FOR OFFICIAL USE ONLY
NOT FOR PUBLICATION

TENDERER'S COPY
ORIGINAL COPY

T E N D E R S P E C I F I C A T I O N

TENDER NO. BHEL: NR(SCT): BSSR:STG:455

FOR

ERECTION, TESTING, COMMISSIONING AND TRIAL OPERATION OF STG SETS WITH AUXILIARIES AND PIPING FOR 2X125 MW UNITS(UNIT NO.1&2) AT BARSINGSAR TPS, BIKANER, RAJASTHAN.

PART I – TECHNICAL BID

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

ISO 9001-2000, ISO 14001 and OHSAS 18001 certified company
SubContract and Purchase Deptt.

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A ,
Distt. Gautam Budh Nagar, NOIDA – 201 301.INDIA
Phone: 0091-0120-2515476 / 2515464 / 2515479
Fax 091-0120-2515464 / 2515467
Email: sku@bhelpsnr.co.in / msd@bhelpsnr.co.in

TENDER NO. BHEL:NR(SCT): BSSR:STG:455

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----------

INDEX

Sl. No.	CONTENTS	PAGE
1.	Tender Notice	04-06
2.	Tender Notice- Newspaper	07
3.	Procedure for submission of tender	08
4.	Project Synopsis	09
5.	**Section-III A & B** Special Conditions of Contract	10-64
6.	**Annexure-I -** Terminal Points	65
7.	**Annexure-II -** Exclusions	66
8.	**Annexure-III -** A, B, C & D: Tentative weight schedule	67-72
9.	**Annexure-IV -** Piping details	73-76
10.	**Annexure-V -** List of T&P and IMTEs being provided by BHEL for use of contractor free of hire charges on sharing basis.	77
11.	**Annexure-VI -** Indicative list of major T&P to be provided by contractor at his own cost..	78-79
12.	**Annexure-VII -** Tentative list of major testing instruments / equipment to be arranged by contractor at his own cost.	80
13.	**Annexure-VIII -** Certificate of declaration for confirming the knowledge of site conditions.	81
14.	**Annexure-IX -** Non disclosure agreement	82
15.	**Annexure-X -** General Terms & Conditions of Reverse Auction (RA)	83
16.	**Annexure-XI -** Format for No deviation Certificate	84

ISO 9001-2000, ISO 14001 and OHSAS 18001 certified company
SubContract and Purchase Deptt.

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A ,
Distt. Gautam Budh Nagar, NOIDA – 201 301(INDIA)
Phone: 0091-0120-2515476 / 2515464 / 2515479
Fax 091-0120-2515464 / 2515467
Email: sku@bhelpsnr.co.in / msd@bhelpsnr.co.in

TENDER NOTICE

Sealed tenders are invited from the contractors fulfilling qualifying requirements for the "Erection, Testing, Commissioning and Trial Operation of STG sets with Auxiliaries and Piping for 2X125 MW Units (Unit No.1 & 2) at Barsingsar TPS, BIKANER, RAJASTHAN".

TENDER NO. BHEL:NR(SCT): BSSR:STG:455

QUALIFYING REQUIREMENTS:

"Tenderers who wish to participate should fulfill following 'Qualifying Requirements";

1.0 "Should have executed similar nature of work, covered in this tender for atleast one STG set for 60 MW Unit or higher rating units during last seven years.

'OR'

"Should be executing works of similar nature, as covered in this tender, against direct BHEL's order for a STG set of 125 MW Unit or above rating."

2.0 Party should also have an average annual turnover of minimum of Rs. 110 Lacs (Rupees One Hundred and Ten lacs Only) during preceding three years (2004-05, 2005-06 & 2006-07". The bidders shall submit audited balance sheets in support of this.

3.0 Bidders selection is subject to approval of BHEL's customer for this work i.e M/S NEYVELI LIGNITE CORPORATION LTD(M/S NLCL)."

NOTES:

(i) The Tender Documents comprise of following;
(a) General Conditions of Contract
(b) Special Conditions of Contract, Tender Notice, Project Synopsis etc.
(c) Rate Schedule

(ii) Tender Documents with complete details are hosted on BHEL's web page 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* 18.12.2007**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 (Room No. 104) at the address given above **latest by 18.12.2007**before opening of technical bids commences. Technical bids shall **be opened at 15.30 Hrs. on 18.12.2007**. 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, will 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 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.

(x) BHEL takes no responsibility for any delay/loss of documents or correspondences sent by courier/post.

(xi) Bids, once submitted, shall not be returned.

(xii) Purchase Preference will be given to CPSUs as per Govt. Guidelines.

Sr. DGM/SCP

ISO 9001-2000, ISO 14001 and OHSAS 18001 certified company
SubContract and Purchase Deptt.

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A ,
Distt. Gautam Budh Nagar, NOIDA – 201 301.INDIA
Phone: 0091-0120-2515476 / 2515464 / 2515479
Fax 091-0120-2515464 / 2515467
Email: sku@bhelpsnr.co.in / msd@bhelpsnr.co.in

DOMESTIC NOTICE INVITING TENDER

LAST DATE OF SALE : 18.12.2007
DATE OF OPENING : 18.12.2007

NIT NO. / NAME OF WORK
TENDER NO. BHEL:NR(SCT): BSSR:STG:455 Sealed tenders are invited from the contractors fulfilling qualifying requirements for the ""Erection, Testing, Commissioning and Trial Operation of STG sets with Auxiliaries and Piping for 2X125 MW Units (Unit No.1 & 2) at Barsingsar TPS, BIKANER, RAJASTHAN".

NOTES:

1. Purchase Preference will be given to CPSU as per Govt. Guidelines.
2. Please visit our website at www.bhel.com for complete details of the tender.
3. Bidder(s) can download complete tender documents from BHEL website. They can also purchase hard copy of tender documents from this office on payment of Rs.1,000/- (non-refundable) either in cash or by crossed demand draft in favour of BHEL, NOIDA.

Sr. DGM/SCP

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

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.

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.

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

(2 X 125 MW, Thermal Power Project, Barsingsar, Bikaner, Raj.)

M/s Neyveli Lignite Corporation Ltd., Neyveli, a Govt of India Enterprise with Head Office at Cuddalore Distt, Tamilnadu has entrusted BHEL for Erection, Testing And Commissioning of 2 x 125 MW Thermal Power Project at , Distt. Bikaner, Rajasthan. The Thermal Power Project is a lignite based Power House.

The site location is about 25 KM South west of Bikaner (8 KM west of Palana on NH – 89 Bikaner- Jodhpur- Ajmer road and 15 Km from Bikaner- Jaisalmer- Kandla NH - 15). Palana is the nearest Railway station on Merta Road – Bikaner Section of Northern Railways. The nearest Airport is at Jodhpur

All dispatches are expected by road, as there is no railway siding available. All bidders are advised to visit site and acquaint themselves with the condition prevailing at site before quoting for the work.

SECTION - III `A'

SPECIAL CONDITIONS OF CONTRACT

INDEX

Clause	DESCRIPTION
34	General
35	Preliminary works
36	Civil works, foundations and grouting
37	Consumables
38	Tools & Plants/ IMTE's
39	Supervisory staff & workmen
40	Material handling and storage
41	Preservation of components
42	Cleaning of equipment
43	Erection
44	Welding, HT, RG & NDT
45	Application of Insulation
46	Testing, Pre-Commissioning, Commissioning & Post-Commissioning
47	Condenser painting
48	Finish Painting
49	Progress reporting
50	Drawings & documents
51	Taxes & Duties
52	Extra work
53	Price Variation
54	Rate schedule
55	Instructions to tenderers

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 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 and rectification

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 9001-2000, ISO 14001-1996, OHSAS 18001-1999, 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. 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. 1000/- for the first violation and Rs. 3000/- for the subsequent violations. For serious lapses, as decided by BHEL Engineer/NLC, fines upto Rs. 50000/- 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 NLC (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 Discrimation/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 **200** (Two 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 of noncompliance of above an amount of Rs. 200/- per tree shall be recovered from the contractor.

35.0 PRELIMINARY WORKS

35.1 The contractor shall provide his tool stores for special tools and instruments at a convenient location near to the place of working in TG hall. Necessary area shall be provided to contractor by BHEL. This is to be cleared after completion of the work. If so required he will have shift the same if required to give fronts to other agencies engaged at site.

35.2 The contractor shall set up longitudinal and transverse axes and two or more level bench marks accurately on TG floor. BHEL Engineer shall certify these. The certified TG-Center lines and datum level shall be the reference for TG and all auxiliaries' erection and alignment work. The contractor shall transfer these axes to all the floors to facilitate further execution.

35.3 All matching surfaces of components shall be well cleaned with cleaning agent and burrs shall be removed by filing and blue matched where-ever required. Wherever

necessary sealing / lubricating / anti-seize compounds shall be applied as per recommendation of Engineer. Machining / grinding required for fitting of keys, pins, packers & dowels etc. shall be carried out by contractor at his cost. The contractor is expected to have his own arrangements for machining activities.

35.4 The accuracy of all equipment / instruments and their functioning shall be established before they are permitted for use on the job. If the Engineer doubts the accuracy of the precision tools, any time during erection, the contractor shall arrange the checking / calibration of tools / equipment/ instruments at his cost.

36.0 CIVIL WORKS, FOUNDATIONS AND GROUTING.

36.1 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.

36.2 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.

36.3 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 20 mm. The material required for this has to be arranged for by the contractor at his cost.

36.4 Grouting of equipments is in the scope of the contractor. The Contractor has to ensure that all the matching joints, which are not to be grouted, shall be kept free from the grouting mixture by applying tape or any other alternative method approved by Engineer. **The contractor has to arrange for all materials required for carrying out the grouting including supply of the Special Grout as indicated in the drawings and as approved by the Engineer.** The contractor will be required to supply and apply actual quantity of Non- Shrink Grout as per the site requirement without any extra cost.

36.5 After the grouting, the foundations are to be cured by contractor to the satisfaction of Engineer. The contractor shall check and verify the alignment of equipment, alignment of shafts of rotating machinery, the slopes of all bearing pedestals, centering of rotors with respect to their sealing bores, couplings etc. as applicable and the like items to ensure that no displacement had taken place during grouting. The values recorded prior to grouting shall be used during post grouting check up and verifications. The contractor in a manner shall maintain such pre and post grout records of alignment details, acceptable to the engineer.

36.6 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 chemical

cleaning pumps, tanks and any other temporary supports 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.

37.0 CONSUMABLES

37.1 The contractor shall provide within finally accepted price, all consumables like all welding electrodes (including alloy steel and stainless steel), filler wires, TIG wires, all gases (inert, welding, cutting), soldering material, dye- penetrants, radiography films. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, H&S, packers, shims, wooden planks, scaffolding materials hardware items etc required for temporary works such as supports, scaffoldings are to be arranged by him. Sealing compounds, gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by him.

37.2 All the shims, gaskets and packing, which go finally as part of equipment, shall be supplied by BHEL free of cost.

37.3 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.

37.4 It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of electrodes etc before procurement of welding electrodes and TIG filler wires. On receipt of electrodes and wires at site these shall be subjected to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number, date of expiry etc and produce test certificate for each lot / batch with correlation of batch / lot number with respective test certificate. No electrode without a valid test certificate will be used.

37.5 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 and records maintained.

37.6 Storage of all consumables including welding electrodes shall be done as per requirement / instruction of the Engineer by the contractor at his cost.

37.7 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.

37.8 All lubricants and chemicals required for cleaning, pre-commissioning, commissioning, testing, preservation and lubricants for trial runs of the equipment shall be supplied by BHEL / BHEL's client. All services including labour and T&P 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 / packed and returned to stores.

37.9 Transportation of oil drums from stores, filling of oil for oil flushing, first filling of oil and subsequent change over or topping / making up till the unit is commissioned and handed over to customer is included in the scope of this contract. The contractor shall have to return all the empty drums to BHEL / BHEL's client store at no extra cost. Any loss / damage to above drums shall be to contractor's account.

37.10 Special consumables that are required for final box up like anti-seize compounds, jointing compound and sealing compound shall be provided by BHEL However the contractor shall use them to the satisfaction of BHEL Engineer.

38.0 TOOLS AND PLANTS / IMTE's

38.1 T&P being provided by BHEL to sub-contractor free of hire charges shall be shared by other subcontractors working for BHEL at site and the allotment done by BHEL Engineer shall be final and binding.

38.2 Besides the T&Ps and IMTEs being made available to contractor, free of hire charges by BHEL, all other T&Ps and IMTEs required for successful and timely execution of the work covered within the scope of this tender, shall be arranged and provided by the contractor. He should ensure that these are in good in working condition. **Indicative list of T&Ps and IMTEs to be arranged by the contractor are given as per Annexure-VI & VII** . 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.

38.3 All distribution boards, connecting cables, wire ropes, hoses, pipes etc, including temporary air / water / electrical connections etc shall have to be arranged by the contractor at his own cost.

38.4 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.

38.5 The operation of all BHEL's T&Ps being provided free of hire charges shall be in the scope of the contractor. The contractor shall arrange, at his own cost, trained operators, fuel and other consumables for their operation. All lubricants shall be provided by BHEL free of cost. The contractor will give the requirement well in advance.

38.6 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 the contractor of his responsibilities for proper and safe handling of equipment, consistent good performance of operators and regular performance evaluation of operators.

38.7 The day to day and routine maintenance of BHEL's T&Ps should be carried out by contractor as per manufacturers / 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 that 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.

38.8 The contractor shall arrange at his cost all spares needed for upkeep of all T&Ps other than cranes and Hydraulic Test pumps supplied by BHEL. For cranes, repair / replacement of filter, batteries, self, dynamo 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.

38.9 The contractor, at his own cost shall arrange all supervision and labour required for maintenance and attending breakdowns of BHEL' T&Ps.

38.10 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. If required, contractor has to return the crane with original boom.

38.11 The area and infrastructure development of the area to be carried out by the customer. However in construction projects of this magnitude it is possible that all the areas / approaches may not be ready. In such cases 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. No compensation on this account shall be payable.

38.12 In the event of contractor not using and maintaining BHEL T&Ps 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.

38.13 The contractor shall furnish regular utilization report of the BHEL T&Ps, as per requirement of BHEL.

38.14 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.

38.15 It shall be responsibility of the contractor to take delivery of T&Ps 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 Engineer in project site in good working conditions after use.

38.16 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 workload). If contractor delays return of T&P and IMTE, hire charges as applicable shall be levied by BHEL from time, it was requisitioned till the time of actual return.. T&Ps & IMTEs returned in damaged / unserviceable 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.

38.17 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 / final bills

38.18 Customer shall provide two nos. 100/20 MT EOT crane(s) as available in the TG hall to the contractor free of charge. The crane may be provided with a trailing cable that has to be handled by the contractor till the charging of the down shop leads. The contractor shall deploy his own operators for operating the cranes under supervision of BHEL/its customer. The running / capital maintenance of the EOT cranes is excluded from the contractor's scope. Routine maintenance like cleaning and oil topping (oil will be provided by NLCL) will be carried out by the contractor.

38.19 75/100/150 MT capacity Crawler crane will be provided by BHEL free of hire charges and on sharing basis to the contractor for handling of feed storage tank and deaerator. The operation & maintenance of BHEL's 100/ 150 MT crane shall be carried out by BHEL. **But the operation of BHEL's 75 MT crane shall be carried out by the contractor**. The contractor shall provide one helper, fuel and other consumables for above mentioned BHEL's cranes within the finally accepted rate.

38.20 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.

38.21 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.

38.22 Retesting / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within 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.

38.23 BHEL shall have lien on all T&P, 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./ extended period. The contractor and/ or his Sub-contractors without the prior written approval of the Engineer shall remove no material brought to the site.

38.24 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&P, 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.

39.0 SUPERVISORY STAFF AND WORKMEN

39.1 The contractor shall deploy all the skilled workmen like millwright fitters, welders, crane-operators, drivers, gas cutters, riggers, sarangs, masons, carpenters, electricians, helpers and instrument technicians to carry out the works as per specifications. In addition to skilled, semi-skilled and unskilled workmen required for all the works, suitable workmen required for handling and transporting of equipment from site storage to erection site, erection, testing and commissioning as contemplated under this specification shall be deployed. 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 insist on removal of any employee / workman of the contractor at any time, if they find him unsuitable. The contractor shall remove him forthwith.

39.2 The supervisory staff including qualified and experienced 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. They should in general see and ensure 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. The engineers deployed by the contractor should be experienced TG engineers well conversant with engineering drawings, related documents and erection processes.

39.3 The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations / activities at site. The contractor and his personnel shall cooperate with other personnel / contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

39.4 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 conforms to the dimensions and tolerances given in the drawings / documents / instructions given by BHEL Engineer from time to time.

39.5 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.

39.6 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.

39.7 During the course of erection,

- If the progress is found unsatisfactory,

- If the target dates fixed from time to time for every mile stones are to be advanced / not being met,
- if it is found that the skilled workmen like fitters, 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. The expenses so incurred will be recovered from the contractor's bills with overheads.

39.8 If the contractor or his workmen or employees shall break, deface, injure or destroy any part of a building, road kerbs, fence, enclosure, water pipes, cables, drains, electric / telephone poles, wire, trees or any other property or to any part of erected components, the contractor shall make the same good at his own expense. In default, BHEL may cause the same to be made good by other workmen or by other means and deduct the expenses from any money due to the contractor. BHEL's decision will be final and binding.

39.9 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.

39.10 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 manpower, 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. The contractor shall identify separate persons at site for quality control and safety.

40.0 MATERIAL HANDLING AND STORAGE

40.1 All the equipment furnished under this contract shall be received from the project stores, sheds / storage yards and transported to pre assembly area / erection site and stored in the storage spaces in a manner so that they are easily retrievable till the contractor erects them. While drawing / lifting material from BHEL / customer stores, contractor shall ensure that the balance / other materials are stacked back immediately.

40.2 While BHEL will endeavor to store / stack / identify materials properly in their open / close / semi closed / tarpaulins covered storage yard / shed, it shall be contractor's responsibility to assist BHEL in identifying materials well in time for erection. They should take the 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 program.

40.3 The contractor shall take delivery of components, equipment / consumables from storage area after getting the approval of BHEL Engineer on standard indent forms.

40.4 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.

40.5 All the equipment shall be handled very carefully to prevent any damage or loss. No untested wire ropes, slings, lifting equipment, d-shackles, dog-clamps and eyebolts 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.

40.6 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. Dragging of piping / valves should be avoided. In case of any damage the cost shall be covered from the contractor.

40.7 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.

40.8 Contractor shall be responsible for examining all the plant and materials 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 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 number of watch / ward personal to avoid any pilferage of material. As per General Conditions of contract under provisions of clause No 29 BHEL will reserve the right to recover the cost of repair / replacement, if any, to bring back the equipment in original order, in case the equipment / material is lost / damaged while in the custody of the contractor. BHEL's decision in this regard shall be final and binding on the contractor.

40.9 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.

40.10 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.

40.11 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.

40.12 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.

40.13 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. The contractor will maintain an account for all items received and returned to BHEL.

40.14 The contractor shall ensure that all the packing materials and protective devices installed on equipment during transit and storage are removed before installation.

40.15 It shall be the responsibility of the contractor to keep the work / storage areas in neat, tidy and working conditions. All surplus / unusable packing and other materials shall be removed and deposited at location(s) specified by BHEL within the project premises. If required weighing of the same within the project premises will have to be carried out.

40.16 Contractor shall also ensure that for lifting rotors from the casing, only rotor lifting tackle supplied by the manufacturer is used as per the instruction given and on one side of the sling turn buckle of required size shall be used and rotor shall be lifted slowly only when it is in perfect level. Contractor shall ensure that the sling points on the rotor are as per the instructions of the manufacturer given in the drawings and he shall ensure that rubber or leather pads are given between the sling and rotor shaft to avoid any damage, scratches/ nicks on the rotor shaft. Under no circumstance shall the contractor put his slings around journal shaft or shall lift the rotor till it is fully balanced.

Contractor shall ensure that all rotors when removed from package / casing are placed over suitable stands and supported at the points as shown in the drawings. Contractor shall cover the journals of the rotors with grease and cloth, and also cover the rotor with cloth tarpaulin to avoid any damage to the rotor blades. The rotors shall be kept in a place, which is safe from falling objects and away from main passages.

40.17 For unloading turning & lifting stator to the TG floor level and placing of stator on its foundation the contractor shall strictly comply with the instructions of the BHEL Engineers.

41.0 PRESERVATION OF COMPONENTS

41.1 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 blocked up at least six inches (150mm) off the ground.

Motors, valves, electrical equipment, control equipment and instruments etc shall be stored indoors in a warehouse to be provided by the 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.

Insulation materials shall be stored indoors or otherwise protected against getting wet.

41.2 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.

41.3 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.

41.4 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.

42.0 CLEANING OF EQUIPMENT

42.1 The contractor shall thoroughly clean all the components before installation. The components whose surfaces are coated with protective coating and sent to site are to be thoroughly cleaned by suitable mechanical / chemical means as per the approved procedures.

42.2 Contractor shall ensure that turbine cylinders, rotors, pedestals, diaphragms, glands, packing rings, etc. shall be cleaned with kerosene, petrol, approved solvents or and carbon tetra chloride before assembly and erection of the equipment. For cleaning purposes he shall use only soft cotton cloth. Contractor shall never use cotton waste for cleaning any TG equipment. Generator and other electrical equipments before erection shall be cleaned with dry air / vacuum cleaner.

42.3 The contractor shall clean inside of all pipes and fittings from dirt, sand and loose scales, mechanically and by air blowing before being erected. All pipelines shall be thoroughly blown and / or flushed. If necessary certain pipelines may have to be cleaned by acid pickling/chemical cleaning. The procedure for the same shall be provided by BHEL. However, all chemicals and inhibitors shall be provided by BHEL free of cost. Disposal of chemical has to be carried out by the contractor at his own cost as per advice of the engineer

43.0 ERECTION

43.1 All normal erection and assembly techniques necessary for completion of works under this specification and magnitude have to be carried out. It is not possible to specifically list out all of them. Absence of any specific reference will not absolve the contractor of his responsibility for the particular operation. These would include,

- Scaffolding and rigging operations,
- Machine / flame / electric cutting, grinding, welding, radiography and stress relieving
- Fitting, fettling, filing, straightening, chamfering chipping, scrapping, reaming, as cleaning, checking, leveling, blue matching, aligning and assembly.
- Machining, surface grinding, drilling, doweling, shaping

- Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication.

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

43.3 No members of any ladder / structure / platform should be cut without specific approval of BHEL. In case it is necessary to cut, the contractor shall rectify / repair in a manner acceptable to BHEL / customer without any additional cost.

43.4 The contractor shall erect scaffolding / temporary platforms for erection. These should be of adequate capacity and shall never be over loaded. These should be replaced when not found suitable during erection work and dismantled on work completion & removed from work site.

43.5 Corrections like straightening of ladders, tube support plates adjustment / removal of ovulates in pipes and opening or closing the fabricated bends of piping to suit the layout shall be considered part of the work and the contractor is required to carry out such work within finally accepted price / rate as per instructions of Engineer.

43.6 The contractor shall carry out assembly and erection of condenser components normally on the condenser foundation directly. This includes

- Assembly and welding of bottom plate, side plates, hot well, springs and steam throw device.
- Complete fabrication and welding of shell out of loose side-walls dome walls, and stand pipes.
- Assembly and welding of water chambers and water-boxes.
- Assembly and welding of support plates, baffles and stiffening structure,
- Tubes insertion, expansion and cutting/ trimming.
- Hydraulic test and water fill test and any other fitting/ assemblies required to complete the assembly.

43.7 The contractor shall carry out the condenser tube insertion, S.S welded straight tube dia 22x22 bwg x7500mm length and expansion at site after the installation of condenser on its foundation. Condenser tubes shall be handled strictly as per instructions of BHEL Engineer. Before installation of tubes, the contractor shall check for any dents, mechanical damages or any other defects of tubes caused during storage. These should be thoroughly internally and externally cleaned for all extraneous matter as per the directions of the engineer.

43.8 Before insertion of tubes, the contractor shall clean the surface of the holes in the main tube plates and tube support plates for paint, corrosion spots oxide scale etc. as per the instructions of the engineer. Even reaming of support plates if required for smooth insertion of tubes is to be carried out by contractor at his cost and reaming and its arrangement is to be arranged by contractor.

The contractor shall carry out the insertion & expansion of the condenser strictly in accordance with the instructions issued by the engineer. Tubes may require adjustment of length on both ends. The contractor shall ensure to provide covering

above the top row of tubes to avoid any damage to the tubes prior to tube insertion of BHEL Engineer at his cost.

43.9 The contractor shall carry out the condenser neck welding with casing only after final installation of casing. However the contractor shall adjust the gap between condenser neck and LP exhaust hood uniformly by suitably lifting the condenser as directed by engineer. Also the makeup pieces required for this purpose shall be fabricated and welded to the dome walls by the contractor.

43.10 Some of the rotating equipment and electrical motors are provided with protective greases only. Contractor shall arrange for cleaning of the same with petrol or some other reagent. If necessary, dismantling some of the parts of the equipment would be necessary. He shall arrange for re-greasing / lubricating them with recommended lubricants and for assembling back the dismantled parts, at quoted rate. Lubricants will, however, be supplied free of cost by BHEL.

43.11 All rotating machines and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary by dismantling and refitting before erection. If, in the opinion of Engineer, the equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works are to be carried out by contractor at his cost.

43.12 All the shafts of rotating equipment shall be properly aligned to those of the matching equipment to as perfect and as accurately as practicable. All bearings, shafts and other rotating parts shall be thoroughly cleaned and suitably lubricated before starting.

43.13 All the motors and equipment shall be suitably doweled after alignment of shafts with tapered/parallel machined dowels. The contractor at his own cost shall arrange for the machining of dowel pins required for the same. However the materials for dowel pins shall be issued by BHEL free of cost.

43.14 The bearings shells will be blue matched at site and checked for bearing clearances. The contractor shall carry out scraping of bearing housing, if required to any extent. No extra claim for blue matching of any two surfaces up to 1mm initial gap will be entertained. The contractor shall also check air gap and adjustment of stator/ rotor to magnetic center shall be carried out as part of erection.

43.15 The contractor shall fabricate and weld pipes, special bends, as required for installing lube oil systems. The contractor shall also service the lube oil system, carry out the hydraulic test of oil coolers and piping systems as required.

43.16 The contractor as part of the scope of work if required or if directed by BHEL shall carry out the servicing and realignment of skid-mounted equipment.

43.17 All electrical panels, control gears, motors and such other devices shall be properly dried by heating to improve IR value, before they are installed and energized. Bearings, slip rings commutators and other exposed parts shall be protected against ingress of moisture and corrosion during storage and periodically inspected.

43.18 The contractor shall completely erect and test all the piping systems including their hangers, supports, valves, insulation, and accessories including sampling lines and coolers as per specifications and drawings. The services will include welding, pre-

heating, stress relieving, bolting, testing, cleaning, insulation and painting. System shall be demonstrated in condition to operate continuously in a manner acceptable to the Engineer. Welding shall be used throughout for joining pipes except where flanged screwed or other type joints are specified or shown on the drawings. All piping shall be erected true to the lines and elevation as indicated in the drawings

43.19 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 nb (mm) will be fabricated at site wherever required.

43.20 Certain adjustments in length may be necessary while erecting high-pressure pipelines. The contractor should remove the extra lengths/ add extra lengths to suit the final layout after preparing edges a fresh by adopting specified heat treatment procedures, at no extra cost.

43.21 It is possible that a few flanges may not be matching. The contractor shall be required to cut and re-weld the same as and when required without any additional cost.

43.22 The contractor shall be responsible for any modifications of shop fabricated pipes prior to installation to accommodate minor site alteration in pipe routing at no extra cost.

43.23 **The part of LP piping mainly CW and ACW will run in excavated trenches underground as well as over the ground, however part of other LP piping may also run underground.** The Underground piping shall be protected as per IS 10221/ as specified in the drawing and documents by applying one coat of coaltar/ primer / enamel confirming to AWWA C -203/IS-10221 after pipe surface cleaning by wire brush then apply layer of tape comprising of coaltar. **All the welding, painting, coaltar protection tape and other consumables as per specifications are in the scope of contract.** Supply and application of wrapping tape shall confirm to AWWA C -203/IS-10221 (appendix-B) with thickness of tape as 4mm / any other specification specified in the drawings and documents for the piping. The inside of CW pipes shall be supplied painted. However, the inner surface of pipes is to be protected as per specifications where ever it's not painted or the paint is found damaged. Main pipes for CW system are expected to be supplied in diameter Nb 2200 mm and Nb 1400 mm. The loose pipes of CW shall be supplied in the lengths of approximately 10 meter or less. The ACW pipes for the buried portion shall be of diameter 600 mm.

The pipe shall be encased in concrete as per relevant drawings at the rail and road crossing by other agency. Civil works such as excavation of trenches, construction of ducts, concrete encasing, refilling and compaction of earth for CW and ACW piping are not in the scope of this contract. Civil work for the buried portion of other smaller bore LP piping is in the scope of this contract.

The connection to the pipes terminal points including edge preparation, fit-up, welding applicable NDE etc are in the scope of work. Certain adjustments in length may be necessary while erecting pipelines. The contractor should remove the extra lengths/add extra lengths to suit the final layout after preparing edges afresh at no extra cost. Minor adjustment like removal of ovality in pipes is in the scope of work. All drains / vents / relief tubes / escape pipes / air relief valves/ safety valve/ piping

to various tanks / sewage / drain canal / flash box / sump / atmosphere etc from the piping and equipments erected by the contractor is completely covered in the scope of work.

Welder's pit for welding lower part of pipes in-situ for buried part of piping shall be made in the trench for CW / ACW or for any other LP Piping by the contractor as incidental to work for the buried piping including dewatering of these pits/ trenches is in the scope of contractor within the awarded price. The preparation of earth if any for handling LP piping during erection process out side the excavated area / movement of handling equipments etc. is in the scope of contractor.

The method of welding will be arc welding and details will be indicated in the drawing / documents. BHEL engineer will have the option of changing the method of welding as per site requirement. Welding of weld joints, including root, will have to be done with specified welding electrodes. The root welding has to be back gouged from inside the pipe by grinding and welded. The welding has to be done both from inside as well as from outside the pipes as per the relevant engineering document.

The requisite tests (hydraulic test, welds, NDT, wrapping coating and for paintings etc) are to be performed as per the drawing, specifications within the scope of this contract.

For unburied portion the work has to be done as per the drawing and specifications applicable, except the wrapping and coating.

Contractor shall provide temporary plates for blanking for the hydraulic test of CW / ACW pipes which he can take back after use. BHEL shall provide stiffening materials on returnable basis. Fabrication of blanks, fit-up & welding of requisite blanks for conducting hydraulic test is in contractor's scope. Removal of blanks and restoration of the concerned system / line is to be done as part of work. No separate payment will be made for these activities.

43.24 All vents and drains for piping equipment covered in the scope whether shown in the drawings or not, shall be terminated outside the TG hall in atmosphere and at sump-pit as directed by the engineer.

43.25 Wherever piping erected by the contractor is connected to equipment/ piping erected by the other agencies the joint at the connecting point shall be the responsibility of the contractor of this specification.

43.26 Normally the high-pressure valves will have prepared edges for welding. But, if it becomes necessary, the contractor will prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like `T' pieces, weld neck flanges, reducers etc., shall be suitably matched with pipes/valves for welding.

43.27 The valves will have to be checked, cleaned or overhauled (including lapping of seat) in full or in part before erection and/or after chemical cleaning and during commissioning.

43.28 The contractor shall be responsible for correct orientation of all valves so that seats, stems & hand wheels are in desired direction. It is the responsibility of the contractor to obtain the information regarding orientation of valves not fully located on drawings before the same are installed.

43.29 Steel for suspensions for piping, will be supplied in running lengths. These are to be cut to suitable sizes and adjusted as per requirement.

43.30 No temporary supports should be welded on the piping. In case of absolute necessity prior approval should be taken from BHEL Engineer. In such cases heat treatment, if required, shall be carried out by the contractor

43.31 All hangers, supports and anchors shall be installed as per drawing to obtain safe and reliable and complete pipe installation as per instructions of Engineer. Any additional support as called for by Engineer shall have to be fabricated and erected by the contractor. The raw materials required for fabricating such supports shall be supplied by BHEL free of cost and contractor shall be eligible for payment of such additional supports as per applicable rate.

43.32 Spring suspensions/ constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Any adjustments, removal of temporary arrestors / lockers etc., have to be carried out as and when required.

43.33 Contractor shall install piping in such a way that no excessive or destructive expansion forces exist either in the cold condition or under conditions of maximum temperature and pressure. All bends, expansion joints and any other special fittings necessary to take care of proper expansion shall be incorporated as per the advice of Engineer. During installation of expansion joints, anchors, care must be taken to see that full design movement is available at all times from maximum and minimum temperature.

43.34 The contractor shall carry out the tightening of the field bolts on the equipment and piping covered under this specification by using either the calibrated torque wrench method or the turn of part method. The procedure to be followed, the tools and the equipment deployed shall be subject to the approval of Engineer. All the torque wrenches shall be calibrated as per requirement and before they are put in use on any job.

43.35 The contractor shall ensure that all supporting elements, anchors & restraint have been installed and adjusted in accordance with the drawings / sketches & other written instructions of the Engineer. The contractor shall inspect the hangers associated with the piping systems as follows:

- After hydraulic test, with the piping in the cold position, with all travel stops removed, with the pipe completely insulated and complete in all respect ready for start up.
- Piping in the hot position with the unit operating at the maximum load.
- Piping in the cold position during the first complete shut down.

43.36 The hanger assemblies shall not be used for attachment of rigging to hoist the pipes into position. Separate temporary supports shall be used to securely hold the pipe in position till pipe supports are completely assembled and attached to the building structure.

43.37 Layout of small bore piping as required shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipelines

even after completion of erection or from aesthetic point of view. Contractor at no extra cost should carry this out.

43.38 Erection of power cylinders, electrically operated valves and their actuators etc. coming under various groups is covered under the scope of this specification. However C&I calibration for pneumatic power cylinders shall be arranged by BHEL through C&I agency at no cost to the contractor for this package. However the alignment and any mechanical adjustments including link adjustment, opening & reconnection of links, replacement of power cylinder of any mechanical part, air filter & regulator cleaning etc. required during calibration and operation, the shall be carried by the contractor for this package. However, if recalibration is required till handing over of the equipments the same shall be organized by the contractor for this package as detailed above within the accepted rates. The

43.39 All valves, including motorized valves, flap valves, dampers and actuators, shall be serviced and lubricated to the satisfaction of Engineer before erecting the same and during pre-commissioning also. Welding or jointing of extension spindle for valves to suit the site conditions and operational facility shall be part of erection work within the quoted rates

43.40 The contractor shall also or grind the valve seat, if required, to ensure satisfactory performance of valves at no extra cost. All parts such as gaskets, gland packing which form the permanent part of equipment shall be supplied by BHEL free of cost.

43.41 Erection and welding of necessary instrumentation tapping points, thermocouple pads, thermo-wells, valves, battery of first root valves, condensing vessels, flow nozzles and control valves to be provided on TG, auxiliaries and pipe lines covered within the scope of this specification, will also be the responsibility of the contractor. The welding of all the above items will be contractor's responsibility even if the:

- Product groups, under which these items are released, are not covered in the scope of this tender.
- Items are supplied by any agency other than BHEL.
- ***ADDITIONAL THERMOWELLS AS REQUIRED FOR CONDUCTANCE OF THE PERFORMANCE GUARANTEE TEST ARE TO BE INSTALLED BY THE CONTRACTOR.***

43.42 Erection of CO_2 systems complete in all respects, including cylinders stands, connecting piping, valves, distribution headers, main control panels etc is in the scope of contractor. The delivery gas cylinders is to be taken from BHEL / its client stores, their handling of cylinders and filling of gases in the system as and when required till unit is commissioned and handed over, shall be the responsibility of the contractor, The empty cylinders are to be returned to BHEL/its client stores.

43.43 Additional platforms and ladders of permanent nature incidental to the job for approaching different equipment / valves as per site requirement, which may not be indicated in drawings, shall be fabricated and installed by the contractor. The materials required will be supplied by BHEL free of cost. The contractor will be eligible for payment for such additional platform and ladders at the rate applicable rate against item No. 5 of the rate schedule.

43.44 The contractor shall carry out kerosene oil /D.P tests of all bearing housing of turbine & generator. The kerosene DPT kit for the tests shall also be arranged by the contractor at his own cost.

43.45 NA

43.46 Wherever cables are to be laid under the scope of subject work the same shall be laid in cable trays, dressed, properly glanded and terminated.

43.47 The contractor is strictly prohibited in using the TG / Aux. Components for any temporary supporting or scaffolding woks etc. In case of such misuse a sum of determined by Engineer will be recovered from contractor's bills

43.48 Certain skid mounted instruments like pressure gauge, pressure transmitters, temperature gauges, flow switches, flow indicators, etc., are received in assembled condition as integral part of equipment. Contractor shall dismantle such instruments and hand over them to BHEL for calibration. Contractor shall re-erect them in position just before commissioning of the equipment or as and when directed by BHEL

43.49 The feed storage tank will be received in one-piece approximate weight- 24 MT and Header assembly apprx. Wt. 10 MT, are to be assembled, welded and tested at site. Besides the provisions under Clause No. 38.19, all other arrangements for erection of feed storage tank and deaerator has to be made by contractor with in their finally accepted price

43.50 The contractor shall be responsible for obtaining necessary approval and making whatever additions / modifications considered necessary by the Electrical Inspector, Boiler Inspector or other authorities to bring the installation in conformity with the applicable rules and regulations. The liaison with the inspectors, arrangement for inspection / inspector's visit, preparation of documents, furnishing clarification, information etc. as and when required will done by the contractor at his cost.

43.51 The contractor shall assist BHEL in preparation of as built piping drawing.

44.0 WELDING, HEAT-TREATMENT, RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

44.1 The pressure parts, equipment and piping shall be erected in conformity with the provisions of Indian Boiler Regulation and as may be directed by BHEL as per any standard / 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.

44.2 Welding of pressure parts, equipment, piping, high tensile structural steel shall be done by certified high pressure welders who posses valid certificate of CIB of the State in which the equipment is erected as per provision of IBR. The H.P. welder who possesses necessary certificate shall ensure re-validation as per relevant provisions 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 not be utilized for high-pressure works.

44.3 All welders including tack welders, structural and high pressure welder shall be tested as per ASME section IX / IBR and approved by BHEL Engineer before they

are actually engaged on work even though they may possess a valid IBR certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification of welders. BHEL Engineer will issue all the welders qualified for the work, an identity card. The welder will keep the same with him at work place at all times. He may be stopped from work if he is not found in possession of the same.

44.4 Engineer may stop any welder from the work if his performance is unsatisfactory for any reason or if there is a high percentage of rejection in the joints welded by him. The welder having passed qualification tests does not absolve the contractor of contractual obligation to continuously check the welder's performance.

44.5 Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor’s expense. The Engineer, prior to any repair being made, shall approve the procedure for the repair of defective welds. After the repair has been carried out, the compliance shall be submitted to the engineer.

44.6 The contractor shall carry out the root run welding of all HP / LP piping, valves by TIG welding method only. The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required. During the root runs of stainless steel joints, the contractor shall before and during welding have to purge the pipes with inert gas. All arrangements required for the above shall be the responsibility of the contractor at no additional cost.

44.7 All expenses for testing of contractor's welders including destructive and nondestructive tests conducted by BHEL at site or at laboratory shall have to be borne by the contractor only. Limited quantity of raw material required for making test pieces will be supplied by BHEL free of cost.

44.8 The regulators used on welding machines shall be calibrated before putting these into use for work. The Contractor at his cost shall also arrange periodic calibration for the same.

44.9 **Only BHEL approved electrodes and filler wire** will be used. 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 should have a co-relation with the lot number / batch number given on electrode packets. No electrodes will be used in the absence of above requirement. The thermostat and thermometer of electrode drying oven will be also calibrated and test certificate from Govt. approved / accredited test house traceable to National / International standards will be submitted to BHEL before putting the oven in use. The contractor shall also arrange periodical calibration for the same.

44.10 All butt / fillet welds shall be subject to dye penetration test as per the instructions of the engineer at no additional cost.

44.11 The contractor shall maintain a record in the form as prescribed by BHEL of all operations carried out on each weld. He has to 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 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.

44.12 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 should be done. Gas cutting will be allowed only wherever edge preparation otherwise is impractical. All slag / burrs shall be removed from the edge and all the hand cuts shall be ground smooth to the satisfaction of engineer.

44.13 All welds shall be painted with anticorrosive red oxide paint once radiography and stress reliving works are over. Necessary consumables and scaffolding etc including paints shall be provided by contractor at his own cost.

44.14 Pre-heating, radiography and other NDT 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. Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.

44.15 Contractor shall arrange all necessary stress relieving equipment with automatic recording devices. The contractor arrange for labour, heating elements, thermocouples, thermo-chalks, temperature recorders, thermocouple attachment units, graphs, sheets insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress relieving operations. The contractor should take a note of the following,

- Temperature shall be measured by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL.
- 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 prior to the starting of SR operations.

44.16 The contractor shall also be equipped for carrying out other NDT like LPI / MPI / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. Ultrasonic testing, wherever required, will be arranged by BHEL. Necessary help in conducting the UT shall however be rendered by contractor.

44.17 The technical particulars, specification and other general details for radiography work shall be in accordance with ASME, IBR or ISO as specified by BHEL.

44.18 Contractor for radiography work shall use iridium-192. The geometric un-sharpness shall not exceed 1.5 mm. The contractor should take adequate safety precautions while carrying out radiography. Contractor at his cost shall arrange necessary safe guards required for radiography (including personnel from BARC).

44.19 Low speed high contrasts, 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.

44.20 All radiographs shall be free from mechanical, chemical or process marks, to the extent they should not confuse the radiographic image and defect finding. Penetrameter as per ASME or ISO must be used for each exposure.

44.21 Lead numbers and letters are to be used (generally 6mm size) for identification of radiographs. Contract number, joint identification, source used, welder's identification and SFD are to be noted down on paper cover of radiograph.

44.22 Lead intensifying screens for front and back of the film should be used as per the above-referred ASME specification.

44.23 The joint is to be marked with permanent mark A, B, C to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the down streamside of the weld.

44.24 For multiple exposures on pipes, an overlap of about 25-mm of film should be provided.

44.25 Radiography personnel with sufficient experience and certified by M/s BARC for conducting radiographic tests in accordance with safety rules laid down by Division of Radiological protection only have to be deployed. These personnel should also be registered with DRP / BARC for film badge service.

44.26 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.

44.27 The contractor shall have a dark room fully equipped with radiography equipment, film (un-exposed), chemicals and any other dark room accessories.

44.28 Contractor shall note that 100% radiography will be done at the initial stages on all the piping 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 BHEL welding schedule / IBR / Customer’s requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL. Radiography on LP piping joints is not envisaged. However other NDT test as called for in the FQP including LPI, MPI and HT will have to be carried out

44.29 All the Radiographs shall be properly preserved and shall become the property of BHEL. They are to be reconciled with the work done, joints radiographed and submitted to BHEL / customer.

44.30 Since radioisotopes are being used, all precautions and safety rules as prescribed by BHEL/BARC/ Customer shall be strictly followed. BARC / DRP certificate to be provided before taking up the work.

44.31 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 is to be replaced immediately.

44.32 Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re- submitted for evaluation.

44.33 However, if the defect persists after first repair, further repair work followed with radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radiographed at contractor's cost.

44.34 If the contractor does not carry out 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.

44.35 Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of progress. The contractor shall make all necessary arrangements including labour, supervisors/ Engineer required for the work as per directions of BHEL.

44.36 The contractor shall assist BHEL Engineer in preparing 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. The contractor shall strictly adhere to such schedules.

44.37 The pressure parts, equipment and piping shall be erected in conformity with the provisions of Indian Boiler Regulation and as may be directed by BHEL as per any standard / 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.

45.0 APPLICATION OF INSULATION

45.1 All attachment welding, including welding of hooks / supports as per pitch both on equipment and piping shall be done as directed by Engineer. Attachment welding shall have to be done by certified welders. If necessary contractor may have to cut the hooks to correct length.

Application of red oxide paint including supply of paint on welded portions as directed by BHEL is also included on the scope of work.

45.2 The mineral wool mattresses (bonded / un-bonded) / LRB mattresses are received at site in standard sizes. These are to be dressed / cut to suit site requirements by the contractor.

45.3 The number of layers / thickness of mineral wool / LRB mattresses for auxiliaries, pipe lines, valves and other vessels shall be as per various drawings and as directed by Engineer. For applying the mineral wool mattress, the required holding materials, if necessary by fabrication of rings/ hooks shall be fixed as directed and as per drawings and spec.

45.4 The contractor should ensure, proper finishing of surface of the insulation, sheeting and cementing

45.5 The contractor should ensure that the finished surface of the insulation works conforms to the dimensions and tolerances given in the drawings. Aesthetic finish and accuracy of work are most important.

45.6 It is the responsibility of the contractor to ensure that the insulation materials and sheet metal covering issued to him for application are well protected against loss or damage from weather conditions. Closed / semi closed sheds or any other arrangements required for this will by him at his cost. If any damage occurs to the material due to improper storage or due to any causes attributable to the contractor except for normal breakage or damages allowed in such cases, the cost of such damaged material shall be to the account of the contractor.

45.7 Aluminum sheet cladding will be fabricated to the sizes and shapes specified in drawings. Beading, swaging, beveling of sheets, crowning the sheets if necessary will be carried out by him. Two coats of anti-corrosive black bituminous paint are to be applied on inner surfaces of the cladding. Bitumen sealing compound on the joints if necessary is included in the scope of this work. **Contractor may note that he will also supply anti-corrosive black bituminous paint & bituminous sealing compound required for above works at his cost.**

45.8 Aluminum sheet metal cladding over insulation will consists of plain / ribbed / corrugated sheets. The sheets will be supplied in standard sizes. Cutting them to required size, grooving, fabricating bends, boxes etc., for proper covering is contractor's responsibility. Any cutting / bending / welding of fabricated skin casing sheets if required will also covered within the scope of this contract.

45.9 A logbook shall be maintained by the contractor to obtain clearance for application of insulation. If the contractor does the work on his own accord without prior permission the area may have to be redone at his cost.

45.10 Contractor is liable for the exact accounting of the material issued to him and he shall make any unaccountable losses good. Wastage allowance for the material issued are as below:

- Wool / LRB mattresses and cladding sheets 2%
- Insulation bricks and mortar 2%
- Castable refractory 1%

45.11 The entire surplus, unused materials etc., supplied by BHEL shall be returned to BHEL after the work is over. Materials like gunny bags and packing materials, empty containers may be returned at periodical intervals.

45.12 The contractor shall leave certain gaps and opening while doing the work as per instructions of BHEL engineer to facilitate inspection during commissioning and to fix gauges, fittings and instruments. The gaps will have to be finished as per drawings at a later date by the contractor at his cost.

45.13 If during erection and commissioning any of the parts are to be temporarily fixed and then replaced by permanent ones at a later date or if any of the parts are to be removed for modification, rectification, adjustment and then refitted or if some parts are to be opened for inspection and checking and for measurement of metal surface temperature the same may necessitate removal and re-application of insulation and sheet metal cladding, which shall be done by the contractor and the erection rate quoted shall be inclusive of such contingencies.

45.14 Removable type of insulation shall be provided for valves, fittings, expansion joints etc as per the drawings or as directed by BHEL Engineer.

45.15 All temporary pipelines required during testing, pre-commissioning and commissioning should be insulated as directed by BHEL at no extra cost to BHEL. However required insulation material shall be issued by BHEL free of cost.

46.0 TESTING, PRE-COMMISSIONING, COMMISSIONING, AND POST-COMMISSIONING.

46.1 The contractor shall carry out all the required tests and pre-commissioning and commissioning activities required for their successful and reliable operation. These would include hydraulic test of condenser, land flow test, chemical cleaning of piping alkali and, water flushing, oil flushing of oil system etc. as instructed by BHEL.

All the chemicals required for carrying out these activities will be supplied by BHEL/Customer free of cost.

All required tests (Mechanical and electrical) indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests / activities may not have been listed in these specifications.

Specialized test equipment, if any, shall be provided by BHEL / its client free of hire charges. However contractor has to take proper care of the equipment issued to him.

46.2 The contractor shall carry out the air-tightness test on assembled generator to the satisfaction of BHEL Engineer. The necessary arrangement for testing with dry-clean air shall be made by the contractor at his cost. Compressed air for testing can be taken by the contractor from the existing system

46.3 All the tests may have to be repeated till all the equipment satisfy the requirement / obligation of BHEL at various stages. The contractor shall repairs all joints (shop welded or site welded) failed during testing.

46.4 All items / material required for conducting hydraulic test, alkali flushing, oil flushing, steam blowing etc., will be supplied by BHEL / its customer.

All temporary piping along with their supports for steam blowing, alkali flushing, chemical cleaning and effluent disposal are to be erected. Insulation on temporary piping wherever required is to be carried out by the contractor for subject work. Required quantity of insulation material will be issued by BHEL as free issue item.

The contractor will service and overhaul the equipment being erected by him if any. He will also be responsible for their installation wherever required. He will dismantle the total system and return the same to BHEL / their customer store as directed. No separate payment will be released for erection & dismantling of the required equipment & piping.

46.5 Oil flushing shall be done as per most modern methods. The contractor is required to make all arrangements for the same. All material and equipment will be provided on returnable basis by BHEL for the same.

46.6 All items / material required for conducting hydraulic test, Detergent flushing, oil flushing, steam blowing etc., will be supplied by BHEL / its customer.

The Detergent cleaning operation including the required looping in piping, draining and disposal will be carried out by the Contractor will have to ensure the readiness and availability of CEP, associated regenerative systems and the piping which is to be cleaned (i.e. main condensate, drip and feed water systems etc.). Any other work required on the permanent system will have to be carried out by the Contractor.

All temporary piping along with their supports for steam blowing in the systems erected by the Contractor, and the required loops for chemical cleaning of the piping erected by the contractor will have to be erected, dismantled and normalization after the cleaning process of the system within the quoted rates.

The Contractor will also be responsible for their installation wherever required. He will dismantle the total system and return the same to BHEL / their customer store as directed. No separate payment will be released for erection & dismantling of the required equipment & piping.

The scope of pre-commissioning activities cover installation of all necessary temporary piping, supports, valves, blanking, pumps, tanks etc. and other accessories with access platforms valves, pressure gauges, electric cables, switches, cutting of some of existing valve, placing of rubber wedges in the valves etc., required for hydro test, chemical cleaning, alkali flushing, steam blowing or for any other tests as the case may be and will carry out above activities under this scope of work as per instructions of BHEL. The scope also covers the off site disposal of effluents

46.7 All arrangement required for steam blowing including removal, reinstallation and welding of CRH NRV and installation of steam blowing arrangements including steam blow off piping is included in the scope of work.

46.8 It shall be the responsibility of the contractor to preserve the cleaned surface as per BHEL's requirement.

46.9 It shall be specifically noted that the employees of the contractor may have to work round the clock along with BHEL/Customer Engineers and hence overtime payment by the contractor may be involved. The contractor's finally accepted rates/ price shall be inclusive of all these factors also.

46.10 It shall be the responsibility of the contractor to provide various category of workmen in sufficient numbers along with supervisors with necessary consumables, T&P, IMTEs etc., along with any other assistance required during pre-commissioning, commissioning and post -commissioning of equipment and attending any problem in the equipment erected by the contractor till handing over. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.

46.11 In case, any rework is required because of contractor’s faulty erection that is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during pre-commissioning and commissioning, the contractor will dismantle/open up the equipment / part and reassemble / redo the work without any extra claim.

46.12 During commissioning, opening / closing of valves, changing of gaskets, realignment of rotating and other equipment, attending to leakage and

adjustments of erected equipment may arise. This is included in the scope of work. Of the contractor.

46.13 The contractor shall make all necessary arrangements including making of temporary closures on piping / equipment for carrying out the hydro-static testing on al piping equipment covered in the specification at no additional cost.

46.14 The water boxes of the condenser will be tested hydraulically to 1.5 times the design pressure after its assembly at site. The arrangement of all the blanking for carrying out the hydraulic test shall be the responsibility of the contractor at no additional cost. However only the main blanking flanges with fasteners for CW inlet and CW outlet of the condenser shall be provided by BHEL free of cost. The contractor will carry out fabrication of blanks.

46.15 Hydraulic test of the steam space shall be carried out by filling the water up to 1 Meter or as required above the top row of tubes to facilitate leak detection, add flouroscein solution to the water (20 parts / M3). The water must remain in the condenser for at least 24 hours so that even the smallest leak can be seen. The flourescein and UV hand lamp, temporary piping and hoses for filling the condenser for Hydraulic test / cleaning of condenser steam space shall be arranged by the contractor at his cost. Disposal of flourescein shall be done as per the approved procedure.

46.16 The contractor shall fill the condenser upto the specified level as many times as called for by the Engineer for checking of the turbine at no additional cost

46.17 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 including repair, rectification and replacement work are necessary, the contractor shall carry out the same as per Engineer's instructions. The parts to be replaced shall be provided by BHEL.

46.18 During hydraulic testing of pipes, all piping having variable spring type supports shall be held securely in place by temporary means while constant spring type support hangers shall be pinned or blocked solid during the test.

46.19 The contractor shall carry out cleaning and servicing of valves and valve actuators prior to pre-commissioning tests and / or trial operations of the plant. A system for recording of such servicing operations shall be developed and maintained in a manner acceptable to BHEL Engineer to ensure that no valves and valve actuators are left un-serviced.

46.20 Cleaning & servicing of all the filters / strainers, toppings of oils coming in the system shall be done by the contractor till the completion of trial operation and handing over of the unit.

47.0 CONDENSER PAINTING

47.1 The condenser main tube plates will be dispatched to site from the works with surface protection only on water box side. The same shall be removed adopting one of the suitable methods indicated elsewhere in these specifications. The contractor shall do the surface protection of these tube plates after the completion of the tube insertion and expansion activities. The surface shall be first painted with

at least two or more coats of approved quality chemical resistant epoxy zinc chrome primer after thoroughly cleaning all such parts of al dirt, rust scales greases, oils and other foreign materials by adopting suitable methods as approved by BHEL. Afterwards the above parts shall be finished with two or more coats of approved quality high build black coal tar coating. Before the painting is taken up, the contractor shall plug all the holes with suitable tapered plastic / wooden plugs to avoid any damage to the tube ends. The plastic / wooden plugs and paints required for the above operations shall have to be arranged by the contractor at his cost. The above paints are also to be applied on water chamber / box. The thickness is to be confirmed by suitable measurement. Contractor may note that he will also supply chemical resistant epoxy zinc chrome primer & high build black coal tar required for above works at his cost.

47.2 The condenser steam space shall be surface protected with at least two coats of suitable steam washable paint. Before the painting is taken up, the contractor shall clean the surfaces to be coated by adopting suitable methods. The approved quality paint is to be arranged by the contractor at his own cost.

48.0 FINISH PAINTING

48.1 All exposed metal parts of the equipment, structure, auxiliaries, piping, and other items (covered within the scope of this contract) after installations are to be painted as per requirements /specifications for the project. Mostly the equipment / components installed are with one coat each of primer paint and synthetic enamel / heat resistant / epoxy paint. However, due to aging, the same may have got deteriorated for peeled off. The surfaces are to be thoroughly cleaned of all dirt, rust, scales, grease, oils and other foreign materials by wire brushing, scrapping and any other method as per requirement of BHEL. The same will be inspected and approved by the engineer before painting. These cleaned surfaces are to be touch up painted with suitable approved primer matching with shop paint approved final colour. Besides above two coats of approved primer paint is to be applied on all the bare/unpainted surfaces after cleaning as above. The gas cut stubs would require to be grounded and rounded before painting.

48.2 After applying the primer paints all structure / equipment / items, shall be finish painted with two coats of alloyed resin machinery enamel paints as specified by BHEL engineer. In case proper finish is not obtained in two coats, the contractor shall apply additional coat (s) till proper finish is achieved. After completion of painting all bright spots shall be cleaned to the satisfaction of Engineer.

48.3 Certain equipment like control panels, valves etc. shall require spray painting. The contractor shall make arrangements of the required equipment for spray painting. Spray painting at the job site shall be permitted only at times and locations approved by Engineer.

48.4 **All paints and primers to meet the specifications, tools and other consumables including scaffolding materials required for touchup and finish painting shall be supplied by the Contractor at no extra cost to BHEL.** The paint supplied shall be BHEL approved make only 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. No paint whose shelf life has expired should be used for painting.

48.5 The contractor may zbe required to fill up dents / marks by applying putty before final painting of equipment. All materials and arrangements have to be made within quoted lump sum price/rates.

48.6 The contractor shall provide legends with direction of flow on equipment and piping in size specified by Engineer. Letter writing shall be done in Hindi / English or in both languages.

48.7 The painters have to under go test on a mock plate of size 1m*1m and only qualified painters will be allowed to work.

48.8 The contractor shall ensure availability of

- Ford Cup-4 to measure consistency of paint,
- Automatic magnetic gauge to measure the dry film thickness and
- SSPC Visual standards to assess degree of cleanliness of surfaces to be painted.

48.9 All paints should be stored in well-ventilated store. The painters and other personnel deployed should use proper protective equipment to avoid inhalation of fumes.

49.0 PROGRESS REPORTING

49.1 Contractor is required to draw mutually agreed monthly erection program in consultation with BHEL well in advance. Contractor shall ensure achievement of the program. He shall also timely arrange for additional resources considered necessary for the same at no extra cost to BHEL

49.2 Weekly progress review meetings will be held at site during which actual progress during the week vis-à-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor during discussions shall also present the program for subsequent week. The contractor shall constantly update/revise his work program 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.

49.3 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report and other reports as per performa considered necessary by the Engineer.

49.4 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 program and the slippage does not accumulate and affect the overall program.

49.5 The daily manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

49.6 The Contractor shall submit progress photographs 10 copies in Compact Disc (CD) every month relating to the progress in sequence of work of all major site activities. BHEL/NLC will arrange necessary permission for the same.

49.7 The progress report will also highlight inspection status. The Contractor shall submit one copy of the inspection certificate duly signed by representatives/authorised agencies after inspection along with the progress report.

49.8 All schedules, drawings, document and reports shall be furnished in softcopies also to enable speedy implementation of work and monitoring of the same.

50.0 DRAWINGS AND DOCUMENTS

50.1 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.

50.2 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.

50.3 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.

50.4 The data furnished in various annexure 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.

51.0 TAXES & DUTIES

51.1 **TDS under Income Tax, Sales Tax, VAT and surcharge 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.

51.2 **Price quoted shall be inclusive of all taxes/duties except for 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 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.

51.3 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.

51.4 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.

51.5 Contractor has to make his own arrangement at his cost for completing the formalities (Including arrangement of Road Permits, if any), if required, with Sales Tax/VAT Authorities, for bringing their materials, plants, and equipment at site for the execution of the work under this contract.

52.0 EXTRA WORK

52.1 BHEL may consider for payment of extra works on man hour basis **@ Rs.30/-** (Rupees thirty only) per man hour only for such of those works which:

a Require major revamping or rework and which are totally unusual to normal erection work.

b Require rectification / modification for improvement in the design during commissioning,

c Requiring fresh fabrication of components in place of rejected / replaced components

52.2 The rates indicated as above, shall include over time, if any, consumables, supervision, use of tools and tackles and other site expenses and incidentals.

52.4 The extra works, if any, shall be carried out by a separate gang, which will be identified for certification of man-hours. This gang will not be utilized for any other work during the period that they are engaged in the extra-work. Logbook should be maintained and should be signed jointly by the contractor's representative and BHEL Engineer on day-to-day basis. However, signing of the logbook 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 man-hours that 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.

53.0 PRICE VARIATION

53.1 The rates quoted for scope of work as defined in this tender are subject 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 = Gross billed amount 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.

53.2 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 rights to freeze variation for that much of duration of delays, from time to time, which are entirely attributable to the contractor. **Price variation on last 4.5% of CV will be based on average index.**

53.3 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 variation 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.

54.0 RATE SCHEDULE

54.1 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.

54.2 The tenderer shall quote the rates 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.

55.0 INSTRUCTIONS TO TENDERER

55.1 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)

55.2 No deviations to the tender conditions will normally be accepted.

55.3 The tenderer is 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.

55.4 The contractor in the event of this work awarded to him, shall establish a site office at site and keep posted an authorized 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 authorized 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.

SECTION - III B

INDEX

Description	Clause No.
56	Scope of work
57	Facilities to be provided by BHEL/Contractor
58	Time schedule
59	Over run
60	Terms of payment
61	Liquidated Damages
62	Security Deposit
63	Insurance
64	Others

SECTION - III B

SPECIAL CONDITIONS OF CONTRACT

56.0 SCOPE OF WORK

56.1 BHEL has been awarded the work of Design, Manufacture, supply, installation, erection & commissioning of 2X125 MW unit at Lignite TPP, Barsingsar, Bikaner by M/s Neyveli Lignite Corporation Ltd., Neyveli, a Govt of India Enterprise. The equipment consists of Boiler, Electro-static precipitator, Fans, milling systems, DG set, sSeam turbines, Generators, Boilers Feed Pumps, Condensate Extraction Pumps and piping along with the associated auxiliary supports and controls and balance of plant packages.

The scope of work under this tender consists of :

- Taking delivery of the Turbo-generator materials consisting of condenser, turbine, generator along with their rotating & static auxiliaries like BFPs, Emergency BFPs, CEPs, Deaerator, FST, Heaters and other auxiliaries, Piping ,Valves, H&S etc and DG set from the project storage yard / stores / sheds to erection site or some of the materials directly from transport vehicles at site as decided by BHEL.
- Their preservation, safe keeping, watch and ward.
- Checking, dressing, chipping and leveling of foundations.
- Pre-assembly, erection, alignment of various equipment, machining and grouting.
- Welding , heat treatment, and NDT of P91 pipes as per specifications
- Welding, heat treatment, radiography and other non-destructive tests wherever required
- Hydraulic testing, air leak test, and other pre commissioning tests,
- Insulation and finish painting including supply of paints etc.,
- Chemical cleaning, alkali flushing & oil flushing.
- Steam blowing including erection and dismantling of all temporary piping, valves, pumps, tanks etc. required for above operations and other commissioning activities including post commissioning operations and stabilization of the unit,
- Unit trial operation, resolving any deficiencies observed and handing over of 2X125 MW BARSINGSAR TPS, BIKANER, RAJASTHAN.

56.2 Contractor shall make necessary arrangements to ensure following within their quoted rates:

1. **Contractor shall ensure deployment of qualified level-2 Engineer for NDT services at site.**
2. Contractor shall ensure **deployment of Qualified & Experienced Safety Engineer / Officer** at site.
3. Contractor shall ensure that all the **T & Ps deployed** by them, including cranes, **(Indicative lists of T&Ps and IMTEs to be arranged by the contractor are given as per Annexure-VI and Annexure-VII.) are regularly certified by approved testing agency** & the relevant certificates to this effect are to be given to BHEL for records**.**

It may be noted that non-compliance to the above three conditions will result in penal action as may be decided by the competent authority of BHEL.

56.3 SERVICES OF EXPERIENCED PERSONNEL'S:

56.3.1 The contractor under this contract shall also provide **free of cost services** of skilled persons for a total period of **80 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 /Billing /Progress software package / other packages available at site or for office work for total **16** man months,
- Skilled workers for working in store, colony and in maintenance of office for a total **32** man months and
- Unskilled workers for working in office for a total **32** 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 BARSINGSAR for the categories given plus 10% will be made from the final bill of the contractor.

56.3.2 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 submitted to Construction Manager, BHEL Site for his approval. These qualified Engineers shall be provided for **thirty (30) man-months** as per site conditions. The Engineers shall possess a minimum qualification of a mechanical / 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.

56.4 Major equipment to be installed, tested and commissioned under this specification is given below. **The weights and other details indicated under various Annexure are tentative and may vary.** The contract value will be

worked out based on the rates quoted against each item of rate schedule and quantity indicated against each items. The quantity indicted against each item may vary to any extent and no compensation will be payable in variation of individual quantity.

However, in case of overall reduction in contract value beyond 30%, the contractor will be eligible for compensation as per the following provision:

"The actual 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 shall take above into account while quoting the unit rates quoted as per Rate Schedule so as to take care of such variation during execution stage.

Major equipment to be installed

(A) CONDENSER

Condenser complete with all accessories such as;

- Hot-well, hinge assemblies, nozzles for various connections along with baffles.
- Steam throw off devices, air extraction piping,
- Stand pipes along with fittings including gauge glasses for level indication, hangers & supports to make the system complete in all respects.

(B) STEAM TURBINE

High Pressure and low pressure steam turbines complete with sole plates, foundation holding down bolts, bearing, bearing pedestals, rotors, couplings, main oil pumps, steam gland seals, hydraulic turning gear and hand barring gear.

- Combined main steam stop and control valves, combined reheat stop and control valves, steam strainers for main and reheat steam lines etc., LP bypass stop and control valves along with their servomotors necessary supports for Integral piping and secondary structure if required.
- Cold reheat and extraction NRV along with their servomotors, necessary supports and secondary structure if required.
- Complete Installation of necessary blanking to protect the valves and turbine internals during hydraulic testing and steam blowing. If required CRH NRV may have to be dismantled and replace with a spool during steam blowing. It will be re-installed after completion of steam blowing. Both side-welding joints of spool piece and CRH - NRV are in the scope of this tender.
- Complete governing system for the turbine including governing control rack, LP bypass control, rack, valve test devices and racks, turbine gland

sealing system complete with converters, associated piping, valves and fittings, specialties, fire protection valves and devices, hangers and supports to make the system complete in all respects.

- Complete cross around piping along with their supports from IP turbine to LP turbine.
- Complete extraction piping along with their supports and protective covers from LP turbine to condenser dome walls.

(C) GENERATOR

Generators complete with its auxiliary systems. THE GENERATOR STATOR SHALL BE ERECTED USING EOT CRANES. THE GERATOR STATOR, ROTOR AND OTHER HEAVY EQUIPMENTS/ PARTS MAY BE DIRECTLY RECEIVED AT SITE FORM THE TRANSPORT VEHECLES. THE CONTRACTOR HAS TO INTERACT WITH THE TRANSPORTER FOR THE SAME IF REQUIRED.

- Installation of side mounted Air to water coolers.
- Insertion of rotor, leveling, alignment & coupling with LPR.
- Erection of Bushings.
- Brush less excitation system along with PMG, placement, leveling, centering and coupling with generator rotor.
- End shields, Shaft seals, gas coolers, terminal bushings, connected piping, valves, fittings, hangers and supports etc.
- CO2 fire extinguishing equipment for generator.

(D) STATIC AUXILLIARIES

- Flash tanks with drains & vents.
- Deaerator & Feed storage tank (in single pieces), complete with ladders, platform and other accessories.
- Drain coolers along with fittings, piping, steam traps and Gland steam condensers and air exhausters with motor and fittings, associated piping, hangers and supports etc. to make the system complete in all respects.
- LP Heater-1 horizontal located in condenser neck.
- LP and HP heaters, fittings, group protection device, stand pipes along with fittings including gauge glasses for level indication, safety valves etc. to make the equipment complete in all respects.
- RE Joints along with in built CW pipes, flanges and tie rods and spool pieces, H &S etc. to make system complete in all respect.
- CW Butterfly valves along with counter flanges, gaskets and fasteners to complete the system in the main CW supply and return lines of size1400 NB approximately, 04 nos. in each unit.
- Condenser online tube cleaning system (COLTCS) complete.

- 2X 100% main Air Ejectors and one starting ejectors for maintaining condenser vacuum, along with its accessories, to make the equipments complete in all respects.
- Suction strainers for boiler feed and condensate extraction pumps along with supports and other fixtures.
- Turbine oil coolers, Control oil coolers, gland steam condenser, drain coolers, steam jet main ejectors, along with stand pipes and fittings including gauge glasses for level indication, safety valves etc. to make the equipment complete in all respects.
- Oil strippers, strainers, oil injectors and duplex oil filters.
- Main oil tank, Control oil tank, drain oil and dirty oil tanks along with fittings including gauge glasses for level indication, to make the equipment complete in all respects.
- Working oil and lubricating oil coolers of Boiler feed pumps.
- Air cooling system, carbon dioxide systems including dryers, CO2 gas control units and gas stands, racks and distributors to make the system complete in all respects.
- Plate heat exchangers for SG and TG
- Simplex strainers for ACW and DMCW
- Electric hoists & Chain pulley blocks

(E) ROTATING AUXILLIARIES

- Emergency DG set and it's all associated scope of works i.e. equipments, skids, piping, fittings, supports, structural works etc.
- AC motor driven boiler feed pumps mounted on common frames, hydraulic couplings, and BFP motors, BFP booster pumps, working oil and lube oil coolers including integral piping.
- AC Motor driven condensate extraction pumps complete with associated motor and its accessories including integral piping.
- A.C. motor driven Main oil pumps.
- A.C. and DC motor driven lubricating oil pumps including DC motors starters along with resistance box.
- 2 nos. AC Control oil pumps.
- Recirculation oil pump with motor
- AC & DC motor driven jacking oil pumps including DC motors starters along with resistance box.
- Unit oil centrifuging and purification equipment machines.
- Oil vapour and gland steam exhausters.
- Gas Driers.
- HP/LP dozing skids. Accessories etc.

- Miscellaneous pumps for ACW, DMCW, DMCW Booster, Service Water booster, hot well makeup, emergency makeup, Boiler fill, any other pump supplied by BHEL but not mentioned and sump pumps etc.
- Central lube oil storage & purifying system consisting of clean oil storage tank, dirty oil storage tank, central oil purifier, dirty & clean oil transfer pumps, drain oil return pumps, oil unloading vessel & interconnecting piping. (Common system for both STG units)

(F) PIPING SYSTEMS

Major PIPING SYSTEMS are to be erected, tested and commissioned under this specification are given below. Indicative weights of some of the major items are as per Annexure-IV. Bidders are required to quote rate in per metric tonne for entire work as per tender specification for piping systems as per item no. 2 of rate schedule.

PIPING

a) TURBINE / GENERATORS INTEGRAL PIPING SYSTEMS

- **Interconnecting piping between HP Stop Valve (L & R) to overload bypass valve (Appx. pipe size dia 168.3 x 18.3 thk, material alloy steel grade P 91, approximate no. of weld joints – 32 nos. of P91 to P91 and 4 nos. of P91 to P22, appx. wt. 2.5 MT) for each unit 1 and unit 2**
- Lube oil piping
- Control oil piping
- Seal steam system
- Drainage piping
- Spray piping
- Gas system piping
- ACW of generator cooler piping

b) BOILER FEED PIPING

- Boiler feed suction from deaerator to booster pumps, discharge from booster pumps to main BFPs.
- Boiler feed pump inter stage spray
- Boiler feed re-circulation piping.
- Boiler feed pump leak off line.

c) TG- CYCLE PIPING

- CRH piping- only CRH NRV erection including both side welding joints.
- Main condensate suction.
- Main condensate discharge including excess return and minimum re-circulation.

- Condensate supply for CEP sealing, L.P. dosing dilution, spray to LP BP valve / exhaust hood / turbine etc., spray to HP flash box, valve gland sealing.
- Condensate supply from condensate surge tank to CEP sealing and makeup to condenser and valve gland sealing.
- Steam extraction to HPH 5 & 6.
- Steam extraction to deaerator from turbine.
- Steam extraction to LPH –2 & 3.
- Cascading piping between heaters to condenser and to deaerator.
- Drains from GSC, LPH-1 through drain cooler.
- Deaerator overflow and drain
- HP & LP flash box vent and drain.
- Steam from aux. Steam header to turbine sealing system and its drain to flash box.
- Oil piping of central lube oil system.
- Vent pipes from HPH – 5 & 6 to flash box and start up vents.
- Vent pipes from LPH – 1, 2 & 3 to condenser.
- Vent pipe from CEP to condenser.
- Vent pipe from GSC to atmosphere.
- Drain & vents from above piping.
- Condenser hot well drain.
- Turbine wet steam-washing system.

d) MISCELLANOUS PIPING

- HP/LP dosing skid piping including dressing drains to neutralizing pit.
- Impulse piping up to and including first battery of root valves.

e) LP PIPING

- CW piping from RE Joints terminals of condenser including BF Valves & flanges etc. from customer Terminal point.
- ACW / ACW piping from customer terminal points and up to equipments
- DM water system piping
- Drinking water system piping
- Service water

NOTES

All the above systems of piping include the erection of pipes, bends, elbows, valves, fittings, impulse piping up to and including first root valve(s), sampling lines, drains, hangers and supports, bellows, orifices, flow nozzles and other accessories so as to make the system complete in all respects.

Above systems of piping can be regrouped / renamed or any addition or deletion in the system can be made in order to make system complete as per requirement. No extra claim shall be entertained on this account.

The equipment and piping systems indicated above are only major items and does not cover all the equipment / piping system to be erected / commissioned. Contractors are however, required to erect / commission within the price quoted by them, all connected equipment / system shown in manufacturer's drawings / other documents which may be necessary for erection completion and overall commissioning of both units TG sets.

INSULATION

All piping and equipment, as per requirement / drawings are to be thermally insulated with bonded / unbonded mineral wool /LRB mineral wool and to be covered with aluminium cladding.

Only spray insulation wherever applicable is not covered in this scope of work.

ADDITIONAL PLATFORM / STRUCTURES

Additional platforms and approaches wherever required by the engineer to facilitate operation are to be fabricated and installed. This does not include those of de-aerator and FST. These are covered under the erection of static auxiliaries.

56.5 (SPECIAL PROCESS) For Piping Systems of P91 material

56.5.1 (SPECIAL PROCESS) For Piping Systems, P91 material is **envisaged for Interconnecting piping between HP Stop Valve (L & R) to overload bypass valve of TG.** Special care is essential for carrying out the installation of this system and strict quality norms and welding procedure will have to be followed at site. The Contractor is advised to get familiarized with the work procedure. In addition to the general clauses for Welding, HT and NDT given under specifications of this tender, the following clauses will be applicable. This welding is to be carried out strictly under the supervision of BHEL Engineer and all repairs etc will be carried out as per the laid out procedure.

The details mentioned hereunder comprise of the major requirements for the process. The Contractor has to provide all services and consumables required for completion of the work.

Erection, welding, heat treatment and NDE works or as specified by the BHEL during execution of **PIPING OF P91 MATERIAL** and for the combination of materials like P-22 with P-91 or other combinations of alloy steels shall be the part of contract. Some of the salient details in regards to P91 material are being indicated in the clauses mentioned below however the erection, welding and NDT process are to be done as per the procedure /specifications to be furnished by BHEL / as per the instructions by site engineer.

56.5.2 Prior to erection, supplied pipes shall be inspected thoroughly and if any defect like crack, lamination, and deposit noticed, the same shall be confirmed by Liquid Penetrant Inspection (LPI). If confirmed, it shall be referred to BHEL.

56.5.3 Cutting of P-91 material shall be done by bandsaw / hacksaw /machining / grinding only.

56.5.4 Edge preparation shall be done only by machining/ by chamfering machine. In extreme cases, edge can be prepared by grinding with prior approval of BHEL.

56.5.5 During edge preparation care should be taken to avoid excessive pressure to prevent heating up of the pipe edges.

56.5.6 All edge preparation done at site shall be checked by Liquid Penetration Test. **Weld built-up on edge preparation is prohibited.**

56.5.7 The **pipe fit-up** for welds shall be carried out properly, as per drawing specifications, by **using temporary pipe clamps** arranged by the contractor to ensure proper alignment and root gap. Use of site manufactured clamps for fit-up is acceptable. **Neither tack welds nor bridge piece shall be used to secure alignment**. Partial root weld of minimum 20mm length by GTAW may be allowed with the prior permission of BHEL engineers.

56.5.8 Suitable reference punch marks shall be made on both the pipes (at about 200 mm from the EP) at least on four axis to facilitate U.T on weld joint.

56.5.9 Provide Enclosure for Welding area suitable for guarding against cold draught, water and dust at all welding locations.

56.5.10 No pre-heating is required for **fixing Thermocouples** (of Ni-Cr / Ni – Al of 0.5 mm gauge size) **with resistance spot welding**.

56.5.11 Argon gas to be used both for purging as well as shielding shall be of 99.99 purity levels conforming to IS 5760-1998. Dry Argon gas with requisite quality shall be 56.5.11used for purging the root side of weld. The gas flow rate to be maintained during purging is 10 to 25 liters / minute and for shielding during GTAW is 8 to 14 liters / minute

56.5.12 The purging dam (blank) shall be fixed on either side of the weld bevel prior to Pre-heating. The dam shall be fixed inside the pipe and it shall be located away from the heating zone. Purging is to be done for root welding (GTAW) followed by two filler passes of SMAW in case of butt welds.

56.5.13 Wherever possible, solid purging gas chambers are to be used which can be removed after welding. If not possible, only water-soluble paper is to be used.

56.5.14 Wherever possible, solid purging gas chambers are to be used which can be removed after welding. If not possible, only water-soluble paper is to be used.

56.5.15 Purging is not required in case of nozzle and attachment welds, when they are not full penetration joints.

56.5.16 Start purging from inside of pipe when root temperature reaches 220 deg. Centigrade. Provide continuous and adequate Argon gas to ensure complete purging in the root area. The minimum preflushing time for purging before start of welding shall be 5 minutes, irrespective of the pipe size.

56.5.17 **Preheating**: Prior to start of pre-heating ensure that surfaces are clean and free from grease, oil and dirt. Pre-heating temperature shall be maintained at 220 deg. Centigrade by using induction heating. The temperature shall be ensured by using a calibrated autographic recorder and two calibrated thermocouples fixed at 0 and 180 degree positions on both pipes 50 mm away from the edge. The thermocouples shall be welded with spot welding machine. The pre-heating arrangement shall be inspected and approved by BHEL engineer. Alternate arrangements shall be made during power failure. Two numbers additional square thermocouple are to be fixed for emergency use. Gas burners shall be employed to maintain the temperature until the power resumes.

56.5.18 **Welding**: Root welding shall be done using GTAW process (as per WPS) five minutes after the start of Argon purging. Filler wires shall be clean and free from rust or oil. Argon purging shall be continued minimum two filler passes of SMAW.

56.5.19 **Post Weld Heat Treatment**: Heating shall be done by Induction heating / resistance heating as per the procedure / specifications provided by the BHEL engineers. Generally for pipe thickness less than 20mm, the resistance heating may also be opted which shall be decided by BHEL site engineer in accordance to technical specification for P91 materials. Generally the PWHT temperatures for P-91 with P- 91 material shall be 760 + 10 Deg. C and the soaking time shall be 2.5 minutes per mm of weld thickness, subject to a minimum of two hours. The rate of Heating / Cooling is to be strictly maintained.

56.5.20 The PWHT temperature shall not deviate from the values specified in the chart range since any deviations to the specified holding temperature range, will adversely affect the mechanical properties of the weldment and may lead to rejection of the weldment. The weld joints should be kept dry. Under no circumstances any water / liquid is allowed to come in contact with weld as well as preheated portion of the pipe

56.5.21 **The recording of time and temperature shall be continuously monitored with a calibrated recorder right from pre-heating. This shall be ensured at every one hour by site-authorized personnel of contractor**.

56.5.22 The width of the thermal insulation beyond the heating band shall be at least two times the heating bandwidth on either side of the weldment.

56.5.23 All equipment like recorder, thermocouple, compensating cable, oven, thermostat etc. should have valid calibration carried at BHEL approved labs. The calibrated reports should be reviewed and accepted by calibration In-charge at site prior to use.

56.5.24 Same procedures of welding and heat treatments shall be followed for the weld joints repairs. The NDE shall be conducted for the entire weld joint.

56.5.25 All the NDE i.e. LPI, MPI, UT and hardness shall be performed on the weld joints as per the standards/ specifications / direction of BHEL. The maximum allowable hardness at weld and parent metal shall be 300 HV10. Joints having

hardness above 300 HV shall be re-heat treated and hardness shall be checked again.

56.5.26 Welders qualified as per ASME Section – IX and IBR on P-91 material shall only be engaged for the welding of P91 materials. Welders shall have to undergo all the training for above. **The welders shall have to be tested and qualified by BHEL site**. Contractor shall arrange for the same and entire expenditure towards this shall be borne by the Contractor.

56.5.27 **Contractor shall deploy exclusive Engineer and Supervisor who will be responsible for the completion of all activities from weld fit-up to final clearance of weld joints after satisfactory NDE and acceptance by BHEL / Customer / IBR.**

56.5.28 **No interruption is allowed during preheating, welding and PWHT**. Hence all equipment for the purpose of power supply, welding, heating etc. shall be kept available for the excegencies. Therefore all alternative arrangements, Diesel generator for providing power to the welding and heating equipment, reserve thermocouple connections, gas burner arrangement for maintaining temperature etc.) shall be arranged by the contractor within the normal scope of this contract. All the preventions / procedures to be ensured to avoid abruption to on going heating / cooling process. Before start of erection, welding and heat treatment process for P 91 materials all the associated persons shall acquire complete knowledge on the subject from BHEL site engineers to avoid metallurgical failures.

56.5.29 The heating equipment shall be installed and commissioned wherever required at site. For routine and breakdown maintenance, Contractor shall have to deploy sufficient Manpower, Tools & Plants within his quoted rate. The contractor shall provide electrical cables and switches required. All the equipment shall be protected by providing covers or sheds at site by the contractor.

56.5.30 All the **consumables to carry out the work for the P91 materials** required for welding and heating process i.e. filler wire, welding electrodes, K type thermocouples fiberglass insulated with heavy duty T/C connector, heating elements (annealing cables), compensating cables, insulating materials (glass fiber cloth temperature rating 1260 o C, glass fiber cord dia 3 mm (twisted) temp rating 1260 o C, ceramic fiber blanket RT grade density 96 kg / cub M-temp rating 1260 o C, ceramic fiber rope fiber glass 12 mm dia.- temp rating 1260 o C), gas burner arrangement, all gases, purging dams, blanks, welding electrodes, filler wires, etc. except those consumables supplied by BHEL units if any **shall be in the scope of contractor**.

The following will have to be provided by the Contractor for P 91 material heating, welding & testing:

- Heating Machine with Outgoing Cables
- Suitable Power Backup (DG Set) as and when required.
- Spot welding Machine for Fixing of Thermocouples
- Calibrated Thermocouples
- Calibrated temperature Recorder

- Contact Type calibrated temperature Gauge.
- UT Testing and Hardness testing
- Qualified operator for Induction Machine and DG Set
- All cables for connecting Induction Machine and DG Set to Main Supply along with Changeover System.
- Welder Qualified as per ASME IX and IBR for P91 Materials. Welder Qualification tests will be conducted at site.
- Exclusive Trained Welding Engineer for Supervising P91 Welding and Heat Treatment
- Qualified NDE Engineer (Level -II) and welding Supervisor (Level-I)
- Required GTAW and SMAW machines
- Welding Machine for Demagnetizing along with cable and Residual Field Indicator
- Providing Enclosure for Welding area suitable for guarding against cold draught, water and dust at all welding locations.
- Providing of Argon purging for the welding operation (including supply of consumables eg Water Soluble Paper / Aluminiun Dam arrangement.)
- Providing of welding consumables.
- Providing of Heating by Gas Burner as Standby Arrangement.
- Providing of Baking ovens and portable ovens
- Providing Band Saw/ hacksaw/ Grinder for Cutting with tools.
- Providing machining for Edge preparation
- Providing of LPI and MPI Facility as specified in the Welding process, including supply of all consumables.
- Providing and applying insulation band as specified in the welding procedure.

Above comprises of the major requirements for the process. The Contractor has to provide all equipments, services and consumables including electrodes and fillers etc. for completion of the work.

56.5.31 DG set for backup power supply, provided by contractor for construction and heat treatment activities is to be operated by the contractor bi-weekly / as specified by the supplier to ensure its healthiness during excegencies of power failure for heating processes of P91 materials on account of power failures. Cables and switches, required fuels and other consumables & its operations and maintenance shall be in the scope of contractor within the awarded value.

56.5.32 The contractor shall arrange welding Machine for Demagnetizing material along with cable and Residual Field Indicator.

56.6 Terminal points and Exclusions as applicable to this specification have been given in Annexure I & II respectively.

56.7 Approx. weight of major components has been indicated in Annexure - III & Annexure – IV.

57.0 FACILITIES TO BE PROVIDED BY BHEL / CONTRACTOR

57.1 BHEL shall provide limited open space for office and store/ workshop at site free of rental charge. It is the responsibility of the contractor to develop the space for construction of office sheds, to provide all utilities like electricity, drinking water etc., as a part of his scope of work within the accepted rates. Contractor shall make water arrangement from the water pipe line of local network area.

Electric power for office and workshop will be provided free of charge at one point as decided by BHEL. Further distribution will have to be made by contractor at his own cost

Construction power, for construction purposes will be provided free of cost at one point near erection site from supply point. Further distribution will have to be made by contractor at his own cost All wiring must comply with local regulations and will be subject to Engineer's inspection and approval before connecting supply. Required calibrated energy meter for measurement of power consumed has to be arranged / installed by Contractor at his cost. The contractor shall submit to the Engineer his electrical power requirements.

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

57.2 **The land for labour colony** shall be allotted by BARSINGSAR/BHEL. Limited open space for labour colony shall be provided **on nominal rent of Rs.1.00 (Rs. One only) per month for every five cent of land or part thereof (100 Cents = 1 Acre)** within a distance of five KMs from the site. The Contractor may build only temporary structure on the land for the purpose it is allotted. The land is not transferable in any manner either in whole or in part nor it can be utilized for the purpose of any other Contract. 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.

On completion / termination of the work, the Contractor shall remove all temporary structure built by him and restore the land in its original condition and the land shall be handed over to BARSINGSAR. The Contractor at his cost shall remove debris generated from demolition of temporary structure. If the contractor fails to give vacant possession of the land as aforesaid in the original condition BHEL/ BARSINGSAR reserves the right to withhold payment of Contractors bill till handing over of the vacant possession of the land and contractor shall be liable to pay compensation determined by BHEL/ BARSINGSAR for such unauthorised occupation of land. The compensation shall be recovered from the bills of contractor, without any notice.

57.3 The Contractor shall be provided with **Electric Power on chargeable basis at one place only as decided by the BHEL in the labour colony**. The Contractor at his own cost will do further distribution. The Contractor at his own cost shall install the calibrated Energy meter for the electricity metering.

Free water supply at one point in the labour colony shall be provided. The Contractor at his own cost shall do further distribution at his own cost

57.4 **Water for construction purposes shall be provided free of charge** at a one point within erection site. Contractor shall arrange further distribution of water for construction purposes at his own cost

57.5 Permanent lighting inside the powerhouse will be provided at a later stage. Till such time such arrangements are made, the contractor at his cost should arrange for temporary lighting in and around his work area.

57.6 BHEL will not be responsible for any loss or damage to the contractor's equipment as a result of variation in voltage or frequency or interruptions in power supply.

57.7 Provision of distribution lines of both electrical power and water from the central points to the required place with proper distribution boards observing the safety rules laid down by the electrical 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. 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 own cost. The contractor shall adjust his working shifts / hours accordingly and deploy additional manpower if necessary so as to achieve the targets.

57.8 The contractor while drawing construction power supply from Distribution Board should strictly adhere to following points.

All electrical installations should be as per Indian Electricity rules.

All distribution Boards installed by the contractor should be constructed with fireproof materials viz. Steel frames, Bakelite sheets etc.

Connection for single phase should be taken from phase and neutral. Nowhere the connection should be taken with earth as neutral.

Contractors have to make their own arrangement for their equipment/ DB earthing

All electrical connections should be made through connectors, nuts and bolts, switches, plug and sockets. Loose connections or hooking up of wires shall not be permitted.

All electrical equipment / tools and plants should be properly earthed. DBs to be earthed diagonally opposite at two points.

Contractor should use "MCCB" and "ELCB" either on incoming or outgoing connections to the DBs.

Contractor should ensure that all the CBs / TPNs/ Fuses/ MCCB / ELCB cables etc. should be of adequate rating/ capacity.

For permission of supply connections contractor has to submit a test report of their installations with a single line diagram of connected/ proposed loads.

57.9 ELCB will be tested once in a week or as directed by BHEL by actually simulating the earth leakage for all installations and the same shall be recorded in the logbook to be maintained by the contractor.

57.10 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.

57.11 Adequate lighting facilities such as floodlights, hand lamps and area lighting shall be arranged by the contractor at the site of construction, contractor's material storage area etc.

57.12 On completion of work or as and when required by BHEL, all the temporary buildings, structures, pipe lines, cables etc shall be dismantled and levelled and debris shall be removed, as per instructions of BHEL, by the contractor at his cost. In the event of his failure to do so, the Engineer will get it done and expanses incurred shall be recovered from the contractor along with prevailing overheads. The decision of BHEL Engineer in this regard shall be final.

57.13 Contractor shall install a computer with modem to connect with BHEL server (LAN) AT SITE.

58.0 TIME SCHEDULE

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, BHEL Engineer will certify the actual date of start of work after adequate mobilisation of manpower and T&P by the contractor.

58.1 Entire work as detailed in the tender specification shall be completed within **16 months** from the date of start of erection work. The various milestones to be achieved are as under for unit – I :

	MILE STONES	**MONTHS**
1.	Erection Start	Date of start of erection work
2.	Box-up for oil flushing	SIX
3.	Oil flushing completion	SEVEN
4.	Barring gear	EIGHT
5.	Rolling & Synchronization	NINE
6.	Trial operation & Handing over	TWELVE

Unit II shall have a phase shift of four months for above mile stones

NOTE:

Contractor has to mobilise adequate resources to meet BHEL's commitments to their 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 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 BHEL's commitments to its customer in line with the provisions of General Conditions of Contract.**

However in case contractor discharges his contractual responsibility even before schedule contract period, he will be allowed to wind up his set up without any financial implication on either side.

58.2 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.

58.3 The contractor has to ensure that work is completed in all respect leaving no pending points. However the punch list / pending points, which are possible to attend at site shall be fully liquidated within two months from successful trial operation of the unit.

59.0 OVERRUN

59.1 In case due to reasons not attributable to the contractor, the work gets delayed and the 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/-** per month (Rupees eighty thousand only) on receipt of advance notice intending to claim over run and on fulfillment of following conditions: -

1. The reasons for delay in completion of work are not attributable to contractor but however subject to the provisions of clause – 31 (Force Majeure).
2. Contractor achieves the targets fixed during the over run period.

59.2 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.

59.3 The contractor shall maintain sufficient workforce and other resources required for completion of the job expeditiously for the entire contractual period including total extended period.

60.0 TERMS OF PAYMENT

60.1 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.

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

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

(A) PROGESSIVE PAYMENT

AA-I **0.5% of the awarded contract value** on start of pre assembly work by deploying at least one number of 18/ 20 T crane and one number of 15/20 T trailer with pulling unit in working condition at site.

AA-II **2 x 0.25% of the awarded contract value** on placement of condenser base plate on foundation after pre assembly & certification by BHEL Engineer for its correctness.

AA-III An amount limited to 1.0 % of the awarded contract value shall be payable in one or more installments, solely at the discretion of Construction Manager/ BHEL at different stages of the contract execution to facilitate resource augmentation or to meet any exigency of work. In case of its non utilization 'OR' its part utilization, the entire/balance payment against this category shall be released along with commissioning of STG.

(AB) PROGRESSIVE PAYMENT on prorata basis (82% of Lump sum price)

(Applicable on items covered under item no. 1 of rate schedule)

Sl. No.	DESCRIPTION	% OF LS PRICE
1	CONDENSER	**2 X 7.5%**
2	TURBINE	**2 X 12%**
3	GENERATOR	**2 X 6.0%**
4	STATIC AUXILIARIES	**2 X 7.5%**
5	ROTATING AUXILIARIES INCLUDING DG SET	**2 X 8.0%**

(AC) PROGRESSIVE PAYMENT on prorata basis (82% of unit rate)

(Applicable on items covered **under item no. 2** of rate schedule)

On transportation, pre assembly wherever applicable, placement in position and rough alignment.	2X15.0%
On completion of alignment / fastening / welding / grouting along with proper supports.	2X20.0%
On completion of radiography / NDT / stress relieving / other quality checks.	2X5.0%
On system completion	2X1.0%

NOTE:

Further percentage break up for payment against above, if required, will be mutually discussed and finalized at site.

(AD) PROGRESSIVE PAYMENT on prorata basis (82 % of unit rate)

(Applicable on items covered **under item no. 3a & 3b** of rate schedule)

On transportation of required quantity of materials on locations and its proper protection.	2X5%
On fabrication / fixing of retainers, lagging & stitching of mattresses and welding of retainers against 3(a) and wrapping/ coating of underground piping against 3(b)	2X20.0%

On fixing of casing supports, fabrication, beading, sealing, bitumen painting, installation and screen fixing of cladding & completion of all jobs against 3(a) and testing of wrapping/ coating of underground piping against 3(b)	2X15.0%
On system completion and area cleaning.	2X1.0%

(AE) 82 % of Unit rate shall be payable on prorate basis as under:

(Applicable on items covered under **item no. 4** of rate schedule)

On transportation and fabrication	2X25%
On completion of erection alignment / fastening / welding / grouting along with proper supports.	2X16.0%

NOTES:

1. Further percentage break up for payment against above, if required, will be mutually discussed and finalized at site.
2. The above break up is only for payment purposes and does not cover all equipment in the scope of the subject work.

(B) PRE-COMMISSIONING & COMMISSIONING (9 % of CV)

1	Alkali flushing of pre-boiler system.	2X1.0%
2	Oil flushing.	2X1.0%
3	Steam blowing.	2X0.5%
4	Steam rolling and synchronisation	2X1.0%
5	Trial operation and handing over	2X1.0%

NOTE: If the commissioning activities could not be carried out due to no fault of contractor, BHEL Site in charge, at his discretion, after recording reasons for exercising such option, can split and release payment up to 50% of milestone payment on completion of work, to the extent possible, required for carrying out that particular milestone / commissioning activity.

(C) 2.5% of CV shall be payable on prorata basis for PAINTING

(D) 2.0% of contract value (CV) will be payable **on handing over** of the unit to BHEL's Customer 'OR' 3 months after 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 considered as handed over on completion of trial operation.

(E) The balance 2.5% CV shall be payable on completion of all pending work, rework wherever required, area cleaning, reconciliation of materials and fulfillment of contractual obligations and passing of final bill.

NOTE:
Payments at 'D' & 'E' shall be released after adjustment of the CV based on actual work carried out.

61.0 LIQUIDATED DAMAGES (LD)

61.1 The time stipulated in the Contract shall be deemed to be the essence of the Contract. In case the Contractor fails to adhere to the time specified in CL NO. 58.1 above, then LD will be levied by BHEL. The LD for delay will be based on the unit wise time schedule. The Contract Value of each unit for the purpose of LD shall be taken as 50% of the total Contract Value including price variation. The ceiling of LD for each unit shall be 10% of the Contract Value of each unit including price variation.

61.2 The LD shall be applicable unit wise at the rate of ½% of the contract value of each unit including price variation per week of delay or part thereof limited to a ceiling of 10% of the contract value of each unit including price variation.

62.0 SECURITY DEPOSIT

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.

63.0 INSURANCE

63.1 Besides provisions under clause no. 29.0 of GCC regarding insurance, the following shall also be applicable. The contractor shall also take care of the same while submitting their offer.

63.2 Insurance for all materials pertaining to the Contractor (T&Ps, Construction Materials etc.) during transit, storage and during construction shall be in his (Contractor's) scope.

63.3 The Contractor shall provide insurance cover to all persons employed/engaged by him throughout the period of Contract, including the extended period, if any.

64.0 OTHERS

64.1 In case of any contradiction between General Conditions of Contract (GCC) and Special Conditions of Contract (SCC), the latter shall prevail.

64.2 **Bidders selection is subject to approval of BHEL's customer**. The Price Bids of only those bidders will be opened 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.

ANNEXURE-I

TERMINAL POINTS

STEAM TURBINE AND AUXILIARY SYSTEM

SYSTEMS	TERMINAL POINTS
Main Steam	Inlet of ESV
Hot reheat	Inlet of IV
Cold reheat	only CRH NRV including both side welding joints
LP Bypass	Inlet nozzles of condenser
Aux. Steam	Inlet ends of gland seals for inlet of Aux. steam.
Feed water	Inlet and outlets of HPH-5 and HPH-6, BFP discharge end and recirculation lines terminal points at feed discharge headers.
Electrical	Terminals of all drive motors junction boxes and panels to which owner's cables are to be connected.
Generator	Outlet end of generator terminal bushing.
DM make-up water	DM make-up line at customer terminal point
CW system	Inlet and outlet at customer's terminal point - (Unit I –supply 150W, 92S, CL EL(-) 2.9mtr appx. –Return 150W, 95S, CL EL(-) 2.9mtr appx Unit II –supply 150W, 89S, CL EL(-) 2.9mtr appx. –Return 150W, 86S, CL EL(-) 2.9mtr appx)
ACW piping	Inlet on the common water supply line and outlet on the common water return line on the water-cooling system supply & return headers.
Instrument air	Flange on the common air supply header
Service air	Flange on the common air supply header
Service water	At one point as decided by the owner at BOP + 4.5 mtr appx..
Potable water	At one point as decided by the owner at BOP + 4.5 mtr appx

Note:

All terminal points shall be as shown in BHEL drawings and documents and also depending on site conditions and mutually agreed with BHEL Site engineer. The contractor has to execute the work within the scope of this contract. The terminal points decided by BHEL shall be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.

ANNEXURE – II

EXCLUSIONS

1 All civil works other than dressing and chipping of foundation surfaces, fixing of supports and hangers in trenches, walls.

2 All cabling work other than those supplied by BHEL with the equipment.

3 Complete control and instrumentation work other than those specifically included in this specification.

4 All AC & DC motor starters, switchgears and associated controls center unless otherwise specifically mentioned in the specification.

5 Application of spray insulation for steam turbine and other equipment.

6 Supply of lubricating oil for TG set.

7 Supply of chemicals required for chemical cleaning.

8 Supply of CO2 gases for generator protection.

9 Supply of all shims and gaskets, which go finally as part of equipment.

10 CW System except specified in the scope , fire water reservoir and fire pumps

11 DM Water up to terminal point

12 Labs except express labs for analysis of samples of water, steam and gas specified in the contract with NLCL for plant

13 Power Transformers (GT, UAT,SAT and IBT)

14 Switchyard

15 ETP

16 Communications and Illumination

ANNEXURE-III

TENTATIVE WEIGHT SCHEDULE

SUMMARY OF WEIGHTS

(LUMPSUM PACKAGE)

TURBINE, GENERATOR & AUX.		APPROX. WEIGHT PER SET
A	CONDENSER	400 MT
B	TURBINE	500 MT
C	GENERATOR	240 MT
D	STATIC AUXILIARIES	180 MT
E	ROTATING AUXILIARIES	150 MT

('BLACK START DG SET' SHALL BE COMMON FOR BOTH THE UNITS)

NOTE:

1. Besides items indicated above, there is likely hood of addition of new items for release of some items integral to TG aux package. Contractor's finally accepted rates shall be applicable for such Items also.

2. Erection and dismantling of all temporary piping valves, pumps tanks etc. for carrying out hydraulic test, chemical cleaning, steam blowing and other tests as stated elsewhere in tender document. However no additional payment will be made on account of erection / dismantling of any temporary systems.

3. Final painting of all items is included in the scope. Paints required for the purposes as per specifications and shades specified by the engineer are to be arranged by the contractor at his cost.

ANNEXURE-III A

SIZE & WEIGHT SCHEDULE OF MAJOR COMPONENTS OF STG, GENERATOR AND H/E

SLNo.	DESCRIPTION	dc	QTY	WEIGHT
	STEAM TURBINE			
1	STEAM TURBINE OIL COOLER	CD	2	10220
2	L.P.SIDEWALL (TS)	MT	1	11553.8
3	L P FRONT BEARING PEDESTAL	MT	1	12476.1
4	L.P.INNER CASING-II TOP	MT	1	22000
5	L.P.INNER CASING BOTTOM	MT	1	14500.8
6	L.P OUTER CASING UPPER PART(T.S)	MD	1	12214.6
7	L.P OUTER CASING UPPER PART(G.S)	MD	1	12459.6
8	L.P.ROTOR	MT	1	27934.7
9	HP-IP TURBINE ASSLY	MT	1	108603.7
10	I.P VALVE CASING EXEC-II	MT	1	10717.2
	HEAT EXCHANGERS & AUX			
11	RE JOINTS ASSY	MT	1	60000
12	BF VALVES WITH COUNTER FLANGES	MT	4	20000
13	COLTCS	MT	1	15000
14	SUPPORT PLATE	MD	22	20900
15	FRONT WATER BOX ASSLY.	MD	2	18000
16	REAR WATER BOX ASSLY.	MD	2	13500
17	CONDENSER SPRING ASPER KF2-5600/160	DS	24	12000
18	AIR EXHAUSTER WITH INDUCTION MOTOR	DS	2	11200
19	HP HEATER NO 5	MD	1	18000
20	HP HEATER NO 6	MD	1	23738.3
21	STORAGE TANK ASSLY	CD	1	24523.5
22	HEADER ASSENBLY	CD	1	10365

ANNEXURE-III B

SIZE & WEIGHT SCHEDULE OF MAJOR COMPONENTS OF ROTORY AUXILIARIES- BFP, BP & CEP FOR EACH UNIT

(A) BOILER FEED PUMP (BFP), BOOSTER PUMP (BP) & EMERGENCY BFP

SL. NO.	DESCRIPTION OF EQUIPMENT	DIMENSIONS (MM) LENGTH X BREADTH X HEIGHT	UNIT WEIGHT (KG)	TOTAL QTY. (NOS.)	APPX. WEIGHT (KG)
01	BFP SKID (PUMP ASSLY. + BASE PLATE+ TUBING + SEAL COOLERS)	2250 X 1000 X 1050	5770	2	**11540**
02	BP SKID (PUMP ASSLY. + BASE PLATE + TUBING)	1650 X 1200 X 950	2511	2	**5022**
03	HYDRAULIC COUPLING	1800 X 1700 X 1800	3000	2	**6000**
04	HYDRAULIC COUPLING WORKING OIL COOLER	3700 X 1500 X 500	1700	2	**3400**
05	HYDRAULIC COUPLING LUBE OIL COOLER	3100 X 1300 X 450	1000	2	**2000**
06	BFP SUCTION STRAINER AT BP SUCTION	900 X 800 X 1400	725	2	**1450**
07	BFP RECIRCULATION VALVE	1800 X 550 X 1400	300	2	**600**
08	LOCAL GAUGE BOARDS WITH INSTRUMENTS	2000 X 300 X 1800	400	4	**1600**

(B) CONDENSATE EXTRACTION PUMP (CEP)

SL. NO.	DESCRIPTION OF EQUIPMENT	DIMENSIONS (MM)	UNIT WEIGHT (KG)	TOTAL QTY. (NOS.)	TOTAL WEIGHT (KG)
		LENGTH X BREADTH X HEIGHT			
01	CEP ASSEMBLY WITH CANISTER	ϕ 1100 X 4500	3450	2	**6900**
02	CEP FOUNDATION RING	1100 X 1100 X 150	185	2	**370**
03	CEP SUCTION STRAINER	900 X 800 X 1400	650	2	**1300**
04	LOCAL GAUGE BOARD WITH INSTRUMENTS	2000 X 300 X 1800	400	1	**400**

(C) BLACK START DG SET (COMMON FOR BOTH UNITS)

01	BLACK START DG SET WITH ACCESSORIES	ISG	1	**10000**

ANNEXURE-III C

MAJOR DIMENSIONS & WEIGHTS OF ITEMS OF KN TURBINE

	TURBINE TYPE: K30-16+N30-2X3.2, M/C NO. T0659, T 0668				
S.NO	ITEM DESCRIPTION	DIMENSIONS OF ITEM(LXBXH)MM	QTY	WT./ PIECE (TON)	TOTAL WEIGHT (TON)
1	COMBINED HP-IP (K)-MODULE	6370X4360X3120	1	113.0	113.0
2	HP EXHAUST INSERT	1150X1100X1100	1	2.0	2.0
3	HP VALVE	3915X3350X1300	2	5.8	11.6
4	HP OVERLOAD BYPASS VALVE	1500X1300X680	1	5.0	5.0
5	IP VALVE	4230X1350X4360	2	9.3	18.6
6	VALVE ACTUATORS*	1500X400X400	9	1.0	9.0
7	FRONT BEARING PEDESTAL (K-TURBINE)	1700X2500X1435	1	9.0	9.0
8	REAR BEARING PEDESTAL (K-TURBINE)	1600X3100X1610	1	9.6	9.6
9	REAR BEARING PEDESTAL (LP TURBINE)	1350X2600X1430	1	6.2	6.2
10	BEARING PEDESTAL LOOSE PARTS	1000X1000X1000	1	1.1	1.1
11	LP ROTOR	5510X2240X2240	1	26.4	26.4
12	UPPER LP INNER CASING-I	1070X2690X1280	1	4.2	4.2
13	UPPER LP INNER CASING-II (INCL. GUIDE WHEELS)	2550X4960X1500	1	13.0	13.0
14	LOWER LP INNER CASING-II(INCL. LOWER LP INNER CASING-I & GUIDE WHEELS)	2550X4960X1720	1	18.5	18.5
15	DIFFUSER (LP)	450X3025X3025	2	1.4	2.8
16	LP LONGITUDINAL GIRDER	5280X1050X1210	2	7.0	14.0
17	LP SIDE WALL	760X4960X2750	2	5.3	10.6
18	LP OUTER CASING	2400X5200X2150	2	6.5	13.0
19	LP TURBINE LOOSE PARTS	2000X2000X2000	1	7.3	7.3
20	CROSS AROUND PIPING**	1500X1200X962	2	0.9	1.8
21	CROSS AROUND PIPING**	2750X1200X962	2	1.5	3.0
22	CROSS AROUND PIPING LOOSE PARTS**	1000X1000X1000	2	0.5	1.0
23	LP BYPASS VALVE**	850X1100X5500	2	3.0	6.0
24	LP BASE PLATES	500X500X600	1	2.2	2.2
25	LP EXTRACTION PIPING	4500X3000X3500	1	5.3	5.3
26	MS STEAM STRAINER	1400X685X960	2	1.5	3.0
27	HRH STEAM STRAINER	2075X860X1260	2	2.5	5.0
28	FOUNDATION BOLTS	4500X3000X2000	1	4.6	4.6
29	INTER CONNECTING PIPING BET. HP VALVE & HP OVERLOAD VALVE	4500X3000X3000	2	2.0	4.0
30	HP OIL SUPPLY UNIT**	2900X1300X2350	1	3.0	3.0

*: DS ITEM **: DD ITEM

ANNEXURE-III D

SCHEDULE OF DIMENSIONS & WEIGHTS

PRODUCT: 125 MW S.T.G, TYPE: TARI 1080-36P PROJECT: NLCL

S.NO	DESCRIPTION EQUIPMENT	OVERALL DIMENSIONS IN MM			WEIGHT IN M.T
		LENGTH	BREADTH	HEIGHT	
1	GENERATOR STATOR	8200	4020	3966	163.0
2	GENERATOR ROTOR	8900	1200	1200	37.0
3	FOUNDATION ITEMS	LOOSE ITEMS			8.0
4	BEARINGS	1810	540	1228	5.7
5	AIRCOOLER UNIT	6600	1900	3500	7.0
6	EXCITER	4600	2020	1803	7.0
7	CO_2 EQUIPMENT	-	-	-	3.0

ANNEXURE – IV

A- PIPING

a) TURBINE / GENERATORS INTEGRAL PIPING SYSTEMS

- Interconnecting piping between HP Stop Valve (L & R) to overload bypass valve (Appx. pipe size dia168.3 x 18.3 thk, material alloy steel grade P 91, approximate no. of weld joints – 32 nos. of P91 to P91 and 4 nos. of P91 to P22, appx. wt. 2.5 MT) **for each unit 1 and unit 2**
- Lube oil piping
- Control oil piping
- Seal steam system
- Drainage piping
- Spray piping
- Gas system piping
- ACW of generator cooler piping

b) BOILER FEED PIPING

- Boiler feed suction from deaerator to booster pumps, discharge from booster pumps to main BFP's.
- Boiler feed pump inter stage spray
- Boiler feed re-circulation piping.
- Boiler feed pump leak off line.

c) TG- CYCLE PIPING

- CRH piping- only CRH NRV erection including both side welding joints.
- Main condensate suction.
- Main condensate discharge including excess return and minimum re-circulation.
- Condensate supply for CEP sealing, L.P. dosing dilution, spray to LP BP valve / exhaust hood / turbine etc., spray to HP flash box, valve gland sealing.
- Condensate supply from condensate surge tank to CEP sealing and makeup to condenser and valve gland sealing.
- Steam extraction to HPH 5 & 6.
- Steam extraction to deaerator from turbine
- Steam extraction to LPH –2 & 3.
- Cascading piping between heaters to condenser and to deaerator.
- Drains from GSC, LPH-1 through drain cooler.

- Deaerator overflow and drain
- HP & LP flash box vent and drain.
- Steam from aux. Steam header to turbine sealing system and its drain to flash box.
- Oil piping of central lube oil system.
- Vent pipes from HPH – 5 & 6 to flash box and start up vents.
- Vent pipes from LPH – 1, 2 & 3 to condenser.
- Vent pipe from CEP to condenser.
- Vent pipe from GSC to atmosphere.
- Drain & vents from above piping.
- Condenser hot well drain.
- Turbine wet steam-washing system.

d) MISCELLANOUS PIPING

- HP/ LP dosing skid piping including dressing drains to neutralizing pit.
- Impulse piping up to and including first battery of root valves.

e) LP PIPING

- CW piping from condenser including BF Valves and flanges to customer terminal point
- ACW piping from customer terminal points and up to equipments
- DM water system piping
- Service water
- Drinking water system piping

NOTES:

All the above systems of piping include the erection of pipes, bends, elbows, valves, fittings, impulse piping up to and including first root valve(s), sampling lines, drains, hangers and supports, bellows, orifices, flow nozzles and other accessories so as to make the system complete in all respects.

Above systems of piping can be regrouped / renamed or any addition or deletion in the system can be made in order to make system complete as per requirement. No extra claim shall be entertained on this account.

The equipment and piping systems indicated above are only major items and does not cover all the equipment / piping system to be erected / commissioned. Contractors are however, required to erect / commission within the price quoted by them, all connected equipment / system shown in manufacturer's drawings / other documents which may be necessary for erection completion and overall commissioning of both units TG sets.

TENTATIVE WEIGHT SCHEDULE OF TG CYCLE / LP PIPING

PGMA	PIPING SYSTEMS DESCRIPTION	WEIGHTS
	CUSTOMER NO : 6882, 6883	
80- 322	CRH PIPING TO DEAERA	6,900
80- 331	EXTRACTION STEAM TO	3,200
80- 332	EXTRACTION STEAM TO	1,300
80- 335	EXTRACTION STEAM TO	4,900
80- 336	EXTRACTION STEAM TO	1,100
80- 337	EXTRACTION STEAM TO	880
80- 371	DRAIN FLASH TANK VEN	860
80- 375	UNLISTED SV EXHAUSTS	6,600
80- 381	HP HEATER VENTS - TG	970
80- 382	LP HEATER VENTS	2,000
80- 388	CONDENSER AIR EVACUA	1,800
80- 400	CONDENSATE SUCTION	1,900
80- 401	CD FROM PUMP TO LPH1	10,500
80- 403	CD FROM TG TP TO DEA	4,900
80- 407	CONDENSATE FOR SEALI	2,600
80- 408	CONDENSATE DUMP FROM	1,700
80 -418	ERECTION MATERIALS FOR INSTT.	500
80- 419	DEAERATOR SAFETY VAL	540
80- 420	BOILER FEED PUMP SUC	4,900
80- 421	BOILER FEED PUMP REC	5,200
80- 439	TURBINE FLASH TANK D	1,200
80- 442	GLAND STEAM COOLER D	400
80-443	LP HEATER-1 TO CONDENSER	1,600
80- 444	LP HEATER-2/3/4/5 DR	2,800
80- 446	DEAERATING HEATER OV	4,000
80- 447	HP HEATER DRAINS	3,300
80- 449	TG CYCLE PIPING DRAI	7,300
80- 463	TG AUX COOLING WATER	153,000
80- 468	MAIN CIRCULATION WATER PIPING	360,000
80- 473	DEMINERALISED WATER SYSTEM	5,500
80- 478	DRINKING WATER PIPING	6,500
80- 496	DRAIN FLASH TANK VEN	4,300
80-601	LOW PRESSURE DOSING PIPING	300
80- 928	H&S FOR BOILER LIGHTUP **	45,000
80- 930	H&S FOR SYNCHRONISATION **	30,000
80- 933	H&S FOR LP PIPING **	10,000
	SUB TOTAL	**700,000**
	Tentative Weight for two units LP/Cycle piping	**1,400,000**

** Only pertinent weights shall be applicable for the piping erected under the scope of this contract as per the decision of BHEL site.

B- INSULATION

All piping and equipment, as per requirement / drawings are to be thermally insulated with bonded / unbonded mineral wool /LRB mineral wool and to be covered with aluminium cladding.

Only spray insulation wherever applicable is not covered in this scope of work.

Wrapping coating and testing of buried LP piping is to be carried out as per the specifications, drawings and documents.

C- ADDITIONAL PLATFORM / STRUCTURES

Additional platforms and approaches wherever required by the engineer to facilitate operation are to be fabricated and installed. This does not include those of De-aerator and FST. These are covered under the erection of static auxiliaries

ANNEXURE-V

LIST OF T&Ps and IMTEs being provided by BHEL for use of contractor free of hire charges on sharing basis.			
S.NO.	**EQUIPMENT**	**CAPACITY**	**QTY**
1	EOT Crane (in T.G. hall)	100T/20T	2 Nos.
2	Crawler crane for CW pipes, Deaerator & FST handling	75T/100T/150T	1 No.
3	Chemical Cleaning Arrangement	By BHEL agency	One Set
4	Motorized hydraulic test pump		One Set
5	Bolt stretching device		One Set
6	Air Compressor	140/210 CFM	1 No
OTHER SPECIAL T&P			
7	Slings for lifting turbine rotors with lifting beam		One Set
8	Slings for lifting generator stator with lifting beam		One Set
	IMTE'S		
9.	Motorised magger 2.5 / 5 KV, Variac single/ three phase, tong tester, Analog / digital multimeter, Micro ohm meter, DC Power supply source, Phase sequence indicator, Rheostate 5A / 50 & 5 A/ 100 Ohms, Techometer hand held and HV Test KIT 0-50 KV AC		As per requirement

Notes:

1. Any other special T&P if supplied by the manufacturer and available with the customer will also be provided to the contractor free of hire charges as and when made available. Special tools and tackles are to be used only for the purpose for which these are meant and to be returned in good condition. However low height jack may not be made available and will have to be arranged for by the contractor.
2. Other terms and conditions regarding above items shall be as per clause no. 38 (T&P/ IMTEs)
3. One of the 75/100/150T cranes will be provided for lifting of FST & Daerator and 75 T crane may be permitted for erection of CW buried portion pipes on entirely at the discretion of Construction Manager BHEL if the contractor is not able to carry out the work with the capacity of other cranes available with him. Similarly other crane(s) of BHEL can also be provided for handling items which could not be handled with 18/20 crane of contractor entirely at the discretion of BHEL. The operation of 100/150 T cranes shall be done by BHEL and the operation of 75 T crane is in the scope of contractor. The maintenance of 75/100/150 MT crane shall be carried out by BHEL, however required maintenance crew and fuel for operation of crane shall be provided by the contractor at his cost. The lubricant will be issued free by BHEL. However, BHEL entirely at its dissertation can allow use of this crane in other areas / works also on the same terms and conditions.

ANNEXURE-VI

INDICATIVE LIST OF MAJOR T&P TO BE PROVIDED BY CONTRACTOR AT HIS OWN COST.			
S.NO	**EQUIPMENT**	**CAPACITY**	**QTY**
1	Mobile crane	18/20T	1 NO.
2	Hydra / Mobile Crane	10T or ABOVE	1 NO
3	Trailer with pulling unit	20T/15T	1 NO.
4	Trailer with pulling unit	40T	As and when required
5	MIG/ CO2 welding m/c		As per requirement
6	Welding Generators, Transformers, Rectifiers And TIG Welding Machines		Adequate nos.
7	Hydraulic Jack (Low Height)	25/50/100T	Adequate nos.
8	Screw Jacks	5/10/25/50T	Adequate nos.
9	Hydraulic Pipe Bending Machine (Manual)		1 number.
10	Stress Relieving Sets, including oil cooled transformers, heating coils, panels Recorders Etc.		Adequate nos.
11	Vacuum Cleaner (Industrial)		1 number.
12	Surface Grinder		1 number.
13	Electric Winches		Adequate nos.
14	Torque Tension Meter/ Wrench Upto 1000ft Lbs Range		1 number.
15	Electronic / Electrical Tube Expander (With Tools)		1 number.
16	DG Set for backup supply for P91 welds		As and when required before start of P91 welding process
17	3 PH DISTRIBUTION BOARD WITH COMPLETE SET UP FOR DRAWL OF CONSTRUCTION POWER	600 AMP	2 Nos..or as per requirement
18	ELECTRIC CABLE FOR DRAWL & DISTRIBUTION OF CONSTRUCTION POWER		AS PER REQUIREMENT
19	DEWATERING PUMP		AS PER REQUIREMENT

NOTE			
	The above list specifies only major T&P (may not be complete to be deployed by the contractor. All additional / other tools and plants which are required for satisfactory & timely completion of work shall also be deployed by the contractor within finally accepted rate / price.		
	Above tube expander kit is required to be deployed by contractor besides BHEL Tube expender.		
	Contractor will have to get all major T & Ps certified by a Govt. or other authorized Agency before being put to use.		
	Other terms and conditions regarding above items please also refer clause 38 (T&P/ IMTEs).		

ANNEXURE-VII

TENTATIVE LIST OF MAJOR TESTING INSTRUMENTS / EQUIPMENT TO BE ARRANGED BY CONTRACTOR AT HIS OWN COST.				
SL.No.	**DESCRIPTION**	**RANGE**	**ACCURACY**	**QTY**
1	Hand operated Megger	Up to 200 M ohms 500V/ 1000V	±5% at center scale ±10% at end of scale	2 No.
2	Digital Multimeter 3½ digit	Voltage 200 mV to 1000V	±1%+1 digit	2 No.
		Current 200 mA to 10A DC	±0.8%+1 digit	
		Current 20 mA to 20A AC	±0.8%+1 digit	
		Resist 200 ohms to 20M ohms	±0.5%+1 digit	
3	Dumpy level	0 to 350 mm	LC-0.01	1 No.
4	Surface plate	Up to 1.0 Sq. Mtr	Grade 1,2,3	1 No
5	Straight Edge	Up to 2 Mtr long	Grade 1,2,3	1 No.
6	Temperature recorder for 0-1000C 6/12 points with thermo couples / rods and compensating cable			2 Sets
7	Master pressure gauge	0 – 4 Kg/cm2	0.02	1 No.
NOTES:				
	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.			
	Contractor must re-ascertains / recheck range and accuracy of each IMTE from BHEL Engineer well in advance before arranging calibration / deployment.			
	Other terms and conditions regarding above items shall be as per clause no. 38 (tools & plants / testing & measuring instruments).			

ANNEXURE- VIII

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.

Tenderers Name and Address

Place: (Signature of the Tenderer with stamp)

Date:

ANNEXURE-IX

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-X

GENERAL TERMS AND CONDITIONS OF REVERSE AUCTION (RA)

Against this NIT for the subject work, **tender may be processed through Reverse Auction mode i.e., ON LINE BIDDING ON INTERNET. The General Terms and Conditions of the RA shall be as follows;**

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. BHEL will inform to the vendor in writing, in case of reverse auction along with the details of Service Provider to enable them to contact & get trained.
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 format (provided by Service provider) before start of Reverse auction. Without this, the vendor will not be eligible to Participate in the event.
6. BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Contract Value (Tentative) Based on Rate Schedule/BOQ".
7. Reverse auction will be conducted on scheduled 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. During Reverse Auction, if no bid is received within the specified time, BHEL at its discretion, may decide to revise opening price/scrap the reverse auction process/proceed with conventional mode of tendering.
11. **Sealed bid Reverse Auction:** The opening bid (In the initial auction) of the bidders shall be same as that quoted in their Final Sealed price submitted to BHEL. **The bidders shall confirm in writing to BHEL that their opening bid (In both cases) shall be same as that quoted in their final sealed price bids submitted to BHEL against this NIT along with Technical Bid (Part-I)**.
12. Bids-given by the bidders during the Reverse Auction process will be taken as an offer to execute the work. Bids once made by the bidder, can not be cancelled/withdrawn and bidders shall be bound to execute the work as mentioned above at the final bid price. Should be bidder (Lowest) back out and not execute the contract as per the rates quoted, BHEL shall take action as appropriate.
13. BHEL reserves the right to cancel Reverse Auction (RA) without assigning any reasons and resort to considering the sealed bids submitted by vendor for processing and finalizing the tender.
14. Any variation between the on-line bid value and the signed document will be considered as sabotaging the tender process and will invite disqualification of vendor to conduct business with BHEL as per prevailing procedure.
15. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.

ANNEXURE - XI

FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

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

Sub.: No Deviation Certificate for the Erection, testing, commissioning and trial operation of and handing over of 2X125 MW TG set with auxiliaries and piping of unit # 1 &2, at Barsingsar TPS, BIKANER, RAJASTHAN".".

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited 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)