equipment handled and erected by him till such time of final painting. It shall be contractor's responsibility to arrange for required paints (Primer), thinners, labour, scaffolding materials, cleaning materials like wire brush, emery sheets, etc., cleaning of surface and provide one coat of preservatives / paints (primer) from time to time as decided by BHEL engineer. The accepted rate shall include this work also. It is to be noted that such painting may have to be done as and when required till such time the final painting is carried out.

- 40.3 The contractor shall effectively protect the finished work from action of weather and from damage or defacement and shall cover the finished parts then and there for their protection.

- 40.4 Any failure on the part of contractor to carry out works according to above clauses will entail BHEL to carry out the job from any other party and recover the cost from contractor.

#### **41.0 WELDING, HEAT TREATMENT, RADIOGRAPHY and NDT:**

- 41.1 The pressure parts & IBR pipe lines shall be erected in conformity with the provision of Indian Boiler Regulations and as may be directed as per any other standards/ specification in practice, in BHEL. The method of welding ( arc, gas, tig or other method) may be indicated in the detailed drawings/ schedules.

BHEL Engineer will have the option of changing the method of welding as per site requirements. **Semi automatic welding (GMAW) process shall be used for non-pressure parts / ducting / structures etc to the maximum possible, considering its cost efficiency, better quality and time saving features.**

- 41.2 Welding of pressure parts / equipment / piping / high tensile structural steel shall be done by certified high pressure welders who possesses valid certificate of CIB of the state in which the equipment is erected as per provision of IBR. The HP welder who possesses necessary certificate shall appear well in advance before the expiry of the validity of his certificate for re-qualification test as per relevant provision of IBR and keep the certificate valid till the completion of work. The services of such welders, the validity of whose certificates have expired, shall have to be terminated forthwith.
- 41.3 All welders including tack welder, structural and high pressure welder shall be tested as per ASME section IX and approved by BHEL Engineer before they are actually engaged on work though they may possess the IBR certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The records of qualification and performance of each HP welder shall be maintained by the contractor in Performa given by BHEL Engineer. All the welders qualified for the work will be issued an identity card by the contractor with the approval of BHEL Engineer and welder will keep the same with him at work place. The record of joints, consumables & equipments along with welders identity shall be maintained by the vendor as per BHEL Engineer's instructions.
- 41.4 The method of welding (ARC, Gas, TIG, MIG or any other method) may be indicated in the detailed drawing/ Schedules and specifications. BHEL Engineer will have the option of changing the method of welding as per requirement. The root run welding of all butt welds of tubes/ pipes (HP or LP), instrumentation tapping points etc. will be done by TIG welding process only. Subsequent welding will be done as per welding schedule / Instructions of the engineer including full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required. The contractor within the finally accepted rates shall arrange purging with inert gas in case of stainless steel joints as per requirement.
- 41.5 Complete penetration of welding shall be achieved and all welded joints shall be subject to acceptance by the Engineer. All welds shall be painted with anticorrosive paint. Necessary consumables and scaffolding etc. including paints shall be provided by contractor at his own cost.
- 41.6 Engineer may stop any welder from the work if his work is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by a particular welder which, in the opinion of the Engineer, will adversely affect the quality of the welding though the welder has earlier passed the tests prescribed by Engineer. The welders having passed qualification tests does not relieve the contractor of contractual obligation to continuously check the welder's performance.

- 41.7 Faulty welds caused by the poor workmanship or lack of supervision or lack of supervision on the part of the contractor shall be cut and re-welded at the contractor's expenses. The procedure for the repair of defective welds shall be approved by the Engineer prior to any repair being made. For each batch of approved brasses certified showing compliance with the specification shall be secured and shall be submitted to the BHEL Engineer.
- 41.8 All charges for testing of contractor's welders including destructive and non-destructive tests conducted by BHEL at site or at any laboratory shall have to be borne by the contractor only. The materials for plate test pieces and for pipe and tube will be given by BHEL.
- 41.9 All welds shall be painted with anticorrosive paint, once Radiography and stress relieving works are over. Necessary consumables and scaffolding etc. including paints shall be provided by contractor at his own cost. Daily welding reports in the proforma suggested by BHEL should be submitted without fail.
- 41.10 **Only BHEL/NTPC/PPCL approved electrodes and filler wire will be arranged and used by the contractor, within the finally quoted price. BHEL reserves the right to test any approved electrode being used by the contractor. Testing charges for the same shall be borne by the contractor.** All electrodes shall be baked and dried in the electric electrode drying oven to the required temperature for the period specified by the Engineer before these are used in erection work. All welders shall have electrodes drying portable oven at the work spot. The electrodes brought to the site will have valid manufacturing test certificate. The test certificate will have co-relation with the lot No. / batch No given on electrode packets. No electrodes will be allowed to be used in the absence of above requirement. The thermostat and thermometer of electrode drying oven should also be calibrated and test certificate from Govt. approved / accredited test house traceable to National / International standards shall be submitted to BHEL before putting the oven in use. Periodical calibration for the same shall also be arranged by the contractor within the finally accepted rates.
- 41.11 The regulators used on welding machines shall be calibrated before putting these into use for work. Periodic calibration for the same shall also be arranged by the contractor at his cost and records shall be maintained. The regulators used with the gas cylinders should be of reputed make and preferably ISI marked.
- 41.12 Preheating, radiography and other ND tests, post-heating and stress relieving after welding of tubes, pipes, including attachment welding wherever necessary, are part of erection work and shall be carried out by the contractor in accordance with the instructions of the Engineer. All equipment's and consumables essential for carrying out the above process have to be arranged by the contractor at his cost.
- 41.13 Contractor shall arrange all necessary heating equipment with automatic recording devices. Also the contractor shall have to arrange for labour, heating elements, thermocouples, etc. insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress relieve

operations. Temperature shall be measured at least at two different points for pipes above 200 mm dia. by thermocouple, and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL. The contractor has to provide thermo-chalks, temperature recorders, thermocouple attachment units, graphs, sheets, etc. for checking within the finally accepted rates. All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt. approved / accredited Test Houses traceable to National / International standards will also be arranged by the contractor for such equipment at his cost. The contractor shall obtain the signature of Engineer or his representative on the strip chart of the recorder after setting up the weld joints for heat treatment operation prior to the starting.

- 41.14 The technical particulars, specification and other general details for radiography work shall be in accordance with ASME, IBR, DIN or ISO as specified by BHEL.
- 41.15 Iridium-192 shall be used by contractor for radiography work. The geometric unsharpness shall not exceed 1.5 mm. Taking adequate safety precautions shall be the responsibility of the contractor while carrying out radiography. Necessary safe guards required for radiography (including personnel from BARC) shall be arranged by contractor at his cost. All related documents issued by BARC shall be submitted by the contractor to BHEL.
- 41.16 Low speed high contrast, fine grain films (D-7 or equivalent) in 10 cm. width only be used for weld joint radiography. Film density shall be between 1.5 to 2.0.
- 41.17 All radiographs shall be free from mechanical, chemical or process marks, to the extent they should not confuse the radiographic image and defect finding. Penetra meter as per ASME, DIN, and ISO and as specified by BHEL must be used for each exposure.
- 41.18 Lead numbers and letters are to be used (generally 6 mm size) for identification of radiographs. Contract no., joint identification, source used, welder's identification and SFD are to be noted down on paper cover of radiograph.
- 41.19 Lead intensifying screens for front and back of the film should be used as per the above referred ASME specification.
- 41.20 The joint is to be marked with permanent mark A,B,C, etc., to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the down stream side of the weld.
- 41.21 For multiple exposure on pipes, an overlap of about 25 mm of film should be provided.
- 41.22 The contractor shall have a dark room fully equipped with radiography equipment, film (un-exposed), chemicals and any other dark room accessories ie all the facilities including airconditioners for storing and processing radiography

films. There should be adequate number of radiography personnel with sufficient experience and certified by M/s BARC as Radiographer for conducting radiography test in accordance with safety rules laid down by Division of Radiological protection. These personnel should also be registered with DRP / BARC for film badge service. The proof of having sufficient film / chemicals to complete the entire work should be shown to BHEL.

- 41.23 All arrangements for carrying out radiography work including dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency having all above facilities and who are duly approved / accredited by BARC and/or other Regulatory authorities. Detailed particulars of such agencies will be submitted and got approved by BHEL Engineer before the actual deployment of agency for radiography work.
- 41.24 Contractor shall note that 100% radiography will be done at the initial stages on all the HP welding joints. Subsequently, radiographic inspection will be done on the basis of quality of welding. However minimum percentage of joints to be radiographed shall not be less than the requirement of IBR or as specified by BHEL. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL. Every rejection shall be penalised with further two no of additional weld joints to be radiographed in case of percentage radiography.
- 41.25 If the contractor does not carryout radiography work due to non-availability of source/ film/ chemical/ operator etc., BHEL will get the work done departmentally or through some other agency at the risk and cost of the contractor.
- 41.26 All the radiographs shall be properly preserved and shall become the property of BHEL.
- 41.27 Since radio-isotopes are being used, all precautions and safety rules as prescribed by BHEL/BARC/Customer shall be strictly followed. BARC/ DRP Certificates to be provided before taking up the work.
- 41.28 The defects as pointed out by the engineer shall be rectified and re-radiographed immediately to the satisfaction of BHEL Engineer. The decision of the engineer regarding acceptance or otherwise of the joint will be final and binding on the contractor.
- 41.29 Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of HP welders. If the performance of welder is unsatisfactory, he shall be replaced immediately.
- 41.30 Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re-shots submitted for evaluation. Radiographs shall be taken on joints after carrying out repairs. However, if the defect persists after first repair, as per radiograph, carrying out radiography shall be repeated till the joints

is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radiographed at contractor's cost.

- 42.31 The contractor shall also be equipped for carrying out other NDT like LPI / MPI etc. as required as per welding schedule/ drawings within the finally accepted rates/ prices. Ultrasonic testing, wherever required, will be arranged by BHEL. Necessary help in conducting the UT shall however be rendered by contractor.
- 41.32 Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make all necessary arrangements including labour, supervisor/ Engineer required for the work as per directions of BHEL.
- 41.33 The contractor shall maintain a record in the form as prescribed by BHEL of all operations carried out on each weld and maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejection if any, percentage of rejection, heat treatment (if any) etc. and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or other wise of the welds shall be final. All site welding joints shall be subject to acceptance by BHEL Engineer.
- 41.34 All butt / fillet welds shall be subject to dye penetration test as per the instructions of the Engineer at no additional cost.
- 41.35 The contractor shall carry out the edge preparation of weld joints at site in accordance with the details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting will be allowed only wherever edge preparation otherwise is impractical. All slags / burrs shall be removed from cuts and all the hand cuts shall be ground smooth to the satisfaction of engineer.
- 41.36 The contractor's Engineer shall prepare as per direction of BHEL Engineer the complete field welding schedule for all the field welding activities to be carried out in respect of piping and equipment erected by him involving high pressure welding at least 30 days prior to the scheduled start of erection work at site and submit the same to BHEL Engineer for approval. Such schedules shall be strictly adhered to by the contractor after approval.

## **42.0 PROGRESS REPORTING**

- 42.1 Contractor is required to draw mutually agreed monthly erection programmes in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed programme and shall also timely arrange additional resources considered necessary at no extra cost to BHEL
- 42.2 Weekly progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled programme shall be discussed for actions to be taken for achieving targets. The programme for subsequent

week shall also be presented by contractor for discussions. The contractor shall constantly update/revise his work programme to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of non-conformities.

- 42.3 The contractor shall submit daily, weekly and monthly progress reports, manpower reports , materials reports, consumables (gases / electrodes) report and other reports as per proforma considered necessary by the Engineer.
- 42.4 The progress report shall indicate the progress achieved against planned, with reasons indicating delays, if any, and shall give the remedial actions which the contractor intends to take to make good the slippage or lost time, so that further works again proceed as per the original programme and the slippages do not accumulate and effect the overall programme.
- 42.5 The daily manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

### **43.0 DRAWING AND DOCUMENTS**

- 43.1 The detailed drawings, specifications available with BHEL engineers will form part of this tender specification. These documents will be made available to the contractor during execution of work at site. The contractor will also ensure availability of all drawings / documents at work place.
- 43.2 Necessary drawings to carry out the erection work will be furnished to the contractor by BHEL on loan which shall be returned to BHEL Engineer at site after completion of work. Contractor shall ensure safe storage and quick retrieval of these documents.
- 43.3 The contractor shall maintain a record of all drawings and documents available with him in a register as per format given by BHEL Engineer. Contractor shall ensure use of pertinent drawings / data / documents and removal of obsolete ones from work place and returning to BHEL.
- 43.4 The data furnished in various annexures enclosed with this tender specification are only approximate and for guidance. However, the change in the design and in the quantity may occur as is usual in any such large scale of work.
- 43.5 Should any error or ambiguity be discovered in the specification or information the contractor shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.
- 43.6 Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimension / details, without specific approval of BHEL.
- 43.7 Any ambiguity found in the drawings should be brought to the notice of engineer prior to start of work.

43.8 Certain revisions of drawings are received during the course of execution, if the same have been received prior to start of particular (specific) job then no claim will be admissible on this account.

**44.0 INCOME TAX, SERVICE TAX AND SALES TAX ETC**

**44.1 TDS under Income Tax, Sales Tax, VAT etc**, if any, shall be deducted at prevailing rates on gross invoice value from the running bills unless Exemption Certificate from appropriate Authority / Authorities is furnished.

**44.2 Price quoted shall be inclusive of all taxes except service tax.** The service tax, as legally leviable & payable by the contractor under the provisions of applicable law/act, shall be paid by BHEL as per contractor's bill. However, contractor shall have to submit proof of service tax deposited by them immediately after the deposit but not later than the next bill submitted after the due date of deposit. The contractor shall furnish proof of Service Tax registration with Central Excise Division covering the services covered under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by contractor on BHEL for this project The contractor shall obtain prior approval of BHEL before billing the service tax amount and should submit proper CENVATABLE invoice as per the Service Tax Rules.

With introduction of Cenvat credit rules 2004 which came into force w.e.f. 10.09.2004, excise duty paid on input goods including capital goods used for providing the output service and service tax paid on input service can be taken credit of against the service tax payable on output service. **As such, while offering the rates, the contractors may take into account the benefit of above provisions as the cost of input to contractors will be the cost net of excise duty and service tax and adjust their offer price accordingly to make it more competitive.**

**44.3** In VAT applicable States, "Tax Invoice" if required under the relevant State VAT law shall be submitted alongwith other compliances as per concerned VAT Act.

**44.4** Contractor shall get his organization registered with concerned sales tax/VAT authorities within 15 days of award of this contract, if applicable. The delay on this account and delay in bringing the material shall be to contractor's account and no extension of time shall be allowed on this account. The sales tax/VAT registration for this contractor shall be forwarded to BHEL within 30 days from the date of LOI. In case the contractor is already registered for sales tax/VAT with Govt. Authorities he must quote his registration no, while submitting their tender.

**44.5** Contractor has to make his own arrangement at his cost for completing the formalities, if required, with Sales Tax/VAT Authorities, for bringing their materials, plants, and equipment at site for the execution of the work, including arrangement of Road permit as applicable under this contract.

**45.0 EXTRA WORK:**

- 45.1 BHEL may consider for payment of extra works on manhour basis @ Rs.30/- (Rupees thirty only) per manhour only for such of those works which:
- Require major revamping or rework and which are totally unusual to normal erection work.
  - Require rectification / modification for improvement in the design during commissioning,
  - Requiring fresh fabrication of components in place of rejected / replaced components.
- 45.2 The rates indicated as above, shall include over time, if any, consumables, supervision, use of tools and tackles and other site expenses and incidentals.
- 45.3 The extra works, if any, shall be carried out by a separate gang or beyond working hours which can be identified for certification of manhours. Log book should be maintained and should be signed jointly by the contractor's representative and the BHEL Engineer on day to day basis. However, signing of the log book does not necessarily mean acceptance of the extra works which would be identified by Engineer whether work is covered in one of the above categories. Only those works and manhours which are certified by the BHEL Engineer-in-charge, will be considered for payment. The decision of BHEL in this regard shall be final and binding on the contractor.

#### 46.0 PRICE VARIATION

- 46.1 The finally accepted rates for scope of work as defined in this tender are subjected to price variation provisions as per following formula:

$$P1 = \frac{0.75 \times P0 (F1 - F0)}{F0}$$

P1 = Increase/Decrease in billing amount (variation) for the particular month of billing.

P0 = Billing amount calculated for the month as per contract provisions.

F1 = All India CPI published by Labour bureau, Simla, Govt. of India, for Industrial workers (Base 2001 =100) applicable for the month under consideration i.e. for which bill has been raised.

F0 = All India CPI published by Labour bureau, Simla, Govt. of India, for Industrial workers (Base 2001 =100) **applicable for the month of opening of technical bid.**

- 46.2 The contractor will be required to raise the bills for price variation payments on a monthly basis irrespective of the facts whether any increase or decrease in CPI. Price variation as per above formula will be calculated and paid/deducted on the total contract value (excluding payments towards extra works and over run, if any) on month-to-month basis from the date of award. BHEL however reserves the right to freeze variation for that much of duration of delays, from

time to time, which are entirely attributable to the contractor. Average of applicable **price indexes paid shall be taken as index for PVC for final 5% amount.**

- 46.3 With the provision of price variation as above NO CLAIM / COMPENSATION on account of any increase whatsoever, (irrespective of whether variation are steep / unanticipated or not compensated by the above escalation provisions in full towards minimum wages, consumables, electrodes, gases or any other item / reason) will be payable during the entire period of execution including extended period, if any.

#### **47.0 RATE SCHEDULE**

- 47.1 Contractor shall fully understand equipment description and scope of work before quoting. The scope of work and responsibility of the contractor as mentioned under these specifications shall be covered within the quoted rates / price.

- 47.2 **The tenderer shall quote the rates / Price as per the rate schedule only, in Part-II price bid (Original). Conditional price bids or price bids with any deviation / clarification etc. are liable to be rejected. No cutting / erasing / over writing shall be done.**

- 47.3 **Contractor's total quoted price as per rate schedule will be taken as tentative only. The contractor undertakes to erect / commission actual quantities as per advice of BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually erected at site and payments will also be regulated for the same. The quantities indicated against each item may vary to any extent and no compensation will be payable in variation of Individual quantity. However, in case of over all variation in Contract value (as indicated in LOI), beyond (minus) 30%, the contractor will be eligible for compensation as per the following provision:**

**"The total executed value shall be raised by 10 % subject to the condition that the total value of work executed plus increase as above shall be limited to 70 % of the awarded contract value"**

Contractors are requested to take above into account while quoting. The contractor confirms that unit rates quoted above takes care of such variation during execution stage.

#### **48.0 INSTRUCTIONS TO TENDERER**

- 48.1 Offers received without data / information required to be submitted under tender clauses-11.1 to 11.11 are liable to be rejected. All these data / information should be duly supported by documentary evidences (Refer note below clause-11)

- 48.2 No deviations to the tender conditions will normally be accepted.

- 48.3 The tenderers are advised to actually visit the site and fully acquaint themselves with site conditions, location of stores, transportation routes, quantum of work etc. before quoting their rates for this work. BHEL shall not

be responsible in any way for non-familiarization of site conditions. Once the tenderer has quoted for the work, it is implied that he has ascertained various site condition and NO CLAIM whatsoever will be entertained by BHEL on any such account.

- 48.4 The contractor in the event of this work awarded to him, shall establish a site office at site and keep posted an authorised responsible officer who should hold a valid power of attorney for the purpose of the contract. Any order or instruction of the Engineer or his duly authorised representative shall be communicated to the contractor's representative at site office and the same will be deemed to have been communicated to the contractor at his legal address.

**49.0 LIQUIDATED DAMAGES (LD)**

- 49.1 For delay in completion of work attributable to the contractor, the LD shall be applicable at the rate of ½% of the contract value per week of delay or part thereof limited to a ceiling of 10% of the contract value as mentioned under clause no.25.5 of the GCC of the tender.

**50.0 SECURITY DEPOSIT**

- 50.1 The contractor shall submit Security Deposit within 15 days from the date of issue of LOI as per clause no. 16.2 of the General Conditions of Contract (GCC). In case the contractor opts to furnish Bank Guarantee as a part of Security Deposit, the BG shall be issued as per the Performa enclosed as per Annexure-H of the GCC and also that the BG should be issued preferably through any of the Member Banks listed on Page No. 34(a) of the GCC; For BG through any other Nationalized Bank (Not covered in the list of Member Banks of GCC), the discretion of its acceptance shall lie solely with BHEL.

**51.0 OTHERS**

1. In case of any contradiction between General Conditions of Contract (GCC) and Special Conditions of Contract (SCC), the latter shall prevail.
2. The tenderer shall specifically confirm he has inspected the site of work and is fully conversant with the prevailing conditions under which work is to be executed and will not raise claim of any nature due to lack of knowledge of site condition. He will also confirm that local taxation laws at the site have been clearly understood by him.
3. For Reverse Auction/ for Price Bids opening ,only those bidders will be considered who will be qualified for the subject job on the basis of pre-qualification evaluation/Techno-commercial bids and acceptance of customer. BHEL reserves the right to reject the bidders with unsatisfactory past performance in the execution of a contract. BHEL,s decision in this regard shall be final & binding.

**SPECIAL CONDITIONS OF CONTRACT**

**PART-B**

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<b>Cl. No.</b>	<b>Description</b>
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<b>54</b>	Finish painting
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**SPECIAL CONDITIONS OF CONTRACT**

**SECTION-III (PART-B)**

**52.0 SCOPE OF WORK**

52.1 BHEL has been awarded the work of Design, Manufacture, supply, installation, erection, testing & commissioning of 1500 MW, Module 1 & 2 at Pragati III CCPP at Bawana, Delhi on turnkey basis.

Scope of these specifications cover complete work of handling, transportation of materials from Project storage yard / stores to erection site / place of erection , storage at erection site, preservation, watch and ward, dressing, chipping and leveling of foundations, cleaning , checking, testing, pre-assembly, erection, calibration, alignment, grouting, welding, NDT wherever required, preservative/ touch-up painting including supply of paints etc, earthing of equipment, including other activities required for erection, testing, commissioning, post commissioning, trial operations & handing over of all ELECTRICAL, CONTROL & INSTRUMENTATION equipment and items indicated in the rate schedule covered within the scope of these specifications for **1500 MW PRAGATI III CCPP AT BAWANA, DELHI.**

52.2 **The quantities mentioned in the rate schedule are tentative and may vary as per the actual engineering / requirement to complete the package for electrical and C & I work. Some of the items may be added or deleted which shall have to be executed by the contractor within his scope of work and shall be paid as per the rates awarded in the contract. The contractor shall have to erect, test and commission entire material listed in the rate schedule. The decision of BHEL in this regard shall be final and binding on the contractor.**

**The rates for the additional items may be considered on the rates of similar category of items in the rate schedule as approved by BHEL.**

The scope of work shall also include the following within the quoted item rates:

- i.) Re-rolling of cables on drums as required by site engineer.
- ii.) Obtaining provisional and final approvals from Electricity Authorities.

The scope of work also covers all performance tests necessary to ensure that workmanship confirms to relevant standards and that such tests are adequate to demonstrate that the installations complies with the requirements of this specification. All arrangements for conducting tests are to be made by contractor within their quoted rates and tests may have to be repeated to satisfy BHEL / NTPC/PPCL.

52.3 Contractor to ensure services of qualified and experienced Diploma / degree Electrical Engineer having experience in respective field and qualified and experienced Diploma / degree Instrumentation Engineer having experience in respective field, with sufficient nos as desired by site entirely for the commissioning activities from second month of mobilisation till contract completion. **This shall be indicated separately in manpower deployment plan to be submitted by contractor.** These Engineers shall be reporting directly to the BHEL Engineer for the main work .

All Supervisors/ Engineers shall have to be supported individually by all independent groups comprising of workers like electrician, technicians and helpers etc. and required T & P and IMTE's.

52.4 The contractor under this contract shall also provide free of cost services of skilled persons for a total period of 82 Man-months exclusively for use by BHEL. This manpower will be required for following services:

- Qualified computer operators (minimum 'O' level qualified) capable of operating the material management software package / other packages available at site or for office work for total 12 man months,
- Skilled workers for working in store, colony and in maintenance of office for a total 40 man months and
- Unskilled workers for working in store, colony & office for a total 30 man months.

Persons so deployed shall have to work in extended hours whenever required. Workmen provided as per the above provisions shall be fully trained and experienced in the nature of work for which they are deployed.

**In case contractor fails to provide above-mentioned manpower as desired by BHEL, the latter shall have the right to hire such services from other agencies at the risk and cost of the contractor. However, if BHEL does not utilize the man months as per above provision, fully or partly, recovery at the rate of the prevailing minimum wages at Bawana, Delhi for the categories given plus 10% will be made from the final bill of the contractor.**

52.5 The scope of work will also include providing **free of cost services of experienced and qualified Engineers** by contractor for direct supervision of various works of power plant preferably works other than the scope covered under this tender. The qualification and experience of the engineers shall be acceptable to the Construction Manager BHEL Pragati-III BAWANA site. These qualified Engineers shall be provided for **Thirty Six (36) man-months** as per site conditions. The Engineers shall possess a minimum qualification of a electrical engineering degree and working experience in power plants. They shall be deployed in all areas covered under various specifications as well as other related areas as may be deemed essential based upon work requirements, though not specified. They shall be guided by BHEL Engineers to ensure smooth work progress as and when /where required /deployed. No separate payment shall be paid for providing the services as per this clause. The contractor shall provide these free of cost services within the quoted rates as per Rate Schedule.

***In case contractor fails to provide above-mentioned manpower as desired by BHEL, the latter shall have the right to hire such services from other agencies at the risk and cost of the contractor. However, if BHEL does not utilize the man months as per above provision, fully or partly a lump sum of Rs 10,000/- (rupees ten thousands only) per man month for the un-utilised man months will be recovered from the bills of the contractor.***

The brief description of major equipment/ items to be erected tested and commissioning under the scope of subject work is as described below. However change in design/specification may occur as is usual in any such large work for which no compensation will be payable. Contractor shall complete the entire work as detailed in tender specification including dry out / centrifuging of transformers within the contractual rates. In case during testing, commissioning, post commissioning, trial operation the IR values of electrical equipment is found low, the contractor shall make arrangements and dry out the equipment within the quoted rates. Removing & reconnection of equipment will be the part of scope at no extra cost to BHEL.

**Erection, Testing & Commissioning, handing over of following Electrical, Control & Instrumentation scope of work as per schematics, drawings , manuals and as detailed below in brief:-**

### **ELECTRICAL SCOPE**

- A)** Generator Transformer-420/16.5kV,220.6MVA,OFAF, GasTurbine-04 Nos.  
Overall Dimensions:16000X8000X11000 MM  
Overall Weight: 266MT  
Shipping Weight: 175MT  
Oil Qty. 59850 Ltr.

GeneratorTransformer-420/16.5kV,292.4MVA,OFAF, SteamTurbine-02 Nos.  
Overall Dimensions:15500X8000X11000 MM  
Overall Weight: 304MT  
Shipping Weight: 208MT  
Oil Qty. 66020 Ltr.

### **B) ISOLATED PHASE BUSDUCT**

IP busduct details per module (2 GTG+1STG) are as: 4nos, 9000A, Al Conductor, Al Alloy Enclosure Bus ducts connects Gas Turbine Gen Transformer to the Generator has tap off for 04 nos SAT, LAVT & NG cubicle.

02 Nos,11000A ,Al Conductor, Al Alloy Enclosure Bus ducts connects Steam Turbine Gen Transformer to the Generator has Tap Off for 02 nos SPVT and NG Cubicle. In the Neutral Side, the Star Formation is made to form the star point and the Generator is earthed thru the NG Transformer. The approximate total route length of the GTG Main Run & Tap Off is 213

m(per unit) & 102 mt (estimated).STG Main Run & Tap Off is 224 m(per unit) & 22 m (estimated).

The approximate weights of the supporting structure are 20 MT (estimated)

In addition, there is 3 nos LAVT per GTG set having dimensions 1450 mm x 800 mm x 1750mm (estimated) & 3 nos SPVT per STG set having dimensions 1450 mm x 800 mm x 2700mm (estimated)

The conductor section in the Main Run is Circular shape 465 mm dia duct, 15 mm thick and that of Tap Off is 114.3 mm OD , 8.56 mm thk , 01 Nos NG Cubicle per GTG unit having dimensions 2000X1250X1750 & 01 Nos NG Cubicle per STG unit having dimensions 2000X1250X1455

Hot air blowing Unit having a total weight of 1.0 MT is envisaged. Seal Off bushing and Rubber bellows are also provided in the bus duct.

**(C) SEGREGATED PHASE BUSDUCT:**

Rated: 2750A

Segregated phase bus duct are from Station Aux. Transformer (04nos.) to respective Switchboards, switchboards interconnected as per scheme. Total Length of Segregated Phase Bus duct for both module is approx. 434 meter.

**(D) 6.6 KV SWITCH GEAR**

6.6 kV Switchgear System consists of Spring Operated Metal Clad Vacuum Interrupters with Protection and Metering CTs , PTs , Relays and Meters. The weight of each panel including trolley is approx. 1.9 MT. Panels will be transported in section of 2-3 panels.

There are 2 Boards each having 36 panels(Approx.)

**(E) LT SWITCHBOARDS**

LT Switch Boards consists of Air CKT Breakers, SFUs, relays, meters, contactors, CTs, PTs etc. with protection and metering scheme.

415 V, 2500 A, GTG PMCC-	04 Nos
415 V, 2500 A, STG PMCC-1&2-	02 Nos
415 V, 1000 A STG MCC-1&2	02 Nos
415 V, 400 A HRSG MCC-1&2	02 Nos
415 V, 3000 A STATION SERVICE SWGR	01 Nos
415 V, 3000 A CWPH SWGR	01 Nos
415V, 3000 A, WATER TREATMENT/FIRE WATER SWGR.	01 Nos

415V, 2500 A RWPH SWGR	01 Nos
415V, 2000A, DG PCC	01 Nos
415V,1250A, DM PLANT MCC	01 Nos
415V, 1000 A, AIR CONDITIONING MCC	01 Nos
415V ,1000 A,ETP MCC	01 Nos
415V, 630 A, MISC. SERVICE MCC	01 Nos

415V, 630 A, VENTILATION MCC-1&2	02 Nos
415V, 400 A, CHLORINATION/CLARIFIED WATER MCC	01 Nos
415V ,630 A ,COMPRESSOR MCC	01 Nos
415V ,630 A ,FIRE FIGHTING MCC	01 Nos
415V ,400 A,WATER TREATMENT PLANT	01 Nos
220V, 630 A STATION DC DB	01 Nos
125V, MAIN DCDB	04 Nos
125V, AUXILIARY DCDB	04 Nos

**(F) LT SERVICE TRANSFORMERS (DRY TYPE/ OIL COOLED TYPE):**

The checking of foundation, levelling alignment etc. will be done by erection contractor. Receipt & transportation of transformers & accessories / auxiliaries from stores to site, erection after foundation checking and carrying out minor modification wherever required, Testing and Commissioning of transformers

LT SERVICE TRF	6.6kV/433V, 2000kVA (Oil cooled)-02 Nos.
LT SERVICE TRF	6.6kV/433V, 1600kVA, (Oil cooled)-12 Nos.
LT SERVICE TRF	6.6kV/433V, 2000kVA, (Dry Type) - 04 Nos.
LT SERVICE TRF	6.6kV/433V, 1600kVA, (Dry Type) - 02 Nos.

**(G) DC System**

The DC system consists of 2 sets of 220V battery chargers and 220 V Ni-Cd batteries & 4 sets of 125V DC battery chargers and 125 V DC batteries 6 sets of 24 V DC battery chargers and DC batteries (DG set)

**BATTERY CHARGERS**

- Erection of Panels after foundations checking / fabrication of base frames or stools (wherever applicable) and carrying out minor modification wherever required; Joining of panels, inter-panel wiring, busbar & earthbar connections, mounting of loose supplied items, .
- Erection of Isolater Fuse Boxes ; Testing of complete board & including testing / calibration of all instruments and schemes; Dummy load test of Chargers including arranging of dummy load and temporary power supply etc.

**DC BATTERY**

Dimension and number of cells of each battery bank shall be as per drawing, documents and specifications. Erection of battery after assembly of battery stands, inter-connection of batteries and first charging; Capacity testing using dummy load and subsequent recharging ( in case of failure of capacity test, the charging Discharging cycle is to be repeated ) Dummy load test of chargers includes arrangement of dummy load and temporary connection in absence of regular power supply.

- **UPS system**

- a) Battery charger panels
- b) Bypass switch
- c) UPS distribution board
- d) Battery sets

**H)** Control & Protection Relay Panels

**I)** Cabinets and Misc. Electrical Equipment (JBs, Welding Sockets, Local PBs etc.)

**J)** Variable Speed AC Drives Panels

**K)** The Cabling system consists of Cable Tray installation, Cable laying and Cable termination as per BOQ.

**L) DG Set (03 Nos.)**

The Electrical system of the 1250 KVA, Emergency DG Sets

**M)** Functional Electrical Site testing of LT/HT Motors

**(II) INSTRUMENTATION SCOPE**

**AA)** PANELS – MARK VI/Max Control / Distribution / Starter Panels/HRSG Control Panel/STATION CNI Panel Etc

**BB)** Control, Monitoring & information system based on BHEL make max DNA system for:

Gas Turbine Controls comprising of Electronic System Cabinets catering to

- Electro-Hydraulic Turbine Controls (EHTC)

Steam Turbine Controls comprising of Electronic System Cabinets catering to

- Electro-Hydraulic Turbine Controls (EHTC)
- Automatic Turbine Run-up System(ATRS)
- Gland Steam Pressure Controls (GSPC)
- Turbine Stress Evaluator (TSE)
- Automatic Turbine Tester(ATT)
- Turbine Protection (TP)
- HP/LP bypass (HP/LP BP)

**DD)** Man Machine Interface & Data Acquisition System comprising of:

- Operator Workstations (max Station)
- Engineering station (common for SG/TG/GT)
- Computers / PLC based Equipments

- Laser printers (B/W-A3)
  - Ethernet Switches
- EE) Instrumentation Cables as per schematics
- FF) Erection of miscellaneous Material for GT/TG/HRSG/STATION CNI:
- Junction boxes
  - CJBs
  - Cable Trays (short length)
  - Clamps
  - Mounting Frames
  - Power cylinders
  - Rigid Pipe / Conduits
  - Pneumatic Tubes (Copper/ SS Tubing)
  - Impulse line(CS/SS/AS)
- GG) INSTRUMENTS (TRANSMITTERS / GAUGES / SWITCHES / TEMPERATURE SENSING ELEMENTS LIKE RTDs & THERMOCOUPLES
- HH) DETECTORS /VIBRATION, SPEED & OTHER TURBOVISORY PICK UPS
- II) SAMPLE HANDLING SYSTEM / ANALYZER SYSTEM
- JJ) CONTROL VALVES CALIBRATION
- KK) ELECTRONIC WATER LEVEL INDICATOR SYSTEM
- LL) INSTALLATION & TESTING OF LABORATORY EQUIPMENTS
- 52.6 **Contractor shall erect, test, commission all the equipment, cabinets, panels, instruments etc. as per sequence prescribed by BHEL Engineer at site.** The sequence of erection / commissioning methodology will be decided by the BHEL Engineer depending upon the availability of materials / work fronts etc. No claim for extra payment from the contractor will be entertained on the grounds of deviation from the methods of erection / commissioning adopted in erection / commissioning of similar jobs elsewhere or for any reasons whatsoever.
- 52.7 The customer NTPC/PPCL may depute their representative for checking and supervision of important stages of work. The contractor shall be required to provide all facilities for inspection of works, without any cost implications to the Engineer. Any defect in quality of work or deviations from drawings / specifications pointed out during such inspection shall be made good by the contractor in the same way if pointed out by the Engineer, without any cost implication to BHEL.
- 52.8 Contractor shall plan and transport equipment / components from storage yard sheds to erection site and erect them in such a manner and in a sequence that material accumulation at site should not lead to congestion. Contractor shall plan activities considering plying of his vehicles on ring road also. Materials

shall be stacked neatly, preserved and stored in the contractor's shed and work areas in an orderly manner. If required, the contractor shall arrange shifting of surplus material expeditiously failing which the same will be arranged by BHEL at contractor's risk and cost.

**53.0 ERECTION**

53.1 All works such as cleaning, checking, levelling, aligning, assembling, temporary erection for alignment, dismantling of certain equipment for checking, cleaning, surface preparation, fabrication at site, cutting, grinding, straightening, blue matching, chamfering, filing, chipping, drilling, machining, surface grinding, shaping, fitting up etc. as may be applicable in such erection works are to be treated as incidental to erection and necessary to complete the work satisfactorily and shall be carried out by the contractor as part of the work.

53.2 Any fixtures, scaffolding materials, concrete block supports, steel structures required for temporary supporting, for pre-assembly or checking, welding, lifting and handling during pre-assembly and erection shall be arranged by contractor at his cost.

The following provisions cover the technical requirements for some of equipment installation. The brief idea about the work involved is indicated below however the work is to be carried out in accordance with the recommendations of the equipment manufacturer drawings, documents furnished to the contractor by BHEL or as directed by BHEL Engineer.

53.4 Any cutting of masonry work, which is necessary shall be done by the contractor at his own cost and shall be made good to match the original work. The Contractor shall obtain prior approval before cutting any masonry / concrete work.

53.5 Conduits shall be thoroughly cleaned before pulling in the cable.

53.6 Pipes sent in standard length shall be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. Bends upto 80 mm Nb will have to be fabricated at site.

53.7 In case of Transformers if any leakage / sweating is observed from field assembled / shop assembled gasket joints, valves, welded joints the same shall be attended by the contractor including draining of oil, refilling of oil & centrifuging if required at no extra cost to BHEL till handing over period. Sealing compound and any other consumable, if needed, shall be arranged by the contractor with in the quoted rates.

53.8 Calibration log-sheets / history cards of all the instruments, panels, drives, relay testing etc. under the scope shall be recorded and submitted on BHEL approved formats. Proper logging will form a part of calibration / erection activity for the purpose of monthly running bills payments.

- 53.9 The contractor shall use only SHEARING machine or HACKSAW for cutting angles, flats, channels and trays. No gas cutting is permitted. Drill machine shall be used for drilling holes.
- 53.10 The contractor should note that after execution of work they will hand over marked up drawings "as erected" drawings to BHEL Engineer at site for preparation of firm "as built" drawings. "As erected" drawings will bear the signature of BHEL Engineer and contractor.
- 53.11 The contractor shall paint the name / put tag numbers on all the equipment / instruments / cables etc. erected by him. Materials for tagging shall be supplied by the contractor. Contractor at his cost shall also arrange the adhesive etc.
- 53.12 Contractor shall fabricate and erect stands / supports for Junction boxes, push button stations, fixing of push button and plugging of holes in JB's. This is considered inclusive in the item erection.
- 53.13 DRIP SHIELDS shall be fabricated for all field mounted panels / instruments / instrument racks / JB Racks / control cabinets etc. The hardware / material shall be supplied by BHEL. The fabrication forms part of erection work.
- 53.14 The Pumps, Motors and motorized valves actuators and solenoid valves will be erected by other agency. Their electrical commissioning, wherever required, is to be carried out by the agency within the subject scope of work at the finally accepted rates of applicable item as per Rate schedule. The staff earmarked for commissioning will carry out the work in association and guidance of BHEL Engineer as a part of system commissioning for which no extra cost will be paid by BHEL.

## **ELECTRICAL SCOPE**

### **(A) HT TRANSFORMERS**

The material handling contractor will unload the transformer main tank near the respective foundation, depending upon site conditions.

Scope of work includes checking and preparation foundation, shifting of main tank assembly to respective foundation, erection of accessories and auxiliaries, carrying out minor modification wherever required; Preparation of oil and oil filling under vacuum, dry out of transformer, testing of transformer, oil and other auxiliaries, laying of cable trays up to marshalling box, cabling up to marshalling box and termination for auxiliaries, earthing of accessories to earth conductor /riser, testing of all auxiliaries, pre-commissioning and charging of transformers. Final painting of transformers, including supply of paints, is also to be carried out within *quoted / accepted unit rate of respective transformer.*

**420/16.5kV,220.6MVA,OFAF,GTG TRF.-04 NOs**

**420/16.5kV,292.4MVA,OFAF,STG TRF.-02 Nos**  
**16.5/6.9kV,31.5MVA,ONAF, SAT-04 Nos**

**(B) ISOLATED PHASE BUSDUCT**

Foundation checking and carrying out minor modifications wherever required, erection of Structure , Busduct , LAVT ,SPVT, NG Cubicle etc , alignment of total busduct and readiness for welding , Welding of Bus , Ducts and shunts , by MIG /TIG and NDT and X-ray tests .

Fixing of Rubber Bellows, SOBs, Wall Frame assembly, Flexible and Rigid Bus Connections, CTs , VTs , NGT and NGR . Erection of earth Conductors, Air Pressurization equipment and carrying out Water and Air Tightness Tests. Cabling of CTs upto Marshalling Box after MB erection , testing of CTs and wiring and other tests , Hipot of Main Busduct .

**(C) SEGREGATED PHASE BUSDUCT:**

**Rated: 2750A**

Segregated phase bus duct are from Station Aux. Transformer (04nos.) to respective Switchboards, switchboards interconnected as per scheme. Foundation checking and carrying out minor modification wherever required, erection of structures, Bus duct sections, LAVT & NG / NGT cubicles, hot air blowing equipment and other loose items as per relevant drawings / documents, alignments and jointing by bolting of total Bus duct, fixing of Rubber Bellows, seal Off Bushings, wall frame assembly, Flexible & rigid Bus connections, CTs, VTs, NGT & NGR , erection of earth conductors,, cabling up to JB / Marshalling Box , testing of CTs, VTs, NGT & NGR contact resistance checks on bus duct, Hi-pot of Bus duct, earthing of system with main earth conductor / riser. Total Length of segregated phase duct is approx. 434 meter .

**(D) 6.6 KV SWITCH GEAR**

6.6 kV Switchgear System consists of Spring Operated Metal Clad Vacuum Interrupters with Protection and Metering CTs , PTs , Relays and Meters. The weight of each panel including trolley is approx. 1.9 MT. Panels will be transported in section of 2-3 panels.

There are 2 Boards each having 36 panels(Approx.)

Erection of Panels after foundation checking and carrying out minor modification wherever required, Jointing of panels, inter panel wiring, busbar & earth bar connections, mounting of loose supplied items, testing of complete panels, BEB, FEB and spare trucks, HV test of main and Control bus, testing & commissioning of breakers after scheme checking including testing / calibration of all instruments and relays.

**(E) LT SWITCHBOARDS**

LT Switch Boards consists of Air CKT Breakers, SFUs, relays, meters, contactors, CTs, PTs etc. with protection and metering scheme.

415 V, 2500 A, GTG PMCC-	04 Nos
415 V, 2500 A, STG PMCC-1&2-	02 Nos
415 V, 1000 A STG MCC-1&2	02 Nos
415 V, 400 A HRSG MCC-1&2	02 Nos
415 V, 3000 A STATION SERVICE SWGR	01 Nos
415 V, 3000 A CWPH SWGR	01 Nos
415V, 3000 A, WATER TREATMENT/FIRE WATER SWGR.	01 Nos
415V, 2500 A RWPH SWGR	01 Nos
415V, 2000A, DG PCC	01 Nos
415V,1250A,DM PLANT MCC	01 Nos
415V, 1000 A, AIR CONDITIONING MCC	01 Nos
415V ,1000 A,ETP MCC	01 Nos
415V, 630 A, MISC. SERVICE MCC	01 Nos
415V, 630 A, VENTILATION MCC-1&2	02 Nos
415V, 400 A, CHLORINATION/CLARIFIED WATER MCC	01 Nos
415V ,630 A ,COMPRESSOR MCC	01 Nos
415V ,630 A ,FIRE FIGHTING MCC	01 Nos
415V ,400 A,WATER TREATMENT PLANT	01 Nos
220V, 630 A STATION DC DB	01 Nos
125V, MAIN DCDB	04 Nos
125V, AUXILIARY DCDB	04 Nos

**(F) LT SERVICE TRANSFORMERS (DRY TYPE/ OIL COOLED TYPE):**

The checking of foundation, levelling alignment etc. will be done by erection contractor. Receipt & transportation of transformers & accessories / auxiliaries from stores to site, erection after foundation checking and carrying out minor modification wherever required, Testing and Commissioning of transformers

<b>LT SERVICE TRF</b>	<b>6.6kV/433V, 2000kVA (Oil cooled)-02 Nos.</b>
<b>LT SERVICE TRF</b>	<b>6.6kV/433V, 1600kVA, (Oil cooled)-12 Nos.</b>
<b>LT SERVICE TRF</b>	<b>6.6kV/433V, 2000kVA, (Dry Type) - 04 Nos.</b>
<b>LT SERVICE TRF</b>	<b>6.6kV/433V, 1600kVA, (Dry Type) - 02 Nos.</b>

**(G) LIGHTING TRANSFORMERS (DRY TYPE):**

The transformer will be unloaded by the material handling contractor. The checking of foundation, levelling alignment etc. will be done by erection contractor. Issue of transformer & accessories / auxiliaries from stores & Transportation to site, Erection of accessories and auxiliaries after foundation

checking and carrying out minor modification wherever required & Testing of transformer.

**LTG TRF                                      415/415V, 100/50kVA                                      -01 Nos**

**(H) LT BUSDUCT**

Erection of Busduct Structures after foundation checking and carrying out minor modification wherever required. Erection of Busducts , Alignment of total Busduct, bolting of Ducts and Busbars and fixing of all flexible / rigid connections; Checking of bolt tightness, earth resistance of busduct and Hi-pot of busduct, Connection of Earth bar and fixing of space heaters, JBs, cabling and other accessories.

3000A(Oil filled transformer)	Nos	02
2500A(Oil filled transformer)	Nos	12
3000A(Dry Type transformer)	Nos	04
2500A(Dry Type transformer)	Nos	02

**(I) DC BATTERY CHARGERS**

Erection of Panels after foundations checking / fabrication of base frames or stools (wherever applicable) and carrying out minor modification wherever required; Joining of panels, inter-panel wiring, busbar & earthbar connections, mounting of loose supplied items, Testing of complete board & including testing / calibration of all instruments and schemes; Dummy load test of Chargers including arranging of dummy load and temporary power supply etc.

220 V, 400A Float-cum-boost Chargers -02 Nos  
 125V DC Float-cum-boost Chargers –04 Nos  
 125V DC Float-cum-boost Chargers for standby EOP-04 Nos

**(J) DC BATTERY**

Erection of battery after assembly of battery stands, inter-connection of batteries and first charging; Capacity testing using dummy load and subsequent recharging ( in case of failure of capacity test, the charging Discharging cycle is to be repeated ) Dummy load test of chargers includes arrangement of dummy load and temporary connection in absence of regular power supply.

**220 V STATION Battery System (Ni-Cd)890Ah,170 cells-02 Nos**  
**125 V DC Battery System -04 Nos**  
**125 V DC Battery System for standby EOP-04 Nos**  
**24 V DC Battery System (Ni-Cd), 362 Ah,20 cells, for DG set**

**(K) Neutral Earthing Equipment**

04 nos Neutral grounding resistance are to be supplied for the Station Aux. Transformers. The NGR will be supplied in knocked down condition and is to be assembled at site.

NGR for Station Aux. Transformer – 4 nos

**(L) CONTROL & RELAY PANELS (LT MCCs, GRP / GCPs, DCDBs, DD / GD CONTROL PANEL, UPS etc.)**

Erection at site / control room including chipping of floor, fabrication and fixing of base channel frame, levelling & alignment with spirit level, welding the base channel to the embedded plates / channels, grouting, fixing of anti-vibration pads, termination of inter panel connections, mounting / connections of loose instruments, inter panel bus bar connections, commissioning including loop checking, system checking, and putting necessary controls on automatics.

**Tenderer may note that fabrication / fixing / painting of base channel / suitable steel stool, if required, will be included in quoted / accepted price of respective panel & no separate payment will be released for same.**

Terminations of cables will be by conventional screwed connections. Checking of internal wiring, rectification, testing and calibration of equipment mounted inside is in the scope of contractor. The contractor may have to change / replace items found faulty without any extra cost, however materials for this shall be provided by BHEL. Mostly panels will be delivered fully wired. However wherever required termination of loose wires, bus wires is to be done. Canopy for panels will be supplied loose & shall be installed by the contractor after erection of panels. The cleaning of panels have to be done with electrical vacuum cleaner, besides conventional cleaning with brush etc. The drilling of holes in the gland plates for cable entry shall be part of panel erection. All blank holes / gaps in the gland plates / boxes etc. shall be properly sealed. The base frames shall be painted suitably. The contractor shall carry out the plugging and sealing of left out holes in the gland plates and other openings at the bottom of panels at his own cost by using fire retardant mortar or good quality sealing material as advised by BHEL.

Any minor alterations required in the bus bar arrangement, wiring in the panels/ cubicles shall also form part of the work. During testing, commissioning, some equipment / modules may need replacement / repairs. All such replacements / repairs and assistance during commissioning and running of the unit till handing over to the Customer are part of the scope as some of the test / commissioning will have to be done after the machine is running on various loads.

**(M) CABLE RACK AND TRAY**

Cable trays shall be supplied either ladder, prefabricated, slotted or duct type. **Cost of cable tray erection as per BOQ Cum Rate Schedule shall include fabrication of supports to suit site requirement, fixing of support in position by welding as per Engineers instruction, erection and fixing of cable trays and racks by welding or by bolts and nuts.** Jointing of trays can be carried out by bolting / welding as per direction of Engineer. Contractor shall carryout cutting of tray only by Hacksaw for obtaining proper routing from

standard lengths supplied. Materials for support fabrication like flats, channels, angles etc. shall be supplied by BHEL free of cost. The cutting & welding points on trays will be painted by primer & Al paint by the contractor including supply of paint within the erection price and no extra cost to BHEL. These cable trays may also be required for laying copper tubing, plica type / GI flexible conduits, local cabling and metal temp. thermocouples.

Beside above angels / channels of various sizes may have to be fabricated / erected, for use as cable trays, from structural steel to be supplied by BHEL free of cost. *Payment for fabrication / erection of these type trays shall be released as per applicable rates for structural fabrication.*

In many cases, trays are supplied with tray covers. These covers have to be erected after completion of bottom cable tray and lying of cables etc. The covers are to be properly secured on the bottom trays and no separate payment will be made for putting these covers. If required, GI / Al strip clamps are to be used.

**(N) CABLE LAYING**

The total length of Cables envisaged for the Plant is as under:

- 6.35/11 KV Cable
- LT Power Cables
- LT Control Cables
- Screened Cables

Laying, dressing & clamping (by Nylon / PVC ties or Aluminium strips or any other method specified by BHEL Engineer) of the cables in the cable trays / angles. The final dressing of cables on cable trays not erected by contractor shall also be done with Nylon Cord / Aluminium strip.

**Cost of cable laying as per BOQ Cum Rate Schedule shall include the cost of Nylon / PVC ties & Aluminium strip required for dressing / clamping.**

The cable run number shall be provided by punching Aluminium Tag plates and tying suitably with nylon ties (at both ends and at regular intervals as advised by BHEL Engineer), which shall be arranged by contractor at his cost. However the tags provided along with cables etc. shall be free issued to contractor. Contractor at his own cost shall arrange any additional Aluminium strip required.

While laying cables, existing cable tray covers and false flooring may require to be removed and re-fixed. The same has to be done at no extra cost to BHEL

**(O) CABLE TERMINATION**

- a) Termination HT Cables Only Shall Be Measured And Paid Separately As Per Quoted / Accepted Rate Of Respective Item Of BOQ CUM Rate Schedule.
- b) For Cables Other Than HT Cables, The Cost Of Cable Laying As Per BOQ Cum Rate Schedule Shall Also Include The Cost Of Termination With Suitable Crimping Type Lugs Including Supply Of Ferrules ( for cross / direct ferruling as per BHEL instructions). Only Cable Lugs & Glands Shall Be Issued By BHEL As Free Issue Item. Drilling of holes in gland plates of HT / LT switchgear, transformer, control panels, JBs etc as per requirement shall also be part of cabling at no extra cost to BHEL.

- c) The contractor shall carryout insulation testing, simulation testing etc. as per the instructions of Engineer at site.
- d) Screen of signal cables shall run in insulated sleeve (to be arranged by contractor at no extra cost) and shall be terminated as per the instructions of the BHEL Engineer.

**(P) JUNCTION BOX, PUSH BUTTONS ETC**

Includes fabrication / fixing / painting of stands for junction boxes / push buttons / frame mounted panels etc will be included in quoted / accepted price of respective item.

**Tenderer may note that fabrication / fixing / painting of stands for junction boxes / local push buttons / indication boxes etc. will be included in quoted / accepted price of respective item. No separate payment will be released for fabrication / erection of these stands. Contractor will be paid extra for fabrication / erection of stand only for the weight in excess of 25 kg per junction box / local push button / indication box etc. and this extra weight will be paid as per applicable rates for structural steel fabrication / erection.**

**(Q) RIGID PIPE/CONDUITS**

Cutting / threading of standard lengths of conduits, laying on fabricated supports or on floor, using screwed fittings, clamping, sealing of open ends. Approved Good quality sealant shall be used to make the joint water proof.

**(R) PLICA FLEXIBLE CONDUIT**

Laying of conduits in cable trays, end connection with instrument / J.B. /panel, using suitable connectors / unions etc. (which shall be supplied by BHEL). Suitable thread / Plica sealant shall be used to make the conduit system water proof. Aluminum painting, clamping and tagging in tray / angle forms part of erection job

**(S) EARTHING**

Earthing work mainly involves laying and tack welding of of conductors on columns / beams at every one meter interval and bolted connections with equipment at least at two points. Low hydrogen content electrodes shall be used for welding. All the above ground welded joints shall be coated with two coats of red oxide primer and two coats of enamel paints.

**(T) DG set**

Complete Electrical work of Emergency Diesel generator set having rating 1250 KVA. Total 03 Nos.

**INSTRUMENTATION****(AA) PANELS – Mark VI/Max Control / Distribution / Starter Panels/HRSG Control Panel/ Station CNI Panel Etc.**

Erection at site / control room including chipping of floor, fabrication and fixing of base channel frame, levelling & alignment with spirit level, welding the base channel to the embedded plates / channels, grouting, fixing of anti-vibration pads, termination of inter panel connections, mounting / connections of loose instruments, inter panel bus bar connections, commissioning including loop checking, system checking, and putting necessary controls on automatics. ***Tenderer may note that fabrication / fixing / painting of base channel (including supply of paints) / suitable steel stool, if required, is included under the scope of this work. Contractor will be paid for fabrication / erection as per applicable rates for structural steel fabrication / erection.*** Checking of internal wiring, rectification, testing and calibration of equipment mounted inside is in the scope of contractor. The contractor may have to change / replace items found faulty without any extra cost, however materials for this shall be provided by BHEL.

Mostly panels will be delivered fully wired. However wherever required termination of loose wires, bus wires is to be done. Canopy for panels will be supplied loose & shall be installed by the contractor after erection of panels. The cleaning of panels have to be done with electrical vacuum cleaner, besides conventional cleaning with brush etc. The drilling of holes in the gland plates for cable entry shall be part of panel erection.

All blank holes / gaps in the gland plates / boxes etc. shall be properly sealed. The base frames shall be painted suitably. The contractor shall carry out the plugging and sealing of left out holes in the gland plates and other openings at the bottom of panels at his own cost by using fire retardant mortar or good quality sealing material as advised by BHEL. **Any minor alterations required in the bus bar arrangement, wiring in the panels/ cubicles shall also form part of the work. During testing, commissioning, some equipment / modules may need replacement / repairs. All such replacements / repairs and assistance during commissioning and running of the unit till handing over to the Customer are part of the scope as some of the test / commissioning will have to be done after the machine is running on various loads.**

**(BB) INSTRUMENTS (TRANSMITTERS / GAUGES / SWITCHES / TEMPERATURE SENSING ELEMENTS LIKE RTDs & THERMOCOUPLES)**

- For instruments supplied loose, the scope includes issue from stores, calibration, erection (including fabrication and fixing of frames / stands by welding to steel structure or by chipping & grouting with RCC columns / floor) and charging / loop checking. The work includes installation of housing connecting manifold / PG valve on supports / racks to be suitably fabricated for the instruments being supplied loose.

- For instruments supplied duly mounted on skids / racks, the scope includes dismantling from skids / racks, reinstallation after testing / calibration, restoring electrical connections, if any, pressure testing of connected piping and charging / loop checking. Servicing of manifolds PG valves shall also form part of erection job within the quoted prices.

Some instruments may need repeated calibration / replacement. The same will be carried out by the contractor at no extra cost to BHEL including calibration of instruments needed for replacement, which will be supplied by BHEL. Erection of thermo elements like RTDs & Thermocouples includes erection of thermo-wells, wherever required, at no extra cost to BHEL. The contractor, as directed by BHEL Engineer, will provide tags on all the instruments at no extra cost to BHEL.

**Tenderer may note that fabrication / fixing / painting of stands including fabrication / erection of Instrument canopy (wherever required) for instruments will be included in quoted / accepted price of respective instrument. No separate payment will be released for erection of gauge board as this will be included in item rates of instruments mounted on the gauge board. Contractor will be paid extra for fabrication / erection of stand only for the weight in excess of 25 kg per instrument and this extra weight will be paid as per applicable rates for structural steel fabrication / erection.**

**(CC) DETECTORS / VIBRATION, SPEED & OTHER TURBOVISORY PICK UPS:**

Blue matching with the assembly fixtures / main equipment surface trial fixing, fixing by drilling / tapping, final doweling. Moreover some detectors may have piggy-backs signal detectors mounted on them as such these forms part of detectors assembly. The integral cables of the above shall be routed & dressed properly up to their JB / Proximeter.

***Erection of proximitors, proximitor housings / JB required for respective pick up and calibration / commissioning of pick ups will be included in quoted / accepted item rate of respective pickup.***

**(DD) PNEUMATIC TUBES (COPPER / SS TUBING):**

Fabrication and erection of single angle supports / tray supports for single multi run tube. Laying tubes in the angles / trays from the panel to the equipment, instrument to instrument, air supply line to drive / instrument, air line connections, clamping properly as per standard ferruling and termination at both ends. This includes all fittings and needle valves, stop valves etc. also. Proper tagging of valves and pneumatic tubes on both ends shall be done for proper identification. No extra charges will be claimed by contractor for any modification carried out after laying of pneumatic tubes / draft pipe lines due to site requirement in general.

**(EE) IMPULSE LINE (AS / CS / SS)**

Fabrication and erection of channel / angle / slotted angle supports, cleaning impulse pipe with wire brush and compressed air, edge preparation, cold bending, laying to the required slopes, clamping, welding of isolation / drain valves and fittings by butt / socket welding / swoze lock joints. Servicing of valves, connecting with the process end and to the instruments, NDT, Hydraulic testing the impulse lines, and painting the lines as per requirement of BHEL engineer. The impulse line may have to be cleaned chemically for removing grease / rusting. Proper tagging of valves and impulse lines on both ends shall be done for proper identification. No extra charges will be claimed by contractor for any modification carried out after laying of Impulse / draft pipe lines due to site requirement in general.

**(FF) COMPUTERS / PLC BASED EQUIPMENTS**

All computer related items / equipment like CRT, monitors, printers, key boards, pre-fabricated connecting leads etc shall be installed in control room and control desk as per direction of BHEL Engineer. **Cost of PC set ( including printer, monitor, UPS, interconnecting leads etc) installation as per BOQ Cum Rate Schedule shall also include the cost of installation / placement of furniture ( to be issued by BHEL as free issue item) as per requirement / instruction of BHEL Engineer.** The Software installation and commissioning is not included in the scope of this contract. However, any assistance required for testing / commissioning have to be provided by the contractor within the quoted price. Hardware found defective during testing / commissioning and till handing over to Customer, have to be removed for repair / replacement and reinstalled within the quoted rates.

**(GG) ELECTRONIC WATER LEVEL INDICATOR SYSTEM**

EWLI includes fixing of electrodes, local and remote indicator panel / display units and interconnection of these by cables. Only cost of laying cables for interconnection of EWLI system shall be measured and paid separately. Erection of all other equipments / panels/ display units forming EWLI system shall be included in the quoted rate per system.

**(HH) CALIBRATION OF CONTROL VALVES**

The work also includes minor rectification / alterations in tubing, servicing of accessories, setting of limit switches, calibration of Actuators and position feedback transmitters.

**(II) SAMPLE HANDLING SYSTEM / ANALYZER SYSTEM**

Includes installation of main analyzer panel, analyzer, probes, sensors and other accessories like sample gas cylinders, mechanical / electrical interconnections (including SS Tubing & Electrical heat Tracing, wherever required) between various components, energizing, testing & commissioning.

**(JJ) POWER CYLINDER ERECTION**

Platforms on which Power Cylinders are to be mounted are usually provided by the Civil Contractor / other agency. However minor structure work required shall form a part of the work within the quoted rate of the the respective cylinder. Fabrication / erection of stands for mounting of the cylinders The work also includes minor rectifications/alteration in the tubing , servicing of accessories , setting of limit switches , calibration of actuators and feedback position transmitters .

**54.0 TESTING, PRE-COMMISSIONING, COMMISSIONING AND POST-COMMISSIONING.**

- 54.1 Site testing shall be required for all equipment installed by the contractor to ensure proper installation, setting, connection and functioning in accordance with drawings, specifications and manufacturer's recommendations.
- 54.2 Commissioning protocols are to be prepared as advised by BHEL Engineer for getting approved by customer / Consultant.
- 54.3 Testing, and pre-commissioning checks shall be as per relevant codes / practices and BHEL drawings / specifications/ approved commissioning Protocols and same shall include, but not be limited to the following:

**I. TRANSFORMERS**

- (a) Insulation resistance and earth resistance checks.
- (b) Oil testing like BDV of oil of each drum before pouring, after processing and in the course of day out, moisture content tests as and hen required. Provision should be made for preparation of oil in a separate tank before filling in the main transformer tank.
- (c) Checking of Buchholz Relay, oil level indicator PRV, calibration of OTI, WTI etc.
- (d) Winding resistance, vector group, turns ratio test on different taps, magnetizing current, core balance check etc.
- (d) After installation the contractor will get oil samples tested at an accredited test lab as per relevant IS as advised by BHEL Engineer and submit the test results, in case the test results are found unsatisfactory the tests will be got repeated by the contractor after reprocessing of oil & submitted to BHEL for approval/acceptance.
- (e) Turns ratio, polarity, insulation resistance and winding resistance checks on all CT's.

**II. HT / LT SWITCHGEAR PANELS:**

- (a) IR test of power and control circuits & High voltage test of Bus bar.

- (b) Checking of protections and interlocks of all related schemes.
- (c) Calibration of all indicating & metering instruments, relays, timers etc.
- (d) Checking of operation of all relays and other protective devices e.g. thermal overload relays, single phasing preventers etc.
- (e) Carrying out of suitable modifications as per system requirement.
- (f) Operation of all illumination, space heating circuits etc.

### **III. BUS DUCTS:**

- (a) Insulation and earth resistance checks.
- (b) High voltage test on Bus bars after drawing out VTs and disconnecting lightning arresters surge capacitors and other connected equipment e.g. generator , generator transformer etc.
- (c) Measurement of contact resistance of joints, bus bar loop resistance etc.
- (d) Testing of CTs, VTs, NGC including primary and secondary injection tests.
- (e) Making all arrangements for testing of the Generator and GT on the 11KV side.
- (f) Testing of generator circuit breaker.
- (g) Testing pre-commissioning & trial run of hot air blowing unit.

### **IV. BATTERY AND BATTERY CHARGER, UPS**

- (a) Checking of battery charger panel.
- (b) Calibration of all indicating and measuring instruments.
- (c) Dummy load test of battery charger.
- (d) Charging of battery and recharging after carrying out battery discharge test/ capability test of battery using dummy load.
- (e) In the absence of regular power supply to battery chargers arrangements are to made for battery charging from temporary construction power supply points.

### **V. CONTROL & PROTECTION PANELS**

- (a) Checking of complete wiring and insulation resistance.
- (b) IR test and loop checking of all field wiring in the panel.
- (c) Checking of all protection, metering and indicating schemes.
- (d) Calibration of all indicating and measuring instruments, relays, timers.
- (e) Checking of all auxiliary schemes e.g. space heating, illumination.
- (f) Checking of operation of all relays, switches and other indicators.
- (g) Commissioning of total scheme including relevant internal equipment.
- (h) Carrying out suitable modifications as per system requirement.
- (i) Carrying out primary injection, secondary injection, stability checks etc.

## **VI. DRIVES AND CONTROLLERS**

- (a) All drives such as power cylinders, pneumatic / motorized valves / dampers etc. and controllers shall be checked for proper installation supports etc. before commissioning.
- (b) All transmitters shall be calibrated and limit switches shall be adjusted.
- (c) All pneumatic and impulse lines shall be cleaned as per instructions of BHEL Engineer.
- (d) All drives shall be operated by simulating various conditions to ensure healthiness of components of the system.
- (e) Re-calibration / rectification wherever required shall be carried out by the contractor within the quoted rates.
- (f) Remote operation of all drives, valves, dampers shall be checked from control room as per instruction of BHEL Engineer.

## **VII. INSTRUMENTATION**

All instruments shall be checked for proper installation, supports, impulse lines, cabling etc. and corrected, wherever required.

All instruments shall be calibrated before installation and proper calibration record shall be maintained to the satisfaction of BHEL Engineer. Instruments received in assembled condition in panels etc. shall also be dismantled, calibrated and re-assembled as per advise of BHEL Engineer.

All impulse and pneumatic lines shall be properly cleaned (oil flushed / chemical cleaned / air blown/ steam blown/ Hydraulic tested etc.) before being charged.

Some of the instruments may require re-calibration during commissioning. The contractor shall remove such instruments, recalibrate and install within the quoted rates.

Various type of Control Panels- Turbine and its auxiliaries Protection Panels, Boiler and its auxiliaries Panels have to be checked.

- 54.4 In case any defect is noticed during tests, trial runs and commissioning such as loose components, undue noise or vibration, strain on connected equipment etc. the contractor shall immediately attend to these defects and take necessary corrective measures. If any readjustment and realignment are necessary, the same shall be done as per Engineer's instructions including repair, rectification and replacement work by the contractor at his cost. The parts to be replaced shall be provided by BHEL.
- 54.5 During this period, though the BHEL's / Client's staff will also be associated in the work, the contractor's responsibility will be to arrange for the complete

requirement of supervision , labour , consumable, T&P and IMTEs required till such time the commissioned units are taken over by the BHEL's customer.

- 54.6 During erection of various equipment, prior to commissioning and after commissioning, protocols have to be made with BHEL customer. The pro-forma and formats as approved have to be printed by the contractor in adequate numbers. The pre-commissioning activities will start with various trials, commissioning operations shall continue till units are handed over to customer. Simultaneous commissioning activities will be progress in various areas, checking of equipment erected, making ready for trial runs, alkali flushing, chemical cleaning, mass flushing etc., all these works need specialized gangs including electricians / instrument technicians in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. The manpower shall not be disturbed or diverted.
- 54.7 It shall be the responsibility of the contractor to provide workmen of various categories in sufficient numbers along with Engineers/ Supervisors including necessary consumables, T&P etc. during pre-commissioning, commissioning and post commissioning period for commissioning of equipment and attending any problem in equipment erected by the contractor till handing over. The rates quoted shall include all these contingencies also.
- 54.8 It shall be specifically noted that the above employees of the contractor may have to work round the clock along with BHEL commissioning Engineer and hence overtime payment by the contractor to his employees may be involved. The contractor's accepted rates shall be inclusive of all these factors also.
- 54.9 In case, any rework is required because of contractor's faulty erection which is noticed during commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during commissioning, the contractor will dismantle / open up the equipment / part and reassemble/redo the work without any extra claim.
- 54.10 During commissioning, opening and closing of valves, attending to leakage, changing of gaskets, modifications in wiring, realigning of equipment, re-calibration of instrument, attending to leakage, minor adjustments of erected equipment may arise. The accepted rates shall include all such works.

## **55.0 FINISH PAINTING**

- 55.1 All the equipment (bus duct, transformers, switchgears, control-panels etc.) within the scope of these specifications shall be received duly painted. The type of painting to be carried out as specified in the tender specification. For panels, during storage and handling the same may get peeled off / damaged / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer / finish paint matching with shop paint / approved final colour along with required tools and other consumables within the awarded price of contract.

Besides above two coats of approved primer paint and at least two coats of approved finish paint to get the desired dry film thickness is to be applied on various loose equipment and all steel structures fabricated and erected at site.

All paints, tools and other consumables including scaffolding materials required for painting shall be arranged and provided by contractor within the quoted rates. Paint and other materials so purchased shall be ISI marked and as per drawing, documents and specifications and painting should be as per colour scheme and quality approved / specified by Engineer. Valid Test certificate for the paint so supplied shall be made available before use of the same on work. The contractor shall provide legend on equipment in size specified by Engineer. Letter writing shall be done in Hindi / English or in both languages. The printers have to undergo test and only qualified painters will be allowed to work.

Certain equipment shall require spray painting (touch up). The contractor shall make arrangements of the required equipment for spray painting of such equipment **including supply of paint**, at his own cost. Spray painting at the job site shall be permitted only at times and locations approved by the owner / Engineer.

## **56.0 FACILITIES TO BE PROVIDED BY BHEL/CONTRACTOR**

- 56.1 BHEL shall provide rent free limited open space, for office & storage shed, as and where made available by PPCL. It is the responsibility of the contractor to construct sheds, provide all utilities and dismantle and clear the site after completion of work or as and when required, as a part of his scope of work.
- 56.2 Contractor shall be responsible for providing all necessary facilities like residential accommodation, transport, electricity, water, medical facilities etc. as required under various labour laws and statutory rules and regulations framed there under to the personnel employed by him.
- 56.3 **Construction power, for construction purposes as well as office use will be provided ON CHARGABLE BASIS ( @ prevailing NDPL rates) at one point near erection / construction site from supply point. Required energy meter, duly calibrated, for measurement of power consumed has to be arranged / installed by Contractor at his cost. Further distribution of power shall be done by contractor at his cost. All wiring must comply with local regulations and will be subject to BHEL's inspection and approval before connecting supply. Contractor is also required to make backup arrangement (providing DG set etc) for power supply to ensure smooth progress of work even during non-availability of construction power.**
- 56.4 Provision of distribution lines of power from the central points to the required place with proper distribution boards observing the safety rules laid down by the authorities of the state shall be done by the contractor, supplying all the materials like cables, distribution board, switch boards, TPN, CBS, ELCBS/ MCCBS / Copper / Brass clamps, copper conductor, change over switches pipes etc. at his

own cost. If any failure is caused in supply of the power and water, it is the responsibility of the contractor to make alternate arrangements at his cost. The contractor shall adjust his working shift / hours accordingly and deploy additional manpower if necessary so as to achieve the targets.

- 56.5 In case of power cuts / load shedding no compensation for idle labour or extension of time for completion of work will be given to contractor.
- 56.6 Adequate lighting facilities such as flood lamps, hand lamps and area lighting shall be arranged by the contractor at the site of construction, contractor's material storage area etc. within finally accepted rates.
- 56.7 No claim for damages will be entertained by the Company on account of interruptions of water supply or limitation of quantity of water as aforesaid or on account of the water so taken being not fit for construction purposes or on any other account in connection with such water supply.
- 56.8 BHEL will make available water for construction/ testing purposes close to the construction areas free of charge at a single point in site. Any further distribution shall be the responsibility of the contractor. Potable / drinking water shall also be provided free of charge at a single point in site & further distribution shall be the responsibility of the contractor.**
- 56.9 The Contractor should make arrangements for storage of sufficient quantity of water required for work.
- 56.10 The Contractor shall during the progress of the work, provide, erect and maintain at his own expenses all necessary temporary workshops, stores, consumables, offices, etc. required for the proper and efficient execution of the work. The planning, setting and erection of these buildings shall have the approval of the Engineer and the Contractor shall at all times keep them tidy and in a clean and sanitary condition to the entire satisfaction of the Engineer.
- 56.11 On completion of work or as and when required by BHEL, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, same will be got done by the Engineer and expenses incurred shall be recovered from the contractor along with prevailing overhead. The decision of BHEL Engineer in this regard shall be final.

## **57.0 TIME SCHEDULE**

- 57.1 The contractor is required to commence the work within 15 days from the date of issue of letter of intent unless BHEL decides to fix any other later date. **However, the actual date of start of work, for the purpose of establishing zero date of the contract, will be certified by BHEL Engineer after adequate mobilization of manpower and T&P by the contractor for material handling work and site facilities.**

- 57.2 Entire work as detailed in tender specification shall be completed within 12 months from the scheduled date of start of work of the contract as per the programs / milestones indicated by BHEL. Contractor has to mobilize adequate resources to meet BHEL commitments to customer as indicated from time to time. **In case due to reasons not attributable to the contractor, the work gets delayed and additional manpower / resources have to be mobilized in Three shift, so as to expedite the work to meet various milestones, same shall be done within the quoted rates as per Rate Schedule, at no extra cost to BHEL. In the event the contractor fails to respond to these requirements, BHEL shall take appropriate actions to meet customer’s commitments in line with the provisions of General Conditions of Contract.**
- 57.3 Various mile stone dates to be achieved, for Module#1 consists of GTG-02 No. HRSG-02 No., STG-01 No. as per the current status of contract, are as below:

<b>MILE STONES</b>	<b>MONTH</b>
• Start Of Erection	15 Days From Issue Of LOI
• GTG # 1 Synchronization	4 <sup>rd</sup> Month
• GTG# 2 Synchronization	5 <sup>th</sup> Month
• HRSG #1 Steam Blowing &SVF	5 <sup>th</sup> Month
• HRSG #2 Steam Blowing &SVF	6 <sup>th</sup> Month
• STG#1 Synchronization	7 <sup>th</sup> Month
• Module –I completion	8 <sup>th</sup> Month

**The milestones of GTG#3,4 shall follow with a time lag of two & four months resp. w.r.t. GTG#2 milestone dates, HRSG#3,4 shall follow with a time lag of two & four months resp. w.r.t. HRSG#2,STG#2 shall follow with a time lag of four months w.r.t STG#1. Module-II shall follow with a time lag of four months w.r.t Module-I.**

Note:

**Depending upon front and material availability, all or some of the mile stone may be required to prepone by one month to meet the commitments of the customer. In this regard BHEL discretion shall be binding of the contractor. Contractor is required to mobilize the additional resources to meet the above contractual commitment within their quoted lumpsum prize. It is the responsibility of the contractor to engage his workmen to execute the awarded scope of work in THREE SHIFTS basis in view of the tight time schedule for achieving the targets set by BHEL within contractors finally awarded rates / prices of this contract.**

**Irrespective of start of work, the contractor has to organize his work to achieve above milestones.**

Contractor has to mobilize all required resources including manpower to achieve above schedule for which no compensation will be payable. However in case of contractor discharges his contractual responsibility even before schedule contract period, he will be allowed to wind up his set up without any financial implications on either side.

The work under the scope of this contract is deemed to be completed in all respects, only when the contractor has discharged all the responsibilities laid down in the contract. The decision of BHEL on completion date shall be final and binding on the contractor.

## **58.0 OVER RUN**

58.1 In case due to reasons not attributable to the contractor, the work gets delayed and scheduled completion gets extended, the contractor shall not be entitled for any over run compensation for a period of first 2 (Two) months after the contractual completion date. In case the scheduled completion time gets extended beyond 2 (Two) months as stated above, the contractor shall be considered for payment of fixed over run charges @ Rs. 80,000/- (Rupees Eighty thousand only) per month on receipt of advance notice intending to claim over run & on fulfillment of following conditions:-

a) The reasons for delay in completion of work are not attributable to contractor but however subject to the provisions of clause - 31.

b) The targets fixed during the over run period are achieved by contractor.

**However, the over run charges shall be limited to 10% of the contract value.**

58.2 Once the claim of over run charges is admitted no other compensation whatsoever (like for delays in receipt of materials, availability of fronts etc.) will be entertained.

58.3 The contractor shall maintain sufficient workforce and other resources required for completion of the job expeditiously/ regular upkeep, operation, maintenance, lubrication of erected equipments till the actual commissioning of the Unit for the entire contractual period including total extended period.

58.4 For the purpose of ORC the actual date of start of erection as certified under clause no. 57.1 shall be considered.

## **59.0 TERMS OF PAYMENT**

59.1 The 'Engineer' will certify regarding the actual work executed in the measurement books and bills, which shall be accepted by the contractor in measurement book.

59.2 Contractor shall submit bills for the work completed under the specification, once in month detailing work done during the month. The format for billing shall be approved by BHEL before raising invoices.

59.3 Subject to any deduction which BHEL may be authorized to make under the contract, the contractor on the certificate of the Engineer at site be entitled for payment as explained hereunder:

**I. 85 % of contract value payable on fulfillment of following conditions:**

**(A) For Equipment / items such as Panels, Cable Trays, cable, JB, impulse pipe, tubing etc. where no calibration is required**

- (i) 50% of item rate shall be payable on erection \ installation /cable laying
- (ii) 20% of item rate on final alignment, welding, clamping, termination etc.
- (iii) 10% of item rate on testing, pre-commissioning, charging etc.
- (iv) 5 % of item rate on pending point clearance

**(B) For equipment/items where calibration and testing is required.**

- i) 20% of item rate on calibration and testing
- ii) 30% of item rate on erection, installation alignment and termination wherever involved.
- iii) 15% of item rate on individual device loop checking/hydro test/ charging of installation and panels.
- iv) 15% of item rate on system loop checks, pre-commissioning checks by simulation/ field calibration or with actual system operation.
- v) 5% of item rate on pending points clearance.

**(C) For equipment/items such as GTG, STG, SAT Transformers, IP Bus Ducts & its accessories etc.**

- i) 20% of item rate shall be payable on placements
- ii) 40% of item rate shall be payable on erection/installation
- iii) 15% of item rate on final alignment, oil centrifuging, welding, clamping, termination etc.
- iv) 5% of item rate on testing, pre-commissioning, charging etc.
- v) 5% of item rate on pending points clearance.

**II Milestone payments—10 % of awarded Contract value (CV)**

- i) 2% of CV on Synchronization of GTG (4 x 0.5 %).
- ii) 1% of CV on completion of trial operation of GTG (4 x 0.25 %).
- iii) 2% of CV on steam blowing in HRSG (4 x 0.5 %)
- iv) 1% of CV on STG on barring gear (2 x 0.5 %)
- v) 1% of CV on Synchronization of STG#1
- vi) 1% of CV on Synchronization of STG#2
- vii) 1% of CV on Completion of trial operation and stabilization of Module#1
- viii) 1% of CV on Completion of trial operation and stabilization of Module#2

**NOTE:**

If the commissioning activities could not be carried out due to no fault of contractor, BHEL Site incharge, at his discretion, after recording reasons

for exercising such option, can split and release payment upto 50% of milestone payment on completion of work , to the extent possible, required for carrying out that particular milestone / commissioning activities.

**III** 2.5% of CV shall be payable on handing over of the unit to BHEL's customer or 3 months after the contractor has discharged his responsibilities as stipulated in this contract whichever is earlier, if delay in handing over is not attributable to contractor. The unit shall be deemed to be handed over on completion of trial operation.

**IV** The balance 2.5% of contract value will be payable on completion of all pending work, rework wherever required, reconciliation of materials, clearance of site and labour colony area in all respect and on submission and passing of final bill.

**NOTE:**

Above payment at III & IV shall be released after adjustment of the contract value based on actual work carried out.

Annexure-I

**LIST OF T&Ps BEING PROVIDED BY BHEL FREE OF HIRE CHARGES ON SHARING BASIS**

SL No	EQUIPMENT	QTY
-------	-----------	-----

**A: T & P**

- |                            |       |
|----------------------------|-------|
| 1. Suitable capacity crane | 1 No. |
| 2. EOT crane in GT/TG hall | 1 No  |

.NOTE: 1. In addition to above any special tools and tackles, if supplied by the manufacturer/ unit will also be provided to the contractor free of hire charges as and when made available.

2. EOT cranes will be erected / commissioned by another agency and may become operational any time during the period of subject work. These EOT cranes will also be provided by BHEL free of hire charges & on sharing basis for subject work. The maintenance of EOT crane will be carried out by BHEL / its Client. Experienced operators as per requirement shall be deployed by the contractor for operation of EOT crane at no extra cost to BHEL. However contractor will not be entitled for any compensation due to non-availability of EOT crane.

3. Other terms and conditions regarding above items shall be as per tender clause 37. (Tools and Plants / IMTEs)

## Annexure-II

**INDICATIVE LIST OF T & P TO BE ARRANGED BY THE CONTRACTOR**

1	Suitable Capacity trailer with pulling unit / Truck	APR
2	Hydra crane 10 / 12T	APR
3	Oil Filtration Machine suitable for HT Transformers with oil tank	APR
4	Suitable capacity Hydraulic jacks	
5	for handling of HT transformers	Adequate Nos.
6	Welding Transformers / Welding generators	Adequate Nos.
7	MIG / TIG Welding Machine for aluminium welding	Adequate Nos.
8	Gas cutting set	Adequate Nos.
9	Grinders	Adequate Nos.
10	Calibrated Torque wrenches for Bus duct application	2 Sets
11	Pedestal mounted Drill Machine	1 No.
12	Hydraulic crimping tool	2 No.
13	Hand crimping tools	Adequate Nos.
14	Industrial vacuum cleaner	1 No
15	Blower	1 No
16	Hydraulic pipe bending machines	APR
17	Hydraulic test Pump	1 No.

NOTES: APR – As per Requirement ; No. - Numbers

1. The above list specifies only major T&P (may not be complete to be deployed by the contractor). All additional / other tools and plants in good and safe working conditions which are required for satisfactory & timely completion of work shall also be deployed by the contractor within finally accepted rates.
2. Other terms and conditions regarding above items please also refer clause 37 (T&P/IMTEs).

**Annexure-III**

Indicative list of IMTEs to be arranged by the **CONTRACTOR** for **ELECTRICAL AND C&I WORK**

Sl.No.	EQUIPMENT	QTY
1.	100V/250V/500 V / 1000V, (Hand operated) megger	1 No.
2.	2.5/5 KV (Motor operated megger)	1 No.
3.	Transformer Oil Testing Kit (Motor operated) 0-100 KV	1 Set
4.	HV Test Kit 0 to 60 KV (100mA leakage current)	1 Set
5.	Digital Multimeters with current probe	6 Nos
6.	Primary Injection Kit	1 Set
7.	Secondary Injection Kit	1 Set
8.	Relay Testing Kit	1 Set
9.	Tong Testers (various ranges) including mA Range	3 Sets
10.	Micro ohm meter with 100Amps DC Source	1 Set
11.	Kelvine double bridge (for low resistance measurement)	1 No.
12.	PPM Measuring Kit	1 No.
13.	Mill volt drop test kit with 100 Amps source	1 No.
14.	Analog Multimeters	2 Nos
15.	Single / three phase variac	1 Each
16.	Motor checker	1 No

For The Calibration of Instrumentation equipments:

S.NO.	DESCRIPTION	RANGE	ACCURACY	QTY
1.	Dead Weight Tester	0-600Kg/cm <sup>2</sup>	LC-0.5Kg/cm <sup>2</sup>	01 Set
2.	Comparison test set (With Sub-standard Pressure gauges)	0-1 Kg/cm <sup>2</sup>	$\pm 0.25\%$ Lc-0.02Kg/cm <sup>2</sup>	} 01 Set
		0-4 k g/cm <sup>2</sup>	-----do-----	
		0-6 Kg/cm <sup>2</sup>	-----do-----	
		0-10kg/cm <sup>2</sup>	-----do-----	
		0-25Kg/cm <sup>2</sup>	+0.25%Lc-0.25 Kg/cm <sup>2</sup>	
		0-60Kg/cm <sup>2</sup>	1 $\pm 0.25\%$ Lc-1.0 Kg/cm <sup>2</sup>	
		0-250Kg/cm <sup>2</sup>	$\pm 0.25\%$ Lc-2.5 Kg/cm <sup>2</sup>	
	0- 400Kg/cm <sup>2</sup>	$\pm 0.25\%$ Lc-2.5 Kg/cm <sup>2</sup>		
3.	Variable DC regulated (Electronic voltage source with digital indication).	0-30V DC	0.2%	1 No

<u>S.NO.</u>	<u>DESCRIPTION</u>	<u>RANGE</u>	<u>ACCURACY</u>	<u>QTY</u>
4.	Oil bath with thermostat,	0-300 Degree Cel.		1 set.

Stirrer and sub-standard  
Glass Thermometers in  
Multiple ranges

5.	Glass U tube mercury mano-meter with standard steel Scale having leveling arrangement.	0-760 mm		APR
6.	Glass U tube mercury mano-meter with standard steel Scale having leveling arrangement.	0-1000 mm		APR
7.	mA/mV source with Digital display.	0-200 mA/200mV		01 No.
8.	Rehostat	100 Ohm, 10 A		03 Nos.
9.	Precision Digital Multimeter	4-1/2 Digits		01 No.
10.	Digital multimeters	3-1/2 Digits		04 Nos
11	High temp. instrument Calibration kit	upto 600 deg.		01 No
12	Decade Resistance box	upto 10 L ohms		01 No
13	500 V / 1000V, (Hand operated ) megger			01 No
14	Single phase variac	15 A		01 No.
15	Hydraulic test pump	upto 250 Kg/mm2	+0.25 %	01 No.
16	Continuity testers			APR
17	Intercom / telephone set for loop checking			APR

Notes:

1. The above list of testing instruments / equipment required for testing / commissioning is only for guidance to contractor and not complete. Any other / additional testing instruments / equipment required for timely and satisfactory completion of job will also be arranged by contractor at his own cost.
2. Contractor must re-ascertain /recheck range and accuracy of each IMTE from BHEL Engineer well in advance before arranging calibration / deployment of IMTE's
3. Other terms and conditions regarding above items shall be as per clause no. 37 (Tools & plants / IMTEs).

Annexure-IV

List of items for Electrical and Control & Instrumentation package

The quantities mentioned below are tentative and may vary as per the actual engineering / requirement to complete the package for electrical and C & I work. Some of the items may be added or deleted which shall have to be executed by the contractor within his scope of work. The decision of BHEL in this regard shall be final and binding.

SL NO	ITEM DESCRIPTION	UNIT	QTY
	<b>HT/LT TRANSFORMERS:</b>		
1	420/16.5kV,220.6MVA,OFAF, GAS TURBINE GENERATOR TRANSFORMER 16000X8000X11000 mm Overall Weight 266MT Shipping Weight 175 MT Oil Qty. 59850 Ltr.	NO.	04
2	420/16.5kV,292.4MVA,OFAF, STEAM TURBINE GENERATOR TRANSFORMER 15500X8000X11000 mm Overall Weight 304MT Shipping Weight 208 MT Oil Qty. 66020 Ltr.	NO.	02
3	16.5/6.9kV,31.5MVA,ONAF, STATION AUX. TRANSFORMER 5200X6200X5200 mm 51MT	NO.	04
4	6.6kV/433V,2000kVA,ONAN 2800X3100X2600 mm 5600KG	NO.	02
5	6.6kV/433V,2000kVA,Dry type 2800X3100X2600 mm 5600KG	No.	04
6	6.6kV/433V, 1600kVA,ONAN 2700X2700X2800 mm 4700KG	NO.	12
7	6.6kV/433V, 1600kVA,Dry type 2700X2700X2800 mm 4700KG	NO.	02

8	415/415V,100/50kVA,Lighting Transformers	NO.	01
9	7MVA,Isolation Transformer for LCI	No.	02
10	EXCITATION TRANSFORMER Dry Type 2500kVA,16.5kV/490V	No.	06
11	STATIC EXCITATION SYSTEM FOR GTG consists of regulation cubicle(02)-1951x1200x2295 mm field breaker cubicle(01)- 1500x1200x2295mm field flashing cubicle(01)-3827x1200x2295 mm AC breaker cubicle(01)- 3827x1200x2295 mm thyristor cubicle(04)- 3404x1200x2295 mm transformer cubicle	SET	04
12	STATIC EXCITATION SYSTEM for STG consists of regulation cubicle(02)-1951x1200x2295 mm, field breaker cubicle(01)-1500x1200x2295 mm, field flashing cubicle(01)-1150x1200x2295 mm, thyristor cubicle(04)-3404x1200x2295 mm, transformer cubicle	SET	02
	<b>ISOLATED PHASE BUS DUCT FOR GAS TURBINE GENERATOR,SAT AND GENERATOR TRANSFORMER</b>		
13	Transportation from stores / storage yard to erection site, assembly, erection, welding, testing & commissioning of Isolated Phase Bus Duct (9000A) for interconnection of Generator & Generator Transformer, SAT, LAVT, NGR/NGT along with all accessories & auxiliaries. Conductor size 465 mm, Thk. 15mm, Enclosure size 1000x6.35 mm , Approx. length per unit 213 Mtrs GTGtap-off(1600A),Conductor size114.3 mm ,Thickness 8.56mm ,Enclosure size 680X4.78 mm, Total Approx. length 102 Mtrs	SET	04
	<b>ISOLATED PHASE BUS DUCT FOR STEAM TURBINE GENERATOR,SAT AND GENERATOR TRANSFORMER</b>		

14	Transportation from stores / storage yard to erection site, assembly, erection, welding, testing & commissioning of Isolated Phase Bus Duct (11000A) for interconnection of Generator & Generator Transformer, SPVT,NGR/NGT along with all accessories & auxiliaries. Conductor size 530 mm, Thk. 16mm, Enclosure size 1070X6.35 mm, Approx. length per unit 224 Mtr. STG tap-off, Conductor size 114.3 mm, Thk. 8.56mm ,Enclosure size 680X4.78 mm, Total Approx. length 22 m	SET	02
	<b>SEGREGATED PHASE BUS DUCT</b>		
	Transportation from stores / storage yard to erection site, assembly, erection, welding, testing & commissioning of Segregated Phase Bus Duct(2750A) for interconnection of Station Aux. Transformers to 6.6kV Switch Boards C.S 2X127.8 mm Enclosure Size 1350X450 mm Approx. Total Length for both Module 434 Mtrs.		
15	Station Aux. Transformers to 6.6kV Switch Boards	SET	04
16	<b>Generator Circuit Breaker</b> including all associated series isolators, earth switches, surge capacitors & SFC connection	SET	04
17	Neutral Grounding Resistor(6.6kV) for Station Aux. transformer Earthing	set	04
	<b>LT BUS DUCT</b>		
18	For Oil filled transformer3000A	SET	02
19	For Oil filled transformer,2500A	SET	12
20	For Dry type transformer,3000A	SET	04
21	For Dry type transformer,2500A	SET	02
	<b>HT SWITCHGEAR</b>		
22	6.6 KV SWITCH BOARD EACH BOARD HAVING 36 PANELS (Approx.) Approx. Dimension 26520x2300x2355 mm	SET	02
	<b>LT SWITCHGEAR</b>		
23	415 V, 2500 A,GTG PMCC-1DA/2DA/3DA/4DA 20340X1500X2460 mm	No.	4
24	415 V, 2500 A,STG PMCC-1&2-1DB/2DB 25080X1500X2460 mm	No.	2

25	415 V, 1000 A STG MCC-1&2-1KA/2KA 16650X1300X2460 mm	No.	2
26	415 V, 400 A HRSG MCC-1&2 -1HA/2HA 6480X1020X2460 mm	No.	2
27	415 V, 3000 A STATION SERVICE SWGR-0DA 9540X1020X2460 mm	No.	1
28	415 V, 3000 A CWPH SWGR-0DB 13380X1020X2460 mm	No.	1
29	415V, 3000A WATER TREATMENT/FIRE WATER SWGR.-0DC 15390X1020X2460 mm	No.	1
30	415V,2500 A RWPH SWGR-0DD 8550X1020X2460 mm	No.	1
31	415V,2000A, DG PCC-0DE 11040X1020X2460 mm	No.	1
32	415V,1250A,DM PLANT MCC 11040X1020X2460 mm	No.	1
33	415V ,1000 A AIR CONDITIONING MCC-0SA 7470X1020X2460 mm	No.	1
34	415V ,1000 A,ETP MCC-0WB 7470X1020X2460 mm	No.	1
35	415V ,630 A ,MISC. SERVICE MCC-0SD 10530X1020X2460 mm	No.	1
36	415V ,630 A ,VENTILATION MCC-1&2-0SB/0SC 7290X1020X2460 mm	No.	02
37	415V ,630 A ,COMPRESSOR MCC-0SF 7470X1020X2460 mm	No.	1
38	415V ,630 A ,FIRE FIGHTING MCC-0SG 7290X1020X2460 mm	No.	1
39	415V ,400 A,WATER TREATMENT PLANT-0WA 6480X1020X2460 mm	No.	1
40	415V ,400 A ,CHLORINATION/CLARIFIED WATER MCC-0SE 6480X1020X2460 mm	No.	01
41	220V,630 A STATION DC DB-0FA 24300X510X2460 mm	No.	1
42	125V, MAIN DCDB -1FA/2FA/3FA/4FA 7470X1100X2460 mm	No.	04
43	125V, AUXILIARY DCDB -1FB/2FB/3FB/4FB 2430X510X2460 mm	No.	04
44	Local motor starters (up to 5.5 KW)	No.	100
45	Local Push Button Stations	No.	260

	<b>BATTERY SYSTEM</b>		
46	220 V, 400A Float-cum-boost Chargers	Set	2
47	220 V STATION Battery System (Ni-Cd) 890Ah, two strings of 170 cells ,1.2V	Set	2
48	125 V DC Battery System 4000x1000x1100 mm	Set	4
49	125V DC Float-cum-boost Chargers 3280x750x2430 mm	Set	4
50	125 V DC Battery System for standby EOP 4000x1000x1100 mm	Set	4
51	125V DC Float-cum-boost Chargers for standby EOP 3280x750x2430 mm	Set	4
52	24 V DC Battery System (Ni-Cd) ,362 Ah, 20 cells,1.2 V 2000X500X500 mm	Set	6
53	Battery charger- 40A 600x500x1000 mm	Set	03
54	Battery charger -20A 550X400X1000 mm	Set	03
	<b>HT POWER CABLES LAYING,DRESSING &amp; CLAMPING</b>		
	6.35/11kV (UE) Armoured, Aluminium Conductor XLPE insulated FRLS outer-sheathed cable.		
55	1C x 630 SQ. MM	Mtr.	17200
56	3C x 150 SQ. MM	Mtr.	8500
	<b>HT POWER CABLES TERMINATION</b>		
	6.35/11kV Indoor termination kits for 6.35/11 kV, XLPE insulated, Unarmoured, Al cable		
57	1 C X630 SQ MM	No.	130
58	3C X 150 SQ MM	No.	82
	Straight through joints for 6.35/11 kV, XLPE insulated, Unarmoured, Al cable		
59	1 C X630 SQ MM	No.	03
60	3C X 150 SQ MM	No.	06
	<b>TREFOIL CLAMPS</b>		
	TREFOIL CLAMPS for 6.35/11 kV, XLPE insulated, Unarmoured, Al cable		
61	1 C X630 SQ MM(Approx. dia. 50+/-2)mm	No.	4200

	TREFOIL CLAMPS for 1.1 kV, XLPE insulated, Unarmoured, Al cable		
62	1 C X630 SQ MM(approx. dia.40+/-2)mm	No.	3700
63	1 C X400 SQ MM(approx. dia.32.5+/-2)mm	No.	2850
	<b>LT POWER CABLE LAYING,DRESSING &amp; CLAMPING</b>		
	1.1 kV, Unarmoured, Stranded Al conductor, XLPE insulation, Inner sheath PVC & PVC outer sheath, FRLS		
64	1 C X630 SQ MM	Mtr	10000
65	1 C X400 SQ MM	Mtr	7600
66	1CX300 SQ.MM	Mtrs.	2000
67	1CX185 SQ.MM,	Mtrs.	6000
68	3C X 240 SQ MM	Mtr	2200
69	3C X 150 SQ MM	Mtr	4500
70	3.5CX240 SQ.MM,	Mtrs.	1500
71	3.5CX 185 SQ MM	Mtr	1800
	1.1 kV, Unarmoured, Stranded Cu conductor, XLPE insulation, Inner sheath PVC & PVC outer sheath, FRLS		
72	1 C X630 SQ MM	Mtr	450
	1.1 kV, Unarmoured, Stranded Al conductor, PVC insulation, Inner sheath PVC & PVC outer sheath, FRLS		
73	2 C X10 SQ MM	Mtr	1800
74	2 C X25 SQ MM	Mtr	3600
75	3 C X10 SQ MM	Mtr	4500
76	3CX16 SQ.MM	Mtrs.	4000
77	3 C X25 SQ MM	Mtr	9000
78	3CX35 SQ.MM	Mtrs.	7500
79	3 C X50 SQ MM	Mtr	7500
80	3 C X95 SQ MM	Mtr	9000
81	3CX150 SQ.MM	Mtrs.	2500
82	3.5 C X25 SQ MM	Mtr	9000
83	3.5 C X50 SQ MM	Mtr	18000
84	3.5 C X95 SQ MM	Mtr	4500
	1.1 kV, Unarmoured, Stranded Cu conductor, PVC insulation, Inner sheath PVC & PVC outer sheath, FRLS		
85	2 C X2.5 SQ MM	Mtr	18000
86	2 C X25 SQ MM	Mtr	2700
87	2 C X50 SQ MM	Mtr	1800
88	2 C X95 SQ MM	Mtr	4500
89	3 C X2.5 SQ MM	Mtr	27000

	1.1 kV, Armoured, Stranded Al conductor, PVC insulation, Inner sheath PVC & PVC outer sheath		
90	3.5 C X25 SQ MM	Mtr	7200
91	3.5 C X50 SQ MM	Mtr	2700
	1.1 kV, Armoured, Stranded Cu conductor, PVC insulation, Inner sheath PVC & PVC outer sheath,		
92	3 C X2.5 SQ MM	Mtr	22000
	<b>SCREENED CONTROL CABLE ,TYPE F , MULTI PAIR(TWISTED) INDIVIDUAL &amp; OVERALL SHIELDED,UNARMoured</b>		
93	4P,0.5 SQ MM	Mtr	40000
94	8P,0.5 SQ MM	Mtr	50000
95	12P,0.5 SQ MM	Mtr	15000
96	20P,0.5 SQ MM	Mtr	10000
	<b>SCREENED CONTROL CABLE ,TYPE G , MULTIPAIR(TWISTED)OVERALL SHIELDED,UNARMoured</b>		
97	2P,0.5 SQ MM	Mtr	65000
98	4P,0.5 SQ MM	Mtr	245000
99	8P,0.5 SQ MM	Mtr	8000
	<b>LT CONTROL CABLE</b>		
100	24CX2.5 SQ.MM	Mtrs.	3000
101	19CX2.5 SQ.MM	Mtrs.	5000
102	19C-1.5 SQ MM	Mtr	10000
103	12CX2.5 SQ.MM	Mtrs.	3000
104	12C-1.5 SQ MM	Mtr	25000
105	7CX2.5 SQ.MM	Mtrs.	5000
106	7C-1.5 SQ MM	Mtr	13000
107	5C-2.5 SQ MM	Mtr	60000
108	5C-1.5 SQ MM	Mtr	40000
109	3CX2.5 SQ.MM	Mtrs.	6500
110	3C-1.5 SQ MM	Mtr	25000
111	2C-1.5 SQ MM	Mtr	25000
112	24PX1.5 SQ.MM,	Mtrs.	4500
113	18PX1.5 SQ.MM	Mtrs.	3500
114	12PX1.5 SQ.MM	Mtrs.	20000
115	12PX0.5 SQ.MM	Mtrs.	10000
116	10PX1.5 SQ.MM,	Mtrs.	3000
117	8PX1.5 SQ.MM	Mtrs.	3000
118	6PX 1.5 SQ.MM,	Mtrs.	30000
119	4PX 1.5 SQ.MM,	Mtrs.	2500
120	2PX1.5 SQ.MM	Mtrs.	7500
121	1PX1.5 SQ.MM,	Mtrs.	10000
122	1PX0.5 SQ.MM	Mtrs.	5000
123	12 Core/2Pair ,Overall shielded , 0.5 SQ.MM	Mtrs.	12000
124	8 Core/2Pair ,Overall shielded , 0.5 SQ.MM	Mtrs.	24000
125	4 Core/2Pair ,Overall shielded , 0.5 SQ.MM	Mtrs.	24000
126	2 Core/2Pair ,Overall shielded , 0.5 SQ.MM	Mtrs.	16000

127	6TX1.5 SQ.MM	Mtrs.	5500
128	2TX1.5 SQ.MM	Mtrs.	4000
129	1 Triad cable	Mtrs.	5000
130	8 Triad cable	Mtrs.	1000
131	Compensating Cable(1Px16AWG) for instrument	Mtr.	1250
132	Compensating Cable(8Px18AWG) for instrument	Mtr.	500
133	Compensating Cable(2Px18AWG) for instrument	Mtr.	500
134	Screened Cable for instrument	Mtr.	1200
	<b>CABLE TRAYS ERECTION INCLUDING SUPPORT &amp; COVERS FABRICATION</b>		
135	Galvanised Ladder/Perforated type cable tray, W=600mm	Mtr	37800
136	Galvanised Ladder/ Perforated type cable tray, W=450mm	Mtr	3600
137	Galvanised Ladder/ Perforated type cable tray, W=300mm	Mtr	1950
138	Galvanised Ladder/ Perforated type cable tray, W=150mm	Mtr	4200
	<b>CABLE TRAY ACCESSORIES</b>		
	<b>Ladder/ Perforated type Horizontal 90 deg bend-600 mm radius, Vertical 90 deg bend-600 mm radius, Tees -600 mm radius, Cross -600 mm radius</b>		
139	600 mm wide	No.	516
140	450 mm wide	No.	150
141	300 mm wide	No.	91
142	150 mm wide	No.	65
	<b>Ladder/Perforated type reducers(50% LHS/50%RHS)</b>		
143	600-450 mm wide	No.	30
144	600-300 mm wide	No.	30
145	450-300 mm wide	No.	20
146	300-150 mm wide	No	10
147	Hot dip galvanized MS sheet 1.6mm thk for covering of cable shaft etc.	Sq.m m	280
	<b>EQUIPMENT EARTHING</b>		
148	GS FLAT 65 X 8 mm	MT	50
149	GS FLAT 50 X 6 mm	MT	10
150	GS FLAT 25 X 6 mm	MT	3
151	GS FLAT 25 X3 mm	MT	2
152	14 SWG GI WIRE	Mtr	1000
153	8 SWG GI WIRE	Mtr	2500
154	20 MM DIA. 1000 MM LONG GS ROD	Mtr	105
155	GI pipe(1/2",1")	Mtr	30
156	GI pipe(1.5",2")	Mtr	20
157	Electrodes in Test Pits GI pipe,100D,1.3MM Thick & 3.75 Long	No.	20

	C & I ITEM DESCRIPTION		
	<b>CONTROL PANELS/RACKS/CONSOLES</b>		
158	MARK-VI Gas TURBINE CONTROL PANEL ALONGWITH<HMI>STATION&NETWORK SWITCH,PRINTER 5820X2400x600 mm	SET	04
159	AUX. Rack(Rotor vibration Monitoring System, Gas detection monitors) 1000x915X2400 mm	SET	04
160	Diverter Damper Control PANEL 1000x450X2354 mm	SET	04
161	Gullotine Damper Control PANEL 1000x450X2354 mm	SET	04
162	GT CO2 Fire Protection Panel 600X300X1200 mm	No.	04
163	DCS Panel for HRSG,TG,STATION CNI 750X800X2415 mm	No.	172
164	I.P. RELAY, DCS PANEL 800X800X2415 mm	No.	06
165	240V UPS PANEL FOR HRSG,TG & BOP 6580X900X2230 mm	No.	02
166	ACDB 2280X895X2115 mm	No.	02
167	HART MANAGEMENT SYSTEM PANEL 1200X800X2415 mm	No.	02
168	GEN GT,SAT PROTECTION PANELS 1000X1000X2295 mm	No.	06
169	UNIT CONTROL PANEL 2000X1000X2345 mm	No.	01
170	ELECTRICAL CONTROL PANEL 2000X1000X2345 mm	No.	01
171	AVR PANEL 3100X750X2295 mm	No.	06
172	FIRE ALARM PROTECTION PANEL 1650X800X2350 mm	No.	01
173	FIRE PROTECTION WORKSTATION& PRINTER 1505X760X735 mm	No.	01
174	VMS PANELS FOR TG,BFP/CEP MOTORS 800X800X2415 mm	No.	10
175	GPS MASTER CLOCK PANEL 900X600X2415 mm	No.	02
176	PA SYSTEM CENTRAL EXCHANGE 545X545X1215 mm	No.	02
177	TSS & VIBRATION MONITORING STATION 1505X760X735 mm	No.	04
178	NETWORK PANEL 800X800X2415 mm	No.	06

179	HART MANAGEMENT STATION 1505X760X735 mm	No.	02
180	PRINTERS(A4 & A3 COLOUR LASER, INKJET ,DOT MATRIX) WITH PRINTER TABLE and accessories	No.	28
181	ENGG./MAXLINK/MAX STORIAN/Operator/WORKSTATION/PC STATION/NOTEBOOK PC/LAN ,24" TFT monitor	No.	67
182	CONTROL DESK	No.	01
183	24 V Battery System with UPS	Set	16
184	DG MCC PANEL 3450X690X2375 mm	No.	03
185	DG AMF PANEL 900X690X2030 mm	No.	03
186	Starter Panel for DC Jacking Oil Motor, Emergency Lube Oil Motor 1000X800X2200 mm	Set	04
187	LCI PANEL ,<HMI> Station, Printers, Networking Interface 4400X2347X1400 mm	SET	02
188	AC REACTOR 1250X1550X1250 mm	SET	02
189	DC REACTOR 1850X2300X1850 mm	SET	02
190	DC Charger & DCDB 3250x840x1800 mm	No.	08
191	24 V DC Battery ISO Box 700X350X1000 mm	No.	08
	<b>INSTALLATION,CALIBRATION&amp; COMMISSIONING OF LOCAL/FIELD INSTRUMENTATION/EQUIPMENT</b>		
192	Flow meters/Flow transmitters	No.	22
193	Temperature gauges/Pressure gauges/ Diff. Pressure gauge	No.	874
194	Temp. Transmitter /Pressure Transmitters / Differential pressure transmitters	No.	1191
195	Level Transmitter/Level gauge	No.	42
196	Online Gas Chromatograph	No.	2
197	Rotameter	set	8
198	Temp. switches/Pressure switches /DP switches	No.	360
199	Level switch/Level switch(Conductivity type)/ Level switch(Float type) / Level Instruments	No.	91
200	Temp. /Level Indicator	No.	18
201	Flue gas Analyser Sample Handling System (Sox/Nox/CO) at Chimney	set	04
202	Oxygen Analyser	No.	04

203	SWAS Sample Handling System	Set	02
204	Analyser(Conductivity/ Dissolved oxygen/ Hydrazine/ Sodium/ Silica/ pH/Flue gas)	No.	100
205	Thermocouples/RTD's	No.	586
206	Thermocouple K Type	No.	66
207	Ch/Al Thermo Couple(Dupl:Ex)	No.	128
208	MTM Thermo Couple (Duplex	No.	180
209	Wheel space, Inner barrel, Bearing Drain, Exhaust, Bearing Metal thermocouples	No.	204
210	Air Filter Regulators	No.	60
211	Thermowells	No.	60
212	I/P Converters	No.	100
213	LVDTs	No.	64
214	Vibration Transducers/Monitor/ Detectors	No.	72
215	Solenoids junction boxes	No.	80
216	Haz Gas detectors	No.	56
217	Vent fan pressure devices	No.	32
218	Flame detectors	No.	16
219	Spark plugs	No.	08
220	Magnetic speed pickups	No.	104
221	Vibration probes, Bentley vibration probes	No.	96
222	Fire detectors	No.	40
223	Solenoid	No.	808
224	Limit switches	No.	20
225	CPD transmitter Box	No.	12
226	Performance transmitter Box	No.	40
227	Gas pressure DP transmitter Box	No.	12
228	Hooters/strobes	No.	40
229	Manual call points	No.	40
230	Condensing Pot-Steam	No.	38
231	Orifice Plate Assembly-Water & steam	No.	34
232	Nozzle Assembly	No.	44
233	Transmitter enclosure & fittings	No.	48
234	EWLI /DWLG for drum	No.	24
235	CCTV System	SET	01
236	Hand held Communicator	SET	04
237	Master Slave Clock System	SET	01
238	Instrument Rack	No.	24
239	Electronic Transmitters/Guided wave radar transmitters	No.	04
240	Local Instrument Enclosure 1450X800X2300 mm	No.	04
241	Local Instrument Enclosure 1100X800X2300 mm	No.	18
242	Local Instrument Enclosure 700X600X2000 mm	No.	44
243	Local Instrument Rack 1950X650X2200 mm	No.	02

244	Local Instrument Rack 1650X650X2200 mm	No.	46
245	Local Instrument Rack 1150X650X1600 mm	No.	66
<b>CABLE TRAY</b>			
246	12 SWG 50mm,100mm Cable Tray(Perforated Type)	No.	250
247	Cable Tray(Perforated Type) Accessories	No.	1050
<b>IMPULSE PIPES/ TUBES ALONG WITH FITTINGS</b>			
248	SS PIPE 33.4X3.4MM(Above 1")	MTRS	10000
249	SS TUBE 12.7X2.1MM(Approx.1/2")	MTRS	2000
250	SS PIPE 21.3X3.7MM(Above 3/4")	MTRS	1000
251	GI Tubing & Fittings/ SS/AS/CS Tubing & Fittings for instrument air lines/	No.	187
252	NB 1" GI pipe	MTRS	150
253	6mm(1/4") OD SS Tube	MTRS	50
254	Copper Tube-6mm/8mm,1/4",1/2" to 1"	MTRS	1000
255	P22-1/2"	MTRS	20
256	<b>Flexible conduiting /Rubber hoses/pipes</b>	MTRS	500
257	Rigid conduit	MTRS	250
<b>JUNCTION BOXES/INDICATION BOXES/LOCAL CONTROL STATIONS</b>			
258	JB 24 way	No.	120
259	Junction boxes up to 48 way	No.	324
260	Junction Boxes 40 terminals	No.	60
<b>COMMISSIONING/CALIBRATION OF MOTORISED ACTUATOR/GATE/CONTROL VALVES</b>			
261	Commissioning of Motorised Valves	No.	508
262	Commissioning/ Calibration of Pneumatic Gates /Valves	No.	28
263	Commissioning of Control Valves	No.	170
<b>INSTALLATION &amp; FABRICATION OF STRUCTURE STEEL</b>			
264	ANGLE ,ISMC,PLATES etc.	MT	40
265	<b>Lab Instruments</b>	SET	01
	<b>Pneumatic Test Bench</b>		<b>1</b>
	<b>Dead Weight Tester</b>		<b>1</b>
	<b>Vacuum Tester</b>		<b>1</b>
	<b>Hydraulic Pressure Gauge Tester</b>		<b>2</b>
	<b>Vacuum Pump</b>		<b>1</b>
	<b>Manometers</b>		
	<b>Test Manometer</b>		<b>2</b>
	<b>U -Tube Manometer</b>		<b>2</b>
	<b>Sub-standard quality pressure gauges of following ranges</b>		

0 - 250 kg/cm <sup>2</sup>		2
0 - 200 kg/cm <sup>2</sup>		2
0 - 100 kg/cm <sup>2</sup>		2
0 - 50 kg/cm <sup>2</sup>		2
0 - 10 kg/cm <sup>2</sup>		2
0 - 5 kg/cm <sup>2</sup>		2
0 - 2 kg/cm <sup>2</sup>		2
0 - 1 kg/cm <sup>2</sup>		2
(-)  - 0 kg/cm <sup>2</sup>		4
Alr Set 4		4
Portable Electro-pneumatic Calibrator		2
Fluidised Temperature bath		1
Thermocouple Test Furnace		1
Barometer		1
Mercury Thermometer (each range) 2 Sets of each of 12 numbers		24
Precision Instrument Radial Drilling Machine		1
Jeweler's Lathe		1
Standard tool box for instrument maintenance work		3
Digital Thermometer and Hygrometer		2
Portable Dry block type Temperature calibrator		
Low temp. portable dry block type calibrator		1
High temp, portable dry block type calibrator 1		1
Portable Infrared Thermometer		1
Portable Flue Gas Analyser		2
Engraving machine		1
Drawing Laminator		1
Bench Magnifier		1
Industrial Vacuum cleaner		1
Electronic Test Bench		1
Multimeter		1
Digital Multimeter, 4½ digits		6
Digital Multimeter, 5½ digits		1
Digital Multimeter, 6½ digits		1
Portable Digital Multimeter, 3½ digits		6
Portable Digital Multimeter, 4½ digits		10
Portable Current/mV Calibrator		10
Resistance Thermometer Bridge		2
Decade Resistance Box		2
Decade Capacitance Box		2
Decade Inductance Box		2

Variac		2
Rheostat/Potentiometer		10
Test RTD		2
Portable Thermocouple/RTD calibrator/Simulator		1
Portable MultiFunction Counter		1
Digital Storage Oscilloscope		2
Power Pack		2
Portable Vibration Meter		2
Portable Vibration Analyser		1
RCL Meter		1
Logic Probe		4
Function Generator		2
Clip On AC Power Meter		1
LAN/Co-axial Cable Meter/Tester		1
Digital Insulation Tester		2
EPROM Programmer		1
Wakie Talkie System		15
Stop Watches		3
Standard Toolbox for Instrument Maintanance Work		3
Soldering and Desoldering Stations with all accessories		2
Portable Digital Tachometer		2
pH Simulator		1
MultiChannel Simulation Unit(Analog)		1
In circuit IC Tester		1
Portable High Speed Trend Recorder		1
Digital Channel Simulator		1
PhotoCopying Machine		2
PCs		2
Portable Handheld Oscilloscope		1
Drawing Scanner (A3 Size)		1
Drawing Laminator		1
Bench Magnifier		1

**ANNEXURE-V**

**CERTIFICATE OF DECLARATION FOR CONFIRMING THE KNOWLEDGE OF SITE CONDITIONS**

We,.....  
..... Hereby declare and confirm that we have visited the project site under the subject namely, .....and acquired full knowledge and information about the site conditions, wage structure, Industrial climate and total work involved. We further confirm that the above information is true and correct and we will not raise any claim of any nature due to lack of knowledge of site condition.

Address. Tenderer's Name and

Place: (Signature of the Tenderer's  
With stamp)

Date:

***NON DISCLOSURE AGREEMENT***

**Memorandum of Understanding**

**BHEL PSNR is committed to Information Security Management System as per Information Security Policy.**

**M/s.....  
providing.....service to BHEL PSNR, Noida hereby undertake to comply with the following in line with Information Security Policy of BHEL PSNR;**

- **To maintain confidentiality of documents & information which shall be used during the execution of the Contract.**
- **The documents & information shall not be revealed to or shared with third party which shall not be in the business interest of BHEL PSNR.**

(  
M/s. BHEL, PSNR )

(  
M/s..... )

ANNEXURE-VII

**GENERAL TERMS AND CONDITIONS OF REVERSE AUCTION (RA)**

Against this enquiry for the subject item / system with detailed scope of supply as per our tender specification, BHEL-PSNR, NOIDA may resort to "REVERSE AUCTION PROCEDURE" i.e. **ONLINE BIDDING on INTERNET.**

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on Internet.
3. In case BHEL decides to conduct reverse auction, BHEL's service provider shall contact the vendor directly and impart them the training.
4. Business rules like event date, time, start price, bid decrement, extensions, etc. also will be communicated through service provider for compliance.
5. Vendors have to fax the compliance form in the prescribed (provided by service provider) before start of Reverse auction. Without this the vendor will not be eligible to participate in the event.
6. **Total Price quoted shall be inclusive of all taxes except service tax in line with the NIT conditions for the subject work in Indian Rupees (INR), which is to be worked out as per the BOQ (Rate Schedule) given in tender enquiry and subsequent changes made, if any. EXCEL Sheet shall be provided, if applicable.**
7. Reverse auction will be conducted on schedule date & time.
8. At the end of reverse auction event, the lowest bidder value will be known on the network.
9. The lowest bidder has to fax the duly signed filled-in prescribed format as provided on case-to-case basis to BHEL through service provider within 24 hours of auction without fail.
10. Any variation between the on-line bid value and signed document will be considered as sabotaging the tender process and will invite disqualification of vender to conduct business with BHEL as per prevailing procedure.
11. In case BHEL decides not to go for Reverse auction procedure for this tender enquiry, the price bids and price impacts, if any already submitted and available with BHEL shall be opened as per BHEL standard practice.

**FORMAT OF UNDERTAKING**

**(To be submitted in the bidder's letter head)**

**REF:**

**Dt.**

**Bharat Heavy Electricals Limited  
Power Sector – Northren Region,  
Plot No. 25 , Sector - 16A ,  
Distt. Gautam Budh Nagar,  
NOIDA – 201 301(INDIA)**

**Sub.: Tender for “Erection, testing, commissioning, post commissioning, trial operations and handing over of all Electrical and C&I Equipments, Power Transformers, Isolated Phase Busduct for 1500 MW Pragati-III CCPP of Pragati Power Corporation at Bawana, Delhi”**

**TENDER NO. BHEL: NR (SCT): BAWANA: ELECT-CNI: 649**

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited BAWANA site before submission of our offer and noted the job content & site conditions etc.

We also confirm that we have not changed / modified the tender documents as appeared in the website and in case of observance at any stage, it shall be treated as null and void. We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT and confirm our acceptance to reverse auctioning process and we hereby convey our unqualified acceptance to all terms and conditions as stipulated in the tender and NIT. In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer strictly in accordance with tender instructions.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized representative of the bidder)