भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)

TCN - 02

Ref: PSER:SCT: NKP-T1800:TCN-02 Date: 03-03-2017

Sub	Tender Change Notice (TCN) - 02.	
Job	PACKAGE A - Erection, Testing & Commissioning of Steam Turbine & its Auxiliaries, Generator & its Auxiliaries, Condenser, Pumps, Dosing Systems (LP, Oxygen, NaOH Etc.), Plate Heat Exchangers, TG Cycle and Integral Piping, Various TG Aux And Misc Equipment etc. of U#1&3 for 3x660 MW, North Karanpura project, Jharkhand.	
Ref	1.0	Tender no PSER:SCT:NKP-T1800:17.
	2.0	BHEL's NIT, vide reference no PSER:SCT:NKP-T1800:5464 Date: 08-02-2017.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT: NKP-T1800:TCN-01 Date:27-02-2017
	4.0	Other References, if any.

With reference to above, following points/documents, relevant to tender, may please be noted and complied with while submitting the offer.

1. Revised Volume-IF-(Rev-01)-(Technical Conditions of Contract) including relevant Appendix-II (Rev-01) attached, superseding Volume-IF (TCC including relevant Appendix-II) issued earlier along with NIT.

2. Clarification of bidders' queries attached vide Annexure-A to TCN-02.

3. Introduction of Annexure-D - Specific Clause w.r.t. BOCW Act & Cess Act of NIT, attached herewith.

4. Revised `No deviation certificate' is attached. Bidder to submit `No deviation certificate' as per attached format only.

5. All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HEAVY ELECTRICALS LTD

Sr.Engineer (SCT)

Encl: As Above.

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)
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T E N D E R S P E C I F I C A T I O N

FOR

HANDLING AT SITE, STORAGE YARD, STORES, TRANSPORTATION TO SITE, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF STEAM TURBINE, TURBO-GENERATOR, CONDENSER, HEAT EXCHANGER, PUMPS, BFP DRIVE TURBINE, TG INTEGRAL PIPING & AUXILIARIES, TG CYCLE PIPING, MISCELLANEOUS PUMPS, MISCELLANEOUS PIPING AND OTHER MISCELLANEOUS EQUIPMENTS, PUMPS at 3x 660 MW, FOR UNIT# 1 & 3 AT NORTH KARANPURA PROJECT, JHARKHAND

IDENTIFIED AS

“PACKAGE-A”

INDEX

Section –I
Scope of work

Broad scope is elaborated as below and the details are covered in TCC. **These scope of work/other clauses of TCC are applicable for respective units,** unless otherwise specified. Scope of Unit #1 and Unit #3 **of Appendix II i**s covered in TG Package-A.

01. Receipt of Materials from BHEL Store/yards/other designated places and transportation to erection site/TG Floor.

02. Erection and commissioning of Main Turbine (HP,IP,LP) with all auxiliaries.

03. Erection and Commissioning of Generator and Auxiliaries.

04. Erection and Commissioning of all BFPs(Turbo-driven + Motor Driven)

05. Erection and commissioning of all CEPs along with suction pipe from hotwell to CEPs suction inlet flanges and other fittings

06. Erection and commissioning of all MISC pumps including ACW Pumps, ECW Pumps, Sump pumps, Condensate Transfer Pumps etc.

07.Erection and commissioning of Gland Steam Condenser, Drain Cooler, LP Heaters, HP Heaters

08. Erection and Commissioning of Deaerator & Feed Storage Tank with platform and accessories.

09. Erection and Commissioning of Misc. Water Pumps packages with their accessories.

10. Erection and Commissioning of Miscellaneous Pumps and Equipments pertaing to Fire Protection System Package of the plant alongwith their accessories.

11. Grouting, painting of all equipments along with supply of required materials, machineries and other resources as required to carry out the job.

12. Arranging statutory co-ordination for IBR related activities.

13. Erection, Commissioning, statutory load testing of Misc. Hoists (both mechanical and electrical) through accredited agency who are authorised to issue such kinds of certificates.

14. Erection and Commissioning of Plate Type Heat Exchangers of respective units.

15. Erection and Commissioning of Auxiliaries of Turbine, Generator, BFPs and other systems.

16. Erection, Commissioning of Turbine lub oil, governing oil, Generator seal oil system, gas system, Jacking oil system, control fluid system, Primary Water system, dirty/waste fluid system, Gland steam system-for main turbine and drive turbines of BFPs Water drainage system, Turbine Governing System with Valves and their servomotors, LP Bypass System with Valves, servomotors and other systems tanks and equipments as per scope.

17. Integral piping.

18. Erection and Commissioning of Various TG Piping system as per relevant annexure including erection of valves, fittings and other associated instruments.

19. Erection and Commissioning of MS, HRH Strainers, Coolers, CRH-NRVs, Extraction NRVs

with associated pipelines etc.

20. Preservation of TG & Aux. Components after receipt from BHEL Store.

21. Chemical cleaning and associated testing plus related activities of different system and normalisation

22. Arrangement of fixing of steam blowing and hydro-test blanks and restoration.

23. Arrangement for hydro-test/steam blowing in strainers including removal/restoration in MS & HRH lines etc.

24. Flushing, steam blowing, related testing, pre-commissioning, commissioning activities of lub oil system, governing oil, gas systems, water lines and other systems of Turbine, Generator, Condenser, BFP and other auxiliaries. This includes preparation for flushing, hydro-test, chemical cleaning, steam blowing, other cleaning activities, actual execution of the activities, normalisation etc.

25. Setting and commissioning of governing system.

26. Preparation of MIRs, following of safety and quality norms and documentation, preparation of material status and up-gradation of activities, networks at regular intervals.

27. Trial run of equipments, systems, each 660 MW Unit (s) as a whole .

28. **Generator Stator Unloading, lifting & placement to TG floor with the help of Strand-Jack"**.

29. The contractor shall make arrangement to unload Generator Rotor, LP Rotor, HP Turbine, IP Turbine, **LPC inner-outer upper half, LPC inner casing assembly (LH) and Brushless Exciter** directly from the trailer /wagon [inside project premises] and transport the same to stores/place of work etc. as directed by Engineer. Subsequent re-handling, if required will also be under the scope of work. Detailed weight schedule is as per Appendix – II. Necessary Cranes, as required for this shall be provided by BHEL free of cost.

It may also so happen that Generator Stator had been received at site earlier and BHEL had unloaded and kept at some convenient storage location at that time. The executing agency of TG job shall require to load, transport and shift the consignment to the work location. Vendor shall quote their rate for this activity under the scope of optional job.

30. PG Testing of main equipment along with all auxiliaries, completion of punch points and assistance for handing over of unit (s) to customer .

31. Following activities are specialized one in normal scope of work, for which external specialized agency has to be tied up –
- Reaming and Honing of coupling holes, machining of coupling bolts for HP-IP, IP-LP, LP-Generator couplings.
- **Voltage drop test and Helium leak test of Generator.**

32. Erection and Testing of Piping as per specification or as per instructions of BHEL Engineer..

33. Final Painting.- Supply and application of finish painting including touch up painting.

Section-II

2.0 PROJECT INFORMATION

2.1 **Details of proposed units :**

North Karanpura Super Thermal Power Project (3x660 MW), a pit head coal based thermal power project, is located in Hazaribagh and Chatra districts of Jharkhand State. Basic inputs i.e. coal, water and land have already been tied up. The project is proposed for the States & Union Territories of Northern, Western and Eastern Regions and the State of Jharkhand. The capacity of the project is 1980 MW comprising of three (3) units of 660 MW each.

Approach to site

The power project is proposed to be located near Tandwa town in Chatra districts in the state of Jharkhand on Hazaribagh-Chatra State highway at a distance of about 50 kms from Hazaribagh city. The nearest commercial airport is Ranchi at a distance of 150 kms from project site. The nearest railhead Khalari Railway Station on Ranchi-Garhwa section of Eastern Railways is about 40 kms from project site.

2.2 SITE VISIT

Contractor should visit site and acquire full knowledge & information about site conditions. The bidder must visit site, to acquaint themselves with the conditions prevailing at site and in & around the plant premises, together with all statutory, obligatory, mandatory requirements of various authorities before submission of bid.

Section –III

Terminal Points and Exclusions

3.0

TERMINAL POINTS:-

The followings are the broad guide lines about the Terminal points however the actual Terminal points shall be guided by the work scope indicated in the respective approved drawings.

A) For ACW piping, Pump house puddle flange / external wall shall be the terminal point. All piping inside pump house including supports, valves, strainers, fittings shall be erected by TG vendor.

B) For filter water, service water, drinking water, fire water & raw water, all piping, valves and fittings coming inside pump house shall be in the scope of TG vendor.

C) BFP and Booster pump suction strainers along with its operating platform is to be installed by TG vendor only.

D) CRHNRV, LPBP valves and extraction NRVs are to be installed by TG vendor.

E) For Hydrogen cooler, Lube oil cooler & Primary water coolers pipelines, all the materials supplied by BHEL- Hardwar shall be erected by TG vendor.

F) Lube oil temp. control valve, PW temp. control valve and H2 cooler Temp. control valves shall be erected by TG vendor.

EXCLUSIONS:-

The following are specific exclusions from the scope of work/specification :-

A) Civil works to the extent not specifically provided for in this tender.

B) Thermal insulation of Main Turbine.

C) Supply of materials for temporary piping (pipe, valve etc.) required for Hydraulic Test, chemical cleaning, flushing or water /steam/air blowing of the pipelines.

D) Supply of chemicals and lube oil /control fluid/Gases used for Generator like H2,CO2 etc. during pre-commissioning and commissioning activities/operation. (except Ultra high purity Nitrogen required for Generator PW System, accumulators charging for pre-commissioning, commissioning, and operation period till handing over to customer, which is included in the scope)

E) Erection of sound proof/acoustic enclosure for turbine.

F) Electrical testing of Generator, Exciter and PMG (during Rolling & Synchronisation).

G) Dry out ,Testing & Commissioning of all HT/LT motors and actuators

H) Regular Operation and maintenance of TG hall EOT crane for complete contract period (including extension, if any).

I) PG Test Impulse piping from root valve, Cabling of field instruments for PG test. However all assistance of issue of materials, return after PG test, assistance during PG test is in the scope of TG vendor. System Isolation, flushing of root valves etc. during PG test is in the scope of TG vendor.

Section –IV

Special conditions of Contract

4.0 DESCRIPTION

4.1 GENERAL REQUIREMENTS

The job to be executed under the specification covers handling at site stores/ storage yard including unloading of stator at designated place, transportation to site of work, unloading at site, erection, testing, commissioning and handing over of –

PACKAGE-A

Steam turbine & its auxiliaries, generator & its auxiliaries, condenser, pumps, dosing systems (LP, Oxygen, NaoH etc.), Central Oil Purification System, Plate heat exchangers, Integral piping, TG piping, various TG Aux and misc equipment etc. of U#1 & 3 (as per Appendix-II, Approximate Detail Weight Schedule of Major items) at 3x660 MW NTPC North Karanpura project at Jharkhand.

The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship for fabrication, engineering and construction management. The vendor should ensure timely completion of work. The vendor must have adequate quantity of tools, construction aids, equipments etc, in his possession. He must also have on his rolls adequate, trained, qualified and experienced supervisory staff and skilled personnel. The entire work under this scope shall be directly executed by the vendor with their own resources; BHEL Engineers/Siemens Engineers shall be available only in advisory capacity.

The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

The terminal points indicated by BHEL should be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.

4.1 A Unloading of Generator stator, Generator rotor, HP turbine, IP Rotor and LP rotor, LPC inner-outer upper half, LPC inner casing assembly (LH), Exciter, Turbine Integral Piping (TIP), its storage, verification and transporting to BHEL stores/place as directed by BHEL and preservation is under the scope of the vendor within quoted rate.

4.1.B Arranging of containers exclusively for the Turbine Integral Piping storage is also included in the scope of the vendor within quoted rate.

4.1.C Ultra High Purity Nitrogen Gas required for i) Generator stator PW system Nitrogen Pressurisation test, Potable Water system Flushing, Accumulator charging of LPBP and CF system shall be supplied by VENDOR.

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

4.1.2 Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical

requirements. Availability of materials and fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the contractor. No claims for extra payment from the contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.

4.1.3 All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory / local authorities are to be arranged by the contractor at his cost in time to ensure smooth progress of work.

4.1.4. The work shall conform to dimensions and tolerances specified in the various drawings/documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations due to contractor's fault, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by BHEL and recoveries will be effected from the contractor's bills towards expenditure incurred including cost of materials and departmental overheads of BHEL.

4.1.5 The contractor shall perform any services, tests etc. which may not be specified but nevertheless required for the completion of work, within quoted/ accepted rates.

4.1.6 All necessary certificates and licenses required for carrying out this work are to be arranged by the contractor expeditiously.

4.1.7 The contractor shall execute the work in the most substantial and workmanlike manner. The stores shall be handled with care and diligence.

4.1.8 BHEL reserves right to recover from the contractor any loss which arises out of undue delay / discrepancy / shortage / damage or any other causes due to contractor's lapse during any stage of work. Any loss to BHEL due to contractor's lapse shall have to be made good by the contractor.

4.1.9 All cranes, transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors / Engineers, consumables etc. except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the contractor. All expenditure including incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clauses. The contractor's quoted rates should be inclusive of all such contingencies.

4.1.10 During the course of erection, testing and commissioning, certain rework / modification / rectification / repair / fabrication etc. may become necessary on account of feedback / revision of drawing. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repair etc. promptly and expeditiously. Daily log sheets signed by BHEL Engineer and indicating the details of work carried out, man-hours etc. shall be maintained by the contractor for such reworks. Claim of contractor if any, for such work will be governed by relevant clause under extra work, provided the reasons for rework are not attributable to contractor, as decided by BHEL.

4.1.11 The contractor shall make all fixtures (like bolt stretching devices, alignment devices, gas tightness/hydraulic test devices etc.), temporary supports, steel structures required for jigs

& fixtures, anchors for load and guide pulleys required for the work. Necessary steel and other materials shall have to be arranged by the vendor within the quoted rate. No separate payment shall be released to the vendor on this account.

4.1.12 The contractor shall take delivery of the components, equipments, chemicals, lubricants etc. from the BHEL stores / storage area after getting the approval of BHEL Engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipments after usage shall be submitted to the BHEL and reconciled periodically. The contractor shall check, tally and inspect all material consignment issued to him and shall maintain proper record or the receipt of material received and such reports shall be produced by the contractor to the Engineer for verification. Any deviation from packing list or damage to any component noticed during receipt of material should be immediately brought to the notice of BHEL engineer. Any claim in this regard after receipt of material by the contractor will not be entertained.

4.1.13 Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas / site to enable other agencies to carry out their work or for any other reason, same shall be done by contractor most expeditiously. No claim for extra payment for such work will be entertained.

4.1.14 Plant materials should not be used for any temporary supports / scaffolding / preparing pre-assembly bed etc.

All scaffoldings to be used will be of steel only and no wooden/bamboo will be allowed. Strict safety norms are to be followed as per safety plan of BHEL/CLIENT.

4.1.15 Spring suspension / constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests / locks, cutting of excess thread length of hanger tie-rod etc. have to be carried out as and when required. Load setting of spring hangers, as per BHEL's documents / instructions, during various stages of erection & testing and after floating of piping / ducting during cold and hot condition will have to be done. This exercise may have to be repeated till satisfactory results are achieved.

4.1.16 Layout of field routed / small bore (up to NB100) piping shall be done as per site requirement. Necessary sketch/layout for routing these lines should be got approved from BHEL by the contractor. There is a possibility of changes in routing the above pipelines even after completion of erection which shall be done by contractor as part of work without any extra claim.

4.1.17 Welding of necessary instrumentation tapping points, root valves, condensing vessels, flow metering & measurement devices and control valves, PG test tapping points and instruments, flow nozzles to be provided on TG & its auxiliaries and integral/TG piping are covered within the scope of this specification. The installation of all the above items will be contractor's responsibility even if:

a) Items are not specifically indicated under the respective product groups as given in the technical specifications.

b) Items are supplied by an agency other than BHEL.

Pre-heating, NDE and post weld heat treatment for above shall be done as per the specifications as part of work.

4.1.18 Certain instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, junction boxes, power cylinders, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal / speed switches of motors, accumulators etc. are received in assembled condition as integral part of equipments. Contractor shall dismount such instruments for calibration and hand over the same to BHEL. Storage / re-erection, calibration will be done by C & I erection agency. This exercise may have to be repeated as per the site requirement. No payment on whatsoever ground on this account shall be entertained by BHEL.

4.1.19 Fixing and seal welding of thermowells & plugs before hydro test / steam blowing of equipment or other piping system is within the scope of work. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld thermo wells after hydro test / steam blowing of lines as part of work.

4.1.20 Actuators / drives, valves etc. may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.

4.1.21 In installation of various equipments it may become necessary to install these on temporary supports / hanger due to various reasons including non-availability of suspension materials. Contractor shall install such temporary suspensions / hangers and later on shift the relevant equipments to their respective permanent hangers / suspensions / supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free of cost and returnable basis. The same shall be returned to BHEL after the use. No extra payment shall be done by BHEL on this account and normalisation is also included in the vendor's scope of work within the quoted rate.

4.1.23 All the works such as cleaning, touch up painting, checking, aligning, assembling, temporary erection for alignment, dismantling of certain equipment for checking and cleaning, surface preparation, fabrication of tubes and pipes, ducts, supports, as per general engineering practices at site, cutting, grinding, straightening, chamfering, filing, chipping, drilling, reaming, rapping, shaping, filling up etc and other works, as may be applicable in such erection works which are treated as incidental to the erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work. All consumables including Paints for touch up painting shall have to be supplied by the contractor within the quoted rate.

4.1.24 Minor adjustments like removal of ovalties in pipes and opening or closing the fabricated bends of high pressure piping to the layout shall be considered part of the work and the Contractor is required to carry out such work free of cost with specified heat treatment procedures.

4.1.25 Extra lengths in various fabricated ducts and piping given as erection allowance, shall have to be cut to suit site conditions. Fabricated pipes are sent in standard lengths and will 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. For any mismatch while matching the joints in tubes, cutting, adjusting, re-welding, addition of spool pieces should be done by the contractor to match site condition without any extra payment. The

pipes and related fittings may have to re-dressed to suit fitting, welding within the quoted rate by the vendor.

4.1.26 Dewatering arrangements (of sufficient capacity) in condenser pit, low point areas, basement floors and other areas where erection is in the scope of the vendor are to be arranged by the contractor within the quoted rate and this facility is to be maintained by the contractor till handing over of the individual Units to the customer. No claims for whatsoever reason on this account shall be entertained by BHEL. In case of non-availability of the same facility at any point of time, the same shall be arranged by BHEL at the risk and cost of the contractor.

4.1.27 The contractor shall provide proper barricading/cordoning/temporary protection over all left out opening at 17 meter/8.5 meter and 0 meter floors for safe working at site. Steel required for this purpose shall be provided by BHEL as per availability free of cost.

4.1.28 The contractor has to make two portable offices (1 no.for exclusive use of BHEL personnel and 1 no.for exclusive use of Siemens personnel) in TG floor. Each office should have one no 1.5 Ton Air conditioner for meeting/discussion with necessary fittings like, tube lights, fans and other fixtures like wiring etc., drinking water , 1 no. computer with printer The required materials for office construction is to be arranged by the vendor within the quoted rate and at no extra cost to BHEL. The room size shall be approx. 6.0 meters (length) x 5.0 meters (width) x 4.0 meters (height) with corrugated sheeting outside and inside false ceiling with decent look. The vendor has to take prior permission of BHEL regarding type, sizes and other requirements of this portable office. The contractor has to arrange for filters for drinking water alongwith consumables /spares from time to time for arranging filtered drinking water. The contractor shall retain one office boy/peon in these offices for up-keepment, documentation and other sundry jobs. This is included in the scope of work till handing over of the Units(s) to the customer. No payment on whatsoever account shall be entertained in this account by BHEL to the contractor.

4.1.29 The Vendor has to carry out transportation of lube oil, Control Fluid, special consumables, gas cylinders etc. from BHEL/Customer's stores, filling of lubricants, gases etc. and filling of oil for flushing, first filling and topping up oil & gasses till handing over to BHEL/Customer is included in the scope of this contract. The contractor shall have to return all the empty and excess drums to the customer/BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities/ processes mentioned in clauses herein from BHEL/customer's stores and charging of chemicals into the system for carrying out various pre-commissioning activities and processes mentioned herein and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of contractor.

4.1.30 All packing and forwarding material shall be returned as soon as the material is unpacked. The location for storage of such materials shall be as indicated by BHEL Engineer.

4.1.31 All Measuring and Monitoring Devices (MMD) used for the work in scope of this tender specifications, shall be calibrated by the accredited agencies who are approved by BHEL or calibration traceability is established upto National Physical Laboratory for proper validity from time to time.

4.1.32 Contractor shall furnish the consumption details of chemicals, lubricants, TIG welding filler wire, welding electrodes and other consumables on monthly basis and take prior approval as specified elsewhere.

4.1.33 For erection, testing and commissioning of different hoists (mechanical and electrical), other handling arrangements, the contractor has to arrange the services of accredited agency (who are authorised to witness and issue certificates by Govt. agency for hoists etc.) within their quoted rate for statutory load testing and issuing of certificates for safe use of these items. Necessary loads for carrying out such load testing shall be issued by BHEL/Customer at free of cost. However, the contractor has to arrange necessary transport and handling and return the load testing materials within the quoted rate.

4.1.34 Area Cleaning – The contractor has to do area cleaning on every date on daily basis. The cleaning has to be done during start of the day and at the end of the day. Non compliance of the above cleaning shall call for penal recovery of Rs.2000.00 in addition to the recovery mentioned elsewhere in the contract, if any, on each instance and at the same time, cleaning of the area shall be done by BHEL at the risk and cost of the contractor. No excuses on this above account shall be entertained by BHEL on whatsoever account.

4.2

4.2.1 The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The vendor and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

4.2.2 All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineers decision regarding the correctness of the work and method of working shall be final and binding on the vendor.

4.2.3 The vendor shall at his cost perform any services, tests etc, although not specified but nevertheless required for the completion of work within his quoted rate.

4.2.4 The vendor shall erect and commission all the equipments as per sequence prescribed by BHEL at site. The sequence of execution, methodology will be decided by the BHEL engineers depending upon the availability of material, work fronts etc. No claims for extra payment from the vendor will be entertained on the grounds of deviation from the methods and sequence of erection adopted in erection of similar TG sets at other places or for any reasons whatsoever.

4.2.5 All the necessary certificates and licenses required to carryout this work are to be arranged by the vendor expeditiously at his cost.

4.2.6 <u>"Generator Unloading , placement to TG floor with the help of Strand-Jack" :</u>

Handling and lifting from special trailer/resting place in front of A row or along A-row, and placement on TG foundation with the help of Strand-Jack is included in the scope of contractor. The contractor shall tie up with specialized agency sufficiently experienced in handling of 660 MW Generator stator by strand jack method and take approval of BHEL regarding the agency and the method before start of work. The contractor shall submit the credentials of this agency to BHEL for review and approval."

The vendor shall extend all necessary assistance for releasing the special trailer (which will come in front of A-row in site with Generator Stator) treating it as his normal scope of work. Stools for keeping the generator stator after unloading shall be fabricated by the contractor as per own/BHEL's design.

In case the stator is not lifted directly from the wagon/trailer, necessary assistance in Unloading of Generator in front of A row of Power House from wagon/trailer, and placement of the same on the designated resting place is included in the scope of work. *Concrete slabs as per approved drawings are to arranged by the contractor during unloading of the stator."*

It may also so happen that Generator Stator had been received at site earlier and BHEL had unloaded and kept at some convenient storage location at that time. The executing agency of TG job shall require to load, transport and shift the consignment to the work location. Vendor shall quote their rate for this activity under the scope of optional job.

Vendor shall co-ordinate with Strand jack arrangement supplier in getting necessary inputs for Civil construction (under scope of BHEL). All arrangements of strand jack including its foundation/sole plate and foundation bolts etc. shall be in vendor's scope.

4.2.7 The vendor has to arrange within his quoted rate, loading of TG equipments at stores/ storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment and required corrections, welding, radiography, levelling, cold pulling, adjusting, heat treatment, hydraulic test, chemical cleaning, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of Main equipments & auxiliaries covered under these specifications and all other activities till handing over the unit to BHEL's customer including completion of PG Test activities. The work shall conform to dimensions and tolerances specified in the various drawings, documents etc. that will be provided during the course of installation. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the vendor shall dismantle and re-do the work duly replacing the defective materials at his cost failing which the work will be got done by BHEL by engaging other agencies or departmentally and recoveries will be effected from contractors bill payment due either of the present contract or any other contract/work etc. towards expenditure incurred including BHEL's overhead charges.

4.2.8 The indicative schedule of weight of major equipments given in Appendix-II & III is meant for providing a general idea only to the vendor about the magnitude of the work involved.

4.2.9 During the course of execution of this work, certain rework/ modification/rectification/repairs/ fabrication etc. will be necessary on account of feed back from various thermal power stations on units already commissioned and/or units under erection and commissioning and also on account of design discrepancies and manufacturing defects and site operation/ maintenance requirements. The vendor shall carryout such rework /modification/ rectification / fabrication/ repairs etc., promptly and expeditiously. Daily log sheets indicating the details of work carried out, man hours, consumables used etc, shall be maintained by the vendor and got signed by BHEL engineer every day. Claims of contractors, if any, for such works will be dealt as per relevant clauses.

4.2.10 All tools and tackles, fixtures, equipments, materials, manpower, supervisors/ engineers, consumables etc. required for this scope of work shall be provided by the vendor within his quoted rate.

4.2.11 The contractor shall make adequate security arrangements including deployment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of

materials/ equipments issued to him for the work. Special care will have to be taken to guard against pilferage / theft of copper tubing, brass fittings, brass valves and other costly materials.

4.2.12 All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipments without the specific permission of the engineer.

4.2.13 Contractor shall ensure proper housekeeping and remove all scrap materials at least once in a week from various levels of power house, working area of TG, auxiliaries and piping around power station and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to do cleaning and remove scrap at contractor's cost and risk.

4.2.14 Access to site for inspection by BHEL and customer engineers shall be made available by the contractor at all times. The exercise may have to be repeated till satisfactory acceptance and is treated as normal scope of vendor’s scope of work within the quoted rate.

4.2.15 Contractor shall mobilise sufficient quantity of wooden/concrete sleepers for stacking of materials in his custody. Scaffolding materials to carry out jobs are to be arranged by the contractor within the quoted rate.

4.2.16 The contractor shall weld all Thermo-wells, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipments under scope of erection of this contract. All embedded temperature measuring elements provided in the bearings will have to be terminated at the junction box by the contractor. Thermo-wells, tapping point connections incorporated in the steam service shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation all Thermo-wells and flow elements with branch pipes be installed and welded. Seal welding of thermo-wells, even if these are erected by other vendors in the erected system of TG vendor’s scope, are to be done by the TG Contractor at no extra cost.

4.2.17 The contractor shall have total responsibility for all equipment and materials in his custody at contractor’s stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL Engineer’s instructions. The machine surfaces / finished surfaces should be greased and covered within the quoted rate.

4.2.18 PRESERVATION & PROTECTION OF COMPONENTS

At all stages of work, equipments / materials in the custody of contractor, including those erected, will have to be preserved as per the instructions of BHEL. Necessary preservation agents, if required for the above work shall be arranged by the contractor within the quoted rate.

4.2.19 The contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials / equipment in their custody and installed equipments from theft / fire / pilferage and any other damages and losses.

4.2.20 Contractor shall collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL / client's stores. In case of failure of contractor in compliance of this requirement, BHEL will make suitable arrangement for removing the same at contractor's risk and cost.

4.2.21 The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, empty drums, cylinders etc. shall be returned to BHEL stores/ designated place in the plant premises, by the contractor, within quoted/accepted rates.

4.2.22 The contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage / excess utilization of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with BHEL's standard overhead charges from the contractor. Decision of BHEL on this will be final and binding on the contractor.

4.2.23 For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL within the quoted rate at no extra cost to BHEL.

4.3 COLLECTION AND RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

All equipments of TG and their auxiliaries are received and stacked by BHEL in closed / semi-closed sheds and open storage yard. Contractor shall take delivery of equipment and all other materials from the storage yard/stores/sheds of BHEL. He shall also make arrangements for verification of equipment, safe custody, watch and ward of equipment after it has been located and handed over to him till these are fully erected, tested and commissioned and taken over by the customer. The vendor should note that the transport of equipments to erection site, assembly yards etc should be done by the prescribed route, without disturbing the other works and contractors and in the most professional manner. Special equipments such as laboratory equipments, measuring and controls equipments, special electrodes, valves, shims, packing materials for joints and seals, lubricants, actuators etc, shall be stored, when taken over by the vendor, in appropriate manner as per BHEL's instructions.

4.3.1 The contractor shall take delivery of the components, equipments, lubricants, chemicals, special consumables, steel etc from BHEL or Customer stores/storage area. The contractor shall hand over all parts, materials, consumables etc. remaining extra over the normal requirement with proper identification tags to BHEL stores. In case of any misuse or use over actual requirement, BHEL reserves the right to recover the cost with departmental charges of parts/materials used in excess or misused.

4.3.2 All material handling equipment required shall be arranged by the contractor for locating/loading at storage yard/stores, transport to site including pre-assembly area, unloading at site/working area, pre-assembly of equipments at the fabrication yard or at working area, inspection, checking and erection except for the cranes provided by BHEL for purpose specifically identified elsewhere in this tender specification.

4.3.3 The approach road for materials movement may not be smooth. Necessary earth filling, dressing of approach road, compaction of approach road, filling of sand bags, laying of steel plates, sands, minor repairs including supply of these materials are in the contractor's scope. Even if it is required to lay steel plate the same has to be done by the

contractor for crane/trailer/truck etc. movement for transportation of materials/ erection activities by the contractor at no extra cost. However, required steel plates shall be issued by BHEL on free of cost and returnable basis. Required transportation of steel plates shall be arranged by contractor within quoted rates. Contractor can not claim any compensation of time or money on account of bad approach roads, in any weather conditions.

Every attempts shall be made by BHEL to keep all the materials (both erectable, T&P, special tools & tackles required to be used for the purpose of erection and commissioning etc.) in fashioned manner. However, there are chances of mix up of materials as many materials shall be received from all sources viz. BHEL/ Manufacturing Units or Vendors simultaneously. In these cases, the vendor has to search /locate the materials from store/yard as the case may be. On completion of tracing the vendor's materials, the vendor should re-stack the balance materials as per the advise of BHEL representatives to suit BHEL's requirement. The vendor has to arrange suitable T&Ps, other means and resources as deemed necessary to meet the above requirement. The above is treated as normal scope of work with no extra cost to BHEL.

4.4 PREPARATION OF FOUNDATION & GROUTING

4.4.1 Buildings, foundations and other necessary civil works for supporting structures, equipments etc, will be provided by the BHEL. The checking of dimensional accuracy, axes, elevation, levels etc, with reference to bench marks of foundations and anchor bolt pits and also adjustments of foundation level, dressing and chipping of foundation surfaces of all equipments up to 50 mm for achieving proper levels will be within the scope of work/ specification.

4.4.2 Enlargement of holes/cut outs /pockets in foundations, relocation of holes/cut outs/ pockets in foundations, making additional holes/cuts out/pockets in foundations different floors/ walls / roofs etc. in civil related areas to accommodate equipments/ piping/system for erection of TG Equipments/ pipings. etc. is included as normal scope of work at no extra cost to BHEL.

4.4.3 All minor foundations and anchor points required for installing erection equipments like winches, anchors etc. are to be cast by the contractor. Restoration of the same is also included within contractor' scope of work.

4.4.4 Grouting of all equipments under the scope of contractor is included in the scope of work/specification. Supplying of Ordinary Portland Cement, Sand, Stone Chips, pea gravels & Non-shrink, free-flowing special grout cement of required specification (like Conbextra-GP-2/NITOMORTAR/ PAGEL V1/ PAGEL V12, special cementitious fluid grouts or equivalent as per BHEL/SIEMENS and/or Customer approval) including arranging the grout mixers for this purpose shall be in the regular scope of the contractor. Arranging of all supporting materials to carry out grouting activities right from starting, making scaffoldings, shuttering to curing is included in the contractor's scope of work. Mixer machines and associated materials and T&Ps to carry out grouting job is included in the contractor's scope of work. Contractor should also carry out cleaning of the foundation surfaces, pocket holes, anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods will be within the scope of this work within quoted rates. All required materials for this shall be arranged by contractor within quoted rates.

The special cementitious fluid grouts material required to be used for installation of BHEL/Siemens' steam turbines, generators and gear units etc. shall got approved from

BHEL/NTPC prior to use of same. These grout materials shall be reputed make and acceptable to BHEL/NTPC. The materials to be supported by manufactures' Test & Guarantee Certificate, Certificate towards Shelf Life.

During grouting, one standby mixer machine in addition to one working machine is to be arranged by contractor to take care of any unforeseen eventuality.

Special care shall be taken for curing of grouts by providing old watered gunny bags or suitable arrangements round the clock. Manpower deployment for pouring water over grouts has to be retained by the contractor on round the clock basis, till successful completion of the curing, as certified by BHEL. Gunny bags shall be provided by contractor.

Selection/use regarding brand/ types of cements/grouting materials and other materials shall require prior approval of BHEL/customer and should have valid test certificates.

As a standard practice, the manufacturer's representatives(grout material supplier) should be made available during application of special grouting materials during each execution time and this is included in the regular scope of contractor's work at no extra cost.

4.5 EQUIPMENTS INSTALLATION – COMMON REQUIREMENTS

4.5.1 Machining of shims, packers, Coupling Bolts and other items

The contractor within his quoted rate has to either own or have tie up for a work shop for machining/cutting/grinding/polishing of key ways, packer plates, hanger/support items, machining of Nuts, bolts, studs, tie-rods, Coupling Bolts, bushes of all equipments, dowel pins, jack bolts etc. and other machining works. The machining scope is elaborated in brief :

4.5.1.1 During the erection, commissioning, handing over of the sets, the contractor within his quoted rate has to carry out necessary machining jobs on Main equipments and Auxiliaries like enlargement of holes by drilling (including flanged faces/surfaces /pieces), gas cutting/grinding/other machining methods and finishing to achieve proper matching/parallelism/ proper erection/ leak proof joints etc., machining /rectification of key ways, machining of coupling bolts, fabrication/ machining of dowel pins, taking out damaged/ seized bolts etc. and reconditioning, threading, making additional holes as per requirement, dressing up of holes/cut out etc. and other machining activities as required to carry out the total execution. In case of relocation of holes/cut outs, the vendor has to carry out blocking of extra holes/cut outs as per requirement of BHEL. The total machining jobs required during erection, testing, commissioning, handing over of Unit to customer is included in the contractor's quoted rate. The contractor within his quoted rate has to enlarge, relocate, make additional holes in flanges, parts of equipment for mating flanges treating it as part of his scope, in case of any discrepancy found in flanges. The holes are to be finished with precision as decided by BHEL and necessary threading inside holes and dressing up also is to be done. Closing of existing holes by suitable method as suggested by BHEL is also to be carried out by the contractor, in case the holes are not required in earlier locations."

4.5.1.2 BHEL will provide only shims and packer plates (either machined or plain) which are received from BHEL's manufacturing plants and go as permanent part of the equipment.

Machining of un-machined packer plates sent by BHEL/Units are included in contractor's scope including scrapping, matching, machining etc. Additional packer plates if required, will have to be arranged and prepared by the contractor out of steel plates (for thickness lesser than 5.0 mm), steel sheets to meet site requirements and is included within normal scope of work of the contractor. Necessary steel plates for this purpose (for plate

thickness of above 5.0 mm) will be provided by BHEL free of cost. SS shims/other shims (for thickness of less than 5.0 mm.) which are required in addition to the supplied quantity of BHEL/Manufacturing Units are included in vendor's scope at no extra cost to BHEL.

4.5.1.3 In addition to the above, the contractor has to arrange machining facilities for carrying out precision machining as required to achieve desired finish for Turbine, Generator, Exciter Coupling bolts within the quoted rate as this is part of normal scope of work. They should arrange calibrated balancing machine for weighing of bolts suitable for this work during execution of the above works. The contractor's quoted rate should be inclusive of all these type of requirements.

4.5.1.4 Turbine, Generator, Exciter Coupling holes require precision machining like reaming, honing etc. as per requirement to achieve required finish before bolting of Turbines, Generator, Exciter Couplings and other equipments and these are included in the contractor's scope of work at no extra cost to BHEL.

4.5.1.5 Enlargement /relocation of holes/pockets, making dowel pin holes, arranging threading arrangements in machined holes in the equipments/system/piping are included in the scope. Material build up and dressing up in case of patch up on holes /cut outs by material build ups are also included in the vendor's scope at no extra to BHEL.

4.5.2 Filling of lubricants for steam turbine, turbo-generator and other rotating auxiliaries for purpose of oil flushing, initial fill up and subsequent topping up during operation. Contractor shall render all above services with manpower, T&P right from taking delivery of these lubricants (which will be in drums from BHEL/customer's stores) and return the empty drums to BHEL /customer's stores. After completion of oil flushing operation, the used oil shall be filled in empty drums and which in turn shall be returned to BHEL/customer's stores. Contractor shall be responsible for any shortage of oils/consumables/other items issued by BHEL.

4.5.3 Contingency arrangement

The contactor has to arrange for making contingency arrangement, if any, to achieve/ major milestones and for this, additional material shall be issued at free of cost by BHEL. The contractor has to do erection/commissioning activities accordingly. It may so happen that some regular erectable items are not received in time. The contractor has to make contingency arrangements with the free materials issued by BHEL as per requirement. The contingency arrangements/items are to be removed/replaced with original items received on a later date. For this, advance information shall be given to the contractor. The contractor has to return all the contingencies materials to BHEL/Customer's store. The total activities are treated as regular scope of work. No payment shall be released by BHEL in this account.

4.5.4 Rescheduling of milestones

The activities at site will be reviewed at regular intervals and any additional resource mobilisation to reschedule the activities/milestones from time to time is included in the contractor's scope of normal work at no extra cost to BHEL. No extra payment on whatsoever account shall be entertained by BHEL.

4.5.5 Erection of LP Heater-1

LP heater 1 is to be erected inside the condenser in rear side, for which contractor may have to be cut open the condenser dome plate already erected, in case the cut out is not

there. After erection, condenser plates have to be strengthened/stiffened as per instruction of BHEL/Customer Engineer/applicable drawings etc.

4.5.6 The vendor within his quoted rate has to arrange services of exclusive electricians & supervisors for carrying out electrical, C&I works during normal pre-commissioning, commissioning, trial run, handing over, stabilisation, PG Test are to be maintained by the contractor till handing over of the respective Unit to the customer within the quoted rate. This is included in the normal scope of work.

4.5.7 All works such as cleaning, levelling, aligning, hot alignment, trial assembly, dismantling of certain equipments/components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, grinding, straightening, chamfering, filling, machining, chipping, drilling, reaming, scrapping, lapping, shaping, fitting-up, drilling of holes, making dowel pins, machining of keys, minor rectification of foundation bolts/holes, machining of coupling holes, machining of hanger & support components etc. which are incidental to the erection/commissioning and any other work/activity which is necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work.

4.5.8 Deleted

4.5.9 Cleaning, servicing, greasing of actuators, pumps, headers, governing system, ESV & IV, control valves, LP bypass and other valves, tanks, vessels etc. during erection and commissioning stages shall be arranged by the contractor within the quoted rate. However, gaskets / packing /special lubricants for replacement will be provided by BHEL free of cost.

4.5.10 All equipment shall be preserved and protected periodically before and after erection as per advice of BHEL engineer. The journals of steam turbine rotors, generator rotor, HT motors and other rotating machines shall be thoroughly cleaned, greased/painted with preservative agents periodically as instructed by BHEL engineer.

4.5.11 All pipes and tube ends of TG components kept at site for erection shall be kept protected with plastic caps/steel caps or shall be closed with wooden plugs. These caps/plugs shall be provided by the contractor without any extra cost to BHEL.

4.5.12 The vendor has to carry out cutting of suspension materials, structures, piping etc. supplied in running lengths to suitable sizes and adjustment as required. This includes pre-assembly of spring suspension/hangers and shock absorber for the required load of piping etc.

4.5.13 LP Turbine exhaust hood spray system, CEP seal and bearing cooling water system, Central oil purification system equipment, dry air system for Turbine preservation, TG integral piping system are also in vendor’s scope within his quoted rate.

4.5.14 The vendor has to make arrangement for servicing of valves, actuators including supply of lapping compounds. The contractor has to maintain a minimum stock of lapping compounds to carry out valve lapping activities within the quoted rate.

4.5.15 The contractor shall carry out scrapping and matching of embedded plates, permanent spacers and all the matching parts of turbine, generator, pumps and other equipments

wherever required. The support and sole plates matching and concrete surface bedding is also covered in the scope of work. The fine dressing of concrete shall be with Prussian blue-match checks.

4.5.16 Packer plates shall not only be blue matched with foundations but also inter-packer contact surfaces, contact surfaces between packer and pedestals, contact surface between packer and foundation frame etc. shall also be blue matched and required percentage contact shall be achieved by chipping and scrapping as per engineer's instructions. Necessary arrangements like providing consumables and other resources are also to be done by the contractor accordingly.

4.5.17 All necessary checks such as accuracy of levels, centre lines, bolt positions, hanger supports, anchor/foundation bolt hole/pit positions etc. sufficiently in advance to ensure correctness of installation of all equipments is covered in vendor’s normal scope of work.

4.5.18 The vendor within his quoted rate has to execute trial run of all motors including checking direction of rotation in uncoupled condition, check alignment and re-couple the motor to driven equipment.

Motors de-couplings, greasing/servicing of equipments/re-couplings are included in the vendor’s scope.

4.5.19 The vendor has to mount instrumentation on turbine, generator and exciter and auxiliaries which are integral part and main equipments/skids/piping/system etc. and render necessary services for their commissioning.

The vendor has to provide assistance during dismantling, erection and commissioning of turbovisory and other electrical and C&I items for Turbine, Generator, Exciter, BFPs, BFP-Drive Turbines and other items. For this purpose, the bearing pedestals are to be opened for working by other agencies/Customer. This exercise may have to be repeated till satisfactory functioning of the items and this is treated as normal scope of work at no extra cost to BHEL for working in respective 660 MW Units.

4.5.20 In case Condenser erection/assembly needs to be started without EOT crane, for such assembly/ pre-assembly, BHEL will provide 75T or higher capacity crane as per availability. However, vendor will make arrangement for shifting/dragging as per instruction of BHEL.

Condenser internal components/parts/surfaces have to be surface protected with steam washable paint as per BHEL standards. The total supply of paints including original paints, primers, thinners including accessories for painting as per specifications /applicable codes/drawings/documents/BHEL/Customer’s instruction are included in the contractor’s scope at no extra cost to BHEL. Inside of water boxes are to be painted (paints to be supplied by contractor) as per BHEL specifications, within quoted rates .

4.5.22 The vendor within his quoted rate has to carry out Erection and commissioning of connecting piping – permanent and temporary for oil purification equipments and all operations for cleaning, oil flushing, dismantling of temporary piping during pre and post-commissioning of equipment up to full load and trial run.

4.5.23 All racks or assembled units like Governing Rack, LP Bypass Rack , Seal Oil Unit, Gas Unit, Seal Oil Valve Rack, Primary water Unit, Primary Water Coolers Units, Gas Cylinder Racks, Alkaliser Unit, CO2 Vapourisor, Gas Valves racks, LLD Racks, Gas driers etc. supplied from manufacturing units will be tested in BHEL / Customer stores or at site. This may require transportation, filling of oil, water etc. in these racks for carrying out

testing of these racks. Defects noticed during erection, testing, commissioning, handing over of the respective Units of these racks will have to be rectified by the contractor free of charges. Further, any pipeline / flanges / fittings/equipments not found assembled properly or part of the components received in damaged conditions from BHEL/Manufacturing Units, the same have to be rectified / corrected by the contractor free of charges. Grouting of these racks is included in the contractor's scope including supply of required grouting and all related materials.

4.5.24 Chipping of foundation, placement, levelling, erection, alignment, setting of correct orientation, cleaning during erection & pre/post commissioning, grouting, fixing of associated instruments with root valves & fittings and impulse piping for equipments, Tanks & vessels shall be treated as part of scope of work under this contract at no extra cost to BHEL.

4.6 PIPING INSTALLATION

4.6.1 The scope of work in piping system (air, water, oil, steam, Control Fluid, gas, drains, vents etc.) will include cutting to required length, laying, edge preparation, fixing and welding of the elbows/fittings/valves/ supports/guides etc., fixing supports/ hangers /shock absorbers, etc. This will include carrying out all other activities/works to complete the erection and also carrying out all pre-commissioning/ commissioning operations mentioned in these specifications as per engineer's instructions and/or as per approved drawings.

Preparation of mitre bends , TEE's & REDUCERS, if required to execute the jobs is included in the contractor's scope of work at no extra cost to BHEL.

4.6.2 The vendor has to carry out execution of piping as per the specifications between equipments constituting terminal points, whether the terminal equipments fall within the scope of the work / specification or not, is within the scope of the work/ specification. The contractor shall complete terminal joints at both ends for all the piping schemes covered in the specification within his quoted rate at no extra cost to BHEL.

Erection, Commissioning of Central Oil Purification System including Oil Purifiers, Pumps, Tanks and associated system are included in Contractor's scope of work at no extra cost to BHEL. This includes making temporary piping arrangement for oil flushing, chemical cleaning, normalisation etc. The vendor have to do erection & commissioning in both Units in totality including piping , tank, pumps and other related systems as indicated in relevant annexure.

The vendor within his quoted rate will have to take piping connection and do necessary erection, commissioning etc. from the system for hooking up with the system with equipments and systems/battery limits.

4.6.3 The vendor has to carry out fit up and welding of piping to the terminal points (such as stubs, valves, flanges on terminal points/equipments, stubs on headers, battery limits etc) forming part of the scope of work/specification and stress relieving and radiography of joints so made are also within the scope of work. Also, where the piping connection to the terminal points involves flanged joints as well as terminal equipment matching of flanges are to be done by contractor, fixing of gaskets, bolting and tightening as per BHEL engineer's instruction is also in this scope of work/specifications. Permanent fasteners and gaskets will be supplied by BHEL.

4.6.4 The contractor within his quoted rate has to execute terminal points works of various piping schemes with customer lines and other contractor's lines. The terminal points work

is inclusive of cutting of existing lines, edge preparation, welding/blanking and hook up work.

4.6.5 The following items of work shall be incidental and forming part of piping fabrication and erection and is treated as his vendor's scope of work at no extra cost to BHEL :

(i) Matching of flanges for achieving parallelism and alignment by resorting to heat correction or other suitable methods as per instructions of BHEL engineers. To locate the cause of vibrations in pumps or other auxiliaries and to carry out necessary corrections in piping and its supports. This may involve cutting, fresh edge preparation, welding, radiography, stress relieving, etc of suction, discharge, re-circulation and other connected piping and its supports at a number of places.

(ii) Increase or decrease in length of pipes supplied, including edge preparation, fit up and welding to suit site conditions.

(iii) Minor adjustment like removal of ovality, correction of bends by suitable method as directed by BHEL engineer .

(iv) Fabrication and erection of racks, steel supports, guides, restraints for all the piping including of those of system piping. Steel for this purpose will be supplied by BHEL.

(v) Erection of flow switches, steam traps, filters, flow meters flow nozzles, other metering elements, flow orifices, flow indicators, valves and other instrumentation fittings supplied either by BHEL or their customer and forming part of the system. This may involve cutting of pipe lines, fresh edge preparation and welding with stress relieving.

(vi) **Fabrication / making of bends for pipes and tubes of diameter up to Nb 100mm (4") with Elctro-Hydraulic Pipe bending machine. Making of bends by heating/ filling sand, cold bending is not allowed.**

(vii) Matching of all fittings like tees, bends, flanges, reducers valves, socket fittings, etc with pipes for welding. This may involve weld build up, edge preparation, etc.

(viii) Servicing including revisioning of equipment ,valves and fittings.

(ix) Cleaning of all pipes by wire brushing and blowing by compressed air or by any other suitable method as suggested by BHEL.

(x) Removal of welding slag and burrs by hand files, with brushes and/or flexible grinders.

(xi) Welding of root valves with small length of piping to the pressure, flow and level tapping points on piping or flow nozzles/orifices/metering elements fixed on piping.

(xii) Welding of supports/guides/restraints as per specifications/drawings or as per directives of BHEL Engineer, to pipes using HP welders.

(xiii) Welding of blanks with stress relieving as required on permanent and temporary basis.

(xiv) ACW Pipes in the puddle flange area may be supplied in excess length. To suit fitting of the adjoining pipes/equipment, the vendor has to carry out suitable cutting of pipes, edge preparation, fit up etc and suitable method necessary to weld, bolting etc. within his quoted rate treating it as normal scope of work.

4.6.6 On all steam, oil, instrument, gas, air piping etc. both TIG welding and subsequent arc welding or total TIG welding process is to be adopted as instructed by BHEL engineer. BHEL's decision shall be final and will be binding on the contractor.

4.6.7 Pipes/tubes, which are supplied in random length, may not be in usual standard lengths. Contractor shall cut/join /dress up the pipe pieces to suit the site requirement.

4.6.8 Pipelines of oil, air, steam and water of less than Nb 100 mm will be field routed as per schemes or as per the instructions of BHEL engineer, and will be supplied in random lengths / running lengths. The contractor shall have to lay the piping according to instructions at sites, after carrying out the necessary bending, fabrication, edge preparation, routing etc. In best professional manner and as per instructions. The supports for field routed piping will be fabricated and erected by the contractor as per the requirement of the work. The steel required for the supports will be provided by BHEL free of cost.

4.6.9 Contractor shall use only bolted clamps for achieving alignment of piping. Suitable fixtures are to be prepared for the purpose.

4.6.10 All weld joints including cleat welding/spots on piping shall be ground / filed / dressed on completion of welding and before radiography as per instructions BHEL engineer. .

4.6.11 Contractor shall erect piping by doing pre-assembly on ground if possible at the first instant. The pipe laying shall be carried out from the available terminal point/points or any other area between the terminal points. The erection can be carried out on temporary supports to obtain proper alignment and welding. After fixing the permanent supports, all the temporary supports shall be removed. The alignment, distances and loading of the supports shall be checked and the required spring compression achieved in the case of spring hangers.

4.6.12 Contractor shall carryout edge preparations for welds joints / piping / pressure parts in accordance with BHEL drawings/BHEL standards/BHEL engineer's instruction. Flame cutting of piping and high pressure parts shall be strictly done as per BHEL engineer's instructions and in his presence only.

4.6.13 Certain rerouting of pipelines may come as revision to suit design variation and the vendor has to execute the erection of the pipelines as desired by BHEL as per the latest requirement , revision of Drawings. This is treated as normal scope of work of the vendor at no extra cost to BHEL.

4.6.14 The following jobs are also to be performed on the pipings in the following fashion:

(a) All drains / vents / relief / escapes / safety valve piping to various tanks/ sewage / drain canal / flash box / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by contractor is completely covered in the scope of this tender.

The vent/drain/escape lines are to be terminated to suitable headers with funnel arrangement at different floors and subsequently to be extended to drains outside TG floor at suitable locations as decided by the customer/BHEL. The vendor has to make headers , funnels and other related arrangement as required necessary by BHEL to complete the job. For this necessary pipe and other materials required to carry out such types of jobs, shall be arranged by BHEL at free of cost. This is included in the scope of contractor’s work at no extra work to BHEL.

(b) Normally, all the weld neck valves, fittings etc. will be supplied with edges prepared. However, wherever required, in some cases, contractor will have to prepare edges at no extra cost.

(c) CEP suction line from condenser hotwell to individual CEPs with all suction strainers, valves ,hanger/supports and other items are included in the contractor’s scope of work.

(d) The vendor has to perform inspection and cutting of pipelines, dynamic separator cutting and rewelding as per requirement of BHEL.

4.7 CONDENSER INSTALLATION

4.7.1

The condenser will be despatched in loose parts mainly comprising of bottom plates, dome valves, front and rear water chamber, front and rear water boxes, side walls, hot well, spring elements, support plates, air extraction pipes, baffles, stiffening rods and pipes etc. The condenser is to be assembled at site in position by welding the different parts. After final alignment and levelling of turbine exhaust and condenser, the same has to be welded to the exhaust position of LP exhaust as per the sequential welding procedure. Any hole enlargement/relocation/dressing up of holes in the condenser water box/ other areas are included as regular scope of work without any extra cost to BHEL.

The contractor within his scope of work has to carry out fixing and welding of Steam Throw devices with condenser, RE Joints with piping upto Battery limit both in CW Inlet and Outlet lines, Butterfly valves and associated systems .

Necessary scaffolding materials (with proper safety measures) for carrying out condenser erection, commissioning, erection of all works inside condenser steam space ,condenser water handling arrangements , butterfly valves and to carry out all the works in TG and associated auxiliaries are to be arranged by the contractor within his quoted rate.

4.7.2

Condenser floating and grouting (alongwith supply of all grout materials like Conbextra-GP-2 or equivalent materials as per approval of BHEL and as per drawings/ instructions) is included in contractor's scope of work within his quoted rate.

4.7.3

The contractor shall carry out the condenser neck welding with LP cylinder exhaust hood only after final installation of LP casing. Neck welding shall be subjected to non-destructive testing.

4.7.4

The hydrostatic testing of steam space and hydraulic testing of water space along with the cooling water lines after assembly of water boxes are also included in the scope. The contractor has to arrange Florescence powder to conduct tube leak detection test in steam space within their quoted rate. In case of tubes leakage, the contractor has to supply required brass plugs and the exercise may have to be repeated till successful completion of the activity. The contractor has to arrange U/V lamp (complete set) to conduct this activity within his quoted price.

4.7.5

Prior to hydraulic testing of water side of condenser, interior surfaces of water boxes shall be painted. Painting of all internal and external surfaces including supplying of paints are included in the vendor's scope within his quoted rate. CW piping inside is to be painted by the contractor. The outside portion of the all the equipment ,pipes and fittings, valves, hangers/supports are to be painted as per applicable standard/drawings/BHEL/Customer's instructions by the vendor within the quoted rate.

4.7.6

All water side surfaces of water chambers including tube plate shall be painted and this painting including supply of paints are include in the vendor's scope at no extra cost to BHEL.

4.7.7

Condenser water box handling arrangements erection, testing, commissioning and statutory load testing from appropriate authorities are included in the contractor's scope of work.

Supply of all kinds of finish paints, thinners, primers , preservatives & all arrangements , manpower with necessary resources for execution of painting jobs for the entire area /equipment, systems are included in contractor's scope of work at no extra cost to BHEL.

4.7.8

TG condenser will be connected with Air cooled Condenser and therefore condenser tubes are not required here.

4.8 GENERATOR INSTALLATION

4.8.1 GENERATOR STATOR

The Generator Stator, weighing 292/300 Metric Tonnes (approx.) , will be delivered to site on a 28-axle special wagon /trailer .

Generator Unloading, lifting & placement to TG floor with the help of Strand-Jack" :

Unloading and lifting scope of Generator Stator has been explained in details vide clause no. 4.2.6 above of Special condition of contract under Section-IV of this TCC.

Stator is to be rested on a Temporary Stool (to be fabricated by the contractor) for about 24 hours with a minimum ground clearance of 500 mm at the stator bottom, to facilitate blue matching of the bottom terminal box for final placement. During this time, loading is to be given only on the special insert plates provided on ground alongside of the A-row for Stator Movement. Suitable Temporary Stools with adequate strength & Capacity to bear the load (weight) of Generator Stator are to be fabricated and placed on the insert plates by the vendor including supply of necessary steel as required. Necessary compaction and concreting of the area beside A-row, where stator will be unloaded and kept on stool temporarily, shall be done by the contractor within his quoted rate, duly considering the load of the stator.

. It may be noted by the contractor that during the entire process of Lifting/Shifting and Placement of the Stator over Generator Foundation Deck, all ground Loads are to be transmitted over ground level ONLY through the existing foundation anchor points built by BHEL/Customer available thereof. Thus no Load is permitted over the Powerhouse floor at Ground Level except the points stated and the TG Foundation Deck. Any further Civil Works to accommodate resting/positioning of Structural columns are to be done over these foundations only. However for unloading from Railway Wagon, the concrete portion of Railway Tracks can be used for load bearing over multiple points as per direction of BHEL

The existing foundation footings/anchor bolts available on the TG Deck and Ground level for erection of the temporary structures for installation of the Strand jack system shall be used by the contractor. Any modification on this is not acceptable and the contractor must ensure that the associate engaged by them for this specialised lifting job visits site or the contractor shall collect all details for this purpose before submission of the bid.

Contractor is also required to furnish a confirmatory certification from any of the Design Consultants as mentioned below, regarding the adequacy of Structural Design and Safety provisions of the Temporary Structures that are proposed for use by Contractor, to Handle a

load of at least 292 T/300 T as detailed above. This confirmation should be furnished by the contractor before taking up the preparatory site activities.

This Certification regarding Design adequacy may be obtained from any of the following Engg. Consultants namely, or any National/International Organization of repute duly accredited by Statutory Body/Authorities to this effect.

i) BHEL ii) M/S DCPL iii) M/S FISTENER iv) M/S DESEIN v) M/S TCE vi) M/S EIL vii) M/S MECON viii) M/S M N Dastur & Co. ix) M/S Lloyd's.

All Equipment/T & P/Temporary Supporting Structures/Slings & Consumables etc. as may be required for the job shall be timely Mobilized and Installed/Erected/Aligned/Welded by Contractor at Site, as per tender schedule and later Dismantled/Demobilized from Site within a period of maximum 2 (Two) weeks after completion of the work for each Unit.

For Heavy Duty Slings including that of for handling of Stator, appropriate Test Certificate from Statutory Agencies declaring the sling to be fit for handling the desired load is to be produced by the Bidder prior to use of the same at Site.

The Lifting/Shifting System to be installed at Site is required to be Load tested at 25% overload than the Load it is intended to carry at Site (i.e. 1.25 Times of 316 T) added with the load of slings and other lifting tackles used by Contractor.

Necessary Insurance Coverage for contractor's Staff, Workmen, materials and Equipment is to be obtained by the Contractor (successful bidder of this tender), within quoted/accepted rates.

These insurance covers have to be taken prior to start of his work at the subject project and he shall make available the Policy to BHEL Site in-charge for necessary verification before commencement of work. However, irrespective of such verification/acceptance, the sole responsibility to maintain adequate insurance cover for his workmen, T&P, assets etc. at all times during the period of contract shall lie with the contractor. Regarding the aforesaid insurance cover, the contractor shall directly deal with the Insurance Company for all matters regarding the insurance in his scope.

Insurance coverage for BHEL/customer owned items is not in the scope of contractor (successful bidder of this tender). Insurance covers to be taken by BHEL is stipulated under relevant clauses of Vol.-IB of this specification (G.C.C).

Contractor is required to assume full responsibility of the safety of the crew/staff and to comply with the security/safety conditions of BHEL and Client / statutory regulations as applicable at site. BHEL shall not be responsible for any accident/injury to the Contractor's Crew/Staff at Site.

During handling of the Equipment, utmost care is to be taken by the Contractor with all safety precautions taken to prevent any mishap/accident to happen and to protect the equipment altogether from any possible damages. However, in case of any plausible eventual damage caused to the Generator or any other Power Plant Equipment during the process of Unloading/Lifting/Shifting and Placement, a case is to be lodged to Insurance Co. immediately after occurrence for which all relevant details sought by the Insurance Co. are to be furnished by the Contractor. Under such circumstances, payment due to Contractor may be kept withheld for some time till settlement of the Insurance Case. Moreover, certain deductions may also be effected based on the attribution of responsibility for damages as assigned by the Insurance Co.

Contractor is also required to arrange all required safety precautions/protective equipment for his working personnel.

Contractor is to furnish the necessary Test Certificates for all relevant Lifting Equipment e.g. Strand wires, Lifting Tackles etc.

In case of poor or non-performance of the Contractor in the job, BHEL reserves the right to take away the job in part or full and get it done by other agency at the risk and cost of the Contractor as may be deemed fit.

4.8.2 The design of the stator lifting arrangement including design of the foundations for installation of the temporary structures for strand jack system is included in the scope of work."

4.8.3 Vendor shall co-ordinate with Strand jack arrangement supplier in getting necessary inputs for Civil construction (under scope of BHEL). All arrangements of strand jack including its foundation/sole plate and foundation bolts etc. shall be in vendor's scope.

4.9 DEAERATOR AND OTHER MISCELLENOUS TANKS INSTALLATION ABOVE TG FLOOR .

4.9.1

BHEL crane of suitable capacity will be issued at free of cost to lift the Deaerator and Feed Storage Tank components to the nearest possible floor/elevation. Contractor has to make his own arrangement of cranes for loading at stores and unloading at site. Arrangements necessary for dragging, placement on foundation/proper elevation, alignment & welding of Deaerator & Feed Storage Tank and all other associated components shall be done independently by the contractor. Necessary rails for dragging has to be arranged by the vendor. Approach road may not be conducive, it may require filling of earth on the approach road, consolidation of approach road, laying of sleepers/steel plates etc. as required for easy crane movement . All these activities are included in contractor's scope.

4.9.2

Local approach platform and approach ladders etc. for Deaerator and FST will be part of contractors work. It may be necessary to cut the structural steel and other members supplied in random length/size to required size and profile for this platform. Dressing of platform and painting are included in the contractor's scope.

4.9.3

The Feed Storage Tank shall be despatched to site in three pieces and the shells are to be assembled at site on foundation. Necessary arrangements for assembly ,welding, fitting, NDTs, Pre-heating, Post-Heating, PWHT, Stress-Relieving as applicable as per standard/applicable code/drawings/documents/QPs to carry out assembly and completion are included in contractor's scope.

Hydro-test and other allied tests as applicable as per drawings/QP/applicable codes of the Feed Storage Tank /Deaerator are also included in the vendor's scope within the quoted rate.

4.10.1 HYDROSTATIC TESTING, PRESERVATION AND OTHER TESTS

4.10.1 Contractor shall carry out the following tests required to complete the erection and commissioning ,trial run , PG Test ,handing over activity of the TG Set :

(1) Hydraulic testing of individual equipments like condenser, coolers, heaters, other auxiliaries and equipments. Required capacity Hydraulic test pump/Fill pump and other necessary arrangement shall be provided by contractor to carry out hydraulic testing of the equipments and piping as part of scope of work under this tender specification.

(2) Ultrasonic test

(3) Dye Penetrant test

(4) Magnetic Particle Test.

(5) Radiographic Testing

(6) Any other NDTs as required to carry out above jobs and deemed necessary

All above facilities (men, materials, equipments, consumables etc) with operating engineer/experienced person and proper approach wherever required shall be provided by the contractor for satisfactory completion of the above tests.

Any re-work for restoration of defective joints/components including arrangement for re-NDT have to be arranged by the vendor within his quoted rate at no extra cost. In case, certain NDTs are required to be carried out additionally as per requirement of BHEL on later date , the same has to be carried out by the vendor at no extra cost to BHEL.

4.10.2

Contractor shall lay all necessary temporary piping, install pumps, valves, pressure gauges, electric cables and switches etc, required for the hydro test. After the test is over, all the temporary piping, pumps, etc will be removed. It may also specifically be noted that servicing, erection and dismantling of piping and equipments for conducting hydraulic test will be done by the contractor. No separate payment shall be made for this purpose.

4.10.3

All the above tests shall be repeated till all the equipments, piping and systems satisfy the technical and statutory requirements. All related works form part of the scope.

4.10.4

Suitable welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration/ venting /drain points with valves as per BHEL engineer's instruction, for performing hydro test of piping is within the scope of work**.** Required valves, fasteners, blank flanges, blanks or steel for blank flanges will be provided by BHEL. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL engineers' instruction.

4.10.5

Hydro test of piping may have to be repeated several times to meet technical and statutory requirements before application of insulation.

4.10.6

While conducting hydraulic test of steam lines, water lines, oil lines either individually or grouping a few lines or in portions , blanks/spools may have to be put up at terminal points, strainers, walls, flanges etc. After conducting the tests, the blanks shall be removed and the lines restored. Also interconnecting piping between boiler and turbine, the hydraulic test may have to be done section wise and some –times piping of other agencies may have to be combined. Contractor shall carry out all such incidental work to satisfactorily conduct the hydro test. Wherever work is involved in the terminal points, Contractor shall carryout the same as per instruction of BHEL engineer. The decision of BHEL engineer is final and the same is binding on the contractor.

The contractor shall carry out any other tests as desired by BHEL engineers on erected equipment covered in the scope of this contract during testing and commissioning to

demonstrate the satisfactory completion of any part or whole of work performed by the contractor.

4.11 PRE-COMMISSIONING TESTS, COMMISSIONING AND POST COMMISSIONING

4.11.1 Commissioning scope of the contractor of the TG and auxiliaries shall involve the following tests and activities of the equipments erected :

(a) Thermal Shock for TG and BFP Lub Oil System :-The contractor has to arrange one 10-15 KW Pump motor set in skid with electrical starter for thermal shock of TG lub oil system within the quoted rate. This will include laying of cables/maintenance of the pump motor set. BHEL will issue plate, piping, valves and other materials free of cost for making arrangements for thermal shock in each Unit separately. For this job, laying of steam lines from the existing plant with insulations, Ordinary/DM water pipelines for connections to coolers and all associated jobs are included in contractor's scope.

(b) Trial run and commissioning of feed pumps, CEP, and various rotating machineries / pumps and other equipments under the scope.

(c) Trial run of motors for various auxiliaries. De-couplings/ Re-coupling are to be done as per requirement.

(d) Hydraulic Test of pipelines, closed systems, Tanks and Vessels.

(e) Flushing of all pipelines by air/oil/water/steam as the case may be.

(f) Servicing of all valves /actuators and fittings.

(g) Providing continuous manpower for pre-commissioning, testing, commissioning of electrical items by engaging electrician(at least two numbers) and Supervisor as per the requirement on normal days including OT hours on normal working days/Sundays/Holidays.

(h) Arrangements for preparation and commissioning of TG , BFPs and other equipment Lub oil, control oil, jacking oil system, seal oil system, gas system, vapour system and other systems are included in the contractor's scope. The activities include hydro-test and normalisation also. All materials sent by BHEL Manufacturing Units required to carry out such kind of activities shall be issued at free of cost by BHEL. The contractor has to arrange the pump-motor set with starter etc.

(i) Mechanical seal repair/replacement of pumps.

(j) Manual/mechanical cleaning of miscellaneous vessels, Cleaning of oil filters, PHEs, Oil and other Coolers of Turbine and Aux., BFP oil/water filters, CEP Strainers, other filters of Turbine, Generator and auxiliaries, cleaning of Oil tanks, Condenser (both in steam side and CW side) Deaerator, FST, self-cleaning strainers ,various other tanks erected by the contractor. This may have to be repeated several times during the erection/commissioning process till handing over of the respective Unit (s) to customer. Necessary CAF gaskets and other resources are to be arranged by the contractor which may be required are within his quoted rate. BHEL will arrange only special gaskets.

(k) Steam Blowing, alkali flushing/water flushing, washing, air blowing, Chemical cleaning of piping systems, Deaerator and FST as per requirement. Contractor shall carry out disassembly and reassembly of vulnerable components like deaerator spray nozzles, gauges, instruments etc. as instructed by BHEL during this process.

(l) Generator gas tightness test : - For this, the contractor will arrange commissioning fixtures including supply of Mercury. This exercise has to be repeated till satisfactory completion of this activity.

(m) Generator Voltage Drop Test:- This activity being specialized one vendor has to tie up with some external specialized agency for successful compliance of this activity.

(n) Helium Leak Test of Generator:- This activity being specialized one vendor has to tie up with some external specialized agency for successful compliance of this activity.

(o) Commissioning of PW system.

(p) Commissioning of lub oil, control oil, jacking oil ,PW System ,gas ,vapour system, waste fluids, and other system of Turbine, Generator, Pumps and other auxiliaries.

(q) Commissioning of all other packages under scope of supply.

(r) Putting TG , MDBFPs and TDBFPs on barring gear for respective 660 MW Unit(s).

(s) Lub oil system optimisation & Governing system setting of Turbine, BFPs and commissioning.

(t) Preparation of commissioning documentation , log sheets, multiplication, photocopies , spiral binding of total volumes of protocols/log sheets for at least six sets. Total computerisation is to be done by the contractor.

(u) Carrying out Pre-Commissioning ,Commissioning activities ,Rolling and synchronisation , handing over of the respective 660 MW Unit (s) with all Auxiliaries.

(v) Attending to all defect /punch/stabilisation points for respective Unit (s)

(w) Full load operation for respective Unit (s).

(x) Trial operation for individual equipments and for respective Unit (s) as a whole for 72 hours.

(y) PG Test and submission of total documentation after multiplication and spiral binding for respective Unit (s).

The above activities/tests/trial runs may have to be repeated till satisfactory results are obtained and also to meet the technical and statutory requirements for respective Unit (s).

4.11.2

Contractor shall lay temporary pipelines with fittings and accessories etc. as instructed by BHEL engineer for the purpose of pre-commissioning and commissioning activities like Hydraulic testing, chemical cleaning, oil flushing, steam blowing ,other activities etc. of equipment , piping , system and other equipments as part of the scope of work. Temporary installations shall be dismantled by contractor and returned to BHEL stores as specified elsewhere in this Technical Specifications.

4.11.3

The contractor shall carry out necessary jobs for total commissioning jobs including mechanical , electrical and instrumentation and other jobs to the satisfaction of our ultimate customer .Necessary manpower has to be arranged by the vendor within the quoted rate.

4.11.4

The contractor shall carry out any other test as desired by BHEL engineer on erected equipments covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or parts of work performed by the contractor

4.11.5

In case any malfunctioning and / or defect is found during tests/ trial runs such as loose components, undue noise or vibrations, bearing temperature rise, any kind of leakages or passing etc. strain on connected equipments etc. The contractor shall immediately attend to these defects/malfunctioning and take necessary corrective measures. If any readjustments, realignments, re-erection and re-works are necessary to attend such problems, till handing over of unit to customer , the same shall be done as per BHEL

engineer's instructions, free of cost, treating it as normal scope of work at no extra cost to BHEL for respective Unit (s).

4.11.6

Cleaning of vessels /oil tank/Other equipments by sand blasting or other methods as per instructions of BHEL engineer , before/after oil flushing and other cleaning is responsibility of contractor.

4.11.7

The contractor shall execute necessary jobs for initial and subsequent fillings of gas in generator gas system as and when required for respective Unit (s) , till the respective Unit(s) are/ is handed over to Customer at no extra cost to BHEL.

4.11.8

The contractor shall carry out air tightness test on generator gas cooling system and water flushing of primary water system to the satisfaction of BHEL engineer. Necessary fixtures for Air tightness test and other tests including supplying of Mercury is included in the contractor's scope. This exercise may have to be repeated as per the requirement of BHEL/Customer without any additional cost.

4.11.9

Replacing/changing mechanical/other seals, Bearings inspection /replacements, changing and cleaning of all kinds of filters/strainers, lub oil optimisation of equipment, pumps, Turbine, Generator and other auxiliaries under the scope etc. during commissioning stage is within the scope of work. This exercise may have to be repeated as per the requirement at no extra cost. Similarly necessary assistance for facilitating opening of bearing pedestal covers for turbo-visory inspection and other jobs in connection with opening of Turbine. Generator, Exciter bearing pedestals may have to be repeated till handing over of the set to customer. The contractor has to arrange calibration of turbo-visory instruments within the quoted rate.

4.11.10

During the stages of commissioning, and till respective Unit (s) is /are handed over to Customer, if any part of TG and auxiliaries need repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim if any, for such repair/rectification/rework/ replacement etc. for reasons not attributable to the contractor, will be governed by clauses 13.0 of the specification. The parts to be replaced shall however, be provided by BHEL free of cost.

4.11.11

During this period, though BHEL's and customer's engineers will also be associated in the work, the contractor's responsibility will be to make available resources in his scope till such time the respective commissioned Unit (s)units are taken over by the customer.

4.11.12 In case any malfunctioning and/or defects are found during tests, trial run such as loose component, undue noise or vibration, bearing temperature rise problem,strain on connected equipment, any kind of leakages etc., The contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment, realignment or rework for rectification is necessary, same shall be done as per BHEL engineer's instruction. This is included in the normal scope of work at no extra work.

4.11.13

The pre-commissioning activities will start prior to oil flushing of the TG and various trials, commissioning operations shall continue till the TG and Aux. is handed over to customer. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, chemicals etc. All these works need availability of Contractor's Engineers, Supervisors ,with gangs of Technicians, supporting electricians, Instrument Technicians, Fitters and other category of manpower , in each area to carry out commissioning jobs as per the requirement of BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilisation of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work is to be undertaken round the clock if required including working on Normal days, Sundays, Holidays etc. in respective 660 MW Units.

4.11.14 Contractor shall cut open works/ equipments/ piping/ system if needed as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over, without any extra payment.

Servicing and preservation of valves/ actuators and other requirements right from receipt from BHEL Store till handing over of the for respective Unit (s) of 660 MW Unit including arrangements of lapping pastes and other consumables are included in the vendor's scope.

4.11.15

During pre-commissioning & commissioning time, it shall be the responsibility of contractor to provide minimum following manpower along with Engineers/Supervisors as part of commissioning jobs starting after around 8 months of TG erection and continuing till handing over of the respective sets to the customer for each 660 MW Units.

Manpower module strength(minimum):

1) Commissioning Engineers 2 nos.
2) Supervisor 3 Nos.
2) Pipe fitter/Millwright fitter 2 Nos.
3) welder 2 Nos.
4) Rigger 3 Nos.
5) Electrician/instrument technician 2 Nos. each
6) unskilled worker 8 Nos.

Manpower shown above are tentative based on planned progress requirement. Actual deployment schedule, based on site requirement is to be reviewed and mutually agreed with BHEL site periodically from time to time & form a joint MOM and the same have to be adhered to and no change will be permitted without written approval of BHEL site.

Further requirement will be reviewed time to time at site and contractor will provide additional manpower to match site requirement without any financial implication to BHEL.

Vendor may be permitted to withdraw any of his manpower, if deemed fit by BHEL Site as per site requirement. The same will be jointly agreed and recorded. BHEL decision in this regard will be final and binding on the vendor.

4.11.16

The above figures shows only minimum required, over and above labour required for completing regular and pending erection and commissioning works and clearing of punch lists. Contractor has to provide number of personnel and other resources as per work demand. **However, in case, such required support services are not provided, BHEL may arrange such deputation or deduct any amount appearing reasonable for such support services, with BHEL overhead.**

4.11.17

It shall be specifically noted that above employees of the contractor has to work round the clock along with BHEL commissioning engineers during normal working hours and OT hours including working on normal days, Sundays, holidays. The contractor has to make necessary adjustment accordingly at no extra cost to BHEL.

4.11.18

During commissioning, opening of valves/actuators, changing of gaskets, checking, realigning of rotating and other equipment, cleaning of all kinds of filters/strainers, cleaning of all CEP, MDBFP, Lub Oil, Seal oil, TDBFP strainers, PHEs , filling /topping up of oils, fluids, filling/purging of gases, attending to leakages in piping, tanks, valves etc. and adjustments of erected equipment may arise on regular basis. Valves /actuators / equipments/ systems shall be repaired/serviced/tuned/readjusted and lubricated to the satisfaction of BHEL engineer during the erection and commissioning as per BHEL engineer's instructions. This is treated as normal scope of work of vendor at no extra cost to BHEL.

Arranging manpower, petrol, CTC, rubber hoses of different sizes as per requirement, gaskets and other standard consumables for opening / cleaning of condenser, deaerator / Feed storage Tank, strainers/filters, coolers, drain pits & other items are included in the contractor's scope at no extra cost till handing over of the Units to the Customer .

4.11.19

It is the responsibility of the contractor to provide for necessary resources till the completion of work under these specification, even in case erection, testing and commissioning of the TG and other equipments are delayed due to reasons not attributable to the contractor.

4.12 WELDING AND HEAT TREATMENT

4.12.1

All electrodes and filler wires shall be procured by the Contractor within the included scope of work.

However, electrode/filler wire supplied by BHEL/Manufacturing Unit shall be issued free of cost by BHEL. The contractor has to maintain proper accountability of the electrode/filler wires issued by BHEL.

Required Filler wires for the complete TG integral piping job shall need to be procured by the vendor within their quoted price.

4.12.2

The selection and use of electrodes will be as per the standards and specifications of BHEL. The vendor should take prior approval from BHEL accordingly.

4.12.3

Contractor should purchase the electrodes as per the recommendations of BHEL engineer, welding manual, welding schedule and other relevant documents. The electrodes shall be purchased only from BHEL approved manufacturers.

4.12.4

The purchase of electrodes shall be accompanied by proper test certificates and these certificates should be submitted regularly for the scrutiny of BHEL engineer.

4.12.5

All electrodes shall be stored in a clean dry area. The storage room shall be of permanent nature and damp proof, and the room shall be exclusively meant for storage of welding electrodes and filler wires. Excepting for a vent in the top, it is not preferred to have any other opening like windows or ventilators. The temperature inside the room has to be kept in the range of 8-10^0 c above atmospheric temperature and humidity should be less than 50%. This is to be accomplished by using electric heaters or infra red lamps. The storage room must be provided with hygrometer and thermometer. Temperature and humidity are to be monitored regularly. 15-20 holders, welding cables, connecting cables to equipments and other welding accessories including temporary electrical connection from construction power point to individual equipment like winches, hoisting equipment, welding generators, transformers, heat treatment equipment and other construction equipment shall be arranged by contractor.

4.12.6

All racks and other items used for storage of electrodes shall be of steel and not of wood.

4.12.7

All electrodes soon after purchase shall be offered for inspection to the BHEL engineer. Contractor shall be strictly prohibited from using electrodes not inspected/approved by BHEL engineer.

All related portable baking ovens for storing/maintaining required temp. range for welding electrodes with proper validity certificates of ovens in adequate quantities are to be maintained by the vendor till completion of the work.

4.12.8

All welding consumables shall be issued to the welders only by authorised person who is controlled by contractor's welding engineer. The necessary baking requirements are to be ensured by Contractor's welding engineer.

4.12.9

All welders shall be tested and approved by BHEL engineer/customer before they are actually engaged on work though they may possess the requisite certificate. BHEL reserves the right to reject any welder without assigning any reasons. Statutory requirements like IBR approval for welders are to be complied with before starting of the work. If required, the welders may have to undergo Procedure Qualification test also. The decision of BHEL Engineer will be final in this regard.

4.12.10

All charges for testing of contractor's welders including destructive and non-destructive tests conducted by BHEL at site shall have to be borne by the contractor including supply of test plates for testing of welders. The materials for testing of welders like plates, pipes both for IBR/Non-IBR welders including making fixtures & payment of statutory charges are included in the scope of work at no extra cost.

4.12.11

BHEL engineer is entitled to stop any welder from his work if his work is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by him, which, in the opinion of BHEL engineers, will adversely affect the quality of welding though the welder has earlier passed the tests prescribed. The fact that the welders

have passed the test, does not relieve the contractor from his contractual obligations to check the performance of the welders. Contractor shall submit a monthly performance record of all welders.

4.12.12

All welded joints shall be subject to acceptance by BHEL engineer whose decision will be final and binding.

4.12.13

Pre-heating and stress relieving before and after welding are part of erection work and shall be performed by the contractor in accordance with instructions of BHEL engineer. Contractor has to arrange for the recorders along with accessories and suitable technicians for heat treatment purpose. The temperature recorders and thermocouples shall be duly calibrated. During preheat and stress relieving operations the temperature shall be measured as per the instructions of BHEL engineers by thermocouples and recorded graphs for the heat treatment works carried out shall be the property of BHEL.

4.12.14

For the purpose of stress relieving, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations are as per the standards of BHEL. Thermocouples have to be attached using battery operated portable thermocouple attachment unit and not by manual arc welding. Contractor shall arrange sufficient number of thermocouple attachment units.

4.12.15

Wherever necessary, contractor should provide temperature indicator/temperature recorder as required by BHEL engineer for measuring preheat temperature for welding or for controlling temperature of metal for hot correction etc. Decision of BHEL engineer on method and of checking preheat temperature or controlling temperature for hot correction and welding shall be final and binding on contractor.

4.12.16

Heat treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. The contractor shall make all necessary arrangements including labour required for the same as per directions of BHEL.

4.12.17

Heat treatment requirements shall be as per the Welding Schedules of BHEL /Applicable codes /Other documents etc.

4.12.18

For weld joints of vessels, equipments, heavy structural items like beams, I-sections, if heat treatment is required, the same shall be carried out as part of the work by the vendor within his quoted rate.

4.12.19 Checking effectiveness of stress relieving by hardness tests (either by Poldi Hardness Tester or other approved test methods as per BHEL engineer's instruction) including necessary testing equipments is within the scope of the work/specification of the vendor.

4.12.20

TIG welding process is to be used for all root pass welds in pipes. Subsequent welding after root pass can be carried out by manual metal arc welding with basic coated electrodes. For the pipe of thickness less than 6mm, the entire welding has to be carried out by TIG welding. However, BHEL site engineer will have the option of changing the method adopted. For manual arc welding shall be done as per weaving technique and the width of weaving shall not exceed 1.5 times of the dia of the electrodes.

4.12.21

Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensions and with respect to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage shall depend on piping system as specified by BHEL engineer.

4.12.22

Joint fit up will be a stage for inspection.

4.12.23

All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

4.13 RADIOGRAPHY

4.13.1

Radiographic inspection of welds shall be arranged by the contractor including all consumables like isotope camera, x-ray film, chemicals etc. Scaffolding and approaches for taking radiographs.

The necessary skilled technician and labourers for taking the radiographs shall be provided by the contractor. While taking radiographs, the contractor has to use proper penetrameter/ image quality indicators as instructed by the BHEL engineer. All the processed and accepted films will be the property of BHEL. In this regard, the contractor has to adhere to the safety rules/regulations laid by BARC authorities from time to time. It may please be noted that invariably the radiographic work will be carried after the normal working hours.

4.13.2

Contractor shall note that 100% radiography shall be taken on all high pressure welding till such time the welders' performance is found to be satisfactory. Subsequently, subject to consistency in welder's performance, the percentage of radiography will be based on BHEL's standard practice/IBR/code/drawings requirement. The defects shall be rectified immediately and to the satisfaction of BHEL engineer. The decision of BHEL engineer regarding acceptance/rejection of the joints will be final and binding on the contractor.

4.13.3

Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re-shots submitted for evaluation. Radiographs shall be taken on joints after carrying out repairs. However, if defect persists after first repair, as per radiograph, carrying out repairs and radiography shall be repeated till joint is made acceptable in case, the joint is not repairable, the same shall have to be cut and repaired at contractor's cost. Decision of BHEL engineer in all these matters is final and binding on the contractor.

4.13.4

100% radiography of weld joints of certain piping have to be carried out as per BHEL standards/drawings/specification.

4.13.5

It may also become necessary to adopt inter-layer radiography/MPT/UT depending upon the site/technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. Necessary trained personnel shall be deployed for this purpose.

Conductance of all kinds of NDTs are in contractor's scope including arrangement of support of manpower, consumables and all incidental charges are included as contractor's scope of work.

The contractor shall have the **exclusive equipment facilty for conducting RT/UT/all other NDTs as required to meet site progress** and also facility of examining radiography films.

Delay in deployment of such facility will attract penal recovery @ Rs. 5000/per day for each occasion of default.

4.14 CHEMICAL CLEANING/ACID CLEANING / ALKALI FLUSHING / STEAM BLOWING / OIL FLUSHING / OTHER BLOWING AND OTHER CLEANING ETC.

4.14.1

Contractor shall lay temporary pipelines with fittings and accessories and also erect/commission pumps after servicing as per requirements, tanks and other installations, as a system as instructed by BHEL for the purpose of chemical cleaning, steam blowing, steam washing, steam flushing, water flushing, water washing, oil flushing etc. of piping and other equipments which are within the scope of work and also systems in which equipments and piping erected by contractor form a part of the scope of work.

It shall be specifically noted by the contractor that all pipes for above works shall be supplied in random length and in loose condition. Contractor has to assemble and erect them as per schemes / drawings provided by BHEL. Further, flanges , bend etc. for completing the scheme shall be machined/ fabricated by the contractor at his own cost . However, plates / steel etc. for the same will be provided by BHEL free of charges.

4.14.2

After the chemical cleaning has been successfully completed, dismantling of all temporary installations as instructed by BHEL is within the scope of work under this specification. The dismantled materials shall be dressed and returned to BHEL as stated elsewhere in this tender specs.

4.14.3

Preservation of the cleaned surfaces will be the responsibility of contractor under the guidance of BHEL engineer.

4.14.4

Hydraulic test of temporary piping is to be carried out as per the instructions of BHEL Engineer. Carrying out repairs, if any, is in the scope of work/specification.

4.14.5

For chemical cleaning of the piping system, contractor will have to lay temporary piping to connect the entire system irrespective of whether the equipment/system connected is in the scope of contractor or not. Decision of BHEL Engineer in this regard will be final and binding on the contractor.

4.14.6

During the initial stages of work, trenches for draining water may not be available after alkali flushing or mass flushing for discharging and emptying. Necessary low point drains and temporary piping for this will have to be provided by contractor from materials provided by BHEL treating it as normal scope of work.

4.14.7

Laying effluent discharge line from mixing tank (for acid cleaning or any other chemical cleaning process) as per the instructions of BHEL engineer and dismantling, servicing for preservation and handing over the same to BHEL stores after completion of the job is within the scope of work/specification.

4.14.8

Radiographic examination of weld joints on temporary pipes as required by the Engineer In-charge of BHEL should be carried out as a part of normal scope o work.

4.14.9

Contractor shall also carry out the repairs or attend leaks etc., in the temporary piping and equipments for the above operations / activities while carrying out the above activities / operations.

4.14.10

For chemical cleaning of system which consist of equipment/piping erected by the contractor and also equipment/piping erected by other contractors of BHEL/customer's contractor has to arrange for workers and supervisory staff as required supplementing/complimenting the labour and supervisory staff mobilised by other agencies for chemical cleaning of the portion of equipment erected by them in the system. Decisions on the strength of gangs and supervisory staff for deployment of labour and allocation of work for them at site, by BHEL engineer is final and binding on the contractor.

4.14.11

Contractors quoted rate shall be inclusive of fabrication, cost of consumables, erection, dismantling of temporary piping and servicing of the equipments and valves and handing over to BHEL.

4.14.12

After carrying out chemical cleaning ,acid cleaning/pickling ,hot water flushing, other methods as applicable for control/lubricating and other system(including oil piping, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems as per instructions of BHEL Engineer shall be carried out. Cleaning of oil tank of lubricating oil system of rotating machineries, cooler etc. before and after oil flushing is the responsibility of the contractor.

4.14.13

For full welding of structures, tanks and piping etc., only welding generators shall be used. The use of welding transformers will be subject to the approval of BHEL Engineer.

4.15 ELECTRICAL AND INSTRUMENTATION

4.15.1

Contractor shall mount all flow indicators, centrifugal/speed switches of motors, accumulators, pressure regulators, etc which are received loose and which are to be erected/mounted at site on air lines, water lines, oil lines, steam lines, auxiliaries and firemen floor and other operating floors on boiler/power house and other equipments. These are to be mounted during erection for finalising routing/position etc. They are to be dismantled after completion of erection work and handed over to BHEL for calibration. After calibration, these instruments shall be remounted by the contractor in their respective positions just before commissioning.

4.15.2

Certain instrumentation like, pressure gauges, power cylinders, flow meters, valve actuators, flow indicators, etc are received in assembled condition as integral part of equipments. Contractor shall dismantle such equipment at an appropriate stage under the instruction of BHEL and hand them over to BHEL for calibration and storage. Contractor shall re-erect them in position just before commissioning of the equipment. Commissioning of the actuator is excluded from the scope of work.

4.15.3

Seal welding of Thermowells, plugs before Hydrotest of equipments and piping systems is also within the scope of this work/specification. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld Thermo wells after Hydro test/steam blowing of lines.

4.15.4

Welding of all Thermowells, draft, pressure and temperature instrumentation points, and all other instrumentation points on piping, and auxiliaries is within the scope of this work.

4.15.5

All the HT Motors shall be preserved with space heaters on, and provided with proper cover till the commissioning of the motors.

4.16 GENERAL

4.16.1 During the course of erection, platforms and floor grills are to be cut at certain places to route steam, oil, water and air piping, cable trays, etc or for accommodating erection, rigging etc, the cutting of platforms and grills should be minimum and as approved by BHEL engineer. After completion of work, the platform/grills cut shall be made good neatly as instructed by BHEL engineer, at no extra cost to BHEL.

Approach platforms for access to valves/equipments/systems which are not regular in nature are included in the contractor's scope of work at no extra cost to BHEL. Necessary materials shall be issued at free of cost by BHEL. Some of the Equipments/Electrical panels received will require site painting and this is included in regular scope of work including supplying ,application and arrangement of paints, primers, thinners etc. at no extra cost to BHEL.

Approach platforms for following major areas are to be done by the contractor :

a. Miscellaneous valves & equipment approach platforms
b. Central lub oil room
c. HP LP bypass approach platforms
d. Flash tank supporting platforms
e. Monorails of miscellaneous hoists.
f. Oil Room/TDBFP Oil Tank ,Oil Pump area

The layout/GA drawings for these areas shall be provided by BHEL.The contractor shall engage a detailer agency for preparation of fabrication drawing, cutting plan etc. These drawings shall be approved by BHEL Engineer and the work shall be done accordingly.

4.16.2

Erection and welding of stainless steel pipes, fittings, valves and other items has to be done by the contractor including supply of necessary stainless steel welding electrodes and is within contractor's scope of the work/specification.

4.16.3 No temporary supports should be welded on to the piping. No temporary shed/office with wooden materials are allowed inside the Premises.

4.16.4

Contractor shall carry out preservation painting on all items taken from stores. The preservation painting has to be carried out on material taken from stores and also on material erected wherever the shop painting has given away. Periodical inspection shall be made as per the instructions of BHEL engineer and the portion of items or the complete items needing painting shall be carried out to the satisfaction of BHEL engineer. This facility shall be provided by the contractor till the commissioning and handing over of the equipment to the customer. Preservative and touch up painting on equipments covered under this specification stored at stores/storage yard shall also be carried out by the contractor at no extra cost.

4.16.5

Adjustment of spring hangers for piping shall be done by the contractor during initial erection. After initial commissioning trials, it is possible that the spring hangers have to be adjusted repeatedly till the correct spring compression is achieved. Contractor shall do the same to the satisfaction of BHEL engineer. The marking of cold and hot positions on the hangers shall be done by the contractor. Necessary arrangements for scaffoldings etc. are to be arranged as per the requirement and may have to be repeated upto the satisfaction of BHEL/Customer. This is treated as normal scope of vendor's work without any coat implications.

4.16.6

The contractor shall return to BHEL the excess materials left over after completion of work, materials issued for temporary pipelines for HT, chemical cleaning, oil drums, containers, packing materials, flushing, blowing etc. and materials issued on returnable basis in neatly dressed condition. Necessary grinding, edge cutting (square facing), edge preparation (vee), painting etc. to the condition similar to the one at the time of issue shall be in scope of work.

4.16.7

Floating of TG, Pumps decks spring foundations and readjustment is included in the contractor's scope of work at no extra cost to BHEL. Necessary manpower with required resources are to be arranged by the vendor within the quoted rate. Necessary approach platform is to be provided by the contractor for this purpose

4.16.8 All kinds of NDTs as per documents/drawings/standards are included in contractor's scope of work within his quoted rate at no extra cost to BHEL.

4.16.9 *Preparation and cutting of Insert plates/foundation sleeves/ other embedment items as per requirement which will be required in the area of TG Oil canal, TDBFP and other areas where the vendor will do erection of main equipment* are included in contractor's scope of work within his quoted rate at no extra cost to BHEL*. Steel for this will be provided by BHEL on free of cost basis.*

4.16.10 Thermal Insulation:

For all piping/TG systems and the equipment with surface operating temperature of 60˚C and above, thermal insulation shall be applied for heat conservation and/or personnel protection such that the temperature of protective cladding shall not exceed 60˚C.

Thermal insulation shall also be provided for piping systems where it is expected that occasional rise in fluid temperature during operation exceeds 60˚C.

Upstream of all drain lines and the lines connected to steam traps shall be insulated up to and including isolating valve for heat conservation. Rest of such lines, drain lines and other lines such as safety valve discharges, vents etc. shall be insulated for personnel protection.

4.17 PG TEST (PERFORMANCE GUARANTEE TEST):

4.17.1 Providing services for preparation for performance guarantee test of equipment /systems is in the scope of this contract.

4.17.2 Providing assistance during conductance of performance guarantee test.

4.17.3 The scope in general shall include :

- Installation and welding all tapping points for fixing of sensors / pr-temp. gauges / thermo-couples / RTDs etc. including laying of connecting wires, impulse pipes, valves fittings etc.

- Providing assistance in calibration test of equipment's as may be required.

- Replacement of regular flow nozzles/orifices with PG test flow nozzles/orifices and restoring back regular ones after PG test.

- Normalization after PG test (removal of impulse pipings, instruments, thermowell, datalogger, temporary fixtures etc.).

- Receipt of all test equipment, appliances etc. its safe handling & storage transportation to site & storage at site.

- Manpower assistance for laying of PG Test cables after receiving.

- Dismantling of various PG test instruments/appliances/devices etc. re-placing in their original cases after re-calibration & handling over to BHEL.

- Re-packing of instruments.

- Removal/restoration of insulation/sheeting for PG test

- Complete restoration of all PG test locations after the test

- Attending to passing valves and Cleaning of passing valves.

NOTE : The above tests and guidelines mentioned are only to give a brief idea of the type of work involved at site and does not constitute the total scope of work.

4.18 MISC. HOIST AND CHAIN PULLEY BLOCKS

4.18.1

All the mechanical and electrical hoists and Chain Pulley blocks as supplied by BHEL-PEM under the scope are to be erected, commissioned by the contractor (for respective units). The contractor has to conduct load test certified by accredited agency for statutory

authority certification. The total activity including arranging agency for certification is included in contractor' scope at no extra cost to BHEL.

4.18.3

Servicing and assembly of General and special valves, actuators , control valves/regulating valves, fixing of filter elements/strainers & steam blowing & blanking devices in LP bypass, M.S. Strainer, HRH Strainer & and blanking of LP bypass, ESV & IV System, for hydro test, steam blowing etc is the part of scope of work.

4.18.4

It may be specifically noted that it should not be construed or claimed by the contractor that with the technical specification and "exclusions and/or inclusions" detailed in this tender specification, BHEL has covered the entire scope of work and/or the details thereof to be executed by the contractor.

4.18.5

Complete control fluid system of Turbine Governing system with related items and LP Bypass System is included in this specification. The vendor has to execute all jobs related to erection and commissioning like cleaning of the systems as specified by BHEL Engineers, lube oil /CF flushing, filling and topping up of lube oil etc shall be part of the work.

4.18.6

Assembly and Installation of Strainer Elements of MS and HRH system , BFP,CEP Strainers, Self-cleaning strainers other filters coming erected by the contractor is within the scope of work. Cleaning of these strainer elements till handing over of the respective Unit of 660 MW Set(s) during trial operation of machine is also covered under this scope.

4.18.7

Chipping of foundation, placement, erection, alignment, commissioning, grouting (including supply of all grout materials), mounting of equipment mounted instruments, panels and other fittings of BHEL (PEM bought out items) supplied pumps & packages are in scope of the work. Erection and commissioning of these Equipments/Pumps & Packages will be required to complete to meet the commissioning schedule/ milestone activities of other areas like Boiler, DM water treatment plant, Ash Handling Plant, Service water requirement, fuel oil handling plant etc. Contractor shall plan and complete erection & commissioning of these equipments on priority as per decision of BHEL Engineer/customer requirement.

4.19 WELD FIT-UP AND WELD JOINT PROTECTIVE PAINT, COMPONENT PRESERVATIVE PAINTING, & FINAL PAINTING ETC.

All protective paints for the protection of weld joint fit-ups, application of primers on finished weld joints are in the scope of contractor.

1) Two coats of steam washable paints shall be applied on steam side of LP turbine and condenser components, as advised by BHEL. The steam washable paints, primer and thinner will be arranged by the vendor and, arrangements for surface preparation and paint application like sand/shot-blasting, consumables like surface cleaning agents, paint brush, brush cleanser, labour and necessary tools and plants are in the scope of contractor.

2) All site weld joints falling in steam side shall be painted with two coats of steam washable paint to be arranged by the vendor.

3) The water boxes shall be sandblasted to remove all traces of primer applied at the works. Thereafter two coats of Epoxide priming paint followed by two/three coats of high build black coal tar epoxy (e.g., "Apcodur CP684" of Asian Paints **or equivalent paints from any other BHEL/Customer approved manufacturer with applicable drawings/documents**). Contractor shall submit manufacturer's batch test certificate / test certificate from

BHEL/Customer approved laboratory for the primers and paints. Prior approval of BHEL/Customer for each and every batch of the primer & paints shall be mandatory. In order to achieve a desired minimum paint dry film thickness (DFT) as specified in BHEL drawing/approved by the customer, number of coats may be applied and method of application shall be as recommended by the paint manufacturer. Required paints & primers and other consumables with other resources shall be arranged by Contractor within their quoted rate .

4) All water side surfaces of water chambers shall be thoroughly surface prepared and painted. Required primer & paints and other consumables for condenser water box shall be provided by Contractor within the quoted rate.

5) Preservation of all components/equipments during various stages of erection, commissioning till handing over is in the contractor's scope. All prescribed methods of surface cleaning prior to application of preservative paint shall be followed by the contractor. Contractor has to arrange all primer and paints, and other consumables like wire brush, painting brush required for this work.

6) Final painting:The scope shall include supply and application of Primer, final paints as required and specified for the components of Turbine, Generator, Condenser and auxiliaries, Pumps packages, equipment, systems, pipings etc within the quoted rate. Arrow marking with nomenclature in English/Hindi or in both languages on the erected system are also included in the scope of work. Even painting with bands and arrows with heat resistant paints in high temperature application zones with arrow and nomenclatures are also included in the scope. The contractor has to arrange required thinner, paints (primer as well as finish paints) and all other supporting materials with resources within quoted rates, as normal scope of work. Regarding selection of brands, types of paints and related items, the contractor has to take prior approval of BHEL/Customer. The contractor has to apply painting as per applicable code/ instruction of BHEL/Customer to achieve required thickness. The contractor has to arrange one calibrated "coat-meter" for thickness measuring/ checking.

7) The total activity of painting including arrangements of all materials, manpower and accessories to carry out paintings plus making scaffolding as per requirement is included in the contractor's scope of work. Before arranging all kinds of materials about paints, the contractor has to take prior approval from BHEL/Customer regarding grade/supplier. Valid test certificate also has to be arranged for this purpose by the vendor.

5.0 OBLIGATIONS OF THE CONTRACTOR(TOOLS,TACKLES,CONSUMABLES ETC.)

5.1 DELETED

5.2 TOOLS AND TACKLES, MEASURING AND MONITORING DEVICES:

5.2.1

The contractor shall provide all T&Ps as per Appendix-V(excepting those in BHEL scope as mentioned specifically) required tools and plants, monitoring and measuring devices (MMD) and handling & transportation equipments for the scope of work covered under these specifications.

The contractor has to arrange for regular statutory /fitness certificates arranged for his own T&Ps, MMDs from appropriate/statutory authorities for contractor's own T&Ps, MMDs at regular intervals within their quoted rate.

5.2.2 **I**t may be noted that the list (Appendix-V) is not exhaustive and is only for guidance. The contractor is required to provide all necessary T&P (other than those specified to be provided by BHEL, if any) measuring (calibrated) instruments & handling equipments to maintain work progress for timely completion of total work as per contract. In case of

project requirement, some activities may have to pre-pone. In such cases the contractor have to deploy additional T&P. Quoted rate shall be inclusive of such emerging requirements. However, contractor shall submit deployment plan of all T&P along with tender bid.

5.2.3 In the event of any failure on the part of the contractor to deploy T & P to sustain desired work progress , BHEL may at his discretion also terminate the contract on this ground and take out any or whole amount of the contract from the scope of the contractor. In the event of failure of contractor to deploy necessary and sufficient T&P/ IMTEs to maintain work progress, **BHEL will arrange the same including mobilization, demobilization, hiring charge, fuel charge etc of same from any of BHEL site/ other agency & charges** as applicable **plus 10% at the risk & cost of contractor** shall be deducted from contractor's RA bill. Decision of BHEL in this regard will be final & binding on contractor.

5.2.4 T&P as per Appendix-V are tentative based on planned progress requirement. Actual Mobilisation schedule, based on front availability, drawaings and material availability at site is to reviewed and mutually agreed with BHEL site periodically from time to time & form a joint MOM for moblisiation of major T&Ps, and the same have to be adhered to and no change will be permitted without written approval of BHEL site.

Further requirement will be reviewed time to time at site and contractor will provide additional T&P/ equipments to ensure completion of entire work within schedule time without any financial implication to BHEL. All other T&Ps shall be provided by the contractor without any extra cost to BHEL. Vendor will give advance intimation & certification regarding capacity etc prior to dispatch of heavy equipments.

5.2.5 All T&P and all IMTEs, which are required for successful and timely execution of the work covered within the scope of this tender, shall be arranged and provided by the contractor at his own cost in working condition.

5.2.6 In the event of non mobilsation of any T&P by the successful bidder and as a result progress of work sufferred, BHEL reserves the right to deduct suitable amount from the dues of the bidder, with assigning reasons thereof.

5.2.7 After completion of major quantum of work, vendor may be permitted to take out any of his T&P progressively, if deemed fit by BHEL Site as per balance work program. The same will be jointly agreed and recorded. BHEL decision in this regard will be final and binding on the vendor.

5.2.8

BHEL will provide crane of appropriate capacity at free of cost for lifting the components of FST and Deaerator to the nearest possible elevation/floor. The contractor shall have to make his own handling and lifting arrangements for further dragging and erection of these items up to their final position.

BHEL will also arrange at free of cost high capacity suitable crane as required for loading, shifting of HP Turbine and the weight of this item is in the range of 90 MT. BHEL shall issue crane of suitable higher capacity on free issue basis (free of any charges) for items which can not be handled by their own (contractor's) crane as per relevant annexure.

Contractor shall provide suitable cranes as per their scope of T&Ps (refer Appendix-V) for material handling at BHEL/client's stores/storage yard as well as site of work. However, services on sharing basis of EOT crane, High capacity crane as per availability for the purposes identified in 'Appendix-IV' will be available as and when these T&Ps are spareable / available at the discretion of BHEL. No excuse for non-availability of BHEL's free issue of T&Ps in time, shall be accepted by BHEL for delay in achieving targets. The

vendor has to arrange necessary resources for achieving targets in case BHEL reschedule the allotment of free issue of T&Ps as per availability.

5.2.9

For free issue of cranes by BHEL on sharing basis , Required fuel and consumables for the Crane will be provided by BHEL free of cost. Crane operator (along with helper, if any) will be provided by BHEL on free of cost basis. The day to day and routine maintenance of BHEL equipment will be carried out by BHEL. Replacement /repair of gasket, hoses, oil seals and any other items required will be provided by BHEL

However, the contractor has to carry out necessary boom reduction, extension for their use and restoration to previous state or as directed by BHEL after the use shall be the contractor's responsibility. No payment on whatsoever account for this job shall be entertained by BHEL.

Related Hydra/Crane for shortening /extending booms and other incidental activities are included in the vendor's scope.

5.2.10

TG Hall EOT Cranes (There are two nos. EOT cranes in TG Hall) :

The crane will be operated and maintained by other agency of BHEL.

5.2.10.1

It may be specifically noted that the EOT crane shall be shared by other agencies working within the TG hall as instructed by BHEL.

Distribution of crane amongst agencies working at plant shall be decided by BHEL/Customer and shall be binding on contractor.

5.2.10.2

No electricity charges for EOT cranes operation shall be on vendor's account .It is free of charge .

5.2.11

Contractor has to arrange slings of all sizes for completing the works covered under these specifications except the special slings which will be provided by BHEL free of charges on returnable basis. 660 MW Generator stator lifting sling shall be provided by the contractor for handling the generator stator without any extra cost..

5.2.12

All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification, fitness for use, validity, calibration etc.The contractor has to arrange special tap set for TG Stator foundation bolts. *The special tap set shall be of size M64 X 2 size or bigger size as required.*

5.2.13

Timely deployment of adequate quantity of T & P is the responsibility of the contractor. The contractor shall be prepared to augment the T & Ps at short notice to match the planned programme and to achieve the milestones.

5.2.14

Complete set (in appropriate numbers) of hydraulic jacks of 50 tonnes, 75 tonnes and 100 tonnes capacity (in lowest possible range of heights, so that it can be used in intricate places of turbine, generators etc.) shall be arranged by the contractor for use

during erection and commissioning of Turbine , Generator and other auxiliaries. These jacks shall be of internationally reputed make (like Enerpack, Fag, Lukas etc.), highly reliable and maintained in excellent working condition. They shall be tested for safe working before deploying in actual work. These jacks shall not be permitted for use anywhere other than Steam-Turbine / Generator area. Sufficient spares for these jacks/pumps like "O" rings, gaskets, washers, hydraulic fluids is included in contractor's scope of work.

5.2.15

All jack bolts that are required during erection for carrying out roll-check etc. will have to be arranged by the contractor. No jack bolts will be provided by BHEL.

5.2.16

Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.

5.2.17

In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make the alternative arrangement at the risk and cost of the contractor.

Necessary scaffolding materials of steel pipes and pipe clamps, planks, G.I. Sheets and other related materials for working at height/inside enclosed space are to be arranged by the contractor within the quoted rate. Total scaffolding materials for platform etc. are to be provided by the contractor within the quoted rate.

Only ISMB 400 or above, if required shall be provided by BHEL at free of cost /charge on returnable basis for making temporary platform for assembly /pre-fabrication of condenser work depending on availability. However the contractor has to make alternative arrangements in case the same can not be arranged by BHEL and this should not be projected as reason for delay for carrying out activities.

5.2.18

The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. Contractor shall obtain prior approval of BHEL for all the T&P before deploying in actual work. The movement of cranes, and other equipment should be such that no damage / breakage occurs to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility.

5.2.19

Normally, use of welding generators only is permitted for welding. The use of welding transformers will be subject to prior approval of BHEL.

5.2.20

The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of Measuring & Monitoring Devices (MMD). Test / Calibration certificates shall be furnished to BHEL. MMD shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL. All calibration shall be traceable to national or international standards.

5.3 CONSUMABLES

5.3.1

The contractor shall provide all consumables required for carrying out the work covered under these specifications excepting those which are specifically indicated as BHEL scope.

TG Special Consumables like Hylomar, Golden Hermetite, Stag-B, Molykote, Anabond compounds, Locktite, Rubber fixing compounds/rubber hoses, petrol, CTC etc. will have to be arranged by the contractor within the quoted rate.

Erection, commissioning jobs should not suffer due to non-availability of these types of consumables. Failure to arrange the same in time may call for BHEL's intervention and BHEL shall arrange the same at contractor's risk and cost with BHEL's standard overhead charges.

5.3.2

All consumables/special materials/cements/paints etc. arranged by the contractor to be used for the work shall have prior approval of BHEL engineer with regard to brand and quality specifications. Test reports / certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL engineer.

5.3.3 PRIMERS & PAINTS

The vendor will provide paint & primer for finish paintings of total area of applications like Turbine, Generator, Condenser, BFPs, CEPs, all types of laid pipes, Fire Fighting Equipments and other auxiliaries including arranging all associated arrangements like spray guns, brushes, nozzles etc. within quoted rate. Painting is to be done as per BHEL/customer's instruction/applicable code/drawings/ documents. Required thickness is to be achieved as per customer's requirement. Painting thickness measuring instruments is to be arranged by the contractor within quoted rate. The paint shall be sourced from BHEL/Customer approved manufacturers/suppliers.

5.4 WELDING ELECTRODES, FILLER WIRES FOR TIG WELDING AND GASES

5.4.1

All welding consumables including electrodes/SS Electrodes/filler wires is in the contractors scope.

Any TIG/Filler wire supplied by BHEL Manufacturing Unit for use in TG area, shall be issued free of cost by BHEL.

5.4.2

All the required welding electrodes as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL , before procurement, regarding manufacturer, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry etc. Batch test certificates shall be made available for verification & record before the actual use of the welding consumables.

BHEL reserves the right to reject the use of any electrodes, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf life expiry, unapproved type / brand etc.

5.4.3

The contractor shall provide all consumables required for carrying out the work covered under this scope of work including TIG/Filler wires for welding of piping joints.

5.4.4

All the required gases like Argon, Oxygen, Acetylene etc including required high purity Nitrogen gas (for purging of Generator stator water system) shall be arranged by the contractor at his cost.

5.5 FIELD OFFICE

5.5.1

The contractor shall make his own arrangements for field office and stores for accommodating necessary equipments, tools room for execution of the work. Only open space will be provided by BHEL / customer, free of charges within the project premises as per the availability of space.

Wooden structure of sheds/office inside the premises is not allowed.

5.5.2

On completion of work, all the temporary buildings, structures, pipelines, cables, etc shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the same will be arranged to be removed and expenditure thereof will be recovered from the contractor. The decision of BHEL engineer in this regard shall be final. However, the scope of dismantling and leveling the area is limited only to the contractor's site office, yard and other spaces occupied by the contractor.

5.5.3

The contractor may note that all operations in their scope which have interfaces with BHEL systems will have to be done only through this computerized system. The vendor has to make all arrangements for connectivity, computing equipment, personnel, software, etc. To operate and interact with BHEL system. No manual systems other than what is not covered by computerized system will be acceptable at site. The successful bidder will have to establish computerized project management system and the install adequate nos. of latest computer facility for his own usage at site.

Additionally, The bidder will have to install 1 nos PCs (multimedia PC work station Pentium- core-2 Duo, 1 GHZ or above, 120 GB HDD, 2 GB RAM, 100/1000 MBPS LAN card) of HCL/ COMPAQ/ ZENITH or equivalent make with window 7 or XP (professional) O/S and required software like MS Office 2007 Professional, AutoCAD 2009 or higher, PageMaker (7.0 etc), ADOBE PDF CREATOR with one no laser jet printer compatible for A3 size printing (ink/ cartridge for which to be supplied as and when required), one no laser jet printer compatible for A4 size printing (ink/ cartridge for which to be supplied as and when required) with power backup at places, as per instruction of BHEL for exclusive use of BHEL. These computers/ printers shall remain contractor's property and they will be allowed to take out the same after completion of original contract period. The contractor shall provide data / information etc in prescribed formats for periodical updating of the progress reports, material management reports, updating of network pertaining to the contractor's scope of work etc.

The contractor shall also provide two nos computer operators and two number service staff for miscellaneous services for BHEL's use at site/ Kolkata for reconciliation, progress review & day-to-day planning purpose, documentation etc. These facilities are to be provided within 30 days from LOI date till completion of scheduled contract period. If contractor fails to provide computer/ printer or personnel as per requirement, for a continuous period of fifteen days or more, BHEL shall have the right to deduct the amount as per following rates on prorate basis, from contractor's RA bill or any other dues.

(i) @ Rs 15,000/- (Fifteen thousand)/ month for each computer operator. Or at actuals (rate +30%) if BHEL arranges this facility, whichever is lower.

(ii) @ Rs 12,000/- (Twelve thousand) / month for each service staff. Or at actuals (rate +30%) if BHEL arranges this facility, whichever is lower.

At actual / market rate for equivalent computer & Printer set up as above (+30%).

In the event of the contract period getting extended beyond the stipulated time for reasons not attributable to you, you will be reimbursed at the above mentioned rate or (actual +15%), whichever is lower, if the services of operator are being used by BHEL.

The contractor's site office must have facilities of communications like Fax, E-mail, and telephone with STD facility within a month from LOI.

5.6 AREA LIGHTING

5.6.1 Contractor shall arrange adequate floodlights, hand lamps and area lighting. Contractor shall use his own materials like cables, fuses, switch boards etc.

5.7 CONSTRUCTION POWER, WATER & LAND

5.7.1 FIELD/ SITE OFFICE

5.7.1.1 The contractor shall make his own arrangements for field office and stores for accommodating necessary equipments, tools room for execution of the work. Only open space will be provided by BHEL / customer, free of charges within the project premises as per the availability of space.

In addition to his site office, the contractor shall arrange a temporary store near the site of erection for temporary storage of small materials like fasteners, gaskets, valve and fittings and other instruments. The necessary structural steel, sheeting, racks etc. for this work shall be arranged by the contractor at his cost.

5.7.1.2 On completion of work, all the temporary buildings, structures, pipelines, cables etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. If contractor is failed to do so, BHEL will get the job done through other agency and the cost will be recovered from the contractor. The decision of BHEL Engineer in this regard shall be final. However, the scope of dismantling and leveling the area is limited only to the contractor's site office, yard and other spaces occupied by the contractor.

5.7.2 LAND FOR SITE OFFICE AND ACCOMODATION OF LABOUR & STAFF

5.7.2.1 The contractor has to plan and use the existing land inside the Project Premise considering the use of land by other Civil /mechanical/ electrical contractors and the storage of plant machineries and materials. The existing land shall be shared by all erections agencies. Land will be allocated with certain time frame and to the extent available/ considered necessary, and will be reviewed by BHEL depending upon the area availability.

5.7.2.2 Land for labour colony near Project Premise may be available free of cost from owner , the contractor shall construct labour colony/ hutment as per his requirements after obtaining approval of formalities from statutory body.

5.7.2.3 The contractor will be responsible for handing back all lands, as handed over to him by BHEL/NTPC.

5.7.2.4 Land within plant premises for fabrication, batching plant, office, storage area etc. for construction purpose shall be provided as per availability free of cost.

5.7.2.5 The contractor shall make his own arrangements for Site /field office and stores for accommodating necessary equipments, tools room for execution of the work. Only open space will be provided by BHEL / customer, free of charges within the project premises as per the availability of space.

5.7.2.6 On completion of work, all the temporary buildings, structures, pipelines, cables, etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so , the same will be arranged to be removed and expenditure thereof will be recovered from the contractor. The decision of BHEL engineer in this regard shall be final. However, the scope of dismantling and leveling the area is limited only to the contractor's site office, yard and other spaces occupied by the contractor.

5.7.4 WATER

5.7.4.1 BHEL will provide construction as well as drinking water at one point, within 500 m from given work premises, free of cost to the contractor.

5.7.4.2. Further necessary network for construction & drinking water system shall be done by the bidder at his own cost.

5.7.4.3 Contractor should arrange on their own, drinking water in their labour colony .

5.7.4.4 BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and the contractor shall claim no compensation for delay in work for such interruption. Contractor may make standby arrangement for water for which no separate payment shall be made by BHEL.

5.7.4.5 Contractor will have to arrange for storage of water to meet the day-to-day requirement.

5.7.4.6 The availability of water (construction as well as drinking) in North Karanpura project may be limited. Contractor shall ensure that no water is wasted. In this regard the contractor shall take all necessary measure towards preservation of water.

5.7.5 ELECTRICITY

5.7.5.1 CONSTRUCTION POWER & GENERAL ILLUMINATION NETWORK:-

BHEL Shall Provide Construction Power free of charge at 415V level at desired point (within 500 M from his workplace).

General illumination system shall be provided by BHEL. However, provision of suitable temporary lights at different working areas for execution of the work & safety of workmen shall be provided by the vendor for his specific individual working area, within the quoted rate. The illumination should be such that minimum illumination requirement as specified by Indian standards for general illumination is maintained

GENERAL:-

If any other voltage level (other than normally available) is required, the same shall be arranged by the contractor from power supply as above. Contractor will have to provide at his own cost necessary calibrated energy meters (tamper proof, suitably housed in a weather proof box with lock & key arrangement) at point of power supply along with calibration certificate from authorized / accredited agency for working out the power consumption. In case of recalibration required for any reason the necessary charges including replacement by calibrated meters is to be borne by the contractor. Supply of electricity shall be governed by Indian Electricity Act and Installation Rules

and other Rules and Regulation as applicable. The contractor shall ensure usage of electricity in an efficient manner and the same may be audited by BHEL time to time. In case of any major deviation from normally accepted norms is observed, BHEL will reserve the right to impose penalty as deemed fit for such cases.

5.7.5.2 The bidder shall have to provide earth leakage circuit breaker at each point wherever human operated electrical drives/ T&Ps are deployed.

5.7.5.3 The power supply will be from the available grid. BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of power supply/ variation in voltage level and no compensation for delay in work can be claimed by the contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds.

5.7.5.4 Bidder will have to arrange sufficient illumination at their own work areas.

5.7.5.5 The contractor should ensure that the work in critical areas is not held up in the event of power breakdown. In the event of breakdown in the electric supply, if the progress of work is hampered, it will be the responsibility of the contractor to step up the progress of work after restoration of electric supply so that overall progress of work is not affected.

5.7.5.6 The contractor shall have to make arrangement at their own cost for illumination that will be required in the individual working area for execution of the work & safety of workmen.

5.7.5.7 The contractor shall have to make arrangement at their own cost for illumination etc in labor colony. However there may be provision of Chargeable Power, subject to availability of source from customer near labor colony for which contractor has to install meters and necessary accessories. The same, if available from customer will be charged on back to back basis as levied by the customer as per applicable standard rate during execution.

5.8 RESPONSIBILITIES WITH REGARD TO LABOUR EMPLOYMENT ETC.

5.8.1 The contractor has to follow relevant clauses of General Conditions of Contract in this regard .

5.8.2 Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.

Exclusive planning engineer/supervisor ,QA and Safety Engineer/officer are to be arranged by the contractor within the quoted rate.

5.8.3

BHEL / customer may insist for witnessing the regular payment to the labour. They may also like to verify the relevant records for compliance with statutory requirements. Contractor shall enable such facilities to BHEL / customer.

5.8.4

It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc for entering the project premises. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer / BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours.

Arranging all erection/commissioning fixtures including required materials and fabrications etc. are included in the contractor's scope of work.

5.8.5 FIRST-AID

Round the clock experienced paramedical personnel with first aid facility & one ambulance including driver, fuel etc. at site is arranged by the agency of BHEL at his cost.

However, the above facilities will be shared by various other BHEL-agencies working at site on chargeable basis (actual cost distributed among the BHEL E&C/BOP vendors present at site on pro rate basis). The subject facility will have to be strengthened as per the requirement during peak work progress at site.

No medical facility within / near the site shall be provided by BHEL.

5.8.6 Contractor shall provide at different elevation suitable arrangement for urinal and drinking water facility with necessary plumbing & disposal, regular cleaning, upkeepment arrangements including construction of septic tank. These installations shall be maintained in hygienic condition at all times. Contractor's quoted rate should be inclusive of this aspect.

5.8.7

If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability/shortfall in provision of resources from the contractor's side BHEL will make suitable alternate arrangements at the risk and cost of contractor in case of slippage from the vendor's end. The expenditure incurred with overheads thereby shall be recovered from the contractor.

5.9 TAXES, DUTIES ETC

5.9.1 TDS under Income Tax shall be deducted at prevailing rates on gross invoice value from the running bills unless exemption certificate from the appropriate authority/ authorities is furnished.

5.9.2 **All taxes excluding Service Tax (including Swachh Bharat Cess & Krishi Kalyan Cess) & BOCW Cess (dealt separately in Tender) but including, Charges, Royalties, Duties, Octroi, Entry Tax, any other Cess, any State or Central Levy and other Taxes for materials obtained for the work and for the execution of the contract shall be borne by you and shall not be payable extra.**

Any increase of the same at any stage during execution including extension of the contract shall have to be borne by the contractor. Quoted/ accepted rates/ price shall be inclusive of all such requirements after taking the Input Credit, if any, as per provisions of the State VAT Act.

5.9.3 Way Bill: No way Bill will be provided by BHEL for bringing materials from outside State to Jharkhand State.

The Bidder has to make their own arrangement at their cost for completing the formalities, if required, with State VAT Act Authorities, for bringing their materials, plants & machinery at site for execution of the works under this contract, Road Permit / Way Bill, if required, shall be arranged by the contractor and BHEL will not supply any Road Permit / Way Bill for this purpose. The contractor must be a Registered Dealer with the Sate VAT Act, if not registered yet and a copy of the said Registration Certificate along with TIN number must be provided to site RAO/ BHEL.

5.9.4 SERVICE TAX

5.9.4.1 Service tax along with a Swachh Bharat Cess and Krishi Kalyan Cess as legally leviable & payable by the Contractor , Vide Sec-65B (44) ,shall be paid by BHEL on contractors gross bill and production of GAR-7 Challan.

5.9.4.2 The Bidder shall issue invoice complying with **Rule 4A of the Service Tax Rules 1994**. The invoice shall indicate the name, address and the registration number (PAN Based STC No.) of the Bidder; the name and address and the registration number(_AAACB4146PST005) of BHEL; the description and value of taxable service provided; and the service tax payable thereon by the Bidder

5.9.4.3 You shall furnish proof of Service Tax registration (**ST-2**) with Central Excise Division covering the Services . Registration should also bear endorsement for the premises from where the billing shall be done by you on BHEL for this Project.

5.9.4.4 BHEL will not be held to be responsible for non-compliance of various Service Tax Rules, being framed from time to time

5.9.4.5 Point of Taxation Rule, 2011 has come into operation from 01-04-2011. As per the rule Invoice must be generated within 30 days from the date of completion of service. In such case, the date of invoice will be the relevant date. However, if the invoice is not generated within 30 days as stated above, the date of completion of service shall be the relevant date.

5.9.4.6 With introduction of Cenvat Credit Rules, 2004 which came into force wef 10-09-04, 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 successful bidder may take into account the benefit of above provisions, as the cost of input to the successful bidder will be net of Excise Duty and Service Tax and adjust their offer price accordingly to make it more competitive.

5.9.4.7 Vendors must take adequate care and cautions w.r.t “Point of Taxation Rule,2012” as otherwise both the Vendors (for non-compliance) and BHEL (unable to take Credit on Input Services, resulting in extra fund flow in that particular month) will suffer.

5.9.5 Any New taxes & duties, if imposed subsequent to due date of offer submission as per NIT & TCN, by statutory authority during contract period (including extension, if the same is not attributable to you), shall be reimbursed by BHEL on production of relevant supporting document to the satisfaction of BHEL. However, you shall obtain prior approval from BHEL before depositing new taxes and duties.

Benefits and/or abolition of all existing taxes must be passed on to BHEL against new Taxes, if any, proposed to be introduced at a later date.

5.10 SUBMISSION OF PERIODICAL REPORTS

Contractor shall submit periodical reports in respect of following aspects of operation:

1) Consumption of consumables like welding electrodes, gases and paints
2) Consumption of construction power
3) Re-conciliation of issued materials and it should be regularly updated.
4) Availability and utilization of BHEL’s Tools & Plants
5) Availability and utilization of contractor’s Tools & Plants
6) Daily manpower and progress reports
7) Daily ,weekly, monthly progress reports/reviews of activities & incidents
8) Calibration reports
9) Records of wages payment
10) Any other report/record as may be specified by BHEL/client.

11) Progress photographs on monthly basis for at least 20 activities/events/visits of dignitaries both in the form of still photography/digital (5 sets each). 3 sets of video cassettes (minimum 3 sets or more as per BHEL'S requirement) after 3 months interval covering all important activities are also to be submitted to BHEL after proper editing.

This is included in the contractor's scope of work at no extra cost to BHEL.

Non-submission of regular reports and photography/video photography will call for recovery by BHEL from contractor's RA Bills etc. and shall be @ Rs.5,000/- for each activity and for each incidence.

6.0 CONTRACTOR'S OBLIGATION IN REGARD TO EMPLOYMENT OF SUPERVISORY STAFF AND WORKMEN

6.1 **T**he contractor shall deploy all the skilled workmen like Mill Wright fitters, welders, gas cutters, riggers, Sarangs, electricians etc. in addition to other skilled, semiskilled and unskilled workmen, required for all the works of handling and transporting from site storage to erection site, erection, testing and commissioning as contemplated under this specification. Only fully trained and competent men with previous experience on the job shall be employed. They shall have valid certificates wherever necessary. BHEL reserves the right to decide on the suitability of the workers and other personnel to be deployed by the contractor. BHEL reserves the right to insist on removal of any employee/ workmen of the contractor at any time, if they find him unsuitable and the contractor shall forthwith remove him. The main fitters should have experience of working in 660 MW/500MW Steam Turbine, Generator, Condenser and their Auxiliaries .The vendor has to submit the list of main fitters and other critical workers beforehand before start of work to BHEL for approval. BHEL reserves the right to accept or reject the an individual or group of fitters and other category of manpower. The vendor has to arrange suitable category of manpower as per requirement of BHEL.

6.2 The supervisory staffs, including qualified Engineers, deployed by the contractor shall ensure proper out-turn of work and discipline on the part of the labour put on the job by the contractor, and in general see that the works are carried out in a safe and proper manner and in coordination with other labour and staff deployed directly by BHEL or other contractor of BHEL or BHEL's client / other agency.

6.3 The contractor's has to arrange his supervisory staff for execution of the work in the most professional manner in the stipulated time. The vendor has to submit list of the manpower for Construction Manager, Engineers, direct supervisory staff, name of skilled fitters etc. for approval of BHEL in advance before start of work. The vendor has to forward list of manpower for approval of BHEL. In case BHEL is not satisfied with the experience of the manpower , the vendor has to arrange required manpower with required experience. Similarly, in case of non-performance of the manpower in any category of manpower on a later date shall call for replacement of suitable individuals with required experience subject to approval of BHEL. The vendor shall ensure accuracy of work and aesthetic finish, which are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.

6.4 The contractor's supervisory staff shall execute the work in the most substantial and workmen like manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract .

6.5 The contractor shall deploy necessary number of qualified and approved full time electricians at his cost to maintain his temporary electrical installation till the completion of work.

6.5.1 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.

6.6 During the course of erection, if the progress is found unsatisfactory, or if the target dates fixed from time to time for every mile stones are to be advanced or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians etc deployed are not sufficient, BHEL after giving reasonable opportunity to the contractor, will induct on the work the required workmen in addition to contractor's workmen to improve the progress and recover from the contractor's bills, any charges incurred for engaging the additional workmen with overheads. BHEL's decision in this regard will be final and binding to the contractor.

6.7 If the contractor or his workmen or employees shall break, deface injure or destroy any part of a building, road-curb, fence, enclosure, water pipes, cables drains, electric or telephone posts or wire, trees or any other property or any part of erected components etc. the contractor shall make the same good at his own expense or in default BHEL may cause the same to be made good by other workmen or by other means and deduct the expenses (of which BHEL's decision is final) from any money due to the contractor.

6.8 The month-wise Manpower deployment plan to be submitted 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. Separate persons shall be identified at site for ‘quality control’ and ‘safety’ by the contractor.

6.9 After the start of commercial operation of machine, commissioning activities will continue. It shall be the responsibility of the contractor to provide following manpower along with supervisor as part of commissioning assistance for respective units till handing over of the respective 660 MW Unit(s) to the customer.

1) Supervisor	-	2 Nos.
2) Pipe fitter/ Mill wright fitter	-	2 No.
3) Welder	-	1 No.
4) Rigger	-	1 No.
5) Electrician	-	1 No.
6) Unskilled worker	-	2 Nos.
7) Gas cutter	-	1 No.

Above workmen may have to work for extended period or round the clock/ holidays/ Sunday /bandh.

2 nos. Supervisor per shift will be required for operation during Trial Run Operation till commercial generation of the Unit. This minimum manpower is excluding normal scope of erection, pre-commissioning, commissioning etc.

Manpower shown above are tentative based on planned progress requirement. Actual deployment schedule, based on site requirement is to be reviewed and mutually agreed with BHEL site periodically from time to time & form a joint MOM and the same have to be adhered to and no change will be permitted without written approval of BHEL site.

Further requirement will be reviewed time to time at site and contractor will provide additional manpower to match site requirement without any financial implication to BHEL.

Vendor may be permitted to withdraw any of his manpower, if deemed fit by BHEL Site as per site requirement. The same will be jointly agreed and recorded. BHEL decision in this regard will be final and binding on the vendor.

6.11 SITE ORGANISATION

The contractor shall provide adequate staffing in the following areas in addition to the staffing requirements of execution as instructed/informed by BHEL:

- Overall Planning, Monitoring & Control – 1 no. exclusive qualified planning engineer who shall submit monthly /weekly programs and attend any progress related meetings. He shall also be responsible for submitting monthly progress report / photographs/material / other input constraints etc. on regular basis.

  1 no. photographer or fixed hired photographer on routine basis.

- Quality Control and Quality Assurance –at least 1 qualified quality engineer,
  - 1 no. qualified supervisors & steward for each 50 workers,
  - 1 no. quality supervisor to fill up all the log sheets as per FQP and other quality related documents
- Materials Management- 3 nos. Supervisors for issuance of materials/collection/locating in the store/transportation etc
- Safety, Fire & Security- 1 qualified safety engineer
- Welding etc – 2 nos. qualified NDT Supervisors (Level-II)
- Full time Electrician – 2 nos.
- 4 persons dedicated specifically for House-keeping (normal working hour + 2 hours OT everyday).
- Industrial Relations and fulfilment of Labour Laws and other statutory obligations.

Manpower shown above are tentative based on planned progress requirement. Actual deployment schedule, based on site requirement is to be reviewed and mutually agreed with BHEL site periodically from time to time & form a joint MOM and the same have to be adhered to and no change will be permitted without written approval of BHEL site.

Further requirement will be reviewed time to time at site and contractor will provide additional manpower to match site requirement without any financial implication to BHEL.

Vendor may be permitted to withdraw any of his manpower, if deemed fit by BHEL Site as per site requirement. The same will be jointly agreed and recorded. BHEL decision in this regard will be final and binding on the vendor.

6.12 ERECTION SCHEDULE

The Contractor should also submit Net-work programs for the erection and commissioning of various items. These networks shall show the Owner/BHEL hold points(CHP) which have to be cleared by Owner/BHEL or their authorised representative(s) before further erection/ commissioning can take place. These programs for the erection and commissioning would clearly identify responsibilities of the Contractor and Owner/ BHEL. Total **Networks for** Erection ,commissioning works till handing over activities **shall be submitted to BHEL by the contractor within 2 weeks of the date of award of work / placement of LOI. This has to be submitted by the vendor in joint consultation with BHEL for reviewing and approval of BHEL. Continuous upgradation and updating has to be done by the vendor and submitted at regular intervals. The intervals are to be decided by BHEL.**

6.13 CONSTRUCTION MANAGEMENT

6.13.1 Based on the PERT Network program, within two (2) weeks of the award of the Contract, the Contractor shall submit a program detailing micro-break up of construction / erection / commissioning, for the implementation. These program would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detailed monitoring, The three monthly rolling program with the first month's program being tentative based on the site conditions would be prepared based on these programs. The Contractor shall also be involved along with the Owner/BHEL to tie up detailed resource mobilisation plan over the period of time of the contract matching with the performance targets.

6.13.2 The program would be jointly finalised by the site in-charge of the contractor with BHEL/owner's project coordinator as well as the site planning representative. The erection program with also identify the sequential erectable tonnages.

7.0 PROJECT PROGRESS REVIEW MEETINGS

Periodic progress reviews on the entire activities of execution in respect of supply & works in scope of bidder will be held once in a month at Calcutta/site. These meetings will be attended by reasonably higher officials of the Contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. Actions will be placed on the concerned agencies and decisions will be taken to expedite/speed up the progress. Minutes of such meetings will be issued reflecting the major discussions and decisions taken and circulated to all concerned for reference and action. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.

In addition to the above and to streamline the construction and erection at site a suitable frequency and forum of periodic meetings between the contractor and the Owner/BHEL will be decided upon as part of erection coordination procedure.

8.0 OBLIGATIONS OF BHEL

8.1 TEST MATERIALS (PLATES & PIPES)

BHEL will not provide any suitable plates and pipes for site test of welders including IBR welders before their deployment and all destructive and non-destructive examinations of test blanks / pieces and the same shall be in the scope of contractor. Responsibilities with

regard to deployment of IBR welders and meeting the stipulations shall be the responsibility of contractor within their quoted rate.

8.2 FILLER WIRE FOR TIG WELDING

All filler wires (except special filler supplied by BHEL/Manufacturing Units as free issue) shall be arranged by the contractor within the quoted rate at no extra cost to BHEL.

8.3 EQUIPMENTS – TOOLS & PLANTS

BHEL will make available only those T&P's that are listed in Appendix-IV, free of charge. Other required T&P's shall be arranged by the contractor. Further details are as under:

8.3.1

BHEL will make available on shareable basis, free of hire charges, services of equipments & T&P indicated in Appendix-IV. As most of the equipments will be in the custody of BHEL and have to be shared among other contractors, the requirements shall be indicated to BHEL sufficiently in advance and finalise allotment of the same. It may be noted that the contractor has to deploy all necessary tools & plants to suit the activity schedules given by BHEL/ Customer. T&P being supplied by BHEL are only to supplement the resources deployed by the contractor.

8.3.2

EOT crane will be provided free of charge for activities of handling & erection within TG Hall. No electricity charges shall be debited to the contractor for operation of TG Hall EOT Crane(s)

EOT crane in TG hall will be issued on need basis and is to be shared with other contractors.

Use/distribution amongst various agencies, of EOT crane, shall be decided by BHEL & binding on contractor.

In case of non-availability of EOT Crane due to either engagement for other agencies work or due to breakdown , the vendor has to suitably re-schedule his activities for achieving required targets. Non-availability of EOT Crane can not be accepted by BHEL as reasons for not achieving targets. No payment on whatsoever reasons for the purpose of EOT crane shall be entertained by BHEL.

In case of other hoists/EOT Cranes operation in the areas of vendor's Erection/Commissioning purview, the vendor has to arrange suitable operator(s) within the quoted rate at no extra cost to BHEL for execution of jobs under their scope of work.

8.3.3

All arrangements, including providing & laying of sleeper beds/still plates etc., backfilling of approaches wherever necessary for safe movement of the cranes/other vehicles/ consignment, as directed by BHEL shall be the responsibility of the contractor. Sleepers for this purpose shall be provided by the contractor. Steel plates , if required shall be issued on free of cost basis. The contractor has to arrange loading, transportation, making approach road for transportation of steel plates, unloading of steel plates and returning to BHEL Store/designated place with reloading, re-transportation , unloading once again within his quoted rate. At no point, work shall be delayed because of bad condition of roads etc.

8.4 OTHER T&Ps

8.4.1

The responsibilities of contractor defined above for BHEL cranes shall also be applicable, mutates-mutandis, in respect of other tool & plants provided by BHEL.

8.4.2

Special tools which are supplied by BHEL as part of maintenance tools to be handed over to customer under regular Packages / DU / DESS Numbers in various product groups may be issued to the contractor free of charges for specific activities only, at the discretion of BHEL. Contractor shall return them in good working condition after the completion of the specific activity for which the tools were spared.

8.4.3

All the tools and plants issued to contractor will be inspected periodically by BHEL engineer. In case contractor fails to make good, the damages caused, BHEL will do the same at contractor's cost. The tools and tackles will be issued only to persons nominated by the contractor.

8.5 CHEMICALS, GASES AND LUBRICANTS FOR PRE-COMMISSIONING AND COMMISSIONING

8.5.1

All lubricants and chemicals required for testing, chemical cleaning, acid cleaning, oil/chemical/gas flushing required for testing, pre-commissioning & commissioning up to trial operation of equipments/unit will be provided by BHEL as free issued materials. Carbon-dioxide and Hydrogen gas for purging and filling in Turbo-generator will also be supplied by BHEL. Contractor shall arrange for taking delivery and loading of all such consumables from BHEL/ Customer Stores/ yard, transportation to site of work and unloading thereon, filling in the system and return the used lube oil, balance quantity of consumables, empty cylinders/ drums etc, to BHEL/Customer stores duly reconciled for quantity.

This is included in the contractor's scope of work.

8.6 INSPECTION / QUALITY ASSURANCE / QUALITY CONTROL / STATUTORY INSPECTION -SHALL BE AS PER GCC PROVISION

8.7 STAGE INSPECTION BY FES / QA ENGINEERS

- Shall be as per provisions of SCC.

8.7.1

Apart from day-to-day inspection by BHEL engineers stationed at site and also by SIEMENS engineers stationed at site or customer's engineers, stage inspection of equipments under erection and commissioning at various stages of erection and commissioning by teams of engineers from field engineering services of BHEL's manufacturing units and quality assurance teams from field quality assurance unit/factory quality assurance and commissioning engineers from technical services of BHEL will also be conducted. Contractor shall arrange all labour, tools and tackles ,IMTEs etc. for such stage inspections free of cost.

Any modifications suggested by BHEL FES & QA Engineers team or Field Engineers of SIEMENS shall be carried out. Claims of contractor, if any, shall be dealt as per clause13, provided such modifications have not arisen for reasons attributable to the contractor.

8.8 Statutory Inspection shall be as per provisions of GCC/SCC.

9.0 Safety, Occupational Health and Environmental Management:

RESPONSIBILITY OF THE CONTRACTOR IN RESPECT OF SAFETY OF MEN, EQUIPMENT, MATERIAL ETC.

9.1	The contractor shall ensure the safety of all workmen, materials and equipment either belonging to him or to others working at site. He shall observe safety rules and codes applied by the owner/ BHEL at site without exception.	
9.2	Passenger lift should have safety cage with multiple rope, ie with safety rope & limit switches etc.	
9.3	Safety nets with hand railings must be provided on all both inside & outside hanging platform of equipments & temporary platforms .	
9.4	Emergency vehicle must be provided.	
9.5	Non-conformity of safety rules and safety appliances will be viewed seriously and BHEL has right to impose fines on the contractor on each incident/each non-conformity as per details given below:	
	Safety measure	Fine (Rs)
9.5.1	Not wearing safety helmet.	5/workmen
9.5.2	Not wearing safety belt.	10/workmen
9.5.3	Grinding without goggles.	25/workmen
9.5.4	Not using 24V supply for internal work.	500/case
9.5.5	Electrical plugs not used for hand machines.	100/case
9.5.6	Welding cables, electrical wires using insulated with proper/standard.	50/joint
9.5.7	Not removing scrap from platform.	Actual cost for removal plus 30 %
9.5.8	Gas cutting without taking proper precaution/not using sheet below per incidence.	100/case
9.5.9	Electrical winches having no guards earthed properly etc.	500/case
9.5.10	Improper earthing of electrical T&P.	200/ equipment
9.5.11	Not protecting/ locating the gas cylinder to avoid catching of fire.	100/cylinder
9.5.12	Not providing earth leakage circuit breaker as per direction of BHEL.	1000/point
9.6	Any other nonconformity noticed not listed above will also be fined. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected on the above will be utilised for giving award to the employee who could avoid accidents by following safety rules. Also, the amount will be spent for improving the safety at site.	
9.7	The contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislation and BHEL/ owner, as he may deem necessary.	
9.8	The contractor will notify well in advance to BHEL/ owner of his intention to bring to the site any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals, which may involve hazards. BHEL/ owner shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the works and the contractor shall strictly adhere to and comply with such instructions. BHEL/ owner shall have the right at his sole discretion to inspect any such container or such construction plant/equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its use. BHEL/ owner shall entertain no claim due to such prohibition and BHEL/ owner shall not entertain any claim of the contractor towards additional safety provisions/ conditions to be provided for/	

	constructed as per BHEL/ owner's instructions.
9.9	Further, any such decision of BHEL/owner shall not, in any way, absolve the contractor of his responsibilities and in case, use of such a container or entry thereof into the Site area is forbidden by BHEL/owner, the contractor shall use alternative methods with the approval of BHEL/owner without any cost implication to owner or extension of work schedule.
9.10	Where it is necessary to provide and/ or store petroleum products or petroleum mixtures and explosives, the contractor shall be responsible for carrying-out such provision and/ or storage in accordance with the rules and regulations laid down in Petroleum Act 1934, Explosives Act, 1948, and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of BHEL/ owner. In case, any approvals are necessary from the Chief Inspector (Explosives) or any statutory authorities, the contractor shall be responsible for obtaining the same.
9.11	All equipment used in construction and erection by contractor shall meet Indian/ International Standards and where such standards do not exist, the contractor shall ensure these to be absolutely safe. All equipments shall be strictly operated and maintained by the contractor in accordance with manufacturer's operation Manual and safety instructions and as per guidelines/ rules of owner in this regard.
9.12	Periodical examinations and all tests for all lifting/ hoisting equipment & tackles shall be carried-out in accordance with the relevant provisions of Factories Act 1948, Indian Electricity Act 1910 and associated laws, Rules in force from time to time. A register of such examinations and tests shall be properly maintained by contractor and will be promptly produced as and when desired by BHEL/ owner or by the person authorized by him.
9.13	The contactor shall be fully responsible for the safe storage of his and his sub-contractor's radioactive sources in accordance with BARC/ DAE (Bhabha Atomic Research Center/ Department of Atomic Energy, Govt. of India) Rules and other applicable provisions. All precautionary measures stipulated by BARC/ DAE in connection with use, Contractor would take storage and handling of such material.
9.14	The contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need, as may be directed by BHEL/ owner who will also have right to examine these safety equipments to determine their suitability, reliability, acceptability and adaptability.
9.15	Where explosives are to be used, the same shall be used under the direct control and supervision of an expert, experienced, qualified and competent person strictly in accordance with the Code of Practices/ Rules framed under Indian Explosives Act pertaining to handling, storage and use of explosives.
9.16	The contractor shall provide safe working conditions to all workmen and employees at the site including safe means of access, railings, stairs, ladders, scaffoldings etc. The contractor shall take all precautions to prevent any accident collapse of scaffolding or fall of persons from scaffolding. The contractor should ensure that scaffolding are designed by a competent person and it erection and repairs should be done under the expert supervision. The scaffolding shall meet the required strength and other requirements for the purpose for which the scaffold is erected. The material used for scaffold should conform to the BIS / International standards
9.16A	The contractor shall ensure that there is no opening in any working platform/ any floor of the building, which may cause fall of workers or material. When ever an opening on a platform/any floor of the building is unavoidable, the opening should be suitably fenced and necessary measures for protection against falling objects or building workers from such platform are taken by providing suitable safety nets, safety belts or other similar means
9.16B	All working platforms, ways and other places of construction work shall be free from accumulations of debris or any other material causing obstructions and tripping.

	Every opening at elevation from ground level through which a building worker, vehicle, material equipment etc. may fall at a construction work shall be covered and/or guarded suitably by the contractor to prevent such falls. Wherever the workers are exposed to the hazards of falling from height, the contractor shall provide full harness safety belts fitted with fall arresting systems to all the employees working at higher elevations and life line of 8 mm diameter wire rope with turn buckles for anchoring the safety belts while working or moving at higher elevations. Safety nets shall also be provided for saving them from fall from heights and such equipment should be in accordance with BIS standards. Wherever there is a possibility of falling of any material, equipment or construction, workers while working at heights, a suitable and adequate safety net should be provided. The safety net should be in accordance with BIS Standards. The contractor shall provide standard prefabricated ladders on the columns where the workers are required to use them as an access for higher elevations till permanent staircase is provided. The workers shall be provided with safety belts fitted with suitable fall arresting system (Fall arrestors) for climbing/getting down through ladders to prevent fall from height.
9.17	The contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to BHEL/ owner or other contractors under any circumstances, whatsoever, unless expressly permitted in writing by owner to handle such fuses, wiring or electrical equipment.
9.18	Before the contractor connects any electrical appliances to any plug or socket belonging to the other contactor or BHEL/ owner, he shall comply with following.
9.18.1	Satisfy BHEL/ owner that the appliance is in good working condition.
9.18.2	Inform BHEL/ owner of the maximum current rating, voltage and phases of appliances.
9.18.3	Obtain permission of BHEL/ owner detailing the sockets to which the appliances may be connected.
9.19	BHEL/ owner will not grant permission to connect until he is satisfied with following.
9.19.1	The appliance is in good condition and is fitted with suitable plug;
9.19.2	The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.
9.20	No electric cable in use by the contractor/ BHEL/ owner will be disturbed without prior permission. No weight of any description will be imposed on any cable and no ladder or similar equipment will rest against or attached to it.
9.21	No repair work shall be carried out on any live equipment. BHEL/ owner must declare the equipment safe and a permit to work shall be issued by BHEL/ owner before contractor carries out any repair work. While working on electric lines/ equipments whether live or dead, suitable type and sufficient quantity of tools will have to be provided by contractor to electricians/ workmen/ officers.
9.22	The contractors shall employ necessary number of qualified, full time electricians/ electrical supervisors to maintain his temporary electrical installations.
9.23	The contractor shall employ a qualified safety officer under approval of Construction Manager, BHEL at site before submission of first RA bill to supervise day to day safety aspects of the equipments and workmen, who will co-ordinate with BHEL/ owner safety officer. In case of work being carried out through sub-contractors, the sub-contractor's workmen/ employees will also be considered as the contractor's employees/ workmen for the above purpose.
9.24	The name and address of such safety officer of contractor will be promptly informed in writing to BHEL/ owner with a copy to safety officer-In charge before he starts work or immediately after any change of the incumbent is made during currency of the contract.

9.25	In case any accident occurs during the construction/ erection or other associated activities undertaken by the contractor thereby causing any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the contractor to promptly inform the same to BHEL/ owner in prescribed form and also to all the authorities envisaged under the applicable laws.
9.26	BHEL/ owner shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/ or property, and/ or equipments. In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury/ accident and he shall comply to remove shortcomings promptly.
9.27	The contractor shall not be entitled for any damages/ compensation for stoppage of work due to safety reasons above and the period of such stoppage of work will not be taken as an extension of time for completion of the facilities and will not be the ground for waiver of levy of penalty.
9.28	The contractor shall follow and comply with all Safety Rules of BHEL/ owner, relevant provisions of applicable laws pertaining to the safety of workmen, employees plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservation. In case of any inconformity between statutory requirement and owner's safety rules of BHEL/ owner referred above, the later shall be binding on contractor unless statutory provisions are more stringent.
9.29	If the contractor fails in providing safe working environment as per the owner's safety rules or continues the work even after being instructed to stop work by BHEL/ owner as provided above, the contractor shall promptly pay to BHEL/ owner, on demand by the BHEL/ owner compensation at the rate of Rs 5,000.00 per day or part thereof till the instructions are complied with and so certified by BHEL/ owner. However, in case of accident taking place-causing injury, to any individual, the provisions contained in relevant paragraph shall also apply in addition to compensation mentioned in this paragraph.
9.30	If the Contractor does not take all safety precautions and / or fails to comply with the Safety Rules as prescribed by the Employer or under the applicable law for the safety of the plant and equipment and for the safety of personnel and the contractor does not prevent hazardous conditions which cause injury to this own employees or employees of other contractors, or Customer's employees or any other person who are at the Site or adjacent thereto, the Contractor shall be responsible for payment of penalty to Customer as per the following schedule:-
9.30.1	Fatal injury or accident causing death : Penalty @ 10% of contract value or Rs.5,00,000/- per person, whichever is less.
9.30.2	Major injuries or accident causing 25% or more permanent disablement to workmen or employees : Penalty @ 2.5% of contract value or Rs.1,00,000/- per person which ever is less
9.31	Permanent disablement shall have the same meaning as indicated in the 'Workmen's Compensation Act' 1923. The penalty mentioned above shall be in addition to the compensation payable to the workmen / employees under the relevant provisions of the Workmen's Compensation Act' 1923 and rules framed there under or any other applicable laws as applicable from time to time.
9.32	These insurance covers have to be taken prior to start of his work at the subject project and he shall make available the policy to BHEL's Construction Manager for necessary verification before commencement of work. However, irrespective of such verification/ acceptance, sole responsibility to maintain adequate insurance cover for his workmen, T&P, assets etc at all times during the period of contract shall lie with the contractor. Regarding the aforesaid insurance cover, the contractor shall directly deal with the insurance company for all matters regarding insurance in his scope.
9.32A	Comprehensive Automobile Insurance for Fatal Injury Property Damage This insurance shall be in such a form to protect the Contractor against all claims for injuries, disability, disease and death to members of public including the Employer's

	men and damage to the property of other arising from the use of motor vehicles during on or off the Site operations, irrespective of the Ownership of such vehicles. The liability covered shall be as herein indicated : Fatal Injury : Rs.100,000 each person : Rs.200,000 each occurrence Property Damage : Rs.100,000 each occurrence
9.33	The contractor will follow HSE policy of BHEL/ PSER and work as per the safety guidelines which is in line with ISO:14001 and OHSAS:18001 standards. A list of the guidelines which should be strictly followed by the contractor is as follows. The scope of contractor shall not be limited to the followings only but shall be guided by the HSE related policies/ guidelines of BHEL as revised to suit the requirement of the standards and statutory requirements.
9.33.1	Nominate a safety officer who will supervise all the HSE aspects.
9.33.2	The safety officer will participate in all safety meeting conducted by BHEL.
9.33.3	Submit site safety plan indicating safety measures to be taken, fire fighting equipments & PPE to be deployed.
9.33.4	Report every near miss incident to BHEL.
9.33.5	Report accident report immediately after the occurrence.
9.33.6	Obtain operation control procedures (OCPs) from BHEL for the work to be executed
9.33.7	Follow factory act.
9.33.8	Every worker should use PPE as per his trade. All PPE should confirm to IS.
9.33.9	Conduct tool box meeting with workers everyday before start of work instructing about the use of PPE. The outcome of the meeting to be recorded in a register.
9.33.10	Check fitness of the PPE and lifting tackles weekly and record in a register which will be verified by BHEL.
9.33.11	No person below 18 years will be employed.
9.33.12	Deploy fire-fighting equipments and refill before expiry.
9.33.13	Keep fire extinguishers of adequate type near the hot job and near the electrical machines.
9.33.14	Copy of valid Test certificates of all T&Ps should be given to BHEL as soon as the item enters the project, without which the T&P can not be allowed to be used.
9.33.15	No body will be allowed to work above 2 meters without safety belt/ harness with lifeline secured to a fixed member.
9.33.16	Good housekeeping has to be maintained. All debris shall be removed from workplace within shortest possible time.
9.33.17	Approach roads should not be blocked with cables, materials or debris.
9.33.18	First aid boxes have to be kept and maintained with all requisite materials as per factory act.
9.33.19	Trained person has to be kept for giving first aid.
9.33.20	Adequate illumination shall be provided where working.
9.33.21	All vehicles should have backlight, reverse horn and reversing light.
9.33.22	Crane operator shall have proper license.’
9.33.23	Crane should have reverse horn.
9.33.24	Only skilled person maintain and operate electrical items.
9.33.25	ELCB has to be used. No temporary connection shall be allowed.
9.33.26	All fuses shall have standard rating and capacity.
9.33.27	All power supply cables should be laid above 3 meter level or underground.
9.33.28	All hand lamps should be powered by 24 volts.
9.33.29	Water-logging of working area shall be removed.
9.33.30	For operating portable machines 3 pin plugs shall be used.
9.33.31	Oxygen and DA cylinders shall be separated labeling full or empty. Full cylinders shall be kept upright.
9.33.32	Cylinders are not transported by rolling.
9.33.33	All oil drums shall be kept horizontal.

9.33.34	Excavated area shall be barricaded off with red-& white tape.
9.33.35	Proper slope of excavation shall be maintained.
9.33.36	Proper sign board and illumination shall be maintained at excavated area.
9.33.37	Wherever possible safety net shall be provided.
9.33.38	Proper platform and hand rail has to be provided at the work place.
9.33.39	All electrical equipments shall be earthed at two points.
9.33.40	Temporary platform should be strong enough, have proper approach and hand rails.
9.34	The above clauses are indicative only and not exhaustive. The other activities to maintain strong HSE conditions at site which may be beyond the above list of guidelines shall have to be done by the contractor.

10.0 DRAWINGS AND DOCUMENTS - shall be as per SCC.

11.0 TIME SCHEDULE, MOBILIZATION, PROGRESS MONITORING, OVER RUN, VARIATION , GUARANTEE ETC.

11.1 TIME SCHEDULE & MOBILIZATION

11.1.1

The contractor has to mobilize his resources and work force in such a manner that the entire work is completed to achieve the following milestone schedule:

Major milestone of Unit # 1	Tentative Schedule
Condenser Erection start	Mar'17
Turbine Erection start	April'17
Turbine Box up	June'17
Oil flushing Start	Aug'17
Barring Gear	Sept'17
Synchronization	Nov'17
Full Load Operation	Jan'17
Trial Run	Mar18

In order to meet above schedule in general, and any other intermediate targets set, to meet customer requirements, contractor shall arrange all necessary resources in consultation with BHEL.

Unit 3 milestone is having 12 (Twelve) months phase lag from Unit 1 milestone date.

11.1.2 Ordering Philosophy, Contract Period and Mobilisation Period (Applicable for package A)

Ordering Philosophy for Package-A:

Scope of TG erection and other associated works for Unit # 1 and 3 shall be covered under single work order.

Contract period for Package-A:

The work of erection, testing, commissioning, PG test, handing over etc. of **Unit # 1** shall be completed **within 14 (Fourteen) months period** and **Unit # 3** job as well as entire scope of work in all respects shall be completed within **26 (Twenty six)** months from the start of erection.

Mobilization Period:

The contractor shall mobilize at site within in 15 days from the date of clearance/ intimation from Construction Manager, BHEL/NTPC Site. However, the actual date of start of work will be certified by BHEL Site In-charge.

The contractor's scope of work under these specifications will be deemed to have been completed in all respect, only when all the activities are completed satisfactorily and so certified by BHEL site-in-charge. The decision of BHEL in this regard shall be final and binding on the contractor.

Decision of BHEL shall be final regarding declaration of completion of all the activities and shall be binding on the vendor. Zero date shall be as declared by BHEL, North Karanpura Project site , which will be final for all contractual purposes.

11.2

11.2.1 Progress Monitoring

Progress will be reviewed periodically (daily / weekly / monthly) including month end review vis-a-vis the plans drawn as above. The contractor shall submit periodical progress reports, and other reports / information including manpower, consumables etc as desired by BHEL.

11.2.2 Ascertaining and Establishing the Reasons for Shortfall

The modus-operandi/ responsibility for establishing, that the causes leading to extension of the contract period is not due to any reasons attributable to the contractor, is on him (the contractor). Review of the performance will be made considering the availability of components to be erected, commissioned, handed over to the customer and other inputs / constraints over which the contractor has no control. The programme will be reviewed area-wise and the following facts will be recorded in case of shortfall at the end of every month:

11.2.2.1

A) Erection / Commissioning programme not achieved owing to non-availability of fronts.

B) Erection/Commissioning programme not achieved owing to non-availability of materials.

11.2.2.2 Erection/Commissioning programme not achieved owing to non-availability of tools and plants, manpower and consumables by the contractor or any other reason attributable to the contractor.

11.2.2.3 Erection / Commissioning programme not achieved due to any other reasons not attributable to the contractor.

11.2.3 CONTRACT EXTENSION

A joint program shall be drawn for the work to be completed during the extended contract period. Review of the program and record of shortfall as described earlier shall be done during the extended period.

The part of extension attributable to the contractor, if any, in total contract extension shall be executed first i.e., immediately after end of contract period. This shall be followed by the extension on account of force majeure conditions, if any, and lastly on account of BHEL

11.3 LIQUIDATED DAMAGE

As per provision of GCC.

11.4 GUARANTEE PERIOD

Even though the work will be carried out under supervision of BHEL engineers, bidder will be responsible for the quality of the workmanship and shall guarantee the work done for a period of 12 months from the date of start of guarantee period of each unit, as certified by the engineer for good workmanship and shall rectify free of cost all defects due to faulty erection. In case bidder fails to repair the defective works within the time specified by engineer, BHEL may proceed to undertake the repairs of such defective works at contractor's risk and cost without prejudice to any other rights and recover the same from SD/ other dues.

The guarantee period will commence from the date of handing over of respective unit to customer or six months after completion of full load operation of respective unit, whichever is earlier, provided, all erection, testing and commissioning works are completed in all respect for respective unit.

Other terms will be as per GCC.

11.5 OVER RUN CHARGES (ORC) –

Over Run Charges (ORC)- Applicable as per relevant clause of GCC subject to a minimum amount of Rs. 50000 and a maximum amount of Rs. 5,00,000.

11.6 PRICE VARIATION

Price variation (PVC) shall be applicable as per GCC with the following changes :

10.1.1.1.1 PVC will be applicable only after expiry of the original contract period.

10.1.1.1.2 PVC will be applicable only on portion of delay not attributable to Vendor.

10.1.1.1.3 Base Index will be average of Indices between 'Latest Due Date of Submission of Offer' and 'Original Contract Completion Date'.

10.1.1.1.4 Ceiling to be limited to 10% of Contract Price.

11.7 INTEREST BEARING RECOVERABLE ADVANCES/ MOBILISATION ADVANCE –

Not applicable for this tender.

11.8 Definition of Work Completion

The contractor's scope of work under these specifications will be deemed to have been completed in all respect, only when all the activities total erection, testing, commissioning, trial run of individual equipments, trial run of each respective 660 MW Set(s) with all auxiliaries, PG Testing, completion of all punch points/defect points /pending points etc. are completed satisfactorily and so certified by BHEL site in charge. The decision of BHEL in this regard shall be final and binding on the contractor.

11.9 RATES/PRICE

The bidder shall quote their rate as per Price bid/ rate schedule only.

11.9.1 The weights mentioned in weight schedule is approximate only and given to facilitate the contractor to make assessment of the magnitude of work under this specification. These are liable to variations as per design consideration. The tenderer has to keep his lumpsum quoted rates firm for variation in weights for items under **rate schedule and no revision of rates / extra work will be entertained for increase in weight of these items except for TG and Misc. piping of relevant Annexure/appendix as detailed below.**

11.9.2 **The quoted lumpsum price shall remain firm for variation up to +/- 20% in the weight for TG / Misc piping, under items "J" and "L" as indicated in Appendix-II. i.e. up to +/- 20% of total MT as per list of items under items "J" and "L" as indicated in Appendix-II shall be payable without any rate revision. Individual total qty. of the list of items under "J" and "L" shall be considered separately to ascertain the applicability of rate revision.**

11.9.3 If the variation in actual erected tonnage of **TG / Misc piping, under items "J" and "L" as indicated in Appendix-II** crosses the limit of (+/-) 20% of the individual group as indicated in appendix-III, the differential tonnage payment beyond the prescribed limit will be made/recovered in the final bill at the rate prescribed below:

For **Gr-J and L** [TG cycle, TG integral and Misc. piping etc] of weight schedule, Appendix-II - Rs 20,000.00/MT.

11.9.4 The omission of specific reference to any method and equipment, system or material necessary for proper and efficient services towards installations of the plant shall not relieve the contractor of the responsibility of providing all services/facilities to complete the work or portion of the work awarded to him. The quoted rate shall deem to be inclusive of such contingencies. Only exclusion specifically mentioned in this tender shall be entertained in all matters.

12.0 TERMS OF PAYMENT

For Erection, Testing and Commissioning of payments shall be made as follows on basis of total respective contract value of work & for percentage as per rate/billing schedule on monthly basis (billing break-up is given in APPENDIX VIII for Package –A. This break up is only for the purpose of regular stage payment and should not be construed as price for individual item and also it does not constitute total scope of work. The total scope of work is as detailed in this tender documents and shall be completed by contractor without making any reference to this break up. BHEL site at its discretion, may further split up/ change the percentages shown below and effect payment to suit the site condition, cash flow requirements according to the progress of the work.

12.1 The contractor shall submit his running bill once in a month at the end of each month. The R.A. bill complete in all respects accompanied by BHEL engineers certified/ measurement sheet, jointly signed and EPF compliance certificate from EPF authority, will be paid after

30 days of submission of the bill. The measurement will be taken as specified in terms and conditions of contract and certified by the BHEL engineer of actual work. However no extra payment shall be made in the event of delay in release of payment.

12.2 Subject to any deduction which BHEL may be authorised to make under the contract, the contractor shall on the certification of the BHEL engineer at site, be entitled to receive payment as explained hereunder.

12.3 For erection, testing and commissioning of turbo-set, auxiliaries and piping as described in rate schedule, intermediate payments shall be made as per the billing schedule on the basis of percentage of total contract value of the job. (These percentages are only for the purpose of progressive payments and should not be considered as price of individual items and vendor should complete all the work without quoting reference to the break up).

12.4 Billing schedule will be as per Appendix -VIII. However, further micro break up for the above schedule can be done at site after awarding of the job to vendor by mutual agreement.

12.5 Out of above break-up for progressive payment, 5 % will be retained from each RA bill which will be released on completion of guarantee period of 12 months. However, this 5 % payment can be released against submission of performance bank guarantee valid for the guarantee period as stated above in prescribed proforma subject to receipt of certificate that all works are completed in all respects. The submission of bank guarantee towards performance guarantee is separate and the bank guarantee towards security deposit cannot be utilised for this purpose. The security deposit will be refunded as per GCC.

Out of above stated R/A bill payment , 1.5 % shall be released for payment against each RA bill in the following manner on certification by BHEL engineer after compliance of each of following activity in each month. In case of non-fulfilment of respective activity by vendor in each month, no payment shall be made by BHEL against corresponding activity and no claim of bidder at a later date, whatsoever, in this regard shall be entertained by BHEL.

- 0.7 % shall be paid on compliance of house keeping of vendor's working area and store/ office areas.
- 0.3% shall be paid on compliance of general illumination of vendor's working area and stores, office area.
- 0.2% shall be paid on compliance of applicable OHSAS requirement as per guidelines of BHEL/ PSER and as specified in the tender.
- 0.3% shall be paid on compliance of applicable Safety requirement as per guidelines of BHEL/ PSER and as specified in the tender.

12.7 BHEL at their discretion may further split up the percentage indicated in billing schedule and effect monthly payment in consideration of site conditions, cash flow requirement etc. according to the progress of work.

13.0 EXTRA CHARGES FOR MODIFICATION AND RECTIFICATION

As per GCC.

14.0 INSURANCE – Shall be as per GCC

15.0 CONTRACT PRICE

15.1 Bidder shall quote rates as per Price Schedule-Volume-III.

16.0 SECURITY DEPOSITE & PERFORMANCE BOND

16.1 Security deposite shall be applicable as per GCC.

16.2 Performance bond shall not be applicable for this tender.

17.0 REVISION ON ACCEPTED CONTRACT RATE

17.1 Not applicable in this tender.

18.0 OTHER POINTS

18.1 All other term & conditions of this specification, not mentioned above shall be governed by the pertinent provisions of GCC, Volume-IB.

Appendix -I

Brief description of Main equipment system

660 MW TG Set with auxiliaries is equipped with Condensing turbine with HP, IP and LP Turbines connected in tandem and this acts as prime mover to drive the Turbo-Generator set. The HP Turbine receives Main Steam from Boiler Super-heater outlet via combined HP stop cum control Valves and after doing required work, the steam passes through CRH-NRVs and the steam is sent back to Boiler Re-heater .

Steam after reheating enters IP Turbine as HRH Steam through combined IP Stop cum Control Valves and after doing work in IP Turbine, the exhaust steam from IP Turbine enters LP Turbine via Cross around pipes. The steam from LP Turbine after doing work enters into the steam space of condenser.

Condenser cools the exhaust steam with the help of Circulating Water which passes through Condenser gets condensed this condensate water is pumped with the help of CEPs for sending to Deaerator via Drain Cooler, LP Heater-1,2,3.

The condensate is heated in heated in Deaerator with the help of pegging steam and this water is fed to BFPs for further pumping. The BFPs further increases pressure with the help of Booster pumps and BFPs via HP Heaters. This feed water is fed to the boiler via Boiler economiser, which in turn helps in generation of steam and sent to Turbine for doing necessary work and the cycle is repeated.

The Turbine, Generator, BFPs are having lub oil system for bearing lubrication. Turbine has Governing system run with the help of Control Fluid system which operates both total Governing system and LP Bypass system.

The Turbine has regenerative/extraction steam system and has NRVs (both mechanical and servomotor operated).

The condenser Air Cooled system gets cold air from ACC system and the ACW Pipes have Butterfly valves for isolations at condenser end.

The cooling water for TG, BFPs lub oil, CF System , Generator Seal oil , H2 Coolers, Exciter Coolers, BFP Working oil system for MDBFPs and other equipment are pumped by different miscellaneous pumps .DM Cooling waters system is cooled by ACW system which is pumped by ACW Pumps. The DMCW Water is cooled both at boiler and TG side with the help of PHEs.

APPENDIX – II (REV-01)

APPROXIMATE WEIGHT SCHEDULE OF MAJOR PACKAGES FOR EACH 660 MW SET

REFER APPENDIX-II (REV-01) ATTACHED SEPARATELY.

APPENDIX – III

Consolidated Weight Schedule for each of UNIT 1 & 3 (PACKAGE-A)

Sl.No.	EQUIPMENT / PACKAGE	APPROX. WT. for Each Unit (in MT)
A.	STEAM TURBINE & AUX.	913.513
B.	TURBO GENERATOR & AUX.	499.299
C.	CONDENSER & AUX.	208.036
D.	BOUGHT OUT ITEMS (BHEL HARIDWAR Scope)	620.00
E.	TANKS AND VALVES SUPPLIED BY BHEL BHOPAL	26.812
F.	HEAT EXCHANGERS	609.790
G.	CEP, TDBFP, MDBFP AND BFP DRIVEN TURBINE	335.45
H.	TG & AUX INTEGRAL PIPING	92.00
I.	TG PIPING SYSTEM, ACW /MISC PIPING SYSTEM	650.500
J.	TANKS, VESSELS, EQPTS & INSTRUMENTS ETC. SUPPLIED BY BHEL-PC CHEMNNAI	74.750
K.	BOUGHT OUT ITEMS (BHEL PEM Scope)	943.00
L.	PLATFORM & STRUCTURES	300.00
	TOTAL WT. FOR EACH UNIT (APPROX.)	**5273.15**

NOTE :

1) The Weights mentioned in weight schedule is approximate only and given to facilitate the contractor to make assessment of the magnitude of work under this specification. These are liable to variations as per design consideration. The tenderer has to keep his lump sum quoted rates firm for variation in weights for items under **Weight schedule and no revision of rates / extra work will be entertained for increase in weight of these items except for Gr. H & I of appendix-III [weight schedule].**

2) The quoted lump sum price shall remain firm for variation up to (+/-) 20% in the weight for items under Srl. No. “H” and “I”, as indicated in Annexure-III, i.e. up to (+/-) 20% of individual Total weight

3) If the variation in actual erected tonnage of items under Srl. No. “H” and “I” crosses the limit of +/- 20% of the individual group as indicated in appendix-III, the differential tonnage payment beyond the prescribed limit will be made/recovered in the final bill at the rate prescribed below:
For items under Srl. No. “H” and “I” of weight schedule, appendix-III - Rs 20,000.00/MT.

APPENDIX-IV

LIST OF T&P TO BE PROVIDED BY BHEL FREE OF HIRE CHARGES ON SHARING BASIS FOR EACH UNIT OF 660 MW SET

SL. NO.	DESCRIPTION & CAPACITY OF T&P	QUANTITY	PURPOSE
01	EOT CRANE IN TG HALL (AS INSTALLED)	As Installed	FOR HANDLING AND ERECTION WITHIN TG HALL.
02	75T/100T/150T/EQUV. OR ABOVE CAPACITY CRAWLER CRANE	As required	1 no. 75T/90T/100T/150T OR ABOVE CAPACITY CRAWLER CRANE will be provided FOR LIFTING OF DEAERATOR SHELL AND FEED STORAGE TANK SHELL SEGMENTS, ECW TANK(SG & TG), NaOH TANK, SERVICE WATER TANK TO THE NEAREST POSSIBLE FLOOR AND FOR SHIFTING OF HP TURBINE & LP TURBINE ROTOR AND OTHER HEAVY COMPONENTS THE TYPES OF CRANES SHALL BE ALOTTED AFTER SEEING THE ACTUAL LOAD REQUIREMENT. The cranes shall be issued for the purpose of loading/unloading and lifting to locations as stated above at erection site.
03	SPECIAL T&Ps SUPPLIED BY BHEL/ MANUFACTURING UNITS **	01	FOR ERECTION, COMMISSIONING OF TG & AUX.
04	HIGH CAPACITY HYDRO-TEST PUMP OF CAPACITY OF 400 KG/SQ.CM OR ABOVE	01	FOR HYDRO-TEST OF DEAERATOR AND FEED STORAGE TANK.
05	LOADS LIKE: PLATES, BLOCKS ETC.	AS REQUIRED	FOR LOAD TESTING OF DIFFERENT HOISTS AND LIFTING EQUIPMENT. HOWEVER THE CONTRACTOR HAS TO ARRANGE FOR REQUIRED SHIFTING AND HANDLING ARRANGEMENT ON THEIR OWN FOR ISSUING FROM BHEL/CUSTOMER'S STORE AND RETURNING TO BHEL/CUSTOMER'S STORE.

NOTE:

** The items issued by BHEL shall be used by the contractor for erection and commissioning works and has to be returned to BHEL after job completion in good working condition.

APPENDIX-V

MAJOR TOOLS AND PLANTS & MMDs TO BE DEPLOYED BY THE CONTRACTOR WITHIN QUOTED RATES FOR EACH UNIT OF 660 MW SET

A: TOOL & PLANTS

Sl.No.	Description	Quantity	Deployment period/ Remarks
01.	12MT and 08 MT Hydra Crane/ Escort/ Tata P&H-1320 or equivalent	One No each	As required at site
02.	Electro Hydraulic Pipe bending m/c	One	As required at site
03.	Trailers with suitable capacity as required	As required	As required at site
	Special trailer	One	As required for transportation of heavy equipments like Heaters, rotors, Turbine casing etc.
04.	Welding Generators (Electric as well as Diesel)	Around 10 nos.	Continuously as required at site. During peak condenser internal activity, requirement may go upto 14 nos.
05.	3 Phase complete set up for drawal of Construction Power	As Required	As required at site
06.	Radiography arrangement including source and film viewer	--do--	As required at site
07.	TIG Welding Sets	--do--	As required at site
08.	Stress Reliving equipment with Temperature Recorders	--do--	--do--
09.	Electrical Baking Oven (Big)	--do--	--do--
10.	Electrical Baking Oven(portable)	--do--	--do--
11.	Mixer machine for Grouting of Equipment on foundations	--do--	--do--
12.	Vacuum Cleaner (Industrial)	one	As required at site
13.	Portable Pipe Cutting & Bending M/C for bending pipes upto Nb 100 mm.	One	As required at site
14.	Air Compressor	01	As required at site
15.	Step Down Transformer(230 V/24V) with adequate number of lamps of 24 Volts	As required	As required at site
16	Electrically Operated Winches 5/3 MT Capacity	As required	As required at site
17	Jacking Bolts/Press Out bolts	As required	As required

18	Jacks of 100 MT Capacity with hand operated pumps and jacks, hoses etc.	06 Nos.	As required
19	Jacks of 50 MT Capacity with hand operated pumps and jacks, hoses etc.	06 Nos.	As required
20	Torque Wrench (0-200 N-M Capacity) with all fittings	01 no	As required
21	Torque Wrench upto 2000 N-M Capacity) or above	01 no	As required
22	Bolts Stretching Device (For Turbine, Generator and auxiliaries)	As required	As required
23	Strand Jack System including lifting jacks of reqd. capacity,wire ropes, control panel,swivelling arrangement, temporary structures including the columns & girders for erection of the strand jack system and the stools for unloading of stator	As required	As required
24	Long filler set	As required	As required
25	Spanners/eye bolts/de-shakles	As required	As required
26	Centrifugal Oil Purifiers/Electro-static oil purifier	01 Set	Before start of oil flushing of BFP/LPBP
27	Erection/Commissioning Fixtures	As required	As required
28	Scaffolding materials with steel pipes, clamps, GI Sheets, Planks etc.	As required	As required
29	Coat-meter for thickness checking of Paint thickness	01 No.	As required
30	M64 X 2 Tap set	02 Nos.	As required
31	Digital multimeters (3.5 digits)	03 Nos.	As required
32	Digital multimeters (4.5 digits)	01 No.	As required
33	Tongue Testers	As required	As required
34	30 A 3 phase Variac	As required	As required
35	Micro-Ohm meter (measuring upto 1 micro-ohm)	As required	As required
36	Motorised megger (measuring upto 5KV range)	As required	As required
37	HV Test Kit (upto 50 KV DC)	As required	As required
38	Vernier	As required	As required
39	Dial Gauges of different sizes and types as per requirement	As required	As required
40	Micro-Meter (both inside and outside)	As required	As required
41	Welding Rectifiers	As required	As required
42	Chain pulley block of 16 MT	As required	As required
43	Chain pulley blocks of other capacities	As required	
44	Pulling & lifting m/c upto 5MT Capacity	As required	As required
45	Multi Sheave pulley upto 100 MT	As required	As required
46	Single Sheave pulley blocks upto 20 MT Capacity	As required	As required

47	Gas cutting torches of different sizes and capacity	As required	As required
48	Grinding Machine	As required (around 20 nos.)	As required
49	Drilling machine	As required (around 20 nos.)	As required
50	Pistol Drilling M/c	As required	As required
51	Wire Rope slings(different sizes)	As required	As required
52	Loose wire ropes (different sizes)	As required	As required
53	Hydraulic jacks with total sets of 25, 10, 5 MT capacity as per requirement	As required	As required
54	Wooden Sleepers	As required	As required
55	Hydro-test pumps(hand operated)	02 Nos.	As required
56	NDT test kits as per requirement	As required	As required
57	Steel Tapes of different sizes as per requirement	As required	As required
58	Plumb Block as per requirement	--do--	--do--
59	Surface Plates of different sizes	As required	As required
60	Straight Edges of different sizes	--do--	--do--
61	Feeler Gauges of different sizes	--do--	--do--
62	Callipers of different sizes as per requirement	--do--	--do--
63	Bolt heating thermocouples	--do--	--do--
64	Magnifying glasses as per requirement	--do--	--do--
65	Piano-wire as per requirement	--do--	--do--
66	Precision water level micro-meter as per requirement	--do--	--do--
67	Parallel and V-blocks as	--do--	--do--
68	Taper wedge as per requirement	--do--	--do--
69	Lead wire as per requirement	--do--	--do--
70	Dial bore indicator as per requirement	--do--	--do--
71	Balancing machine	--do--	--do--
72	Thermometer of different ranges	--do--	--do--
73	Depth gauges as per requirement	--do--	--do--
74	Vernier Callipers of different sizes as per requirement	--do--	--do--
75	GO and No Go Gauge as per requirement	--do--	--do--
76	Drill Sets as per requirement	--do--	--do--
77	Taps and die sets as per requirement	--do--	--do--
78	Spirit levels as per requirement	--do--	--do--
79	Hg manometer	--do--	--do--
80	1.0 KV/500V Megger as per requirement	--do--	--do--

81	Reamers of different sizes as per requirement	--do--	--do--
82	Sand blasting m/c as per requirement	--do--	--do--
83	Spray painting m/c as per requirement	--do--	--do--
84	Bearing pullers as per requirement	--do--	--do--
85	Bearing scrappers and other scrappers as per requirement	--do--	--do--
86	Slip gauges as per requirement	--do--	--do--
87	MIG Welding Sets as per requirement	--do--	--do--
88	Fillers of different sizes as per requirement	--do--	--do--
89	Allen key/screw driver sets as per requirement	--do--	--do--
90	Files of different sizes as per requirement	--do--	--do--
91	Socket wrench sets as per requirement	--do--	--do--
92	Bench grinders as per requirement	--do--	--do--
93	Belt, Number, Letter punches as per requirement	--do--	--do--
94	Lead, Steel, Test, Wooden, Plastic, Nylon Hammer sets as per requirement	--do--	--do--
95	Fire proof tarpaulins as per requirement	--do--	--do--
96	Pipe Cutters as per requirement	--do--	--do--
97	Rubber, PVC hoses with/without re-enforcement of different sizes as per requirement	--do--	--do--
98	Magnetic base for drilling m/c	--do--	--do--
99	Vibrator and mixer m/c for grouting as per requirement	--do--	--do--
100	Mercury plumb block	--do--	--do--
101	Copper Rods	--do--	--do--
102	All kinds of NDT Test kits as per requirement	--do--	--do--
103	Other T&Ps as per requirement to complete the job.	--do--	--do--
104	Ropes of different sizes and lengths as per requirement	--do--	--do--
105	ELC /Portable Purification machine	--do--	--do--
106	Hardness testing machine	One no.	--do--
107	PMI machine	One no.	--do--
108	Machining facility comprising of 1 no. lathe machine and 1 no. small shaper machine	As required	--do--
109	20 HP or of suitable capacity (as decided by BHEL) Diesel Pump – minimum 2 nos. for dewatering of inside of piping, low lying areas, in case of inundation etc due to rain/maloperation of various equipment/systems.	As required (minimum two nos.)	As required

	This facility is to be maintained till handing over.		
110	20 HP or of suitable capacity (as decided by BHEL) Electric Pump – minimum 2 nos. for dewatering of inside of piping, low lying areas, in case of inundation etc due to rain/maloperation of various equipment/systems. This facility is to be maintained till handing over.	As required (minimum two nos.)	
111	125 MT CAPACITY Hydraulic Jack.	04 Nos	

B: <u>MEASURING AND MONITORING DEVISES (MMD):</u>

AS PER REQUIREMENT TO BE FINALIZED AT SITE.

NOTE :

THIS ABOVE LIST IS ONLY INDICATIVE AND NEITHER EXHAUSTIVE NOR LIMITING. CONTRACTOR SHALL DEPLOY ALL NECESSARY T&P TO MEET THE SCHEDULES & AS PRESCRIBED BY BHEL.

APPENDIX-VI

LIST OF CONSUMABLES TO BE PROVIDED BY THE CONTRACTOR WITHIN QUOTED RATES FOR EACH 660 MW UNIT.

Sl.No.	Description	Quantity	Remarks
01.	*Gases like O2, CO2, N2, Argon, D/A and others as per requirement (FOR CONSTRUCTION PURPOSE* ***AND NOT FOR COMMISSIONING USES*** *)"*	As required	Sufficient stock has be maintained.
02	*Ultra high purity Nitrogen r*equired for Generator PW System, accumulators charging for pre-commissioning, commissioning, and operation period till handing over to customer	As required	Sufficient stock has be maintained.
03.	Filler wire for both SS and others as required	As required	
04	Ordinary Portland Cement	As required	
05.	Grouting materials/ Grouting cements	As required	
06	Florescence powder	--do--	For tube leak detection
07	Plugs for tubes	--do--	For plugging damaged tubes
08	Lapping compound	--do--	For valves servicing
09	Mercury	--do--	For Generator gas tightness test and other applications as required
10	Hydraulic oil	--do--	For uses in different equipment and hydraulic jacks, pumps and other applications
11	Paints for preservation, touch up painting, normal and final cum finish painting	--do--	For painting
12	Different types of electrical lamps, tube lights , halogen lamps, sodium vapour lamps with fixtures	--do--	As required
13	Electrodes as per requirement	--do--	--do--
14	Test pieces for welders test like plates, pipes etc.	--do--	--do--
15	Brazing Rods	--do--	--do--
16	Soldering consumables	--do--	--do--
17	Consumables for welding and NDTs	--do--	--do--
18	Thermal chalks of different ranges	--do--	--do--
19	Consumables for Pre-heating, Stress Relieving, Post heating etc.	--do--	--do--
20	Consumables for arranging welders'	--do--	--do--

	qualifying works		
21	Welders accessories	--do--	--do--
22	Handling accessories for handling chemicals, Control fluid and other items as required	--do--	--do--
23	Services for effluent disposal	--do--	--do--
24	Rustolene	--do--	--do--
25	Kerosene	--do--	--do--
26	CTC, Acetone as per requirement	--do--	--do--
27	Petrol	--do--	--do--
28	Diesel	--do--	--do--
29	Special Consumables for TG & Aux. like Hylomar, Golden Hermetite, Stag-B, Molykote , Anabond compounds, Locktite, Rubber fixing compounds/ rubber,plastic, PVC hoses as per requirement	--do--	--do--
30	Shellack Compound	--do--	
31	Red Lead	--do--	
32	Hemp Fibre	--do--	
33	Asbestos Rope (Pure) 2,4,6,8,10, 12,25 mm and other sizes as required	--do--	
34	Insulation Adhesive Tape 20 mm Width and other sizes as per requirement	--do--	
35	Emery Tape as per requirement	--do--	
36	Hack-shaw of different sizes as per requirement	--do--	
37	Emery Paper Gr. 60, 80, 100, 120, 150 , 220 and others as per requirement	--do--	
38	Asbestos Cloth in Wax Paper 1X1 M –as required	--do--	
39	PACKING BLACK PAPER 1X1 M	--do--	
40	ADHESIVE TAPE 0.3 mm THICKNESS-as required	--do--	
41	WHITE COTTON TAPE 12 mm WIDTH-as required	--do--	
42	GRAPHITE POWDER FINE QUALITY – as required	--do--	
43	GRAPHITE FLAKES as required	--do--	
44	RAW LINESEED OIL as required	--do--	
45	DOUBLE BOILED LINSEED OIL AS REQUIRED	--do--	
46	CYLINDER OIL AS REQUIRED	--DO--	
47	ENAMEL PAINT (OF REQUIRED COLOUR) AS REQUIRED	--DO--	
48	MOBILE VELOCITE OIL 'S' AS REQUIRED	--DO--	
49	TURPENTINE OIL AS REQUIRED	--DO--	
50	TRICHLORO ETHYLENE AS REQUIRED	--DO--	

51	METHYLATED SPIRIT AS REQUIRED	--DO--	
52	MOBILOX GREASE 2 (IOC) AS REQUIRED	--DO--	
53	SERVOGEM –2,3 GREASE AS PER REQUIREMENT	--DO--	
54	OTHER SPECIAL GREASE AS PER REQUIREMENT	--DO--	
55	RUST BAN (ESSO) AS PER REQUIREMENT	--DO--	
56	MOLYKOTE PASTE AS PER REQUIREMENT	--DO--	
57	BIRKOSITE AS PER REQUIREMENT	--DO--	
58	WASHING SODA AND SOAP AS PER REQUIREMENT	--DO--	
59	COTTON WASTE AS PER REQUIREMENT	--DO--	
60	CLEAN RAGS AS PER REQUREMENT	--DO--	
61	WHITE CLOTH (CEARSE) AND USED CLOTHS AS REQUIRED	--DO--	
62	SACK CLOTH AS PER REQUIREMNT	--DO--	
63	JELLEY SOAP OR BAR SOAP AS PER REQUIREMENT	--DO--	
64	EMERY CLOTH 100 mm WIDTH ROLL GR. 60, 100, 120, 150,220 AND OTHERS AS PER REQUIREMENT	--DO--	
65	SAND PAPERS GR. 60, 80 ,120 AND OTHER AS PER REQUIREMENT	--DO--	
66	EMERY PASTE (VALVE LAPPING COMPOUND) GR. 60, 80, 100 & 220 AND OTHERS AS PER REQUIREMENT.	--DO--	
67	GRINDING WHEELS, STONES OF DIFFERENT SIZES AS PER REQUIREMENT	--DO--	
68	WELDING ELECTRODES (CARBON STEEL,M.S., ALLOY STEEL AND FILLER WIRES, STAINLESS STEEL BOTH FERROUS AND NON FERROUS) EXCEPTING THOSE SUPPLIED BYBHEL AS PER ANNEXURE-IV) AS PER REQUIREMENT	--DO--	
69	SOLDERING STICK(LEAD -TIN ALLOY) AS PER REQUIREMENT	--DO--	
70	SOLDERING WIRE (SILVER ALLOY) AS PER REQUREMENT	--DO--	
71	SOLDERING FLUX (SILVER ALLOY) AS PER REQUIREMENT	--DO--	
72	BRZING FLUX/BORAX AS REQUIRED	--DO--	
73	SOLDERING FLUX (LEAD-TIN ALLOY) AS REQUIRED	--DO--	
74	MS GAS WELDING WIRE AS REQUIRED	--DO--	

75	DP TEST KIT WITH MAGNIFYING GLASS AS REQUIRED	--DO--	
76	IRON AND STEEL SECTIONS AS REQUIRED	--DO--	FOR ARRANGING SCAFFOLDING AND FIXTURES ETC.
77	MS BOLTS AND NUTS WITH TWO PLAIN WASHERS AND ONE SPRING WASHER AS REQUIRED.	--DO--	
78	MS ANGLES ASSORTED AS REQUIRED	--DO--	
79	MS CHANNELS ASSORTED AS REQUIRED	--DO--	
80	ROUNDS ,FLATS,MS PLATES ASSORTED AS REQUIRED	--DO--	
81	ENGINEERS BLUE / PRUSSIAN BLUE AS REQUIRED	--DO--	
82	CHALK PIECES- WHITE,COLOUR AND POWDER AS REQUIRED	--DO--	
83	TEINE AS REQUIRED	--DO--	
84	BATTERY CELLS 1.5 VOLTS TORCH LIGHT CELLS,PENCIL BATTERY ETC.AS REQUIRED	--DO--	
85	RED AND BLUE PENCILS AS REQUIRED	--DO--	
86	GALVANISED STEEL WIRE 1mm DIA AND OTHER SIZES AS REQUIRED	--DO--	
87	FLANNEL CLOTH 1M WIDTH AS PER REQUIREMENT	--DO--	
88	SPLIT PINS 2mm TO 6 mm AND OTHER SIZES AS PER REQUIREMENT	--DO--	
89	WOOD SCREWS 3/4" TO 3" AS PER REQUIREMENT	--DO--	
90	LEAD SHEET 3 mm AND 4 mm THICKNESS AS PER REQUIREMENT	--DO--	
91	TARPAULINE 3X3 M AND 5X5 M AND 10X5 M AND OTHER SIZES AS PER REQUIREMENT	--DO--	
92	VULCANISED RUBBER FIBRE 0.5 MX0.5 MX15 mm THICKNESS AS PER REQUIREMENT	--DO--	
93	PLYWOOD 1M X 2M X 3mm AND OTHER SIZES AS PER REQUIREMENT	--DO--	
94	NAILS-WIRE 1' TO 3'AS PER REQUIREMENT	--DO--	
95	CANDLES MEDIUM SIZE AS PER REQUIREMENT	--DO--	
96	PORTABLE SWITCH BOARD CONTAINING 15 AMPS TP METAL CLAD SWITCH WITH FUSE 3X15 AMPS, SWITCHES AND 3 PLUG SOCKETS AS PER REQUIREMENT	--DO--	
97	WOODEN PLANK PULLEYS AS REQUIRED	--DO--	

98	All kind of water/oil/steam gasket (asbestos free) (other than those being supplied by BHEL Units)	--DO--	
99	SS shims/other shims (for thickness of less than 5.0 mm.)		
100	Any other items as required to complete the jobs	-do--	

All lubricants and chemicals required for testing, chemical cleaning, acid cleaning, oil/chemical/gas flushing required for testing, pre-commissioning & commissioning up to trial operation of equipments/unit will be provided FREE OF COST by BHEL. Carbon-dioxide and Hydrogen gas for purging and filling in Turbo-generator (during pre-commissioning/commissioning) will also be supplied FREE OF COST by BHEL.

*Ultra high purity Nitrogen r*equired for Generator PW System, accumulators charging for pre-commissioning, commissioning, and operation period till handing over to customer will be in the scope of contractor.

APPENDIX -VII

LIST OF CONSUMABLES TO BE PROVIDED BY BHEL (FREE OF CHARGES)

1. CHEMICALS FOR CHEMICAL CLEANING AND GASES FOR CARRYING OUT PRE-COMMISSIONING, COMMISSIONING ACTIVITIES (EXCEPT ULTRA HIGH PURITY NITROGEN GAS).
2. LUB-OIL FOR OIL FLUSHING & TRIAL RUN OF EQPT.
3. IMPORTED ELECTRODES SUPPLIED BY BHEL'S MFG. UNITS
4. SHIMS AND GASKETS GOING INTO THE EQUIPMENT SUPPLIED BY BHEL'S MFG. UNITS
5. TOUCH UP PAINT SUPPLIED BY BHEL'S MFG. UNITS
6. FUEL AND CONSUMABLES FOR CRANE ON SHARING BASIS

APPENDIX – II (REV-01)

APPROXIMATE WEIGHT SCHEDULE OF MAJOR PACKAGES FOR EACH 660 MW SET

TENTATIVE LIST OF MATERIALS AND EQUIPMENTS COVERED UNDER "PACKAGE-A" SCOPE OF WORKS.

A (ii) BHEL HWR : : GENERATOR U # 1

SNO	PKG. NO/SL	NET WT	DESCRIPTION	PKG SIZE
1	601/0	9985	FOUNDATION PLATES	6400X1680X950
2	602/0	760	FOUNDATION BOLTS	2540X655X600
3	603/0	1670	FOUNDATION ITEMS	5800X1120X520
4	605/0	292000	GENERATOR STATOR	9860X4440X4260
5	606/0	75000	GENERATOR ROTOR	14125X1790X1740
6	607/0	8250	END SHIELD LOWER HALF (TE)	3800X1500X2240
7	608/0	7250	END SHIELD UPPER HALF (TE)	3800X1500X2240
8	609/0	8300	END SHIELD LOWER HALF (EE)	3800X1500X2240
9	610/0	7300	END SHIELD UPPER HALF (EE)END SHIELD UPPER HALF (EE)	3800X1500X2240
10	611/0	1696	GENERATOR BEARING (EE & TE)	1180X1050X1170
11	612/0	897	BAFFLE RING CARRIER &AIR GAP SEAL ASSY.	2035X1885X1200
12	613/0	1158	TERMINAL BUSHINGS	2200X1830X610
13	614/0	5302	TERMINAL BUSHING BOX	3500X2600X1740
14	615/0	1030	SHAFT SEALS (EE & TE) &OIL CATCHER (INNER & OUTER)	2140X1140X965
15	616/0	738	BAFFLE RING ASSY	2070X1870X1080
16	617/0	450	GENERATOR ACCESSORIES	1500X1500X1000
17	618/0	492	FLEXIBLE TERMINAL CONNECTIONS	1350X950X400
18	619/0	500	GENERATOR ACCESSORIES	950X950X450
19	620/0	710	GENERATOR ACCESSORIES	1000X1000X750
20	621/0	85	GENERATOR ACCESSORIES	1700X1200X250
21	622/0	1840	PRIMARY WATER TANK	10500X2400X1200
22	624/0	530	PW TANK PIPE LINES	3000X600X500
23	625/0	790	PLATFORM FOR PW TANK	5000X1200X600
24	626/0	19992	COOLER HOUSING FRAME	4290X4450X1428
25	627/0	65	SEAL RINGS	750X750X200
26	628/0	708	CONNECTION PIECE ASSEMBLY	1650X1100X450
27	630/0	100	GENERATOR-TERMINAL BOXES	2000X1200X600
28	631/0	52	DRY AIR BLOWER	1100X1000X700
29	637/0	29928	BRUSHLESS EXCITER SET	5750X2350X3400
30	640/0	860	EXICITER BED PLATE ACCESSORIES	3900X1250X1150
31	642/0	611	EXCITER ACCESSORIES	2200X1200X1100
32	642/1	392	EXCITER ACCESSORIES (DRY	1800X1500X1100
33	643/0	695	EXCITER BED PLATE	1000X800X800
34	644/0	872	RR WHEEL AIR GUIDE COVER	2800X1500X2000
35	645/0	1940	SEAL OIL STORAGE TANK	5000X1800X1700
36	646/0	4550	PW PUMP AND FILTER UNIT	4000X4000X3000
37	648/1	4300	SINGLE FLOW S.O.U.-PART I	4000X2500X3000
38	648/2	3525	SINGLE FLOW S.O.U. -PART II	2500X2500X3400

39	649/0	460	LIQUID DETECTOR RACK	2132X800X2200
40	650/0	630	GAS UNIT	1980X1640X2420
41	651/0	170	CO2 VAPOURISER	1520X840X840
42	652/0	150	H2 DISTRIBUTOR	2400X900X2400
43	653/0	163	CO2 DISTRIBUTOR	3000X900X2400
44	654/0	60	N2 DISTRIBUTOR	1600X700X2300
45	655/0	89	DRAIN OIL COLLECTOR	1750X550X550
46	656/0	56	RESINS	900X500X500
47	657/0	1986	TG SYSTEM INTEGRAL	2750X1400X1400
48	658/0	172	TG SYSTEM INTEGRAL	1000X940X900
49	659/0	40	CONSUMABLES	800X400X200
Total Net Weight:		**499.299**	**MT**	

A (iii) BHEL HWR : : GENERATOR U # 3

SNO	PKG. NO/SL	NET WT	DESCRIPTION	PKG SIZE
1	601/0	9985	FOUNDATION PLATES	6400X1680X950
2	602/0	760	FOUNDATION BOLTS	2540X655X600
3	603/0	1670	FOUNDATION ITEMS	5800X1120X520
4	605/0	292000	GENERATOR STATOR	9860X4440X4260
5	606/0	75000	GENERATOR ROTOR	14125X1790X1740
6	607/0	8250	END SHIELD LOWER HALF (TE)	3800X1500X2240
7	608/0	7250	END SHIELD UPPER HALF (TE)	3800X1500X2240
8	609/0	8300	END SHIELD LOWER HALF (EE)	3800X1500X2240
9	610/0	7300	END SHIELD UPPER HALF (EE)END SHIELD UPPER HALF (EE)	3800X1500X2240
10	611/0	1696	GENERATOR BEARING (EE & TE)	1180X1050X1170
11	612/0	897	BAFFLE RING CARRIER &AIR GAP SEAL ASSY.	2035X1885X1200
12	613/0	1158	TERMINAL BUSHINGS	2200X1830X610
13	614/0	5302	TERMINAL BUSHING BOX	3500X2600X1740
14	615/0	1030	SHAFT SEALS (EE & TE) &OIL CATCHER (INNER & OUTER)	2140X1140X965
15	616/0	738	BAFFLE RING ASSY	2070X1870X1080
16	617/0	450	GENERATOR ACCESSORIES	1500X1500X1000
17	618/0	492	FLEXIBLE TERMINAL CONNECTIONS	1350X950X400
18	619/0	500	GENERATOR ACCESSORIES	950X950X450
19	620/0	710	GENERATOR ACCESSORIES	1000X1000X750
20	621/0	85	GENERATOR ACCESSORIES	1700X1200X250
21	622/0	1840	PRIMARY WATER TANK	10500X2400X1200
22	624/0	530	PW TANK PIPE LINES	3000X600X500
23	625/0	790	PLATFORM FOR PW TANK	5000X1200X600
24	626/0	19992	COOLER HOUSING FRAME	4290X4450X1428
25	627/0	65	SEAL RINGS	750X750X200
26	628/0	708	CONNECTION PIECE ASSEMBLY	1650X1100X450
27	630/0	100	GENERATOR-TERMINAL BOXES	2000X1200X600
28	631/0	52	DRY AIR BLOWER	1100X1000X700
29	637/0	29928	BRUSHLESS EXCITER SET	5750X2350X3400
30	640/0	860	EXICITER BED PLATE ACCESSORIES	3900X1250X1150

31	642/0	611	EXCITER ACCESSORIES	2200X1200X1100
32	642/1	392	EXCITER ACCESSORIES (DRY AIRBLOWER)	1800X1500X1100
33	643/0	695	EXCITER BED PLATE	1000X800X800
34	644/0	872	RR WHEEL AIR GUIDE COVER	2800X1500X2000
35	645/0	1940	SEAL OIL STORAGE TANK	5000X1800X1700
36	646/0	4550	PW PUMP AND FILTER UNIT	4000X4000X3000
37	648/1	4300	SINGLE FLOW S.O.U.-PART I	4000X2500X3000
38	648/2	3525	SINGLE FLOW S.O.U. -PART II	2500X2500X3400
39	649/0	460	LIQUID DETECTOR RACK	2132X800X2200
40	650/0	630	GAS UNIT	1980X1640X2420
41	651/0	170	CO2 VAPOURISER	1520X840X840
42	652/0	150	H2 DISTRIBUTOR	2400X900X2400
43	653/0	163	CO2 DISTRIBUTOR	3000X900X2400
44	654/0	60	N2 DISTRIBUTOR	1600X700X2300
45	655/0	89	DRAIN OIL COLLECTOR	1750X550X550
46	656/0	56	RESINS	900X500X500
47	657/0	1986	TG SYSTEM INTEGRAL	2750X1400X1400
48	658/0	172	TG SYSTEM INTEGRAL	1000X940X900
49	659/0	40	CONSUMABLES	800X400X200
Total Net Weight:		**499.299**	**MT**	

B (ii) BHEL HWR : : TURBINE U # 1

SNO	PKG. NO/SL	NET WT	DESCRIPTION	PKG SIZE
1	75001/1	960	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	1600X1500X600
2	75001/2	1020	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	2600X600X600
3	75001/3	1370	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	1600X800X700
4	75001/4	715	ARRANGE.OF EMBED(ANCHOR POINT)- ANCHOR BOX TYPE-A	1600X800X600
5	75001/5	715	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	1600X800X600
6	75001/6	860	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	2400X800X600
7	75001/7	740	ARRANGE.OF EMBED(ANCHOR POINT)- EMBED.FOR LPC GUIDE BOLT	1450X1375X1230
8	75001/8	650	ARRANGE.OF EMBED(ANCHOR POINT)- EMBED.FOR LPC GUIDE BOLT	1450X1370X1230
9	75001/9	1140	ARRANGE.OF EMBED(ANCHOR POINT)- LOOSE ITEMS	1350X1150X950
10	75001/10	750	ARRANGE.OF EMBED(ANCHOR POINT)- ANCHOR RODS/NUTS (L=3000)	3300X700X700

11	75001/11	2550	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	2800X800X600
12	75003/1	725	BASE PLATE ASSEMBLY	1400X600X600
13	75004/0	2477	BASE PLATE ASSEMBLY	2200X1150X750
14	75102/0	21901	CASING UPPER PART	10800X3600X3500
15	75103/0	22050	CASING UPPER PART	10800X3600X3500
16	75104/0	584	RUPTURE DIAPHRAGM ASSEMBLY	1100X1100X1500
17	75107/0	9300	CASING SIDE WALL (LEFT)	6700X5000X200
18	75108/0	9300	CASING SIDE WALL (RIGHT)	6700X5000X200
19	75109/0	23000	FRONT WALL (TS)	10800X5000X1400
20	75110/0	23000	FRONT WALL (GS)	10800X5000X1400
21	75111/0	730	LP SHAFT SEAL CASING - TS	2000X1650X750
22	75112/0	730	LP SHAFT SEAL CASING - GS	2000X1650X750
23	75113/0	1452	LP SHAFT SEAL COMPENSATOR (TS)	2800X2800X800
24	75114/0	1452	LP SHAFT SEAL COMPENSATOR (GS)	2800X2800X800
25	75116/1	9307	CASING FRAME SECTION	9000X1500X3600
26	75116/2	7145	CASING FRAME SECTION	2500X1000X2000
27	75201/0	10600	HP/IP BEARING PEDESTAL	4500X1800X2100
28	75202/0	250	HP/IP BEARING PEDESTAL (PARTS)	1000X600X600
29	75401/0	20000	IP-LP BEARING PEDESTAL ASSLYIP-LP	7500X2000X2400
30	75402/0	1000	BEARING PEDESTAL (PARTS)	2200X1700X600
31	75501/0	19500	LP/GEN. PEDESTAL ASSEMBLY	7500X2000X2400
32	75502/0	550	BEARING PEDESTAL (PARTS)	2200X1500X500
33	75601/1	10958	FRONT BEARING PEDESTAL	3400X1400X1600
34	75601/2	519	HYDRALLIC TURNING MOTOR	1300X800X1500
35	75601/3	250	FRONT BEARING PEDESTALS(PARTS)	1000X600X600
36	75705/0	945	LP EXTRACTION A1	3050X1430X1430
37	75706/0	465	LP EXTRACTION A1	2490X1330X1120
38	75707/1	945	LP EXTRACTION A1	3050X1430X1430
39	75707/2	465	LP EXTRACTION A1	2490X1330X1120
40	75708/0	1060	LP EXTRACTION A2	2850X1400X1400
41	75709/0	884	LP EXTRACTION A2	3200X1200X1600
42	75710/0	1210	LP EXTRACTION A2	5630X1150X1150
43	75711/0	935	LP EXTRACTION A3	2860X1200X1200
44	75712/0	903	LP EXRACTION A3	4620X1120X1120
45	75713/0	156	LP EXTRACTION A3	1580X930X810
46	75716/1	3253	EXTRACTION PIPE SHEATHING A2	4700X2200X1800
47	75716/2	50	EXTRACTION PIPE SHEATHING A2	200X200X150
48	75716/3	1910	EXTRACTION PIPE SHEATHING A3	4000X2000X1500
49	75716/4	58	EXTRACTION PIPE SHEATHING A3	300X350X300
50	75717/0	924	COMPENSATORS FOR CASING GUIDE	3000X2000X400
51	75720/0	33000	LP INNER CASING (U/H)	6150X4777X3820
52	75721/0	78000	LP INNER CASING (L/H)	6812X6530X4360
53	75722/1	3250	GUIDE BLADE CARRIER 3R UPPERHALF	3830X2215X915
54	75722/2	4410	ASSEMBLY OF GUIDE BLADECARRIERS 3L	3830X2215X1142
55	75722/3	4000	ASSEMBLY OF GUIDE BLADECARRIER LP	2700X1600X1400
56	75722/4	5000	ASSEMBLY OF GUIDE BLADECARRIER LP	2800X1700X1650
57	75723/1	700	LP CASING ASSEMBLY PARTS	7000X500X500
58	75723/2	770	LP CASING ASSEMBLY PARTS	1500X1000X800
59	75723/3	6	LP CASING ASSEMBLY PARTS	500X500X400
60	75723/4	55	LP CASING ASSEMBLY PARTS	550X400X300

61	75724/1	1450	LP INNER CASING ASSEMBLY(PARTS	3300X1750X350
62	75724/2	890	LP INNER CASING ASSEMBLY(PARTS	600X600X500
63	75725/0	0	GRATING COVERING FOR LP	0X0X0
64	75801/0	95000	LP ROTOR	8174X4500X4456
65	75901/0	27100	IP ROTOR	6090X1880X1700
66	75902/0	29045	IP OUTER CASING (U/H)	6040X4320X2200
67	75903/0	38220	IP OUTER CASING (L/H)	5300X5300X2200
68	75904/0	25000	IP INNER CASING (U/H)	3600X3300X1650
69	75905/0	29000	IP INNER CASING(L/H)	3600X3300X1650
70	75906/0	2707	SUPPORTING ARMS-IP OUTERCASING	1560X1335X1330
71	75907/0	550	IP SHAFT SEALING	1400X1200X900
72	75908/0	6900	IP TURBINE (PARTS)	3000X2500X1600
73	75909/0	365	I.P. TURBINE PARTS	1000X1000X750
74	76001/0	100000	HP TURBINE	XX
75	76002/0	500	HP INLET ASSEMBLY	XX
76	76004/0	37	HP TURBINE PARTS	500X500X500
77	76104/0	31600	ESV & CV CASING WITH VALVESESV	4700X4700X2700
78	76104/1	286	STEAM STRAINERS FOR MSVALVES	1600X700X700
79	76105/1	895	MOUNTING SUPPORT FOR MS VALVE	1200X800X700
80	76105/2	895	MOUNTING SUPPORT FOR MS VALVE	1200X800X700
81	76108/0	31600	ESV & CV CASING WITH VALVESESV	4700X4700X2700
82	76112/0	5500	OVERLOAD VALVE CASINGWITH VALVE	3000X2000X1400
83	76201/0	1000	SUSPENSION OF OVERLOAD VALVE	3800X3000X1000
84	76202/0	45000	IV & CV CASING WITH VALVES	6210X4870X3600
85	76202/2	1248	STEAM STRAINERS FORINTERCEPTOR	2800X1300X1100
86	76205/1	2450	MOUNTING SUPPORT FOR HRH VALVE	2500X1500X700
87	76205/2	2450	MOUNTING SUPPORT FOR HRH VALVE	2500X1500X700
88	76206/0	45000	IV & CV CASING WITH VALVES	6210X4870X3600
89	76301/1	986	SUSPENSION OF LPBP VALVE	3600X1700X800
90	76301/2	986	SUSPENSION OF LPBP VALVE	3600X1700X800
91	76412/0	515	LEAKAGE OIL TANK	1000X1000X3000
92	76413/0	515	WASTE OIL TANK	1000X1000X3000
93	76601/0	3200	COMPONENTS OF COP ASSEMBLY	3000X3000X2400
94	76602/0	3267	COMPONENTS OF COP ASSEMBLY	3700X3000X2000
95	76603/0	5000	COMPONENTS OF COP ASSEMBLY	3100X3100X1100
96	76604/0	2100	COMPONENTS OF COP ASSEMBLY	2100X2200X2200
97	76605/0	11500	COMPONENTS OF COP ASSEMBLY	5000X3300X3000
98	76606/0	2700	COMPONENTS OF COP ASSEMBLY	2270X2270X1730
99	76607/0	1720	COMPONENTS OF COP ASSEMBLY	6200X1000X300
100	76608/0	1200	COMPONENTS OF COP ASSEMBLY(PARTS)	2200X2200X1000
101	76801/0	50	RATING,COLLABORATION	XX
102	76914/0	27	COMPENSATOR	600X600X900
103	77202/0	116	TEMP. & PRESSURE CONNECTIONS	1700X750X750
104	77203/0	1516	IMPULSE PIPES (CARBON STEEL)	6900X500X500
105	77204/1	351	PRESSURE INSTRUMENTS & SENSORS	1000X500X500
106	77204/2	121	TEMP. INSTRUMENTS & SENSORSTEMP.	800X800X500
107	77204/3	16	LEVEL INSTRUMENTS & SENSORLEVEL	2800X400X400
108	77205/0	30	TRANSMITTERS & J.B.OF BEARINGS	500X300X200
109	77206/0	111	IMPULSE PIPES(ALLOY STEEL AND SS)	6900X500X500
110	77207/0	1194	IMPULSE PIPESIMPULSE PIPES	7000X300X300

Total Net Weight:	**913.513**	**MT**	

B (iii) BHEL HWR : : TURBINE U # 3

SNO	PKG. NO/SL	NET WT	DESCRIPTION	PKG SIZE
1	75001/1	960	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	1600X1500X600
2	75001/2	1020	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	2600X600X600
3	75001/3	1370	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	1600X800X700
4	75001/4	715	ARRANGE.OF EMBED(ANCHOR POINT)- ANCHOR BOX TYPE-A	1600X800X600
5	75001/5	715	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	1600X800X600
6	75001/6	860	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	2400X800X600
7	75001/7	740	ARRANGE.OF EMBED(ANCHOR POINT)- EMBED.FOR LPC GUIDE BOLT	1450X1375X1230
8	75001/8	650	ARRANGE.OF EMBED(ANCHOR POINT)- EMBED.FOR LPC GUIDE BOLT	1450X1370X1230
9	75001/9	1140	ARRANGE.OF EMBED(ANCHOR POINT)- LOOSE ITEMS	1350X1150X950
10	75001/10	750	ARRANGE.OF EMBED(ANCHOR POINT)- ANCHOR RODS/NUTS (L=3000)	3300X700X700
11	75001/11	2550	ARRANGE.OF EMBED(ANCHOR POINT)ARRANGE.OF EMBED(ANCHOR POINT)	2800X800X600
12	75003/1	725	BASE PLATE ASSEMBLY	1400X600X600
13	75004/0	2477	BASE PLATE ASSEMBLY	2200X1150X750
14	75102/0	21901	CASING UPPER PART	10800X3600X3500
15	75103/0	22050	CASING UPPER PART	10800X3600X3500
16	75104/0	584	RUPTURE DIAPHRAGM ASSEMBLY	1100X1100X1500
17	75107/0	9300	CASING SIDE WALL (LEFT)	6700X5000X200
18	75108/0	9300	CASING SIDE WALL (RIGHT)	6700X5000X200
19	75109/0	23000	FRONT WALL (TS)	10800X5000X1400
20	75110/0	23000	FRONT WALL (GS)	10800X5000X1400
21	75111/0	730	LP SHAFT SEAL CASING - TS	2000X1650X750
22	75112/0	730	LP SHAFT SEAL CASING - GS	2000X1650X750
23	75113/0	1452	LP SHAFT SEAL COMPENSATOR (TS)	2800X2800X800
24	75114/0	1452	LP SHAFT SEAL COMPENSATOR (GS)	2800X2800X800
25	75116/1	9307	CASING FRAME SECTION	9000X1500X3600
26	75116/2	7145	CASING FRAME SECTION	2500X1000X2000
27	75201/0	10600	HP/IP BEARING PEDESTAL	4500X1800X2100
28	75202/0	250	HP/IP BEARING PEDESTAL (PARTS)	1000X600X600
29	75401/0	20000	IP-LP BEARING PEDESTAL ASSLYIP-LP	7500X2000X2400
30	75402/0	1000	BEARING PEDESTAL (PARTS)	2200X1700X600
31	75501/0	19500	LP/GEN. PEDESTAL ASSEMBLY	7500X2000X2400
32	75502/0	550	BEARING PEDESTAL (PARTS)	2200X1500X500
33	75601/1	10958	FRONT BEARING PEDESTAL	3400X1400X1600
34	75601/2	519	HYDRALLIC TURNING MOTOR	1300X800X1500
35	75601/3	250	FRONT BEARING PEDESTALS(PARTS)	1000X600X600

36	75705/0	945	LP EXTRACTION A1	3050X1430X1430
37	75706/0	465	LP EXTRACTION A1	2490X1330X1120
38	75707/1	945	LP EXTRACTION A1	3050X1430X1430
39	75707/2	465	LP EXTRACTION A1	2490X1330X1120
40	75708/0	1060	LP EXTRACTION A2	2850X1400X1400
41	75709/0	884	LP EXTRACTION A2	3200X1200X1600
42	75710/0	1210	LP EXTRACTION A2	5630X1150X1150
43	75711/0	935	LP EXTRACTION A3	2860X1200X1200
44	75712/0	903	LP EXRACTION A3	4620X1120X1120
45	75713/0	156	LP EXTRACTION A3	1580X930X810
46	75716/1	3253	EXTRACTION PIPE SHEATHING A2	4700X2200X1800
47	75716/2	50	EXTRACTION PIPE SHEATHING A2	200X200X150
48	75716/3	1910	EXTRACTION PIPE SHEATHING A3	4000X2000X1500
49	75716/4	58	EXTRACTION PIPE SHEATHING A3	300X350X300
50	75717/0	924	COMPENSATORS FOR CASING GUIDE	3000X2000X400
51	75720/0	33000	LP INNER CASING (U/H)	6150X4777X3820
52	75721/0	78000	LP INNER CASING (L/H)	6812X6530X4360
53	75722/1	3250	GUIDE BLADE CARRIER 3R UPPERHALF	3830X2215X915
54	75722/2	4410	ASSEMBLY OF GUIDE BLADECARRIERS	3830X2215X1142
55	75722/3	4000	ASSEMBLY OF GUIDE BLADECARRIER LP	2700X1600X1400
56	75722/4	5000	ASSEMBLY OF GUIDE BLADECARRIER LP	2800X1700X1650
57	75723/1	700	LP CASING ASSEMBLY PARTS	7000X500X500
58	75723/2	770	LP CASING ASSEMBLY PARTS	1500X1000X800
59	75723/3	6	LP CASING ASSEMBLY PARTS	500X500X400
60	75723/4	55	LP CASING ASSEMBLY PARTS	550X400X300
61	75724/1	1450	LP INNER CASING ASSEMBLY(PARTS	3300X1750X350
62	75724/2	890	LP INNER CASING ASSEMBLY(PARTS	600X600X500
63	75725/0	0	GRATING COVERING FOR LP	0X0X0
64	75801/0	95000	LP ROTOR	8174X4500X4456
65	75901/0	27100	IP ROTOR	6090X1880X1700
66	75902/0	29045	IP OUTER CASING (U/H)	6040X4320X2200
67	75903/0	38220	IP OUTER CASING (L/H)	5300X5300X2200
68	75904/0	25000	IP INNER CASING (U/H)	3600X3300X1650
69	75905/0	29000	IP INNER CASING(L/H)	3600X3300X1650
70	75906/0	2707	SUPPORTING ARMS-IP OUTERCASING	1560X1335X1330
71	75907/0	550	IP SHAFT SEALING	1400X1200X900
72	75908/0	6900	IP TURBINE (PARTS)	3000X2500X1600
73	75909/0	365	I.P. TURBINE PARTS	1000X1000X750
74	76001/0	100000	HP TURBINE	XX
75	76002/0	500	HP INLET ASSEMBLY	XX
76	76004/0	37	HP TURBINE PARTS	500X500X500
77	76104/0	31600	ESV & CV CASING WITH VALVESESV	4700X4700X2700
78	76104/1	286	STEAM STRAINERS FOR MSVALVES	1600X700X700
79	76105/1	895	MOUNTING SUPPORT FOR MS VALVE	1200X800X700
80	76105/2	895	MOUNTING SUPPORT FOR MS VALVE	1200X800X700
81	76108/0	31600	ESV & CV CASING WITH VALVESESV	4700X4700X2700
82	76112/0	5500	OVERLOAD VALVE CASINGWITH VALVE	3000X2000X1400
83	76201/0	1000	SUSPENSION OF OVERLOAD VALVE	3800X3000X1000
84	76202/0	45000	IV & CV CASING WITH VALVES	6210X4870X3600
85	76202/2	1248	STEAM STRAINERS FORINTERCEPTOR	2800X1300X1100
86	76205/1	2450	MOUNTING SUPPORT FOR HRH VALVE	2500X1500X700
87	76205/2	2450	MOUNTING SUPPORT FOR HRH VALVE	2500X1500X700

88	76206/0	45000	IV & CV CASING WITH VALVES	6210X4870X3600
89	76301/1	986	SUSPENSION OF LPBP VALVE	3600X1700X800
90	76301/2	986	SUSPENSION OF LPBP VALVE	3600X1700X800
91	76412/0	515	LEAKAGE OIL TANK	1000X1000X3000
92	76413/0	515	WASTE OIL TANK	1000X1000X3000
93	76601/0	3200	COMPONENTS OF COP ASSEMBLY	3000X3000X2400
94	76602/0	3267	COMPONENTS OF COP ASSEMBLY	3700X3000X2000
95	76603/0	5000	COMPONENTS OF COP ASSEMBLY	3100X3100X1100
96	76604/0	2100	COMPONENTS OF COP ASSEMBLY	2100X2200X2200
97	76605/0	11500	COMPONENTS OF COP ASSEMBLY	5000X3300X3000
98	76606/0	2700	COMPONENTS OF COP ASSEMBLY	2270X2270X1730
99	76607/0	1720	COMPONENTS OF COP ASSEMBLY	6200X1000X300
100	76608/0	1200	COMPONENTS OF COP ASSEMBLY(PARTS)	2200X2200X1000
101	76801/0	50	RATING,COLLABORATION	XX
102	76914/0	27	COMPENSATOR	600X600X900
103	77202/0	116	TEMP. & PRESSURE CONNECTIONS	1700X750X750
104	77203/0	1516	IMPULSE PIPES (CARBON STEEL)	6900X500X500
105	77204/1	351	PRESSURE INSTRUMENTS & SENSORS	1000X500X500
106	77204/2	121	TEMP. INSTRUMENTS & SENSORSTEMP.	800X800X500
107	77204/3	16	LEVEL INSTRUMENTS & SENSORLEVEL	2800X400X400
108	77205/0	30	TRANSMITTERS & J.B.OF BEARINGS	500X300X200
109	77206/0	111	IMPULSE PIPES(ALLOY STEEL AND SS)	6900X500X500
110	77207/0	1194	IMPULSE PIPESIMPULSE PIPES	7000X300X300
Total Net Weight:		**913.513**	**MT**	

C (ii) BHEL HWR : : CONDENSER U # 1

SNO	PKG. NO/SL	NET WT	DESCRIPTION	PKG SIZE
1	78004/0	5911	BOTTOM PLATE HOT BOX	7900X1100X100
2	78010/0	200	LOOSE ITEMS (BOTTOM PLATE HOTBOX)	1000X300X610
3	78014/0	1355	HOTBOX SUPPORT (PEDESTALEMBEDMENT PLATE)	1500X1500X1000
4	78018/0	973	SUPPORT OF HOT BOX	1500X1500X600
5	78019/0	250	EARTHQUAKE PROTECTION HOT BOX	600X500X500
6	78032/0	5350	SIDE WALL (CURVED PLATE-1)	8850X3850X20
7	78033/0	5030	SIDE WALL (CURVED PLATE-2)	8850X3620X20
8	78034/0	5614	SIDE WALL (CURVED PLATE-3)	8850X4040X20
9	78035/0	5665	SIDE WALL (FRONT SIDE -1)	8930X4040X25
10	78036/0	5749	SIDE WALL (FRONT SIDE -2)	8930X4100X25
11	78037/0	5278	SIDE WALL (TUR SIDE-1)	8280X4060X20
12	78038/0	5356	SIDE WALL (TUR SIDE-2)	8280X4120X20
13	78039/0	5278	SIDE WALL (GEN SIDE-1)	8280X4060X20
14	78040/0	5360	SIDE WALL (GEN SIDE-2)	8280X4120X20
15	78041/0	4516	STIFFENING SUPPORT(CURVED PLATES)	8850X3250X20
16	78042/0	17245	LOOSE ITEMS (STIFFENERS)	8930X4100X60
17	78043/0	17245	LOOSE ITEMS	8930X4100X60
18	78048/0	3441	SHELL INTERNALS	9000X1000X400
19	78049/0	5173	SHELL INTERNALS	9000X1400X400
20	78050/0	4311	SHELL INTERNALS	9000X1200X400
21	78051/0	3734	SHELL INTERNALS	4000X1200X600

22	78052/0	3912	SHELL INTERNALS	6500X1000X500
23	78053/0	1979	SHELL INTERNALS	1500X1000X1000
24	78054/0	1077	SHELL INTERNALS	1900X600X600
25	78055/0	754	SHELL INTERNALS	4200X600X300
26	78056/0	1812	SHELL INTERNALS	1500X1000X1000
27	78057/0	1930	SHELL INTERNALS	4000X3500X200
28	78075/0	4300	STEAM NECK WALL (TUR SIDE)	7800X2800X500
29	78076/0	2850	STEAM NECK WALL (TUR SIDE)	7800X2800X500
30	78078/0	900	STEAM NECK WALL (TUR SIDE)LOOSE	2000X2000X500
31	78103/0	3700	STEAM NECK WALL (GEN SIDE)	7800X2800X500
32	78104/0	3100	STEAM NECK WALL (GEN SIDE)	7800X2800X500
33	78106/0	900	STEAM NECK WALL (GEN SIDE)LOOSE	2000X2000X500
34	78109/0	5000	STEAM NECK WALL (A ROW SIDE)	7800X2800X500
35	78110/0	900	STEAM NECK WALL (A ROW SIDE)	7800X2800X500
36	78112/0	900	STEAM NECK WALL (A ROW SIDE)LOOSE	2000X2000X500
37	78115/0	4800	STEAM NECK WALL (B ROW SIDE)	7800X2800X500
38	78116/0	850	STEAM NECK WALL (B ROW SIDE)	7800X2800X500
39	78118/0	900	STEAM NECK WALL (B ROW SIDE)LOOSE	2000X2000X500
40	78121/0	3500	PIPES (DOME INTERNALSTIFFENING)	9000X1000X500
41	78122/0	2300	PIPES (DOME INTERNALSTIFFENING)	7800X1000X500
42	78123/0	2500	PIPES (DOME INTERNALSTIFFENING)	8000X750X500
43	78124/0	2100	PIPES (DOME INTERNALSTIFFENING)	5700X1000X500
44	78125/0	500	PIPES (DOME INTERNALSTIFFENING)	1600X1000X1000
45	78126/0	500	PIPES (DOME INTERNALSTIFFENING)	1400X1000X1000
46	78127/0	400	PIPES (DOME INTERNALSTIFFENING	1000X800X800
47	78301/0	1510	GLAND STEAM CONDENSER	1750X1700X1700
48	78304/0	34	LOOSE ITEMS OF GSC	700X300X200
49	78305/0	10	LOOSE ITEMS OF GSC (FRAGILE)	600X500X350
50	78315/0	28900	LP HEATER 1	14700X2200X2000
51	78316/0	100	STAND PIPES OF LPH-1	2800X350X350
52	78317/0	110	LOOSE ITEMS OF LPH-1	500X400X400
53	78318/0	50	LOOSE ITEMS OF LP HEATER 1	700X400X400
54	78319/0	120	LOOSE ITEMS OF LPH -1(NFRAGILE)	2100X500X400
55	78320/0	664	TROLLEY FOR LP HEATER 1	1350X800X200
56	78424/0	3000	HYDROGEN COOLER	4800X1200X1300
57	78425/0	3000	HYDROGEN COOLER	4800X1200X1300
58	78428/0	3000	LOOSE ITEMS (HYDROGEN COOLERS)	1200X1200X650
59	78431/0	1070	EXCITER AIR COOLER	3450X900X760
60	78432/0	1070	EXCITER AIR COOLER	3450X900X760
Total Net Weight:		**208.036**	**MT**	

C (iii) BHEL HWR : : CONDENSER U # 3

SNO	PKG. NO/SL	NET WT	DESCRIPTION	PKG SIZE
1	78004/0	5911	BOTTOM PLATE HOT BOX	7900X1100X100
2	78010/0	200	LOOSE ITEMS (BOTTOM PLATE HOTBOX)	1000X300X610
3	78014/0	1355	HOTBOX SUPPORT (PEDESTALEMBEDMENT PLATE)	1500X1500X1000
4	78018/0	973	SUPPORT OF HOT BOX	1500X1500X600

5	78019/0	250	EARTHQUAKE PROTECTION HOT BOX	600X500X500
6	78032/0	5350	SIDE WALL (CURVED PLATE-1)	8850X3850X20
7	78033/0	5030	SIDE WALL (CURVED PLATE-2)	8850X3620X20
8	78034/0	5614	SIDE WALL (CURVED PLATE-3)	8850X4040X20
9	78035/0	5665	SIDE WALL (FRONT SIDE -1)	8930X4040X25
10	78036/0	5749	SIDE WALL (FRONT SIDE -2)	8930X4100X25
11	78037/0	5278	SIDE WALL (TUR SIDE-1)	8280X4060X20
12	78038/0	5356	SIDE WALL (TUR SIDE-2)	8280X4120X20
13	78039/0	5278	SIDE WALL (GEN SIDE-1)	8280X4060X20
14	78040/0	5360	SIDE WALL (GEN SIDE-2)	8280X4120X20
15	78041/0	4516	STIFFENING SUPPORT(CURVED PLATES)	8850X3250X20
16	78042/0	17245	LOOSE ITEMS (STIFFENERS)	8930X4100X60
17	78043/0	17245	LOOSE ITEMS	8930X4100X60
18	78048/0	3441	SHELL INTERNALS	9000X1000X400
19	78049/0	5173	SHELL INTERNALS	9000X1400X400
20	78050/0	4311	SHELL INTERNALS	9000X1200X400
21	78051/0	3734	SHELL INTERNALS	4000X1200X600
22	78052/0	3912	SHELL INTERNALS	6500X1000X500
23	78053/0	1979	SHELL INTERNALS	1500X1000X1000
24	78054/0	1077	SHELL INTERNALS	1900X600X600
25	78055/0	754	SHELL INTERNALS	4200X600X300
26	78056/0	1812	SHELL INTERNALS	1500X1000X1000
27	78057/0	1930	SHELL INTERNALS	4000X3500X200
28	78075/0	4300	STEAM NECK WALL (TUR SIDE)	7800X2800X500
29	78076/0	2850	STEAM NECK WALL (TUR SIDE)	7800X2800X500
30	78078/0	900	STEAM NECK WALL (TUR SIDE)LOOSE	2000X2000X500
31	78103/0	3700	STEAM NECK WALL (GEN SIDE)	7800X2800X500
32	78104/0	3100	STEAM NECK WALL (GEN SIDE)	7800X2800X500
33	78106/0	900	STEAM NECK WALL (GEN SIDE)LOOSE	2000X2000X500
34	78109/0	5000	STEAM NECK WALL (A ROW SIDE)	7800X2800X500
35	78110/0	900	STEAM NECK WALL (A ROW SIDE)	7800X2800X500
36	78112/0	900	STEAM NECK WALL (A ROW SIDE)LOOSE	2000X2000X500
37	78115/0	4800	STEAM NECK WALL (B ROW SIDE)	7800X2800X500
38	78116/0	850	STEAM NECK WALL (B ROW SIDE)	7800X2800X500
39	78118/0	900	STEAM NECK WALL (B ROW SIDE)LOOSE	2000X2000X500
40	78121/0	3500	PIPES (DOME INTERNALSTIFFENING)	9000X1000X500
41	78122/0	2300	PIPES (DOME INTERNALSTIFFENING)	7800X1000X500
42	78123/0	2500	PIPES (DOME INTERNALSTIFFENING)	8000X750X500
43	78124/0	2100	PIPES (DOME INTERNALSTIFFENING)	5700X1000X500
44	78125/0	500	PIPES (DOME INTERNALSTIFFENING)	1600X1000X1000
45	78126/0	500	PIPES (DOME INTERNALSTIFFENING)	1400X1000X1000
46	78127/0	400	PIPES (DOME INTERNALSTIFFENING	1000X800X800
47	78301/0	1510	GLAND STEAM CONDENSER	1750X1700X1700
48	78304/0	34	LOOSE ITEMS OF GSC	700X300X200
49	78305/0	10	LOOSE ITEMS OF GSC (FRAGILE)	600X500X350
50	78315/0	28900	LP HEATER 1	14700X2200X2000
51	78316/0	100	STAND PIPES OF LPH-1	2800X350X350
52	78317/0	110	LOOSE ITEMS OF LPH-1	500X400X400
53	78318/0	50	LOOSE ITEMS OF LP HEATER 1	700X400X400
54	78319/0	120	LOOSE ITEMS OF LPH -1(NFRAGILE)	2100X500X400
55	78320/0	664	TROLLEY FOR LP HEATER 1	1350X800X200

APPENDIX – II (REV-01)

56	78424/0	3000	HYDROGEN COOLER	4800X1200X1300
57	78425/0	3000	HYDROGEN COOLER	4800X1200X1300
58	78428/0	3000	LOOSE ITEMS (HYDROGEN COOLERS)	1200X1200X650
59	78431/0	1070	EXCITER AIR COOLER	3450X900X760
60	78432/0	1070	EXCITER AIR COOLER	3450X900X760
Total Net Weight:		**208.036**	**MT**	

D (ii) BHEL HWR BOIs (FOR U# 1)

S. No	Name of BOI Package	QTY	UNIT	Net wt Kg (Approx.)	Remark
1	EMPTY H2 CYLINDER	235	NO	12455	
2	EMPTY CO2 CYLINDER	110	NO	5830	
3	EMPTY N2 CYLINDER	36	NO	1908	
4	PORTABLE GAS ANALYSER	1	NO		
5	MOISTURE MEASURING SYSTEM	1	NO	200	
6	VAPOUR EXHAUSTER	2	NO	200	
7	MOTORISED TEMPERATURE CONTROL	1	NO	500	
8	H2 GAS ANALYSER CABINET	2	NO	1100	
9	REFRIGERATION GAS DRYER	2	NO		
10	STARTING RESISTOR FOR DC S.O MOTOR	1	NO		
11	GROUNDING BRUSH MONITOR	1	NO		
12	FIBRE OPTIC END WINDING VIBRAT	1	ST		
13	PRIMARY WATER COOLER (PLATE TYPE)	2	NO		
14	STROBOSCOPE	1	NO		
15	GENERATOR INTEGRAL PIPING	1	ST	16000	
16	HYDROGEN COOLERS PIPING	1	ST	8000	
17	PW TEMPERATURE CONTROL VALVE	1	NO	1000	
18	THREE PHASE UPS FOR GENERATOR	1	ST	1000	
19	EXCITER COVER COMPLETE WITH FA	1	NO		
20	ROTOR FLUX PROBE DATA ACQUISIT	1	ST		
21	AIR EXHAUSTER WITH MOTOR	2	NO	400	
22	AIR COOLED CONDENSER PACKAGE	1	ST		
23	BUTTERFLY VALVES	1	ST		
24	NRV WITH ALUMINIUM FLAP	1	ST		
25	OIL PURIFICATION UNIT	1	NO	6500	
26	SPRAY NOZZLES	1	ST		

APPENDIX – II (REV-01)

27	DIRT CATCHERS	1	NO		
28	DAMPER	1	ST		
29	VARIABLE LOAD SPRING CAGES	1	ST		
30	THERMAL INSULATION OF TURBINE	1	NO		
31	THERMAL INSULATION OF TIP	1	ST		
32	TURBINE OIL	1	FT	52000	
33	DRY AIR PRESERVATION SYSTEM	1	NO		
34	OIL PURIFICATION SYSTEM (CENTR	1	NO	6500	
35	DELETED				
36	TURBINE INTEGRAL PIPING	1	ST	57000	
37	H & S FOR TURBINE INTEGRAL PIP	1	ST	20500	
38	CALIBRATED FLOW NOZZLE ASSLY.	1	NO	9500	
39	CONTROL FLUID (FRF)	1	FL	2700	
40	LP BYPASS STOP & CONTROL VALVE	1	ST	23450	
41	STEAM TRAP	1	ST	500	
42	GEAR PUMP (LUB. OIL RECIRCULAT	1	NO	1000	
43	DELETED				
44	LEVEL INSTRUMENTS FOR OIL SYST	1	ST		
45	LEVEL INDICATORS FOR OIL TANKS	1	ST		
46	VACUUM BREAKER VALVE WITH PNEU	1	ST	1300	
47	HPT STEAM EVACUATION VALVE	1	NO	500	
48	TEMPERATURE TRANSMITTER AND AC	1	ST		
49	DC STARTERS & INSTRUMENTATION	1	NO		
50	OIL MODULE	1	NO	18000	
51	OIL THROTTLE VALVES	1	ST	900	
52	SEAL STEAM CONTROL VALVE WITH ACTUATOR	1	ST	900	
53	LEAK STEAM CONTROL VALVE WITH ACTUATOR	1	ST	1300	
54	TURBINE INSTRUMENT RACKS	1	ST		
55	PNEUMATIC GLOBE VALVE	1	ST	900	
56	HYDRAULIC POWER SUPPLY UNIT FOR TURBINE VALVES	1	ST	15000	
57	OIL THROTTLE VALVE FOR JACKING OIL	1	NO	1000	
58	BOROSCOPIC VIDEO IMAGE KIT	1	NO		
	APPROXIMATE TOTAL WEIGHT AS PER SCOPE OF WORK			650000	Kg
	TOTAL WEIGHT =		~	**620**	**MT (Approx.)**

D (iii) BHEL HWR BOIs (FOR U# 3)

S. No	Name of BOI Package	QTY	UNIT	Net wt Kg (Approx.)	Remark

APPENDIX – II (REV-01)

1	EMPTY H2 CYLINDER	235	NO	12455	
2	EMPTY CO2 CYLINDER	110	NO	5830	
3	EMPTY N2 CYLINDER	36	NO	1908	
4	PORTABLE GAS ANALYSER	1	NO		
5	MOISTURE MEASURING SYSTEM	1	NO	200	
6	VAPOUR EXHAUSTER	2	NO	200	
7	MOTORISED TEMPERATURE CONTROL	1	NO	500	
8	H2 GAS ANALYSER CABINET	2	NO	1100	
9	REFRIGERATION GAS DRYER	2	NO		
10	STARTING RESISTOR FOR DC S.O MOTOR	1	NO		
11	GROUNDING BRUSH MONITOR	1	NO		
12	FIBRE OPTIC END WINDING VIBRAT	1	ST		
13	PRIMARY WATER COOLER (PLATE TYPE)	2	NO		
14	STROBOSCOPE	1	NO		
15	GENERATOR INTEGRAL PIPING	1	ST	16000	
16	HYDROGEN COOLERS PIPING	1	ST	8000	
17	PW TEMPERATURE CONTROL VALVE	1	NO	1000	
18	THREE PHASE UPS FOR GENERATOR	1	ST	1000	
19	EXCITER COVER COMPLETE WITH FA	1	NO		
20	ROTOR FLUX PROBE DATA ACQUISIT	1	ST		
21	AIR EXHAUSTER WITH MOTOR	2	NO	400	
22	AIR COOLED CONDENSER PACKAGE	1	ST		
23	BUTTERFLY VALVES	1	ST		
24	NRV WITH ALUMINIUM FLAP	1	ST		
25	OIL PURIFICATION UNIT	1	NO	6500	
26	SPRAY NOZZLES	1	ST		
27	DIRT CATCHERS	1	NO		
28	DAMPER	1	ST		
29	VARIABLE LOAD SPRING CAGES	1	ST		
30	THERMAL INSULATION OF TURBINE	1	NO		
31	THERMAL INSULATION OF TIP	1	ST		
32	TURBINE OIL	1	FT	52000	
33	DRY AIR PRESERVATION SYSTEM	1	NO		
34	OIL PURIFICATION SYSTEM (CENTR	1	NO	6500	
35	DELETED				
36	TURBINE INTEGRAL PIPING	1	ST	57000	
37	H & S FOR TURBINE INTEGRAL PIP	1	ST	20500	
38	CALIBRATED FLOW NOZZLE ASSLY.	1	NO	9500	
39	CONTROL FLUID (FRF)	1	FL	2700	
40	LP BYPASS STOP & CONTROL VALVE	1	ST	23450	

APPENDIX – II (REV-01)

41	STEAM TRAP	1	ST	500	
42	GEAR PUMP (LUB. OIL RECIRCULAT	1	NO	1000	
43	DELETED				
44	LEVEL INSTRUMENTS FOR OIL SYST	1	ST		
45	LEVEL INDICATORS FOR OIL TANKS	1	ST		
46	VACUUM BREAKER VALVE WITH PNEU	1	ST	1300	
47	HPT STEAM EVACUATION VALVE	1	NO	500	
48	TEMPERATURE TRANSMITTER AND AC	1	ST		
49	DC STARTERS & INSTRUMENTATION	1	NO		
50	OIL MODULE	1	NO	18000	
51	OIL THROTTLE VALVES	1	ST	900	
52	SEAL STEAM CONTROL VALVE WITH ACTUATOR	1	ST	900	
53	LEAK STEAM CONTROL VALVE WITH ACTUATOR	1	ST	1300	
54	TURBINE INSTRUMENT RACKS	1	ST		
55	PNEUMATIC GLOBE VALVE	1	ST	900	
56	HYDRAULIC POWER SUPPLY UNIT FOR TURBINE VALVES	1	ST	15000	
57	OIL THROTTLE VALVE FOR JACKING OIL	1	NO	1000	
58	BOROSCOPIC VIDEO IMAGE KIT	1	NO		
	APPROXIMATE TOTAL WEIGHT AS PER SCOPE OF WORK			650000	Kg
	TOTAL WEIGHT =		~	**620**	**MT (Approx.)**

E (ii) BHEL BHOPAL (FOR UNIT # 1)

S. No	Name of item	QTY	UNIT	Net wt Kg (Approx.)	Remark
01	BF VALVE	30	NO	13230	
02	FLASH TANK	4	SET	8143	
03	MISC. TANK	4	SET	5439	
	TOTAL			**26812**	

E (iii) BHEL BHOPAL (FOR UNIT # 3)

S. No	Name of item	QTY	UNIT	Net wt Kg (Approx.)	Remark
01	BF VALVE	30	NO	13230	
02	FLASH TANK	4	SET	8143	
03	MISC. TANK	11	SET	5439	
	TOTAL			**26812**	

APPENDIX – II (REV-01)

F (ii) HEAT EXCHANGERS (BHEL- HYDERABAD) (for Unit # 1)

Sl.No	Equipment	Overall Dimensions (in mm)	Quantity	Dry Weight	(Wt / no.) (in kgs)	
1.	***Drain Cooler***					
a.	Complete Assly.	L 9050 x W 1500 x H 1700	1 no.	13,000		
2.	***LP Heater #2***					
a.	Complete Assly.	L 13500 x W 2000 x H 2550	1 no.	32,000		
3.	***LP Heater #3***					
a.	Complete Assly.	L 13100 x W 2000 x H 2550	1 no.	30,000		
4.	***LP Heater #4***					
a.	Complete Assly.	L 12100 x W 2000 x H 2400	1 no.	28,000		
5.	***Deaerator***					
a.	Header	L 12850 x W 3400 x H 3750	1 no.	36000		
b.	Storage Tank Sec-1	L 11500 x W 4150 x H 4650	1 no.	46500		
c.	Storage Tank Sec-2	L 10550 x W 4150 x H 4650	1 no.	41500		
d.	Storage Tank Sec-3	L 12500 x W 4150 x H 4750	1 no.	51000		
e.	Storage Tank Sec-4	L 10550 x W 4150 x H 4650	1 no.	41500		
f.	Storage Tank Sec-5	L 11500 x W 4150 x H 4650	1 no.	46500		
6.	***HP Heater #6A&6B (each)***					
a.	Complete Assly.	L 10500 x W 2300 x H 2500	1 no.	50,070		
7.	***HP Heater #7A&7B (Each)***					
a.	Complete Assly.	L 12600 x W 2300 x H 2500	1 no.	71,300		
8.	***HP Heater #8A&8B (Each)***					
a.	Complete Assly.	L 10150 x W 2300 x H 2500	1 no.	64,720		
9.	***|External Desuper heater for HP Heater #6A & 6B (each)***					
a.	Per Cooler	Ø 1200 x H 6000	1 nos.	52,000		
10.	***BFPDT Twin oil Cooler***					
a.	Ø 508 x H 5000	Ø 508 x H 5000	2 nos.	5,700		

TOTAL = 609,790

F (iii) HEAT EXCHANGERS (BHEL- HYDERABAD) (for Unit # 3)

Sl.No	Equipment	Overall Dimensions (in mm)	Quantity	Dry Weight	(Wt / no.) (in kgs)	
1.	***Drain Cooler***					
a.	Complete Assly.	L 9050 x W 1500 x H 1700	1 no.	13,000		
2.	***LP Heater #2***					
a.	Complete Assly.	L 13500 x W 2000 x H 2550	1 no.	32,000		
3.	***LP Heater #3***					
a.	Complete Assly.	L 13100 x W 2000 x H 2550	1 no.	30,000		
4.	***LP Heater #4***					
a.	Complete Assly.	L 12100 x W 2000 x H 2400	1 no.	28,000		
5.	***Deaerator***					
a.	Header	L 12850 x W 3400 x H 3750	1 no.	36000		
b.	Storage Tank Sec-1	L 11500 x W 4150 x H 4650	1 no.	46500		
c.	Storage Tank Sec-2	L 10550 x W 4150 x H 4650	1 no.	41500		
d.	Storage Tank Sec-3	L 12500 x W 4150 x H 4750	1 no.	51000		
e.	Storage Tank Sec-4	L 10550 x W 4150 x H 4650	1 no.	41500		
f.	Storage Tank Sec-5	L 11500 x W 4150 x H 4650	1 no.	46500		
6.	***HP Heater #6A&6B (each)***					
a.	Complete Assly.	L 10500 x W 2300 x H 2500	1 no.	50,070		
7.	***HP Heater #7A&7B (Each)***					
a.	Complete Assly.	L 12600 x W 2300 x H 2500	1 no.	71,300		
8.	***HP Heater #8A&8B (Each)***					
a.	Complete Assly.	L 10150 x W 2300 x H 2500	1 no.	64,720		
9.	***|External Desuper heater for HP Heater #6A & 6B (each)***					
a.	Per Cooler	Ø 1200 x H 6000	1 nos.	52,000		
10.	***BFPDT Twin oil Cooler***					
a.	Ø 508 x H 5000	Ø 508 x H 5000	2 nos.	5,700		

TOTAL = 609,790

G. (ii) Pumps (HYDERABAD) (for Unit# 1) :

TURBINE DRIVEN BOILER FEED PUMP

SL. No.	DESCRIPTION	QTY./UNIT	APPROX. WT. (KGS)	PACKING SIZE (mm) (L x W x H)
		TD BFP- 2 NOs		

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01	Turbine Driven Boiler Feed Pump (TD BFP) with Base Plate & Tubing	2	22500	3500 x 3100 x 3000
02	Turbine Driven Boiler Feed Booster Pump (TD BP) with Base Plate & Tubing	2	6500	3000 x 2800 x 2000
03	Recirculation Valve	2	1000	1100 x 1100 x 2900
04	Conical Suction Strainer at BFP suction	2	1400	4000 x 1200 x 1200
05	Basket type Suction Strainer at BP suction	2	2500	1500 x 1500 x 2000
06	Local Gauge Rack (LGB)–1,2 & 3	6	400(EACH) X 6 = 2400	1100 x 900 x 2200
07	Local instrument Transmitter Rack (LIR)	1(For 2 BFPs)	250	2000 x 650 x 2150
	TOTAL		**36550**	

MOTOR DRIVEN BOILER FEED PUMP

SL. No.	DESCRIPTION	QTY./UNIT	APPROX. WT. (KGS)	PACKING SIZE (mm) (L x W x H)
		MD BFP- 2 NOs		
01	Motor Driven Boiler Feed Pump (MD BFP) with Base Plate & Tubing	2	20500	3500 x 3100 x 3000
02	Motor Driven Boiler Feed Booster Pump (MD BP) with Base Plate & Tubing	2	4600	2200 x 1900 x 3000
03	Hydraulic Coupling	2	11500	4000 x 3000 x 4000
04	HC Working Oil Coolers & accessories	2 Sets	2100	5000 x 1000 x 1000
05	HC Lube Oil Coolers & accessories	2 Sets	1000	2500 x 600 x 600
06	Recirculation Valve	2	900	1000 x 1000 x 2800
07	Conical Suction Strainer at BFP suction	2	1200	3100 x 1000 x 1000
08	Basket type Suction Strainer at BP suction	2	2350	1500 x 1500 x 1600
09	Local Gauge Rack (LGB)–1,2&3	6	400(EACH)x6 = 2400	1100 x 900 x 2200

10	Local instrument Transmitter Rack (LIR)	2	150	1050 x 650 x 1500
11	MD BFP Motor	2	30000	4700 x 4500 x 3000
	TOTAL		**76700**	

CONDENSATE EXTRACTION PUMP

SL. No	DESCRIPTION	QTY./UNIT	APPROX. WT. (KGS)	PACKING SIZE (mm) (L x W x H)
01	Condensate Extraction Pump	3	19000	11000 x 3000 x 3000
02	Sole plate	3	1000	2200 x 2200 x 400
03	Canister	3	3400	7600 x 2200 x 2200
04	Basket type Suction Strainer at CEP suction	3	1500	1750 x 1750 x 2000
05	Local Gauge Rack	3	300	1300 x 900 x 2000
06	LIR Rack for Pr. Transmitters	1 (Common for 3 pumps)	250	2000 x 650 x 2150
07	LIR Rack for Diff. Pr. Transmitters	1 (Common for 3 pumps)	150	1050 x 650 x 1500
08	**CEP Motor**	3	9500	3500 (H) X Dia 2100
	TOTAL		**35100**	

G. (iii) Pumps (HYDERABAD) (for Unit# 3) :

TURBINE DRIVEN BOILER FEED PUMP

SL. No.	DESCRIPTION	QTY./UNIT	APPROX. WT. (KGS)	PACKING SIZE (mm) (L x W x H)
		TD BFP- 2 NOs		
01	Turbine Driven Boiler Feed Pump (TD BFP) with Base Plate & Tubing	2	22500	3500 x 3100 x 3000
02	Turbine Driven Boiler Feed Booster Pump (TD BP) with Base Plate & Tubing	2	6500	3000 x 2800 x 2000

03	Recirculation Valve	2	1000	1100 x 1100 x 2900
04	Conical Suction Strainer at BFP suction	2	1400	4000 x 1200 x 1200
05	Basket type Suction Strainer at BP suction	2	2500	1500 x 1500 x 2000
06	Local Gauge Rack (LGB)–1,2 & 3	6	400(EACH) X 6 = 2400	1100 x 900 x 2200
07	Local instrument Transmitter Rack (LIR)	1(For 2 BFPs)	250	2000 x 650 x 2150
	TOTAL		**36550**	

MOTOR DRIVEN BOILER FEED PUMP

SL. No.	DESCRIPTION	QTY./UNIT	APPROX. WT. (KGS)	PACKING SIZE (mm) (L x W x H)
		MD BFP- 2 NOs		
01	Motor Driven Boiler Feed Pump (MD BFP) with Base Plate & Tubing	2	20500	3500 x 3100 x 3000
02	Motor Driven Boiler Feed Booster Pump (MD BP) with Base Plate & Tubing	2	4600	2200 x 1900 x 3000
03	Hydraulic Coupling	2	11500	4000 x 3000 x 4000
04	HC Working Oil Coolers & accessories	2 Sets	2100	5000 x 1000 x 1000
05	HC Lube Oil Coolers & accessories	2 Sets	1000	2500 x 600 x 600
06	Recirculation Valve	2	900	1000 x 1000 x 2800
07	Conical Suction Strainer at BFP suction	2	1200	3100 x 1000 x 1000
08	Basket type Suction Strainer at BP suction	2	2350	1500 x 1500 x 1600
09	Local Gauge Rack (LGB)–1,2&3	6	400(EACH)x6 = 2400	1100 x 900 x 2200
10	Local instrument Transmitter Rack (LIR)	2	150	1050 x 650 x 1500
11	MD BFP Motor	2	30000	4700 x 4500 x 3000
	TOTAL		**76700**	

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CONDENSATE EXTRACTION PUMP

SL. No	DESCRIPTION	QTY./UNIT	APPROX. WT. (KGS)	PACKING SIZE (mm) (L x W x H)
01	Condensate Extraction Pump	3	19000	11000 x 3000 x 3000
02	Sole plate	3	1000	2200 x 2200 x 400
03	Canister	3	3400	7600 x 2200 x 2200
04	Basket type Suction Strainer at CEP suction	3	1500	1750 x 1750 x 2000
05	Local Gauge Rack	3	300	1300 x 900 x 2000
06	LIR Rack for Pr. Transmitters	1 (Common for 3 pumps)	250	2000 x 650 x 2150
07	LIR Rack for Diff. Pr. Transmitters	1 (Common for 3 pumps)	150	1050 x 650 x 1500
08	**CEP Motor**	3	9500	3500 (H) X Dia 2100
	TOTAL		**35100**	

H (ii) BFP DRIVE TURBINE (Hyderabad) (For Unit # 1)

SL.No.	ITEM DESCRIPTION	QTY./unit (per unit of 660 MW)	WEIGHT (Kgs) Each	TOTAL WEIGHT (KGS)	DIMENSIONS FOR EACH UNIT(mm) LxWxH
1.	Steam Turbine	2	65000	130000	4350x4900x(4250 with Gov. Valves &3500 without Gov.
2.	Gear Box	2	1100	2200	1050x1250x1150
3.	Lube oil console Package -I	2	11000	22000	4800x2800x2900
4.	Lube oil console Package -II	2	4000	8000	3100x2800x1200
5.	Emergency oil pump assembly	2	1500	3000	2100x1000x800
6.	Jacking oil pump assembly	2	600	1200	650x1500x600
7.	Oil Purification unit	2	2500	5000	1800x2000x1800
8.	Oil Accumulators	2	350	700	400x700x1800
9.	Governing Console	2	750	1500	800x600x1900

10.	Transition piece	2	2150	4300	1300x1000x1500
11.	Turbine Enclosure	2	4000	8000	3226x2032x2200
12.	DCSC for Emergency Lube Oil Pump	2	600	1200	1600X750X2500
	TOTAL (KGS)			**187100**	

H (iii) BFP DRIVE TURBINE (Hyderabad) (For Unit # 3)

SL.No.	ITEM DESCRIPTION	QTY./unit (per unit of 660 MW)	WEIGHT (Kgs) Each	TOTAL WEIGHT (KGS)	DIMENSIONS FOR EACH UNIT(mm) LxWxH
1.	Steam Turbine	2	65000	130000	4350x4900x(4250 with Gov. Valves &3500 without Gov.
2.	Gear Box	2	1100	2200	1050x1250x1150
3.	Lube oil console Package -I	2	11000	22000	4800x2800x2900
4.	Lube oil console Package -II	2	4000	8000	3100x2800x1200
5.	Emergency oil pump assembly	2	1500	3000	2100x1000x800
6.	Jacking oil pump assembly	2	600	1200	650x1500x600
7.	Oil Purification unit	2	2500	5000	1800x2000x1800
8.	Oil Accumulators	2	350	700	400x700x1800
9.	Governing Console	2	750	1500	800x600x1900
10.	Transition piece	2	2150	4300	1300x1000x1500
11.	Turbine Enclosure	2	4000	8000	3226x2032x2200
12.	DCSC for Emergency Lube Oil Pump	2	600	1200	1600X750X2500
	TOTAL (KGS)			**187100**	

I (ii) PEM SUPPLIES (for Unit # 1)

SL.No.	ITEM DESCRIPTION	QTY./unit (per unit of 660 MW)	TOTAL WEIGHT (KGS)
1.	AIR TRAPS	**50**	**240**
2.	AUX PRDS	**2**	**10420**
3.	BUTTERFLY VALVES (STEAM SERVICE)	**2**	**10420**
4.	DELETED		
5.	FLOAT VALVES	**34**	**68**
6.	FLOW ELEMENT - NOZZLE	**14**	**8500**
7.	FLOW ELEMENT - ORIFICE	**10**	**2500**
8.	GUN METAL VALVES	**100**	**78.5**
9.	HEAT EXCHANGERS (PLATE TYPE)	**11**	**24300**
10.	LUBE OIL TRANSFER PUMPS	**2 Nos. Pumps-Motor Set 2 Nos. Strainers**	**Pump-Motor Set: 102 Kg Approx. Strainer: 280 Kg Approx.**
11.	OXYGEN DOSING SYSTEM	**2 Nos. OXYGEN DOSING SKID. 1 No. FILLED OXYGEN CYLIDER STORAGE RACK.**	**OXYGEN DOSING SKID.- 320 Kg (Approx) FILLED OXYGEN CYLIDER STORAGE RACK.- 2400 kg (Approx.)**
12.	SELF CLEANING STRAINERS	**4**	**13600**
13.	SPRING LOADED BYPASS VALVES		**3300**
14.	STEAM TRAPS	**22**	**83.35**
15.	SUMP PUMPS/SUBMERSIBLE PUMPS	**4**	**1000**
16.	CONTROL VALVE	**33**	**12500**
17.	BALL VALVES	**241**	**1496**
18.	ALUMINIUM SHEETS/COILS		**105000**
19.	CHAIN PULLEY BLOCK		**15000 (Approx)**
20.	CHEMICAL DOSING SYSTEM	**Hydrazine Dozing Skid: 3 Nos. Amonia Dozing Skid: 3 Nos. NaOH Dozing Skid: 6 Nos.**	**Tentative Weight per skid: Hydrazine Dozing Skid: 5500 Kg Amonia Dozing Skid: 5500 kg NaOH Dozing Skid: 2500 kg**
21.	CONTROL VALVE /Severe service	**1**	**2500**
22.	ELECTRIC HOIST		**50000 (Approx)**
23.	M.E.BELLOWS	**11**	**24300**
24.	ELECTRO MAGNETIC FLOWMETER	**7**	**400**
25.	CONICAL STRAINERS	**6**	**300**

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26	DELETED		
27.	THERMAL INSULATION - R-MATTRESSES/P-SECN		645000
		TOTAL (KGS)	**943 MT (Approx)**

I (iii) PEM SUPPLIES (for Unit # 3)

SL.No.	ITEM DESCRIPTION	QTY./unit (per unit of 660 MW)	TOTAL WEIGHT (KGS)
1.	AIR TRAPS	50	240
2.	AUX PRDS	2	10420
3.	BUTTERFLY VALVES (STEAM SERVICE)	2	10420
4.	DELETED		
5.	FLOAT VALVES	34	68
6.	FLOW ELEMENT - NOZZLE	14	8500
7.	FLOW ELEMENT - ORIFICE	10	2500
8.	GUN METAL VALVES	100	78.5
9.	HEAT EXCHANGERS (PLATE TYPE)	11	24300
10.	LUBE OIL TRANSFER PUMPS	2 Nos. Pumps-Motor Set 2 Nos. Strainers	Pump-Motor Set: 102 Kg Approx. Strainer: 280 Kg Approx.
11.	OXYGEN DOSING SYSTEM	2 Nos. OXYGEN DOSING SKID. 1 No. FILLED OXYGEN CYLIDER STORAGE RACK.	OXYGEN DOSING SKID.- 320 Kg (Approx) FILLED OXYGEN CYLIDER STORAGE RACK.- 2400 kg (Approx.)
12.	SELF CLEANING STRAINERS	4	13600
13.	SPRING LOADED BYPASS VALVES		3300
14.	STEAM TRAPS	22	83.35
15.	SUMP PUMPS/SUBMERSIBLE PUMPS	4	1000
16.	CONTROL VALVE	33	12500
17.	BALL VALVES	241	1496
18.	ALUMINIUM SHEETS/COILS		105000
19.	CHAIN PULLEY BLOCK		15000 (Approx)
20.	CHEMICAL DOSING SYSTEM	Hydrazine Dozing Skid: 3 Nos. Amonia Dozing Skid: 3 Nos. NaOH Dozing Skid: 6 Nos.	Tentative Weight per skid: Hydrazine Dozing Skid: 5500 Kg Amonia Dozing Skid: 5500 kg NaOH Dozing Skid: 2500 kg

21.	CONTROL VALVE /Severe service	**1**	**2500**
22.	ELECTRIC HOIST		**50000 (Approx)**
23.	M.E.BELLOWS	**11**	**24300**
24.	ELECTRO MAGNETIC FLOWMETER	**7**	**400**
25.	CONICAL STRAINERS	**6**	**300**
26.	DELETED		
27.	THERMAL INSULATION - R-MATTRESSES/P-SECN		**645000**
		TOTAL (KGS)	**943 MT (Approx)**

J (ii) TG-INTEGRAL PIPING (Part of Bought out items of BHEL HWR) FOR UNIT # 1

SL.NO	DESCRIPTION	APPROX. WT
1.	LUBE. OIL PIPING (CS, SS & Alloy)	92 MT
2.	CONTROL FLUID PIPING (Stainless Steel)	
3.	SEAL STEAM PIPING	
4.	CONDENSATE SPRAY PIPING (CS & Alloy Steel)	
5.	TURBINE WATER DRAINAGE PIPING (CS & Alloy Steel)	
6.	ACW PIPING (OIL & C.F.ROOM)	
7.	GENERATOR INTEGRAL PIPING–SEAL OIL, P.W. PIPING AND GAS PIPING ETC.	
8.	Turbine Overload Piping (Approx. 15 MT/Unit)	
9.	Hangers and Supports (Approx. 20 MT/Unit)	
10.	Any other scope of piping job as per drawing	

J (iii) TG-INTEGRAL PIPING (Part of Bought out items of BHEL HWR) FOR UNIT # 3

SL.NO	DESCRIPTION	APPROX. WT
1.	LUBE. OIL PIPING (CS, SS & Alloy)	
2.	CONTROL FLUID PIPING (Stainless Steel)	
3.	SEAL STEAM PIPING	

4.	CONDENSATE SPRAY PIPING (CS & Alloy Steel)	92 MT
5.	TURBINE WATER DRAINAGE PIPING (CS & Alloy Steel)	
6.	ACW PIPING (OIL & C.F.ROOM)	
7.	GENERATOR INTEGRAL PIPING–SEAL OIL, P.W. PIPING AND GAS PIPING ETC.	
8.	Turbine Overload Piping (Approx. 15 MT/Unit)	
9.	Hangers and Supports (Approx. 20 MT/Unit)	
10.	Any other scope of piping job as per drawing	

K(ii) SUPPLY OF BHEL PIPING CENTRE, CHENNAI, for unit #1

81-110	COOLING WATER PUMP	-	400.00
81-325	MINERAL WOOL MATTRESS	-	40,000.00
81-341	SEALING COMPOUND FOR INSL	-	300.00
81-350	ALUMINIUM CLADDING FOR INSULATION	-	20,000.00
81-411	DIRECT GAUGES FOR STEAM LINES	-	600.00
81-412	DIRECT GAUGES FOR NON-STEAM LINES	-	700.00
81-414	LOCAL CONTROL EQPT FOR NON-STEAM LINES	-	200.00
81-415	TEST THERMOWELLS	-	700.00
81-417	INSTRUMENTATION FOR STARTUP SYSTEM	-	250.00
81-100	CONDENSATE PUMP	-	2,000.00
81-416	PERFORMANCE GUARANTEE TEST MATERIALS	-	1,600.00
81-318	FIX COM FOR MISCELLANEOUS PPG INSULATION	-	8,000.00
	TOTAL		**74.750 MT**

K(iii) SUPPLY OF BHEL PIPING CENTRE, CHENNAI, for unit #3

81-110	COOLING WATER PUMP	-	400.00
81-325	MINERAL WOOL MATTRESS	-	40,000.00
81-341	SEALING COMPOUND FOR INSL	-	300.00
81-350	ALUMINIUM CLADDING FOR INSULATION	-	20,000.00
81-411	DIRECT GAUGES FOR STEAM LINES	-	600.00
81-412	DIRECT GAUGES FOR NON-STEAM LINES	-	700.00
81-414	LOCAL CONTROL EQPT FOR NON-STEAM LINES	-	200.00
81-415	TEST THERMOWELLS	-	700.00
81-417	INSTRUMENTATION FOR STARTUP SYSTEM	-	250.00
81-100	CONDENSATE PUMP	-	2,000.00
81-416	PERFORMANCE GUARANTEE TEST MATERIALS	-	1,600.00
81-318	FIX COM FOR MISCELLANEOUS PPG INSULATION	-	8,000.00
	TOTAL		**74.750**

APPENDIX – II (REV-01)

			MT

L(ii) TG CYCLE PIPING, MISC PIPING system (SUPPLY OF BHEL PIPING CENTRE, CHENNAI, BHEL TRICHY ETC.) for unit #1

PGMA	WBS Description	material	Approx. weight (Kg.)
FOR TG UNIT # 1			
80-992	IMPORTED ELECTRODES	-	8,500.00
80-993	MISC ERECTION MATLS	-	100.00
80-400	CONDENSATE SUCTION	CS	10,000.00
80-401	CD FROM PUMP TO LPH1/DC INLET TEE AND RE	CS	48,000.00
80-402	CD FROM LPH1/DC INLET TEE TO TG TP	CS	33,000.00
80-403	CD FROM TG TP TO DEAERATING HEATER	CS	17,000.00
80-418	ERECTION MATERIALS FOR INSTRUMENTS	CS	2,500.00
80-446	DEAERATING HEATER OVER FLOW AND DRAIN	CS	7,000.00
80-454	SCAPH DRAINS	CS	6,000.00
80-601	LOW PRESSURE DOSING PIPING	CS/SS	3,500.00
80-610	SERVICE AIR-COMP SUCT AND DIS TO RECEI	CS	40,000.00
80-612	SERVICE AIR FOR INDIVIDUAL UNITS	CS	25,000.00
80-614	INST AIR COMP SUC AND DIS TO RECEIVER	CS	25,000.00
80-616	INSTRUMENT AIR FOR INDIVIDUAL UNIT	CS	25,000.00
80-323	STEAM TO BFP DRIVE TURBINE	CS	7,000.00
80-329	EXTRACTION STEAM TO BFP DRIVE TURBINE	CS	14,000.00
80-331	EXTRACTION STEAM TO LP HEATER-2	CS	6,000.00
80-332	EXTRACTION STEAM TO LP HEATER-3	CS	6,500.00
80-334	EXTRACTION STEAM TO LP HEATER-4	CS	8,500.00
80-335	EXTRACTION STEAM TO DEAERATING HEATER	CS	20,000.00
80-336	EXTRACTION STEAM TO HP HEATER NO.1	P22	7,000.00
80-337	EXTRACTION STEAM TO HP HEATER-2	CS	6,000.00
80-338	EXTRACTION STEAM TO HP HEATER-3	CS	8,500.00
80-339	AUX STEAM TO BFD TURBINE	CS	3,000.00
80-349	AUX STEAM TO GLAND SEALS - TG SCOPE	CS	1,000.00
80-363	EXHAUST STEAM FROM PRIME MOVERS-TG SCOPE	CS	28,000.00
80-370	HP DRAIN FLASH TANK VENT TO ATMOSPHERE	CS	45,000.00
80-371	DRAIN FLASH TANK VENT TO CONDENSER	CS	2,500.00
80-375	UNLISTED SV EXHAUSTS - TG SCOPE	CS	3,000.00
80-379	HPH SV EXHAUST TO FLASH TANK	CS	3,100.00
80-381	HP HEATER VENTS - TG SCOPE	CS	6,000.00
80-382	LP HEATER VENTS	CS	200.00
80-385	VENT FROM UNLISTED PPG/EQPT TO COND	CS	20,000.00
80-388	CONDENSER AIR EVACUATION PIPING	CS	4,000.00
80-436	SPRAY WATER TO LPBP DESH	CS	5,500.00
80-439	TURBINE FLASH TANK DRAIN TO CONDENSER	CS	300.00
80-442	GLAND STEAM COOLER DRAINS	CS	400.00
80-443	LP HEATER-1 TO CONDENSER	CS	9,000.00
80-444	LP HEATER-2/3/4/5 DRAINS AND DRIP PUMP I	CS	16,000.00
80-447	HP HEATER DRAINS	CS	40,000.00
80-448	DRAIN FROM UNLISTED EQPT/VESSEL-TG SCOPE	CS	3,000.00

80-449	TG CYCLE PIPING DRAINS AND VENTS	CS	25,000.00
80-457	MANIFOLDS FOR HP FLASH BOX AND CONDENS	CS/AS	2,600.00
80-459	HP FLASH TANK DRAIN TO CONDENSER	CS	2,600.00
80-493	HP FLASH TANK VENT TO CONDENSER	CS	2,000.00
80-494	LP FLASH TANK VENT TO CONDENSER	CS	3,700.00
80-495	LP FLASH TANK DRAIN TO COND	CS	2,500.00
80-545	LP CONDENSATE PIPING WITHIN TG HALL FOR	CS	20,000.00
80-930	H AND S FOR SYNCHRONISATION - TG	CS	68,000.00
	TOTAL		**650.500 MT**

L(iii) TG CYCLE PIPING, MISC PIPING system (SUPPLY OF BHEL PIPING CENTRE, CHENNAI, BHEL TRICHY ETC.) for unit #3

PGMA	WBS Description	material	Approx. weight (Kg.)
FOR TG UNIT # 3			
80-992	IMPORTED ELECTRODES	-	8,500.00
80-993	MISC ERECTION MATLS	-	100.00
80-400	CONDENSATE SUCTION	CS	10,000.00
80-401	CD FROM PUMP TO LPH1/DC INLET TEE AND RE	CS	48,000.00
80-402	CD FROM LPH1/DC INLET TEE TO TG TP	CS	33,000.00
80-403	CD FROM TG TP TO DEAERATING HEATER	CS	17,000.00
80-418	ERECTION MATERIALS FOR INSTRUMENTS	CS	2,500.00
80-446	DEAERATING HEATER OVER FLOW AND DRAIN	CS	7,000.00
80-454	SCAPH DRAINS	CS	6,000.00
80-601	LOW PRESSURE DOSING PIPING	CS/SS	3,500.00
80-610	SERVICE AIR-COMP SUCT AND DIS TO RECEI	CS	40,000.00
80-612	SERVICE AIR FOR INDIVIDUAL UNITS	CS	25,000.00
80-614	INST AIR COMP SUC AND DIS TO RECEIVER	CS	25,000.00
80-616	INSTRUMENT AIR FOR INDIVIDUAL UNIT	CS	25,000.00
80-323	STEAM TO BFP DRIVE TURBINE	CS	7,000.00
80-329	EXTRACTION STEAM TO BFP DRIVE TURBINE	CS	14,000.00
80-331	EXTRACTION STEAM TO LP HEATER-2	CS	6,000.00
80-332	EXTRACTION STEAM TO LP HEATER-3	CS	6,500.00
80-334	EXTRACTION STEAM TO LP HEATER-4	CS	8,500.00
80-335	EXTRACTION STEAM TO DEAERATING HEATER	CS	20,000.00
80-336	EXTRACTION STEAM TO HP HEATER NO.1	P22	7,000.00
80-337	EXTRACTION STEAM TO HP HEATER-2	CS	6,000.00
80-338	EXTRACTION STEAM TO HP HEATER-3	CS	8,500.00
80-339	AUX STEAM TO BFD TURBINE	CS	3,000.00
80-349	AUX STEAM TO GLAND SEALS - TG SCOPE	CS	1,000.00
80-363	EXHAUST STEAM FROM PRIME MOVERS-TG SCOPE	CS	28,000.00
80-370	HP DRAIN FLASH TANK VENT TO ATMOSPHERE	CS	45,000.00
80-371	DRAIN FLASH TANK VENT TO CONDENSER	CS	2,500.00
80-375	UNLISTED SV EXHAUSTS - TG SCOPE	CS	3,000.00
80-379	HPH SV EXHAUST TO FLASH TANK	CS	3,100.00

80-381	HP HEATER VENTS - TG SCOPE	CS	6,000.00
80-382	LP HEATER VENTS	CS	200.00
80-385	VENT FROM UNLISTED PPG/EQPT TO COND	CS	20,000.00
80-388	CONDENSER AIR EVACUATION PIPING	CS	4,000.00
80-436	SPRAY WATER TO LPBP DESH	CS	5,500.00
80-439	TURBINE FLASH TANK DRAIN TO CONDENSER	CS	300.00
80-442	GLAND STEAM COOLER DRAINS	CS	400.00
80-443	LP HEATER-1 TO CONDENSER	CS	9,000.00
80-444	LP HEATER-2/3/4/5 DRAINS AND DRIP PUMP I	CS	16,000.00
80-447	HP HEATER DRAINS	CS	40,000.00
80-448	DRAIN FROM UNLISTED EQPT/VESSEL-TG SCOPE	CS	3,000.00
80-449	TG CYCLE PIPING DRAINS AND VENTS	CS	25,000.00
80-457	MANIFOLDS FOR HP FLASH BOX AND CONDENS	CS/AS	2,600.00
80-459	HP FLASH TANK DRAIN TO CONDENSER	CS	2,600.00
80-493	HP FLASH TANK VENT TO CONDENSER	CS	2,000.00
80-494	LP FLASH TANK VENT TO CONDENSER	CS	3,700.00
80-495	LP FLASH TANK DRAIN TO COND	CS	2,500.00
80-545	LP CONDENSATE PIPING WITHIN TG HALL FOR	CS	20,000.00
80-930	H AND S FOR SYNCHRONISATION - TG	CS	68,000.00
	TOTAL		**650.500 MT**

Note: Price shall be quoted for the above BOQ item list as per following:

a) For the items indicated vide Srl. No. “A” to “L” above, Lumpsum price shall be quoted for execution of those items at the Price Schedule, Vol-III.

GENERAL NOTE:

1) The information furnished in this section is only a summary list regarding the major equipment/ item to be erected and commissioned by the contractor. BHEL reserves the right of adding or excluding any components / items / system according to the site requirements / customer requirements to complete various systems under the scope of work in all respects.

2) Any other systems / components which are integral to equipment supplied by the manufacturing unit is also to be erected and commissioned by the contractor within the quoted / accepted rate / lump sum value.

3) The list is tentative and has been given to enable the contractor to study the nature of work to be done in this contract. There may be variation in size, weight etc.

4)Some of the packages may be sent in parts to suit the site condition / transportation, the same is to be assembled at site without any extra cost, likewise some package may be assembled together and sent as a single assy. Contractor may have to dismantle and erect or, erect as single assembly as per the instruction of BHEL Engineers without any extra cost.

APPENDIX – II (REV-01)

PACKAGE A - Erection, Testing & Commissioning of Steam Turbine & its Auxiliaries, Generator & its Auxiliaries, Condenser, Pumps, Dosing Systems (LP, Oxygen, NaOH Etc.), Plate Heat Exchangers, TG Cycle and Integral Piping, Various TG Aux And Misc Equipment etc. of U#1&3 for 3x660 MW, North Karanpura project, Jharkhand.

TENDER NO PSER:SCT:NKP-T1800:17

ANNEXURE-A TO TCN-02

CLARIFICATIONS

Sl. No.	Reference Cl. No. of Bidding Document	Description of existing provision of NIT	Bidder's query	BHEL's clarification
1	Appendix-II (of Volume-1F TCC) Approximate Weight Schedule 660 MW Set Pg no. 26 , 27 & 29			
1.1	L (ii) of TG Cycle Piping..... For Unit#1		The Piping Listed under these PGMAs are Boiler Scope Piping. These Piping shall not form part of TG scope. Please Clarify and provide revised list with weight schedule excluding such boiler scope portion pipes	Please refer revised Appendix-II (Rev-01) and Appendix –III of TCC, Vol-IF (Rev-01). However, PGMA-80-323 is under the scope of TG job.
	PGMA -80-650	Fuel Oil Supply & Return Piping		
	PGMA -80-673	Lube Oil Piping System		
	PGMA -80-830	H and S For Critical Piping-Steam Line		
	PGMA -80-921	H and S For LIGHT UP Steam Line		
	PGMA -80-926	H and S of Acid Cleaning Piping		
	PGMA -80-928	H and S For Boiler LIGHT UP- TG		
	PGMA -80-323	Steam to BFP Drive Turbine		
	PGMA -80-324	CRH Header to Aux. PRDS		
	PGMA -80-322	CRH Piping to Deaerating Heater		
1.2	L (iii) of TG Cycle Piping..... For Unit#3		The Piping Listed under these PGMAs are Boiler scope Piping. These Piping shall not form part of TG scope. Please Clarify and provide revised list with weight schedule excluding such boiler scope portion pipes	Please refer revised Appendix-II (Rev-01) and Appendix –III of TCC, Vol-IF (Rev-01). However, PGMA-80-323 is under the scope of TG job.
	PGMA -80-650	Fuel Oil Supply & Return Piping		
	PGMA -80-673	Lube Oil Piping System		
	PGMA -80-830	H and S For Critical Piping-Steam Line		
	PGMA -80-921	H and S For LIGHT UP Steam Line		
	PGMA -80-926	H and S of Acid Cleaning Piping		
	PGMA -80-928	H and S For Boiler LIGHT UP- TG		
	PGMA -80-323	Steam to BFP Drive Turbine		
	PGMA -80-324	CRH Header to Aux. PRDS		
	PGMA -80-322	CRH Piping to Deaerating Heater		

PACKAGE A - Erection, Testing & Commissioning of Steam Turbine & its Auxiliaries, Generator & its Auxiliaries, Condenser, Pumps, Dosing Systems (LP, Oxygen, NaOH Etc.), Plate Heat Exchangers, TG Cycle and Integral Piping, Various TG Aux And Misc Equipment etc. of U#1&3 for 3x660 MW, North Karanpura project, Jharkhand.

TENDER NO PSER:SCT:NKP-T1800:17

ANNEXURE-A TO TCN-02

CLARIFICATIONS

Sl. No.	Reference Cl. No. of Bidding Document	Description of existing provision of NIT	Bidder's query	BHEL's clarification
2	APPENDIX-II Sl.No.1(ii)&(iii)	1.Aux.PRDS 2.ButterflyValves(steamservice) 3.CableTraySupportSystemBoltable 4.Electrical Hoists 5.Fire Sealing System	1) 2 units given in tonnage details but not specified in scope of work. 2)2-units given in tonnage details but not specified in scope of work. 3)100-kindly clarify the unit & scope. 4)Quantity not specified. 5)Quantity/tonnage not specified.	1) Scope of work shall be: Erection and Commissioning. 2) Scope of work shall be: Erection and Commissioning. 3) This item has been deleted from scope. Please refer schedule of item list at I(ii) and I(iii) of Appendix-II (Rev-01). 4) Tentative quantity shall be 20 nos. 5) This item has been deleted from scope. Please refer schedule of item list at I(ii) and I(iii) of Appendix-II (Rev-01).
3	APPENDIX-II Sl.NO-D(35}&(43}	Group Cables -25000 Power cables for 24V Solenoid-1000	1-2)Kindly clarify the Scope of work regarding these cables in TG scope.	This item has been deleted from scope. Pl. refer schedule of item list at D(ii) and D(iii) of Appendix-II (Rev-01).
4	APPENDIX-II Sl. NO-K (ii) & (iii)	1.81-036-CW.Storage tank. 2.81-060-Special Tank and Vessel	1)Given in tonnage details but not specified in scope of work. 2) Quantity not specified	This item has been deleted from scope. Pl. refer schedule of item list at K(ii) and K(iii) of Appendix-II (Rev-01).

PACKAGE A - Erection, Testing & Commissioning of Steam Turbine & its Auxiliaries, Generator & its Auxiliaries, Condenser, Pumps, Dosing Systems (LP, Oxygen, NaOH Etc.), Plate Heat Exchangers, TG Cycle and Integral Piping, Various TG Aux And Misc Equipment etc. of U#1&3 for 3x660 MW, North Karanpura project, Jharkhand.

TENDER NO PSER:SCT:NKP-T1800:17

ANNEXURE-A TO TCN-02

CLARIFICATIONS

Sl. No.	Reference Cl. No. of Bidding Document	Description of existing provision of NIT	Bidder's query	BHEL's clarification
5	APPENDIX-II Sl. No.L (ii) & {iii}	1)TG Cycle Piping Misc Piping. 2)80-830-H & S for Critical Piping- Steam Line 3)80-921-H&S for light up steam line. 4)80-926-H& S of acid cleaning piping. 5) 80-928-H&S for boiler light up-TG. 6)80-324-CRH Header to Aux PRDS. 7)80-322-CRH piping to deaerating Heater. 8)80-930-H&S for Synchronization - TG.	1)Heading is for"ForBoiler-U-1"?? 2)-8)H&S covered under critical piping of Only TG scope or boiler scope also?	1) This is the scope of work for TG job. 2) Out of the noted PGMA all are excluded from TG scope of work excepting PGMA 80-930. Pl. refer schedule of item list at L(ii) and L(iii) of Appendix-II (Rev-01)
6	--	1) Insulation of Piping & Equipments	1) Material tonnage available but scope not clarified	Scope has been described under Tender Cl. No. 4.16.10 of TCC, Vol-IF (REV-01)
7	--	1) Time schedule	1) Not available.	Refer Tender Cl. No. 11.1.1 of TCC, Vol-IF (REV-01)
8	--	Electricity charges	1) for site office and store not clear	BHEL Shall Provide Construction Power free of charge at 415V level at desired point (within 500 M from his workplace). One each of above mentioned power source shall be provided for Unit # 1 and Unit # 3.
9	--	--	As Generator Lifting (With Strand Jack Method) is in our scope . Please provide us the Lifting Height (in meters).	Finished Floor level of TG installation is at EL 17.00 Mtr.
10	--	--	Scope of " TG PIPING SYSTEM, ACW /MISC PIPING SYSTEM" is included in tender as 1165.5 MT each and we request to confirm the total scope is for 01 Unit .	Estimated qty. of this piping job scope is 650.50 MT for each unit. Please refer revised Appendix-II (Rev-01) of TCC-Vol-IF (Rev-01) .

Specific clause wrt BOCW Act & Cess Act

1. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.
2. It shall be sole responsibility of the contractor engaging Building Workers in connection with the building or other construction works in the capacity of employer to apply and obtain registration certificate specifying the scope of work under the relevant provisions of the Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 from the appropriate Authorities.
3. It shall be responsibility of the contractor to furnish a copy of such Registration Certificate within a period of one month from the date of commencement of Work.
4. It is responsibility of the contractor to register under the Building and other Construction Workers' Welfare Cess Act, 1996 and deposit the required Cess for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 at such rate as the Central Government may, by notification in the Official Gazette, from time to time specify. However, before registering and deposit of Cess under the Building and other Construction Workers' Welfare Cess Act, 1996, the contractor will seek written prior approval from the Construction Manager.
5. In case where the contractor has been accorded written approval by the Construction Manager and the contractor is required to furnish information in Form I and deposit the Cess under the Building and other Construction Workers' Welfare Cess Act, 1996, fails to do so, BHEL reserves right to impose penalty at the rate of 30% of Cess Amount.
6. It shall be sole responsibility of the contractor as employer to get registered every Building Worker, who is between the age of 18 to 60 years of age and who has been engaged in any building or other construction work for not less than ninety days during the preceding twelve months as Beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996.
7. It shall be sole responsibility of the contractor as employer to maintain all the registers, records, notices and submit returns under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.
8. It shall be sole responsibility of the contractor as employer to provide notice of poisoning or occupation notifiable diseases, to report of accident and dangerous occurrences to the concerned authorities under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the rules made thereunder and to make payment of all statutory payments & compensation under the Employees' Compensation Act, 1923.
9. It shall be responsibility of the Contractor to furnish BHEL on monthly basis, Receipts/ Challans towards Deposit of the Cess under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder along with following statistics :
    (i) Number of Building Workers employed during preceding one month.
    (ii) Number of Building workers registered as Beneficiary during preceding one month.
    (iii) Disbursement of Wages made to the Building Workers for preceding wage month.
    (iv) Remittance of Contribution of Beneficiaries made during the preceding month
10. BHEL shall reimburse the contractor the Cess amount deposited for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder. However, BHEL shall not reimburse the Fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and Contribution of Beneficiaries remitted.

Specific clause wrt BOCW Act & Cess Act

11. It shall be responsibility of the Building Worker engaged by the Contractor and registered as a beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 to contribute to the Fund at such rate per mensem as may be specified by the State government by notification in the Official Gazette. Where such beneficiary authorizes the contractor being his employer to deduct his contribution from his monthly wages and to remit the same, the contractor shall remit such contribution to the Building and other construction Workers' Welfare Board in such manner as may be directed by the Board , within the fifteen days from such deduction.

12. If any point of time during the contract period, non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder is observed, BHEL reserves the right to withhold a reasonable amount from the payables to discharge any obligations on behalf of Contractors. The reasonable amount shall be decided by the Construction Manager in consultation with Resident Accounts Officer & Head HR and shall be final.

13. The contractor shall declare to undertake any liability or claim arising out of employment of building workers and shall indemnify BHEL from all consequences / liabilities / penalties in case of non compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.

ANNEXURE - 2

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

BHARAT HEAVY ELECTRICALS LIMITED,
Power Sector - Eastern Region,
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,
Kolkata – 700 091

Sub	No Deviation Certificate.	
Job	PACKAGE A - Erection, Testing & Commissioning of Steam Turbine & its Auxiliaries, Generator & its Auxiliaries, Condenser, Pumps, Dosing Systems (LP, Oxygen, NaOH Etc.), Plate Heat Exchangers, TG Cycle and Integral Piping, Various TG Aux And Misc Equipment etc. of U#1&3 for 3x660 MW, North Karanpura project, Jharkhand.	
Ref	1.0	Tender no PSER:SCT:NKP-T1800:17.
	2.0	BHEL's NIT, vide reference no PSER:SCT:NKP-T1800:5464, Dated 08-02-2017.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT: NKP-T1800:TCN-01 Date:27-02-2017.
	4.0	BHEL's TCN-02, vide reference no PSER:SCT: NKP-T1800:TCN-02 Date:03-03-2017.
	5.0	All other pertinent issues till date.

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/ issued by you and in case of such 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. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

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/uploaded offer/documents in accordance with tender instructions with acceptance of the terms & conditions of the tender by us and as per aforesaid references.

Thanking you,

Yours faithfully,

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