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

TCN - 02

Ref: PSER:SCT:NBN-T1730:TCN-02 Date: 30-03-2016

Sub	Tender change notice (TCN) 02	
Job	Erection, testing, commissioning, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, piping, miscellaneous equipments etc for 4x250 MW, unit # 3 at BRBCL/Nabinagar Project, Aurangabad, Bihar.	
Ref	1.0	Tender no PSER:SCT:NBN-T1730:16
	2.0	BHEL's NIT, vide reference no PSER:SCT:NBN-T1730:4932 Date: 18-03-2016.
	3.0	BHEL's TCN-01, vide reference PSER:SCT:NBN-T1730:TCN-01, dated 29-03-2016.
	4.0	All other pertinent issues till date.

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

1.0 Introduction of Volume-IF-TCC-TECH-R-00, to volume – IF issued along with NIT.

2.0 Revised `No deviation certificate' as per enclosed Annexure-2. Bidder shall submit no deviation certificate as per enclosed format only.

3.0 All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HYEAVY ELECTRICALS LTD

SR ENGR (SCT)

Encl : As above.

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)
POWER SECTOR EASTERN REGION, DJ-9/1, SECTOR-II, SALT LAKE CITY, KOLKATA - 700 091
फैक्स/Fax : (033) 23211960 फोन/Phone : बोर्ड/EPABX : 23211691, 23211798, 23211796

CONTENT

CLAUSE NO	DESCRIPTION
1.0	**NAME OF WORK**
	Erection, testing, commissioning etc of steam turbine & auxiliaries, generator & auxiliaries, pumps, piping, miscellaneous equipments etc for Unit # 3 of 4x250 MW at BRBCL/NABINAGAR Project, Dist.- Aurangabad, Bihar.
2.0	**SCOPE**
	The scope of services consists of installation of a steam turbine & its auxiliaries, generator & its auxiliaries, condenser, pumps, LP dosing, condenser on line tube cleaning system, Tanks, Integral piping, TG piping, insulation etc of 250 MW capacity set. In general the scope comprises receipt and unloading at TG hall unloading bay of specified heavy equipment with EOT crane and its temporary storage and preservation, if required, re-handling, receipt from stores/ storage yard, transportation to TG hall/ site of pre-assembly/ fabrication, site assembly, erection, finish/ preservation/ touch up painting, site testing, insulation, commissioning, trial run, performance guarantee test and readying for handing over for commercial operation.
2.1	STEAM TURBINE
	It consists of three cylinders (HP, IP, and LP) broadly including the following.for each unit :
2.1.1	Bearing pedestals.
2.1.2	Base plates, foundation holding down bolts.
2.1.3	Combined emergency stop and control valves – 2 nos.
2.1.4	Combined reheat stop and control valves - 2 nos.
2.1.5	Steam strainers & strainer housing for MS lines – 2 nos; HRH lines – 2 nos.
2.1.6	Cross around piping between IP & LP casings.
2.1.7	Hydraulic turning gear with hand barring.
2.1.8	Electro – hydraulic governing system backed up with hydro – mechanical system.
2.1.9	Lubrication & governing oil system.
2.1.9.1	MOT with internals.
2.1.9.2	MOP.
2.1.9.3	AOP with drives - 2X100% AC.
2.1.9.4	EOP with drives, DC – 1 no.
2.1.9.5	JOP with drives – 2 no.
2.1.9.6	Oil Vapour exhauster – 2 nos.
2.1.9.7	Duplex oil filter for LO sys.
2.1.9.8	Duplex oil filter for JO sys.
2.1.9.8	Temp CV for LO sys.
2.1.9.10	LO/ JO sys, piping, valves & all other accessories etc.
2.1.9.11	Unit oil purifier (centrifuge type).
2.1.10	Turbine gland sealing sys including necessary piping, valves, hanger & supports.
2.1.11	Cond spray sys Including necessary piping, valves and hanger & supports.
2.1.12	Turbine drain system Including necessary piping, valves and hanger & supports.
2.1.13	LPBP valves with their supply units & all accessories - 2 nos.
2.1.14	Water inj valves for LPBP valves – 4 nos.
2.1.15	CRH NRVs.
2.1.16	Vacuum breaker valves.
2.1.17	Flow measuring devices for PG test flow nozzles.
2.2	BOILER FEED PUMPS 3x50%.
2.2.1	BFPs.
2.2.2	Hydraulic couplings.
2.2.3	Drive motors.
2.2.4	Booster pumps.
2.2.5	Working oil coolers.
2.2.6	Lub oil coolers.
2.2.7	Seal water coolers.

2.2.8	Suction strainer.
2.2.9	Recirculation valves.
2.2.10	Connecting couplings.
2.2.11	Step–up gear box.
2.2.12	Foundation frame.
2.3	CONDENSATE EXTRACTION PUMPS - 2x100%.
2.3.1	Pump assembly.
2.3.2	Cannister.
2.3.3	Foundation ring.
2.3.4	Suction strainer.
2.3.5	Drive motor.
2.3.6	Motor stool.
2.3.7	Connecting couplings.
2.3.8	Integral piping.
2.4	Auxiliary cooling water pumps with motors – 3 nos.
2.5	DM CW pumps for TG aux with motors - 3 nos.
2.6	DM CW pumps for boiler aux with motors - 2 nos.
2.11	Sump/submersible pump – 2 nos.
2.18	HEAT EXCHANGERS
2.18.1	LPH – 1.
2.18.2	LPH - 2.
2.18.3	LPH – 3.
2.18.4	GSC - 1 no.
2.18.5	Drain cooler – 1 no.
2.18.6	Oil coolers – 2 x 100%.
2.18.7	Tray cum spray type deaerator.
2.18.8	HPH-5.
2.18.9	HPH-6.
2.19	CONDENSER.
2.20	GENERATOR (THRI 108/44C).
2.20.1	Stator.
2.20.2	Rotor.
2.20.3	End shields, bearings – 2 sets.
2.20.4	Gas coolers (twin type) – 2 nos.
2.20.5	Six terminal bushings alongwith rectangular terminal connectors -1 set.
2.20.6	Shaft seals.
2.20.7	Foundation plates & studs.
2.21	Brushless exciter.
2.22	SEAL OIL SYSTEM.
2.22.1	Seal oil mounted on frame complete with following.
2.22.1.1	Seal oil coolers – 2 nos.
2.22.1.2	Duplex filter - 1 no.
2.22.1.3	DP regulating valve – 2 nos.
2.22.1.4	Vacuum tank – 1 no.
2.22.1.5	Intermediate oil tank – 1 no.
2.22.1.6	Flow regulators - 2 nos.
2.22.1.7	Flow meters - 4.nos.
2.22.1.8	Interconnecting pipelines, valves & instruments.
2.22.2	Seal oil unit mounted on frame complete with following.
2.22.2.1	AC seal oil pump - 2 nos.
2.22.2.2	DC seal oil pump – 1 no.
2.22.2.3	Vacuum pump - 2 nos.
2.22.2.4	Constant pressure regulator - 3 nos.
2.22.2.5	Interconnecting pipelines, valves & instruments.
2.22.3	Seal oil storage tank - 1 no.
2.22.4	Pipelines & valves & instruments.

2.23	GAS SYSTEM
2.23.1	Gas unit – 1 no.
2.23.2	Duplex gas drier – 1 no.
2.23.3	Hydrogen distributor – 1 no.
2.23.4	Co_2 distributor - 1 no.
2.23.5	Co_2 vapouriser – 1 no.
2.23.6	Liquid detector rack – 1 no.
2.23.7	Gas pressure regulators - 4 nos.
2.23.8	Piping, valves & instruments.
2.23.9	H_2 gas temp control valve and actuator.
2.24	Waste gas system.
	Bearing vapour exhauster with AC motor valves & Instruments – 2 nos.
2.25	LP dosing system.
2.26	Self cleaning strainers.
2.26.1	SCS – 2 nos.
2.26.2	Flushing pump skid - 2 nos.
2.26.3	Piping etc - 1 lots.
2.27	Plate heat exchanger for TG aux - 3 nos.
2.28	Plate heat exchanger for boiler aux - 2 nos.
2.29	Central/Portable lub oil storage and purification system with pipe connection to unit # 3 and additionally interconnection with existing system of unit # 1 & 2.
2.29.1	Clean oil tank (60 m^3) – 1 no.
2.29.2	Dirty oil tank (60 m^3) – 1 no.
2.29.3	Oil unloading tank (1 m^3) – 1 no.
2.29.4	Clean oil transfer pump 8250 LPH – 1 no.
2.29.5	Dirty oil transfer pump 8250 LPH – 1 no.
2.29.6	Central lube oil purifier, 7500 LPH – 1 no.
2.30	Portable fire extinguishers.
2.31	Miscellaneous tanks.
2.31.1	DMCW tank – 1 nos.
2.31.2	Potable water tank – 1 nos.
2.32	Flash tanks.
2.32.1	HP drain flash tanks – 1 no.
2.32.2	LP drain flash tanks – 1 no.
2.33	INSULATION OF EQUIPMENTS
2.33.1	LPH 1, 2 & 3.
2.33.2	HPH 5 & 6.
2.33.3	Ejectors.
2.33.4	Gland steam cooler, drain cooler.
2.33.5	Deaerator.
2.33.6	Flash tanks, flash boxes their manifolds, vents, drains as reqd.
2.33.7	Other misc equipment.
2.34	INSULATION OF PIPING
2.34.1	LP, HP heaters, GSC, DC drains & vents.
2.34.2	All flash tanks vent to condenser.
2.34.3	Vent from unlisted ppg/ eqpt to condenser.
2.34.4	Other misc piping.
2.34.5	D/A + FST – vent and drain lines.
2.34.6	Turbine washing sys.
2.34.7	Turbine drainage sys.
2.34.8	All safety valve ext From LPH, HPH & D/A.
2.34.9	Any misc piping under scope of erection requiring insulation.
2.35	PIPING (TG) mainly consisting of following major system
2.35.1	Drain flash tank vent to condenser.
2.35.2	Unlisted SV exhausts.
2.35.3	HPH SV exhaust to flash tank.

2.35.4	Vent from unlisted ppg/ eqpt to condenser.
2.35.5	Condensate pump vent.
2.35.6	Condenser air evacuation piping.
2.35.7	Turbine washing system.
2.35.8	Condensate for sealing of vacuum.
2.35.9	Unlisted condensate.
2.35.10	D/A safety valve exhaust to atmos.
2.35.11	Unlisted spray water.
2.35.12	Turbine flash tank drain/ vents to condenser.
2.35.13	SJAE drains.
2.35.14	GSC cooler drains.
2.35.15	Drain from unlisted eqpt/ vessels.
2.35.16	TG cycle piping drains & vents.
2.35.17	Lub oil ppg sys.
2.35.18	H&S for non steam lines and TG piping.
2.35.19	Condensate system piping.
2.35.20	LP, HP heaters drains & vents.
2.35.21	Piping related to LP dosing system.
2.35.22	Aux steam piping to turbine gland seal.
2.35.23	Temporary piping for pre boiler system alkali flushing including supply line & return line upto • eutralization pit, TG oil flushing and BFP oil flushing, as required.
2.35.25	Piping system will include but not limited to the following.
2.35.25.1	Pipes.
2.35.25.2	Fittings.
2.35.25.3	Bolts nuts and gaskets.
2.35.25.4	Instrumentation stubs.
2.35.25.5	Valves, air trap, steam trap, flow elements etc wherever required.
2.35.25.6	Expansion bellows wherever required.
2.35.25.7	Welded attachment on pipes for hangers including hanger & supports.
2.35.25.8	Flash boxes.
2.35.25.9	RE joint wherever required.
2.35.25.10	Y-type strainers.
2.35.25.11	ME bellows.
2.35.25.12	Annubar.
2.36	Control & instrumentation.
2.36.1	Erection of thermowells and all first root valves, stubs, etc for various piping sys. Under the scope of this tender.
2.36.2	Installation of all sensors/ transmitters for measurement of turbine supervisory parameters including JBs mounted on the equipment.
2.36.3	Impulse pipe up to root valve.
2.36.4	Junction box of bearings.
2.36.5	Assistance during calibration & fitting wherever required for turbovisory instrument associated with main turbine.
2.36.6	Removal & refitting of Instruments fitted with equipments/ skid mounted aux system
2.36.7	Turbovisory cabling inside turbine bearing.
2.36.8	Assistance for commissioning of valves, replacement etc.
2.37	Erection of all permanent approach platforms and stairs for VIS and alignment-commissioing support for VIS.
2.38	Maintenace of sump pumps till handing over of the units
3.0	**MAJOR EXCLUSIONS**
3.1	Civil foundation for equipments.
3.2	Transformer, bus duct & other electrical panels.
3.3	MS line.
3.4	CRH line & HRH line.
3.5	HPBP line including valve.
3.6	LPBP line.

3.7	Boiler feed suction, discharge & re-circulation line.
3.8	Cable connection between primary instruments to terminal boxes.
3.9	All AC/ DC motor starters, resistance boxes, switchgear and associated control centres including permanent cabling & earthing unless otherwise specifically mentioned.
3.10	Extraction steam pipings to D/A, LP heaters, HP heaters.
3.11	Turbine instrument rack.
3.12	Field instruments.
3.13	Impulse pipe from first root valve.
3.14	Condenser instrumentation.
3.15	H2 & seal oil instrumentation.
3.16	Annunciation cabinet.
3.17	Calibration and commissioning of control vales and flow nozzles.
3.18	Turbine insulation.
3.19	Commissioning of actuators and HT motors.
3.20	Power House Bldg Elevators
4.0	**MAJOR TERMINAL POINTS**
4.1	Instrument/ service air - connection & welding of IA/ SA line with terminal valves of equipment, which are covered in the scope of this contract.
4.2	ACW piping - connection & welding of ACW pipe with respective equipment (which are covered under the scope of this tender) header or with inlet and outlet flange from the terminal points of LP piping vendor's scope. Additionally, the ACW pipes with butterfly valves, RE joints, supports inside ACW pump house from individual pumps to the terminal points of LP piping vendor is also included in TG vendor's scope.
4.3	DMCW piping - connection & welding of DMCW pipe with respective equipment (which are covered in the scope of this contract) header or with inlet and outlet flanges as applicable.
4.4	CW – inlet & outlet line upto puddle flange in power house and CW pipes with butterfly valves, RE joints, supports inside CW pump house from individual pumps to the terminal points of LP piping vendor.
4.5	CW header for hydrogen cooler.
4.6	Generator – upto generator terminal.
5.0	**PRELIMINARY WORKS**
5.1	The contractor shall, as a first field activity check the turbine, generator and all auxiliaries foundations for the correctness of the same as per the drawings and satisfy himself in all respects, such as location of foundations, consolidation of foundations, absence of voids, levels, correctness of bolt holes, pockets levels and center lines etc. All measurements should be recorded and submitted to Engineer for approval before erection. The contractor shall make arrangement to unload generator stator, generator rotor, LP rotor, HP turbine & IP turbine 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 Annexure – I.
5.2	Before starting erection job, contractor shall ensure that the TG area is sufficiently enclosed against ingress of dust and water, and all debris has been cleared off from the floor to a designated area as per instruction of engineer. The contractor shall arrange to get the working area and surroundings cleaned daily to ensure a dust free atmosphere for working.
5.3	Contractor shall first cover all openings on operating floor and put temporary hand railings on all sides of the floor. Materials for the same will be provided by the contractor at his cost.
5.4	The contractor shall make his T&P stores for special tools and instruments at a convenient location near to the place of working in TG Hall.
5.5	Contractor shall set up longitudinal and transverse access and two or more level bench mark accurately on TG floor which shall be certified by BHEL Engineer. The certified TG center lines and datum level shall be the reference for TG and all

	auxiliaries erection and alignment work.
5.6	Once the TG and condenser center lines have been established, the contractor shall start setting of sole plates work on TG floor and also transporting condenser, turbine and other aux components to site and arrange them according to sequence of erection.
5.7	All matching surfaces of components shall be well cleaned with cleaning agent and burrs shall be removed by filing and blue matching. Wherever necessary sealing/ lubricating anti-seize compounds shall be applied as per recommendation of engineer. The machining/ grinding required for fittings of keys, pins, packers and dowels coupling bolts, coupling holes enlargements, hanger tie rod items machining etc, ie all kinds of machining related jobs etc shall be carried out by the contractor at his cost.
5.8	The accuracy of all equipment/ instruments and their functioning shall be established before they are permitted for use on the job. If the engineer doubts the accuracy of the precision tools, any time during erection, the contractor shall arrange the checking of tools/ equipment/ instruments at his cost and there will be provision of bench mark readings at regular intervals.
5.9	All the works shall be performed to the lines, grades and elevations indicated on the drawings. The contractor shall be responsible to locate and lay out the works both in horizontal and vertical direction. Control point established by the engineer shall be used as datum for works under this contract. Any work done without being properly located may be removed and dismantled by the engineer at the contractor's expenses, if the contractor refuses to do it.
5.10	The contractor shall provide a temporary small office (150 sq ft approx) for BHEL engineers at TG floor for day to day close monitoring of the work within 30 days from handing over of TG foundation. The temporary office should be portable and a rugged one with insulated walls & good finish. Electrical wiring, 1 nos fans, 1 (one) nos 1.5 T AC, 2 nos steel tables, 5 chairs, one computer table, 1 6 ft file rack, 1 filing cabinet & sufficient plug points shall be there inside the office. The contractor shall also provide office stationary, office cleaning services including with supply of a office boy for this purpose and one whole time Computer operator for the above mentioned office. Power will be provided by BHEL free of charges. However this office furnitures including the temporary office will remain property of the contractor and the same shall be taken by them after completion of the work.
6.0	**MATERIAL HANDLING AND STORAGE**
6.1	While BHEL will endeavor to store/ stack/ identify materials properly in their open /closed/ semi closed / tarpaulin covered storage yard / shed, it shall be contractor's responsibility to assist BHEL in identifying materials well in time for erection, taking delivery of the same, following the procedure indicated by BHEL and transport the material safely to pre-assembly yard /erection site in time according to program.
6.2	Contractor shall unload the generator stator, generator rotor, HP turbine, IP turbine and LP rotor, HP heaters directly from trailer/ wagon (inside project premises) in respect of the unit and keep the same at designated place shown by BHEL/ customer. Necessary arrangement for transportation/ shifting of the above items from storage place to erection site, if required, shall be under the scope of this tender.
6.3	All the equipment furnished under this contract, other than those specifically mentioned in the tender, shall be received from the project sites/ sheds/ yards etc located separately and transported to pre assembly area/ erection site safely and stored in the storage spaces in a manner so that they are easily retrievable till they are erected by the contractor. While drawing/ lifting material from BHEL/ customer stores, contractor shall ensure that the balance/ other materials are stacked back immediately.
6.4	Contractor shall ensure that the proper lifting tackle (slings and D-shackles) with test certificates are used during lifting and rigging processes. In case of any damage due to faulty lifting tackles, the cost will be recovered from the contractor.
6.5	Approach road conditions from the stores /yard to the erection site may not be equipped and ideal for smooth transportation of the equipment. Contractor may

	have to be adequately prepared to transport the materials under the above circumstances without any extra cost. Bad condition of road can not be cited as the reason for delay. Minor repair/ construction of approach roads inside site shall be arranged by the bidder within the quoted/ accepted price.
6.6	Contractor shall be responsible for examining/ verifying all the plant and material issued to him one month prior to requirement and notify the engineer immediately of any damage, shortage, discrepancy etc before they are moved out of the stores/ storage yard. The contractor shall maintain exhaustive record and submit to the engineer every week, a report detailing all the receipts during the week. However, the contractor shall be solely responsible for any shortages or damages in transit handling and or in storage and erection of the equipment once received by him. In case any equipment/ material is lost/ damaged while in the custody of the contractor, the cost of repair/ replacement if any to bring back the equipment in original order shall be deducted from the contractor's bill. BHEL's decision in this regard shall be final and binding on the contractor.
6.7	All the materials in the custody of the contractor and stored in the open and dusty locations must be covered with suitable weather proof/ fire retardant covering material wherever applicable and shall be blocked up on raised level above ground. All covering materials including blocks and sleepers shall be arranged by the contractor at his cost.
6.8	If the material belonging to the contractor are stored in area other than those earmarked for his operation, the engineer will have the right to get it shifted to the area earmarked for the contractor, if the contractor fails to do it within reasonable time. Such shifting will be at the risk and cost of the contractor.
6.9	All electrical items, if required, shall undergo drying up operation. Contractor shall have to carry out the same as per direction of BHEL within the quoted rates. Necessary Halogen lamps etc. will be arranged within quoted price.
6.10	Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion due to prolonged storage.
6.11	The contractor shall ensure that all the packing materials and protective devices used for various equipments during transit & storage are removed before the equipment are installed.
6.12	The contractor shall ensure that all surplus damaged unused material, packing wood/ containers/ special transporting frames etc are returned to BHEL/ owner’s designated place with proper documentation.
6.13	The contractor shall be responsible for making suitable indoor storage facilities to store all equipment which require indoor storage during the period under contractor's custody till erection.
6.14	The contractor shall hand over all parts/ materials remaining extra over the normal requirement with proper identification tags to the BHEL, failing which, suitable recoveries shall be made from bills/ dues of the contractor.
6.15	Contractor shall ensure utmost care in handling Rotors. Contractor should use only lifting tackle wherever supplied by manufacturing unit. Slings of proper size and other tackles are to be used for the above purpose. Contractor shall strictly comply with the instruction of BHEL engineers during the above operation. Contractor shall cover the journals with grease and cloth and also cover the rotor with tarpaulin to avoid any damage to rotor/ rotor blades.
6.16	For unloading, turning and lifting of stators and turbine to the TG floor level and placing on its foundation the contractor shall strictly comply with the instructions of the BHEL engineers.
6.17	Contractor shall ensure that while lifting turbine, generator, piping, acid, other auxiliaries, transporting slings shall be put over the points indicated on the equipment or as indicated in the manufacturer's drawings. All care should be taken to safeguard the equipment against any damage.
7.0	**PRESERVATION OF COMPONENTS**
7.1	It shall be the responsibility of the contractor to apply preservatives / touch up paints primer on equipment handled and erected by him till such time of final painting. It shall be contractor's responsibility to arrange for required manpower,

	scaffolding materials, cleaning materials like wire brush, emery sheets, grease, etc including paint and thinners. The quoted erection price shall include cleaning of surface, supplying and providing one coat of preservatives / paints (primer) from time to time as decided by BHEL engineer. Painting may have to be done as and when required till such time the final painting is carried out. BHEL engineers decision in this regard is a binding to the contractor.
7.2	A separate gang of minimum two persons with all the necessary materials specified above shall be provided by the contractor within the finally accepted rates/ price for preservative/ touch-up painting.
7.3	The contractor shall protect finished work from action of weather and from damage or deterioration and shall cover the finished parts then and there for it protection.
7.4	Any failure on the part of the contractor to carry out works according to above clauses will entail BHEL to get done the job through any other party and recover the cost from contractor.
8.0	**WELDING HEAT TREATMENT, RADIOGRAPHY AND NON-DESTRUCTIVE TESTING**
8.1	The equipment and piping shall be erected in conformity with the Indian Boiler Regulations as may be directed as per any other standard/ specification in practice in BHEL. The method of welding (ARC, gas, TIG or other method) may be indicated in the detailed drawings schedules. BHEL Engineer will have the option of changing the method of welding as per site requirements. Contractor can not claim any additional amount from BHEL due to change in welding method. Additional X-ray/ UT/SR/ PWHT if required later on will be in vendor's scope.
8.2	Welding of equipment, piping shall be done by certified high pressure welders who posses valid certificate of CIB of the state in which the equipment is erected as per provision of IBR. The HP welder who possesses necessary certificate shall appear well in advance before the expiry of the validity of his certificate for re-qualification test as per relevant provision of IBR and keep the certificate valid till the completion of work. The services of such welders, the validity of whose certificates have expired shall have to be terminated forthwith.
8.3	All welders including tack welder, structural and high pressure welder shall be tested as per ASME Section IX/IB and approved by BHEL Engineer before they are actually engaged on work though they may possess the IBR certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The records of qualification of welders shall be maintained by the contractor in pro-forma given by BHEL engineer. All the welders qualified for the work will be issued an identity card by BHEL Engineer and welders will keep the same with him at work place. The vendor within his quoted rate to arrange test pieces like plates, pipes etc for welders testing and other statutory formalities.
8.4	BHEL engineer is entitled to stop any welder from the work if his work is unsatisfactory for any technical reason or there is a high percentage of rejection of joints welded by him which, in the opinion of the Engineer will adversely affect the quality of the welding though the welder has earlier passed the tests prescribed by Engineer. The welder, having passed qualification tests, does not relieve the contractor of his contractual obligation to check the welder's performance.
8.5	The contractor shall carry out the root run welding of all HP/ LP piping, valves, instrumentation tapping points etc. by TIG welding method. Also, the contractor shall have to carry out full TIG welding of tubes up to thickness of 6mm if required, as per drawing. During the root runs, the contractor shall have to purge the pipes with inert gas before and during welding. All arrangements required for the above shall be the responsibility of the contractor at his own cost and no additional cost to BHEL.
8.6	All charges for testing of contractor's welders including destructive and non-destructive tests conducted by BHEL at site or carried out at labs shall have to be borne by the contractor only. All items required for the test like plates, welding electrodes, pipes etc are to be arranged by contractor within quoted rates.
8.7	The regulators used on welding machines shall be calibrated before putting these into use for work. Periodic calibration for the same shall be arranged by the

	contractor at his cost.
8.8	All welds shall be painted with anticorrosive paint. Necessary consumables and scaffolding etc. including paints shall be provided by contractor at his own cost. The process used/ approved by BHEL engineer shall be qualified/ followed by the vendor at his cost prior to adoption.
8.9	Complete penetration of welding shall be achieved and all welded joints shall be subject to acceptance by the engineer.
8.10	Preheating, radiography and other NDT tests, post heating and stress relieving after welding of tubes, pipes, including attachment welding wherever necessary are part of erection work and shall be carried out by the contractor in accordance with the instructions of the engineer.
8.11	Contractor shall arrange all necessary heating equipment with automatic recording devices. Also, the contractor shall have to arrange for labour, heating elements thermocouples, etc insulating materials like asbestos cloth, ceramic beads asbestos ropes etc required for heat treatment/stress relieving operations. Temperature shall be measured at least at two different points above 200 mm dia. by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment shall be the property of BHEL. The contractor will provide thermo-chalks, temperature recorders, thermocouple attachment units, graphs, sheets etc for checking within the finally accepted rates. All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt approved/ accredited Test Houses, traceable to National/ International standards will also be arranged by the contractor for such equipment at his cost.
8.12	The technical particulars, specification and other general details for radiography work shall be in accordance with ASME, IBR or ISO as specified by BHEL.
8.13	Iridium - 192 shall be used by contractor for radiography work. The geometric un - sharpness shall not exceed 1.5 mm. Taking adequate safety precautions for handling & storing of radiography source (including making of pit for radiography source) shall be the responsibility of the contractor while carrying out radiography. Necessary safeguards required for radiography (including personnel from BARC) shall be arranged by contractor at his cost.
8.14	Low speed high contrast, fine grain films (D-7 or equivalent) in 10 cm. width only shall be used for weld joint radiography. Film density shall be between 1.5 and 2.0.
8.15	All radiography shall be free from mechanical, chemical or process marks, to the extent they should not confuse the radiographic image and defect finding. Penetretometer as per ASME or ISO must be used for each exposure.
8.16	Lead numbers and letters are to be used (generally 6mm size) for identification of radiographs. Contract no; joint identification, source used, welder's identification and SFD are to be noted down on paper cover of radiograph.
8.17	Lead intensifying screens for front and back of the film should be used as per the ASME specification referred above.
8.18	The joint is to be marked with permanent mark A, B, C etc to identify, the segments. For this a low stress stamp shall be used to stamp the pipe on the down stream side of the weld.
8.19	For multiple exposures on pipes, an overlap of about 25 mm of film should be provided.
8.20	The contractor shall have a dark room fully equipped with radiography equipment, film (unexposed), chemicals and any other dark room accessories. There should be adequate number of radiographic personnel with sufficient experience and certified by M/s BARC as Radiographer for conducting radiographic tests in accordance with safety rules laid down by Division of Radiological protection. These personnel should also be registered with DRP/BARC for film badge service. The proof of having sufficient film/chemicals to complete the entire work should be shown to BHEL.
8.21	All arrangements for carrying out radiography work including dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency

	having all above facilities and who are duly approved/ accredited by BARC and/ or other regulatory authorities. Detailed particulars of such agencies will be submitted and got approved by BHEL Engineer before the actual deployment of agency for radiography work.
8.22	Contractor shall note that 100% radiography will be done at the initial stages on all the H.P. welding joints. Subsequently radiographic inspection will be done on the basis of quality of welding. However minimum percentage of joints to be radio-graphed shall not be less than the requirement of IBR or as specified by BHEL. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL.
8.23	If the contractor does not carry out radiography work due to non-availability of source /film /chemical/operator etc. BHEL will get the work done departmentally or through some other agency at the risk and cost of the contractor.
8.24	All the radiographs shall be properly prepared and shall become the property of BHEL.
8.25	Since radio-isotopes are being used, precautions and safety rules as prescribed by BHEL/BARC/BHEL's client shall be strictly followed. BARC/DRP Certificate to be provided before taking up the work.
8.26	The defects as pointed out by the engineer shall be rectified immediately to the satisfaction of BHEL Engineer. The decision of the engineer regarding acceptance or otherwise of the joint will be final and binding on the contractor.
8.27	Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of HP welders. If the performance of welder is unsatisfactory, he shall be replaced immediately.
8.28	Wherever radiographs are not accepted on account of bad shot, joints shall be re-radiographed; pre/post heating etc. and re-shots shall be submitted for evaluation. Radiographs shall be taken on joints after carrying out repairs. However, if the defect persists after first repair, as per radiographs, carrying out radiography heat treatment etc. shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and radiographed, heat treated etc at contractor's cost.
8.29	Heat treatment and radiography may require to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make all necessary arrangements including labour, supervisors, engineer required for the work as per directions of BHEL.
8.30	The contractor shall maintain a record in the form as prescribed by BHEL of all operations carried out on each weld and maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejection if any, percentage of rejection etc and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or other wise of the welds shall be final and binding with contractor.
8.31	All site welding joints shall be subject to acceptance by BHEL engineer & end user.
8.32	All site butt / fillet weld seams subject to vacuum conditions shall be radiographed. Before the weld seams are subjected to radiography test, the seams shall be properly ground and cleaned.
8.33	All butt welds shall be subject to dye penetration test as per the instructions of engineer at no additional cost.
8.34	The contractor shall adopt the "stitch welding" while carrying out the assembly of condenser. Final welding shall be carried out by "step back seam method" to ensure minimum deformation of the welded parts.
8.35	The contractor shall adopt and be equipped for carrying out other NDT like LPI/MPT etc. Steeloscopy /hardness etc. as required as per welding schedule/drawings provided, within the finally accepted price/rates. Ultrasonic testing, wherever required will be arranged by contractor at no extra cost.
8.36	The contractor shall carry out the edge preparation of weld joints at site in accordance with the details acceptable to BHEL Engineer. Machining or automatic

	flame cutting will be allowed only where edge preparation otherwise is impractical. All slags/burrs shall be removed from cuts and all the hand cuts shall be ground smooth to the satisfaction of engineer.
8.37	The contractor shall assist BHEL Engineer in preparing complete field welding schedule for all the field welding activities to be carried out in respect of piping and equipment erected and involving high pressure welding, at least 30 days prior to the scheduled start of erection work, at site. Such schedules shall be strictly adhered to by the contractor.
8.38	Necessary coordination with IBR authorities for all IBR formalities is to be done by the contractor at his cost except payment of statutory fees.
8.39	Conductance of all kinds of NDTs for the total TG area as per the requirement and applicable drawings/documents /Codes etc. including arranging of all resources with materials , scaffolding materials etc .is in vendor's scope.
9.0	**CONDENSER PAINTING**
9.1	The condenser main tube plates will be dispatched to site from the works with surface protection only on water box side. The same shall be removed as per BHEL Engineer's instruction and BHEL's specification. The surface protection of these tube plates shall be maintained by the contractor after the completion of the tube insertion and expansion activities. The surface shall be first painted with at least two coats of chemical resistant epoxy zinc chromate primer after thoroughly cleaning all such parts of all dirt, rust, scales greases, oils and other foreign materials by adopting suitable methods. Afterwards the above parts shall be finished with two coats of high build black coal tar coating. Before the painting is taken up, the contractor shall clean the tube holes and plug all the holes with suitable tapered plastic/wooden plugs to avoid any damage to the tube ends. The plastic/wooden plugs and plants required for the above operations shall have to be arranged by the contractor at his cost. The above paints are also to be applied on water chamber/box.The required paints are to be arranged by the contractor.
9.2	The condenser steam space shall be surface protected with at least two coats of suitable steam washable paint (HE 1712). Before the painting is taken up, the contractor shall clean the surfaces to be coated by adopting suitable methods.
9.3	Inside of water box shall be painted with paint as per BHEL specification after carrying out sand blasting operation.
9.4	Application of painting as well as supply of paints including primer and other material and other resources for condenser inside painting shall be in the scope of contractor. The vendor should take prior approval regarding brand of paint from BHEL and the vendor has to arrange valid test certificates.
10.0	**FINISH PAINTING OF TURBINE, GENERATOR, PIPING, EQUIPMENT, SYSTEMS AND OTHER PACKAGES**
10.1	All exposed metal parts of the equipment, structure, auxiliaries, piping, and other items/Systems/equipments (covered within the scope of this contract) after installations are to be painted. The surfaces are to be thoroughly cleaned of all dirt, rust, scales, grease, oils and other foreign materials by wire brushing, scrapping, and any other method as per requirement of BHEL. The same will be inspected and approved by the engineer before painting.
10.2	Mostly the equipment/ items/ components will be supplied with one coat of primer paint and one coat of finish paint. However during storage and handling, the same may get peeled off/ deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer and finish paint matching with shop paint/ approved final colour. Besides above, two coats of approved primer paint is to be applied on all the bare/ unpainted surfaces. The gas cut stubs would require being ground and rounded.
10.3	The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as stated below, unless otherwise specified elsewhere in this specification.
10.3.1	Surfaces subject to weathering
	All surfaces shall have a minimum of four coats of paint made up as follows.
10.3.1.1	Primer coat : 35 micron DFT.

10.3.1.2	Tie coat : 35 micron DFT.
10.3.1.3	Finishing coat (2 nos) : 35 micron DFT per coat.
10.3.1.4	The total minimum DFT shall be 140 micron.
10.3.2	Surfaces Inside Buildings
	All surfaces shall have a minimum of three coats of paint made up as follows:
10.3.2.1	Primer coat : 35 micron DFT.
10.3.2.2	Tie coat : 35 micron DFT.
10.3.2.3	Finishing coat (2 nos) : 25 micron DFT per coat.
10.3.2.4	The total minimum DFT shall be 120 micron.
10.4	The type and colour of primer & finish coat shall be selected by the bidder after approval by the owner.
10.5	COLOUR CO-ORDINATION & FINISH
10.5.1	Exterior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and with the surrounding landscape.
10.5.2	Interior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and which will be conducive to the comfort, well-being and high productivity of the operators. Operating plant & services provided shall be colour coded for ease of identification.
10.5.3	All finishes shall be durable and as far as possible maintenance free. Finishes shall be easily cleaned.
10.5.4	Final colours and finishes shall be to the approval of the engineer.
10.5.5	All colour coding shall be in consonance with the existing plant, Colour code shall be decided during detail engineering.
10.6	Certain equipment like control panels, valves etc shall require spray painting. The contractor shall make arrangements of the required equipment for spray painting at his own cost. Spray painting at the job site shall be permitted only at times and locations approved by engineer.
10.7	Colour of paint to be applied over pipes/ equipments will be as approved by BHEL site sngineer.
10.8	Contractor at no extra cost to BHEL shall apply all paints, primers; arrange tools and other consumables including scaffolding materials required for finish painting. Required Paint and Primer need to be supplied by Vendor within his quoted rate. The paint need to be sourced from reputed BHEL approved vendor and quality of the paint shall be checked by BHEL prior to application. In the event of failure in supply of the paint by the vendor of proper quality and quantity as per requirement, BHEL shall supply the paint and recover the cost with due BHEL overhead from the very next payable bills of the Vendor /Any other dues.
10.9	The contractor may be required to fill up dents/ marks by applying putty before final painting of equipment. All materials and arrangements have to be made within quoted price/ rates.
10.10	The contractor shall provide legends with direction of flow on equipment and piping in size specified by Engineer. Letter writing shall be done in Hindi / English or in both languages.
10.11	The painters have to under go test and only qualified painters will be allowed to work.
10.12	Painting work should be completed within completion period in consultation with site.
10.13	The vendor has to do arrow marking with nomenclature, Legends for the system as per the requirement of BHEL.
10.14	The total painting job including supply and application with all resources is included in vendor's scope.
11.0	**SPECIAL ERECTION PROCEDURE TO BE FOLLOWED BY CONTRACTOR**
	Following erection procedure in the area of Condenser, Turbine, Generator and piping is to be adopted by the vendor to squeeze the cycle time-
11.1	CONDENSER
11.1.1	Proper handling and storage of materials, particularly support plates, tube plates etc. to avoid any distortion of this item so that time taken in alignment & rectification

	of various components is reduced.
11.1.2	Proper storage and handling of condenser tubes to avoid any bend and damage to tubes. Lifting beam is required to be used during handling at stores and at site.
11.1.3	Aligning and welding of water box and water chamber pre-assembly outside before placement.
11.1.4	Co_2 /semi automatic welding machine, if required to be used during pre-assembly welding of support plate, water box etc., shall be arranged by the contractor.
11.1.5	Pre-matching and marking of support plates for turbine and generator side.
11.1.6	Use of alignment fixture for support plates. The fixture can be fabricated at site and are to be made available by contractor within quoted rate.
11.1.7	Pre-welding of stiffener rods received in part-lengths from manufacturing units to an optimum length outside.
11.1.8	Use of good quality tube-expansion and End milling machines, at least four in number.
11.1.8	All NDTs are in vendor's scope.
11.1.9	The condenser parts will be sent by BHEL Manufacturing units in pieces as per transportation ease/norm. The same is to be assembled, including fabrication, welding etc. irrespective of no. of pieces shown in the drawing for despatch. No additional work will be admissible on this account.
11.2	TURBINE, GENERATOR
11.2.1	Permanent packers (between base plate and pedestal) can be installed before grouting of HP front & HP rear bearing pedestal base plates.
11.2.2	Final packers (between LP base plate and girder) of the LP outer casing after levelling of the LP outer casing with the help of water level can be installed without waiting for the placement of LP rotor.
11.2.3	Final radial and axial keys of the LP outer casing after its alignment can be installed without waiting for the placement of rotor.
11.2.4	Frequent placement and removal of LP rotor can be avoided by checking all radial and axial clearances of LP inner casing in one attempt.
11.2.5	LP inner casing can be boxed up after placement of LP rotor and checking of radial and axial clearances. There is no need for preliminary coupling of LP- IP rotors.
11.2.6	If proper alignment and centering of the bearing pedestals are maintained before grouting of the pedestals, it requires very little adjustment during alignment and thus less time during alignment process. Also, as the final packers of the bearing pedestals have been installed before grouting, time is saved in fitting of these packers at this stage.
11.3	TG PIPING
11.3.1	Small bore pipings, which are supplied in running length, Electro-hydraulic pipe bending machines and pipe chamfering machine will be used at least to cater 3" schedule 160 pipes.
11.3.2	Pipe line should be mechanically and chemically cleaned before these are erected, as per BHEL standard procedures and BHEL engineer's instructions. BHEL will provide chemical free of cost.
11.3.3	The contractor within his quoted rate has to make edge preparation, and if required mismatch in the pipes are also to be removed to make proper pipe joints.
11.3.4	Pipe bending for small bore pipes by filling sand and heating is not allowed.
11.4	ERECTION OF DEAERATOR AND FEED STORAGE TANK
11.4.1	The Feed Storage Tank shall be received at site in three pieces and shall be erected on the base plate with sliding supports and saddles etc.
11.4.2	The storage tank sections shall be aligned with each other and circumferential joints (two numbers) shall be welded.
11.4.3	The welding shall require edge-preparation with proper fit-up. For this purpose, necessary grinding etc. has to be done in case of ovality and mismatch is observed.
11.4.4	Required pre-heating, PWHT and other NDTs as required shall be carried out and necessary facilities envisaged are included in vendor's scope.
11.4.5	On completion of Feed Storage Tank welding, the Deaerator has to be placed at suitable elevation as per drawing and suitable interconnections pipes with welding

	and other related NDTs.
11.4.6	All the mountings of this package are also included in vendor's scope.
11.4.7	Suitable high capacity crane (preferably 75 MT or above as required as per the load chart) for lifting Deaerator and Feed Storage Tank Components in deaerator floor shall be provided by BHEL free of cost as per Annexure-IV. However, the vendor has to make his own arrangement like laying of rails with suitable facility for dragging the components on Deaerator floor.
11.4.8	Erection of the Deaerator platform is included in vendor's scope at no extra cost to BHEL.
12.0	**ERECTION INSTRUCTION**
12.1	The bidders may note that guidelines / instructions are tentative and subject to change depending upon site conditions, the decision of BHEL engineers will be final in this regard.
12.2	The work will comprise of but not limited to the followings.
12.3	Erection of condenser and TG sub-assembly / components auxiliaries as detailed in the annexure. The schedule of sub-assemblies and weight of individual heavy components given in Technical specifications are approximate and meant for giving a general idea to the tenderer only about magnitude of the work involved. The condenser and turbine generator components are sent in parts for convenience of transportation. They are to be dismantled wherever required, cleaned, assembled stage by stage, erected aligned and adjusted as per drawing / dimensions / tolerances and instructions of BHEL engineers/experts available at site.
12.4	All the work such as cleaning, checking, leveling, assembly, temporary erection, alignment, dismantling of certain equipment for checking and cleaning, overhauling of valves, face preparations, fabrication, welding, heat treatment, NDT and hydraulic test of sheets / plates, tubes, pipes as per general engineering practices at site, cutting, grinding, straightening, filling, chipping, drilling, reaming, lapping, shaping, machining, blue matching, fitting and touch up painting etc as may be applicable in such erection works are treated as incidental to erection and necessary to complete the work satisfactorily. These shall be carried out by the contractor as part of the work.
12.5	Normally weld neck valves will have prepared edges for welding. It may be occasionally necessary to prepare new edges or re-prepare the edges to suit conditions, which shall be done by the contractor at no extra cost. All fittings like 'T' pieces, weld neck flanges, reducers etc. shall be suitably matched, re-edge prepared with pipes for welding. The valves will have to be checked, cleaned, lapped or overhauled in full or in parts before erection, after chemical cleaning and during commissioning. Overhauling of valves is the complete responsibility of the contractor. Experienced technicians for overhauling of valves and labour required to assist the technicians shall be arranged by the contractor at his own cost.
12.6	Suspension for piping etc. will be supplied in running lengths and shall be cut to suitable sizes and adjusted as required. Hangers, components which are being supplied loose shall be assembled at site and erected as part of the work.
12.7	Some pipes may be supplied in running lengths or in fabricated position as per convenience of dispatch. Contractor shall cut and fabricate to suit the layouts. The contractor shall carry out necessary fabrication of these pipes / hangers at site including hot / cold bending as desired by BHEL Engineer at no extra cost. As per layout, suitable bends shall be fabricated at site either by hot / cold bending as directed by BHEL engineer at no extra cost. Some pipes coming under the HP control oil system are having jacketing pipe over and above the oil carrying pipe. Both pipes are to be fabricated, welded as per requirement of drawings / BHEL engineer's instruction at site at no extra cost.
12.8	All rotating machinery and equipment shall be cleaned, lubricated, checked for smooth rotation. If necessary, dismantling and refitting is also to be done before erection by the contractor at no extra cost to BHEL. If in opinion of the BHEL engineer the equipment is to be further checked at any stage of the work, necessary facilities for dismantling, cleaning, lubricating and refitting shall be provided by the contractor at no extra cost.

12.9	The surface of the pipes to be joined shall be suitably prepared as per instruction of BHEL engineers. Edge preparation shall be done by chamfering machine, wherever required and all welding surfaces must be cleaned thoroughly. All wrongs, due to the mistakes of the contractor shall be repaired / redone at contractor's cost. Instrumentation, drains, stubs, root valves which are sent in loose from manufacturing units are to be welded at site as per BHEL engineer's instruction.
12.10	Erection and welding of control valves and flow nozzles coming in the piping system is included in the scope of the contractor. Necessary calibration and commissioning of control vales and flow nozzles are excluded from the scope of the contractor. However, contractor has to provide assistance for commissioning of control valves and flow nozzles.
12.11	Impulse piping, root valves, flow elements, thermowells etc. wherever required for the equipment is to be welded by the contractor as per the instruction of BHEL engineer. The required equipment will be supplied by supplier free of cost.
12.12	The instruction of the motor manufacturer regarding storage of motors and re-conservation must be strictly followed without any deviation.
12.13	All the motors shall be stripped open, thoroughly serviced with proper care and reassembled properly before erection by the contractor, if necessary. During servicing if any deficiency is observed, the same should be taken up with BHEL engineer. This is included in the scope of work.
12.14	Special slings for stator will be provided by BHEL free of cost. Testing of Stator lifting sling from an authorized agency is under the scope of work. The slings are to be handled carefully and returned to BHEL in proper preserved condition, immediately after the work.
12.15	The contractor shall carry out all necessary checks, such as accuracy of levels, centre lines, bolt hole positions, hanger supports etc., sufficiently in advance to ensure correctness of installation of all equipment covered in the scope of work.
12.16	All equipment /materials to be taken inside the plant building shall be cleaned thoroughly before taking them inside and the erected equipment and piping shall also be kept clean by regular cleaning.
12.17	All the shafts of the rotating equipment shall have to be properly leveled and aligned to those of matching equipment to perfection, accuracy as required, and the equipment shall be free from excessive vibrations so as to avoid overheating of bearings and any other conditions which may tend to shorten the life of the equipment. All bearings shafts and other rotating parts shall be thoroughly cleaned and lubricated as per the recommendation of BHEL engineer before starting. All reaming / face matching of bolt holes / coupling faces after alignment prior to coupling will be in the scope of the contractor.
12.18	The contractor shall also weld all thermo wells, small length of pipes to all tapping for pressure, flow and level points, isolating valves and root valves on all equipment 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. Thermowell’s tapping point connection 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 thermowells and flow elements with branch pipes shall be installed and welded as per the Engineer's instruction.
12.19	Installation of coupling bolts of coupling between IPT & LPT and LPT & Generator requires utmost precision. The contractor has to make arrangement for precise machining operation such as reaming, honing etc. for fit up coupling bolts.
12.20	Sometimes, at site, insulation may require to be removed due to some unforeseen reasons. Its removal and re-application is within the scope of work. No extra payment will be made for such work. However, BHEL will supply the necessary insulation material, as required during such re-application. Decision of BHEL Engineer in this regard, will be final and binding on the contractor.
12.21	Machining of shims ,packers ,Coupling Bolts and other items

12.21.1	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
12.21.2	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."
12.22	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.
12.23	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.
12.24	Contingency arrangement
	The contactor has to arrange for making contingency arrangement to achieve/reschedule 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.
12.25	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.
12.26	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.
12.27	Drying out arrangements for all kinds of motors/panels/system including laying of cables, arranging of Engineer/electricians for completing of drying out is included in vendor's scope. Cables for HT Motors or any special cables, if required shall be issued free of cost by BHEL, if required. Motors de-couplings, greasing/servicing of equipments/re-couplings are included in the vendor's scope. Necessary number of

	Halogen lamps are also to be kept in stock by the contractor to take care of such kinds of activities.
12.28	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 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.
12.28	Approach platforms : -
	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.
12.29	INSTRUCTION FOR PIPELINE ERECTION
	The work will comprise of but not be limited to the following:
12.29.1	All pipelines shall be erected as per elevation shown in the respective erection drawings.
12.29.2	Erection of piping system shall be coordinated by the contractor as required, with the erection group of the turbine, generator, condenser, boiler, boiler feed pumps and other major equipment. Approval must be obtained from the construction managers and the equipment manufacturer' field engineering representative prior to making piping interface connection to equipment mentioned above. Sequence of work shall be carefully planned to minimise interference with other groups working in the same area. Actual sequence to be followed shall be subjected to the approval of the engineer and the engineer may, at any time, direct the contractor to reschedule his work as per status of the site work.
12.29.3	All workmanship shall be accomplished using accepted method and procedures of the highest recognised pipe fabrication and erection standards and must be done in a neat manner, in accordance with IBR and other standards and as per the direction of BHEL engineers. While laying of piping, precaution / care must be taken for avoiding fouling between site routed piping / fabricated and other pipings.
12.29.4	Modification of shop fabricated pipes prior to installation to accommodate site alterations in pipe routing shall have to be carried out by the contractor at no extra charges to BHEL.
12.29.5	Pipes of size NB 65 mm and below shall be field run as per general routs, which will be indicated to the successful tenderer. They will be supplied with straight pipes in running meters and are to be bent, edge prepared, welded, heat treated, radio-graphed, to suit the routing requirement.
12.29.6	While erecting the field run pipes, the contractor shall check the accessibility of valves, instrument tapping points and maintain minimum headroom requirement and other necessary clearance from the adjoining work areas.
12.29.7	All field welding, stress relieving and heat treatment shall be done as per the drawing and welding procedure that will be furnished to the contractor during the execution of the contract.
12.29.8	All pipelines shall be given proper slopes towards the drain points, during erection at site as per drawing.
12.29.9	All pipelines shall be provided with suitable vent and drain points with valves on the highest and lowest points of the pipe run although may not be specifically mentioned in the drawing.
12.29.10	For instrument connection, pipe stubs including the instrument tubing up to the root valves shall be installed by the contractor. The erection of instruments is not however included in the scope of this specification.
12.29.11	All vents and drains for piping and equipment whether shown in the drawing and not, shall terminate on the ground floor at a suitable point unless otherwise noted.
12.29.12	Wherever piping erected by the contractor is connected to piping or equipment or

	counter flanges of equipment's erected by some other agencies, the joint at the connecting point including erection of counter flanges supplied along with equipment's, valves etc. shall be done by the contractor.
12.29.13	The contractor shall be responsible for the correct orientation of all valves so that seat, stem and hand wheels will be in desired locations. Information regarding orientation of valves, not fully located on drawings, may be obtained from BHEL engineers.
12.29.14	Setting of limit switch of actuators of valves and its calibration is not in the scope of work. However, assistance for commissioning of valves viz. Mechanical readiness, making approach to valves like temporary scaffolding etc., replacement etc. is in the scope.
12.29.15	Commissioning of the 'Condenser on line tube cleaning system' and 'Self cleaning Strainer' will be done by the original manufacturer/supplier. The contractor shall provide necessary manpower support etc. during the commissioning. *It will require regular cleaning of filters and maintenance of the systems and for this the vendor within his quoted rate has to arrange manpower with all resources treating it as normal scope of work.*
12.29.16	The piping system, coming under the purview of IBR should generally meet the requirements of IBR. However, BHEL will have the option of changing of standard or specifications in this regard, depending upon site condition. The decision of BHEL shall be final and binding on the contractor.
12.29.17	All piping shall be routed so as to avoid undertaking routs of other pipes and their hangers and supports, electrical cable trays, ventilation ducting, structural members, equipment etc.
12.29.18	Adequate clearance shall be ensured with respect to the above to accommodate insulation and pipe movements. While routing the field run piping the following requirement should be taken into account by the contractor.
12.29.19	All piping shall be grouped wherever practicable and shall be routed to present a neat appearance.
12.29.20	The piping shall be arranged to provide clearance for the removal of equipment for maintenance and for easy access to valves, instruments and other piping accessories required for operational maintenance.
12.29.21	Overhead piping shall have a minimum overhead clearance of 2/3 meters above walkways and working areas and 6 meters above roadways unless otherwise approved by the BHEL engineer.
12.29.22	Drains shall be provided at all low points and vents at all high points as per actual layout regardless of whether same have been shown in respective drawings or not. The pipelines shall be sloped towards the drain points. All the drains shall be terminated to the drain pit as per the instruction of BHEL engineer.
12.29.23	For field run piping the contractor shall fabricate and erect all hangers and supports as required with due regard to general arrangement layout of other pipes, hangers, cable trays, ducting, structural members etc. and in consultation with and to the approval of BHEL engineer.
12.29.24	Before performing the welding, all corrosion products, grease, dirt and other foreign matter shall be removed from the surface to be joined and all valves shall be opened full. Tack weld shall be ground or chipped to remove all objectionable projections and all weld splatter shall be removed prior to welding the joint. Piping on both sides of any joint shall be adequately supported throughout the preheating, welding and stress relieving operations to avoid possible cracking of tack welds and initial beads. Temporary supports if used shall be so designed that the joint is relieved of all stress due to weight of the pipe while subject to stress relieving temperature. Whereas joint is subject to cold springs during this operations, the adjacent pipes should be clamped together so as to prevent straining of the metal spacing between joints shall be in accordance with code requirements.
12.29.25	When "C" clamps are tack welded to pipe for the purpose of alignment of a joint, the pipe shall be locally pre-heated in the area where such tack welding is performed, provided such tack welds are adjacent to a joint that will be stress-relieved. However, if preheating is not specified for the adjacent joint, preheating for the

	above tack weld may be omitted. After the joint is completed all tack welds used for this purpose shall be removed flush with the adjacent surface of the pipe by chipping and/or grinding areas where "C" clamps were attached, shall be included in scope of stress relieving, where required.
12.29.26	Pre-fabrication can be carried out in the fabrication shop to be established at site by the contractor to ensure quality of work and to minimise work on the field. Such pre-fabrication /pre-assembly of piping should be based on isometrics and piping arrangement drawing supplied. However, it shall be borne in mind that there may be variations in dimensions between those stated in isometrics and those actually obtained at site due to slight variations in the location of equipment, location of inserts etc. The contractor shall therefore, provide appropriate field joints and fit in sections permitting the pre-assembled pipe work to be installed without major modifications. In any case no extra claim shall be entertained on this account.
12.29.27	All piping shall be routed and located in accordance with the piping arrangement drawings/ isometrics. No deviations will be allowed.
12.29.28	Before laying the piping on supports, the co-ordinates and elevations of all supports shall be checked by the contractor for correctness. Discrepancies of the execution drawings, if any, shall be promptly brought to the notice of the engineer in writing and correction shall be carried out as per his instruction.
12.29.29	When fitting up mating flanges, the pipe shall be properly aligned and the flanges checked to determine that the forces are parallel and that they can be pulled up without inducing stress into the piping and equipment. The bolt holes of the flanges in the vertical plane shall straddle the vertical centre line of the pipe line in the erected portion and for flange in the horizontal plane; the bolt holes shall straddle the plant north-south axis unless otherwise shown on the drawings.
12.29.30	Flange connection to pumps, fans, turbine etc shall be such as not to induce stress on the equipment/ machinery due to misalignment, excessive gap etc. The final tightening shall be done as per the instruction of BHEL engineers only when the machines are made available for final piping connection.
12.29.31	Supports shall be fabricated and erected as per the erection drawings and as per the instruction of BHEL engineer. The auxiliary steel shall be of size as indicated in the drawing. Supports shall be erected with sufficient margin for turn buckle threads for future adjustments.
12.29.32	Fabrication, erection of permanent & temporary approach platforms for taking reading of valves/ actuators, equipment's, drains, vents, instrumentation points, wherever required to be done as per the drawing/ instruction of engineer. Also, bidder may have to fabricate, erect some platforms/ ladders (not envisaged in any drg/ doc) for operation/ maintenance of valve/ actuators (the total approximate weight will 30MT). The required steel will be given by BHEL free of cost. Bidder's quoted/ accepted rates shall be inclusive of this scope.
12.29.33	Flash box, Flash tank shall be fixed on foundation provided by BHEL. Necessary chipping, leveling and grouting of foundation is to be done by the contractor at his cost.
12.29.34	All assembly of fittings, gauges, valves etc. on flash tanks shall be carried out by the contractor at his cost to make it complete in all respect.
12.29.35	All small pipes / tubes shall be carefully routed according to site condition and to avoid fouling with equipment/ other pipelines. BHEL engineer shall be consulted before starting the activities on small bore lines, whose decision shall be final and binding on the contractor.
12.29.36	For commissioning of the unit, if any contingency schemes are planned in addition to normal PGMA's identified, the same contingency pipelines may be included in the scope of contractor without any extra cost for which materials only will be supplied by BHEL. All T&P, consumables are in the scope of contractor. Subsequently, restoration with piping, valves etc. will be in the contractor's scope.
12.29.37	Contractor shall provide necessary services for updating the material records, progress reports at no extra cost.
12.29.38	For maintaining the slopes as given in the drawings for larger thickness and larger diameter pipelines, edge preparation for welding may have to be altered suitably to

	achieve the slope. This shall also form part of the work and the contractor's quoted rate shall include this work also.
12.29.39	In case the supplies of some items are delayed, the contractor has to make temporary spool pieces for the flow control valves, HP bypass valves, flow measurement devices and the pipes are to be prepared for erecting the same temporarily in order to reduce the erection cycle time.
12.29.40	If safety requirements are not being met by the contractor, necessary safety appliances will be provided by BHEL on chargeable basis.
12.29.41	Temporary piping for pre-commissioning activities like, chemical cleaning, alkali flushing, hot water flushing, oil /steam flushing, etc. shall be carried out as part of work.
12.29.42	In addition to above temporary lines, any other contingency lines required due to non-availability of regular pipe materials shall also be erected to meet the commissioning target at no extra cost.
12.29.43	All temporary / contingency pipeline materials shall be arranged by BHEL free of cost. However, consumables like electrodes, gases etc and T&P required are to be arranged by the contractor at his cost. Platform materials for permanent approach platform will be issued free of cost by BHEL.
12.29.44	All the instrumentation tap off points like thermowells, root valves, impulse lines upto root valves etc. shall also be erected and welded by the contractor, irrespective of whether such materials are supplied by BHEL or any other agency.
12.29.45	The root valves, thermowells, instruments will be located in the convenient location/place as required by the customer to facilitate easy operation as per the decision / instruction of BHEL engineers.
12.30	PG TEST :-
12.30.1	Installation and welding of Tapping Points for taking performance test measurements shall be carried out by the contractor as part of this work for the equipments covered under this tender specification under the guidance of BHEL engineer. The contractor has to install PG Test related instruments and other related hardware in the equipments/piping/systems erected by them. At the same time , the contractor may have to carry out installation of PG Test instruments and related hardware on the equipments/systems which are erected by other vendors to facilitate PG Test activity treating them also as part of their work.
12.30.2	For PG Test purpose, the vendors within quoted rate shall perform the following activities for the Unit :
12.30.2.1	Receiving all the PG test materials including electrical, instruments, mechanical items from BHEL Store/other designated place.
12.30.2.2	Installation of PG Test instruments like impulse piping ,valves, supports, fixing/welding of thermo-wells as per requirement. Tapping points/impulse pipelines , thermowells and other supporting activities required to complete the PG Test are to be installed in the system/piping/equipment erected by the vendor and even in areas which are not erected by TG contractor as per the requirement for PG Test purpose. This is treated as normal scope of work of the vendor.
12.30.2.3	Installation of Root Valves, RTDs, Thermocouples, Temperature instruments, pressure/Differentials pressure/vacuum gauges, pressure differential pressure/vacuum transmitters, Power transmitters/Watt meters and all other associated activities.
12.30.2.4	Complete necessary PG Test related activities like laying of cables, tuning of instruments, recording datas.
12.30.2.5	Attending to passing valves.
12.30.2.6	Cleaning of passing valves.
12.30.2.7	Cleaning of condenser tubes with high pressure jet cleaning or with suitable method as suggested by BHEL in addition to Condenser steam space cleaning and inspection, cleaning/inspection of condenser CW system for the portion erected by the vendor.
12.30.2.8	Cleaning of all gauge glass in Hotwell, LP & HP Heaters, FST, Drain Cooler, GSC and other areas with provision of additional lighting.

12.30.2.9	Calibration of all instruments.
12.30.2.10	Replacement of spool pieces/regular flow elements with PG Test Flow nozzles/orifices and restoration after completion of PG Test. In case the pipelines are having insulations, the same is to be removed (both wool and Al/ GI. Sheeting cladding) and these are to be carefully preserved for restoration after completion of PG Test. This is treated as normal scope of work.
12.30.2.11	Arranging additional lighting arrangements during PG test .
12.30.2.12	Arranging additional watch and wards for protection of PG Test instruments and items.
12.30.2.13	Exclusive Engineers/supervisors for conductance of PG Test.
12.30.2.14	Manpower for arranging taking PG Test readings manually(around 10 staff during PG Test exclusively for this purpose)
12.30.2.15	Arranging two number of computer with operators, stationeries, computer papers, photocopy papers etc. ink-jet /lasor printer with cartridge facilities during PG Test period in addition to the existing computer facilities .
12.30.2.16	Compilation of PG test documents , multiplication and spiral binding for at least six sets of such documents.
12.30.2.17	Conductance of actual PG Test and during this time, the contactor has to arrange Engineers/supervisor, manpower during normal working and OT hours including normal working days, Sundays/Holidays.
12.30.2.18	Dismantling of PG test instruments and all related piping etc.
12.30.2.19	Returning all instruments and impulse piping and other total items.
12.30.2.20	Packing of all PG Tests items in boxes for despatch.
12.30.2.21	Restoration of PG Test flow nozzles/orifices with spool pipes/regular flow elements.
12.30.2.22	All other activities required to accomplish PG test in all respect is to be done treating it as normal scope of work by the contractor.
12.30.3	Removal/restoration of thermal of thermal insulations/sheeting required after PG Test completion is included in contractor's scope of work.
12.31	In pipelines like MS, CRH, HRH lines, extraction lines etc., the NRVs/ESVs/IVs, Strainers etc will be erected by the Contractor as per drawings and instruction of BHEL.
12.32	The connection of flanged / welded joints with equipment like deaerator, turbine, condenser, pumps, strainers etc. shall also be carried out by the contractor as part of the job.
12.33	Rerouting / modification of pipelines due to revisions in the drawings received before physically taking up the job shall be carried out by the contractor within the scope of work. No extra claim shall be permitted on this account. The contractor shall check up before taking up erection of any pipelines regarding the availability of the latest revision drawings.
12.34	All temporary lines like alkaline flushing, steam blowing etc. shall be supplied in "as is where is" condition. The contractor shall arrange to carry out the required dressing, grinding, cleaning etc. while carrying out erection. No extra claims on this account will be entertained.
12.35	It is likely that dressing set-up of joints in critical piping and LP piping, grinding of the shop prepared edges will require to be done by the contractor to maintain the desired slopes and all these jobs will be treated as normal erection work.
12.36	All turbo-supervisory pick ups and temperature elements (to be installed inside bearings) for turbine, generator and equipment etc are to be installed by the vendor as per drawing within the quoted rates. The above items may have to be removed for servicing, calibration and then refitted by the vendor.
13.0	**HYDRAULIC TEST AND OTHER TESTS**
13.1	Hydraulic testing pumps and chemical cleaning pumps along with starter as required shall be provided by the BHEL. However, supply of cables, DBs, resistance boxes, fuses etc. required for hydraulic test / chemical cleaning operations will be in the contractor's scope of work. The servicing, installation, electrical connection, erection, testing and dismantling shall be carried out by the contractor as part of the work.

13.2	All pressure parts and some of low pressure parts shall be subjected to hydraulic test as per statutory requirements. In addition gas tightness test of generator has to be carried out. The contractor shall supply necessary labour and other services & arrangements to carry out the required tests as per instruction and direction of BHEL engineers, and is included in the scope of work.
13.3	The contractor shall carry out the air tightness test on generator stator to the satisfaction of BHEL engineers. The necessary arrangement of testing with clean dry air shall be made by the contractor. This may have to be repeated on later date as per requirement of BHEL. Arrangement of hot air with drier is to be done by vendor with thermostat. Purging of Air/H_2/Co_2 in first time & subsequent times till handing over is under the scope.
13.4	Contractor shall lay all necessary temporary piping, install the pumps, blanks, valves, pressure gauges etc. required for the test. Temporary piping, valves, flanges, blanks etc. will be supplied by BHEL on loan basis, free of hire charges. After the test is over all temporary piping, valves, flanges, blanks etc. shall be removed by him and returned to BHEL.
13.5	The hydraulic testing of the equipment and piping covered in this scope of work including vacuum system testing by water filling has to be carried out by the contractor as per instructions of BHEL engineer. The contractor shall provide all facilities required for hydraulic testing.
13.6	All valves coming in the gas system shall have to be hydraulically tested and cocks shall have to be checked for gas tightness before installation in the presence of BHEL engineer.
13.7	All the weld joints of steam inlet pipelines to LPT shall have to be subjected to non-destructive test viz., magnetic particle test, dye-penetration test, and Hardness test in addition to radiography as and when applicable.
13.8	All above tests shall be repeated till all the equipment/ system satisfy the requirement, obligation of BHEL to their customer. As far as the hydraulic pressure test is concerned, the same shall be conducted to the satisfaction of the BOILER INSPECTORATE /CUSTOMER /BHEL. Any rectification required shall have to be done / redone by the contractor at his cost.
13.9	Raw materials for all temporary piping necessary for conducting hydraulic test, chemical cleaning, steam blowing, flushing, effluent disposal etc., will be provided by BHEL free of cost. However, fabrication, servicing, erection including dismantling the same and return of the temporary piping, flanges, valves etc. to BHEL stores is the responsibility of the contractor without any extra charges.
14.0	**PRESSURE TEST FOR PIPING**
14.1	Soundness of the weld shall be tested hydraulically under the supervision of the BHEL engineer and customer, to the pressure indicated in the drawing for each piping system as per requirement. Prior to the test, the piping system shall be inspected by the BHEL engineer to the extent necessary to ensure compliance with engineering design with respect to material, and erection clearance for the test shall be obtained by the contractor.
14.2	BHEL will supply the necessary pipes, valves etc for test. The erection of pumps, temporary piping, valves, pressure gauges and their subsequent removal and return to BHEL after successful completion of the test shall be done by the contractor at his own cost.
14.3	The test shall be repeated till the boiler inspector, BHEL and customer are satisfied.
14.4	Pressure test for piping systems under the purview of IBR shall be carried out according to the relevant clause of IBR and the requirements of boiler inspector.
14.5	For piping system not under the purview of IBR, testing shall be carried out as per the instruction of BHEL engineer.
14.6	The following specifications shall be complied with during hydraulic test :
14.6.1	Vent nozzles with valve shall be provided at the highest point of the runs, to eliminate air pockets. Drain nozzles with valves shall be provided to drain water from pipes. The nozzles and valves shall be of same materials as the pipe.
14.6.2	The lower part of the pipe shall always be filled first with water.
14.6.3	The pressure shall be slowly increased (without shocks) to the stipulated value and

	maintained for ten minutes or as long, as required to visually check all joints.
14.6.4	Following the control specified above, the pressure shall be slowly decreased to the design pressure after which the pipe shall be subjected to a peening test, applying knocks every 150 mm approximately especially in the welded joint areas, with a 0.5 to 1.5 kg Hammer (depending on the pipe wall thickness). The hammer used shall be a round headed one.
14.7	During hydraulic test, the pipes being tested shall be isolated from the equipment which they are connected to.
14.8	Openings for pressure / temperature impulse connections shall be fully closed during and after the test to prevent dust and foreign matter.
14.9	The test records shall be made for pressure testing of each piping system. These records shall contain the following information.
15.0	**DATE OF TEST, IDENTIFICATION OF PIPING TESTED, TEST FLUID, TEST PRESSURE, APPROVAL OF ENGINEER ETC**
	Contractor will supply labour and other services for following also, free of cost as part of the contract:
15.1	For transportation, installation, servicing, running of chemical cleaning pumps /test pumps and after completion to dismantle, service and return to BHEL, contractor will provide required manpower at his cost.
15.2	Contractor has to provide required manpower at his cost for erection of piping, valves etc required for alkali flushing / water flushing from mixing tank and pumps of boiler side to TG system, to drain pit, to neutralising pit, and then dismantling & return to BHEL after completion of cleaning.
15.3	For blanking of pipes at suitable point / installation of blanking devices, laying of temporary pipes for steam blowing, installation and their dismantling and return to BHEL store, contractor will have to provide manpower at his cost.
15.4	For transportation, handling, filling, emptying and refilling etc of flushing oil, fresh oil and lubricants for turbine and other main rotating auxiliaries, contractor will provide required manpower at his cost.
15.5	Contractor has to provide required manpower at his own cost for transportation of carbon di-oxide & hydrogen gas cylinders for filling / pumping from plant store and filling of gas as and when required till the unit is commissioned and handing over of the same.
16.0	**PRE-COMMISSIONING TESTS AND COMMISSIONING OF UNITS**
16.1	Commissioning of the TG set will involve trial runs of all the equipment erected, blowing through the steam lines, flushing of all the lines by air, alkali, steam, running of centrifuge, pickling with acid etc. as the case may be. On completion of satisfactory pre-commissioning tests including mass flushing, oil flushing, steam rolling, synchronising, the trial operation or the unit shall start. The trial operation shall be successful if it is proved that the unit can be operated at commercial load continuously during the period of trial operation. Trial run of the TG set and any other works are incidental to commissioning. Contractor shall provide services of skilled labour, supervision and other services in shift for above, without any extra cost under the contract.
16.2	The contractor has to arrange ElLC - Oil filtration machine alongwith vacuum degasser (filtration below 0.01 micron) for moisture and impurities removal during oil flushing, oil filling of various equipments, and the same is under the scope of contractor. In the absence of timely arrangement of the same, BHEL will arrange the same on hire and deduct with overhead the actual amount from contractor's dues for the period of machine not provided for actual operation.
16.3	The contractor shall carry out the pre-commissioning activities such as alkali flushing of condensate and drip system, oil flushing of lubrication oil and jacking oil, governing system steam blowing of auxiliaries & gland steam pipes, flushing of condenser and generator air tightness test and any other cleaning, blowing and flushing operations required for making the system clean and ready for commissioning. The oil required for initial filling and chemicals required for alkali washing/ acid pickling shall be supplied by BHEL free of cost. All required services for above is in vendor's scope of work.

16.4	All temporary pipelines, tanks, supports and fittings required for carrying out chemical cleaning, steam blowing, oil flushing, alkali flushing, hydraulic testing and for any other pre-commissioning work shall have to be welded and erected by contractor and is in the vendor's scope of work.
16.5	After successful completion of chemical cleaning, steam blowing, oil flushing or other test etc. removal of temporary piping, checking of valves for any accumulation, welding of valves which were kept out during cleaning operation, re-conditioning the valves, restoration of piping and returning of temporary piping, valves, flanges, chemical pumps / test pumps etc. to BHEL store, have to be done by contractor then and there, and is included in the scope of work.
16.6	For above work contractor has to utilise their man power e.g. welders, fitters, riggers, helpers etc, T&P, consumables etc. free of cost.
16.7	All chemicals and required pipes, plates, structures etc. will be supplied by BHEL free of cost but required services is in the vendor's scope.
16.8	HT/LT motor electrical testing and drying out is included from the scope . Manpower help and arrangement of lights for heating is under the scope of work. The contractor shall carry out the trial run of motors including checking the direction of rotation in the uncoupled condition, checking, aligning and coupling the motor to the respective driven equipment.
16.9	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.
16.10	Testing of Generator stator and Rotor impedance, IR etc. as per BHEL norms / QP is under the scope of work.
16.11	In case, any erection defect is noticed during various tests / operations/ trial runs as detailed above, such as loose components, undue noise or vibrations, strain in connected equipment etc. the contractor shall immediately attend to these defects and take necessary corrective measures. If any readjustment and re - alignment are necessary the same shall be done as per BHEL engineer instructions. If any part needs repairs / rectification and replacement the same shall be done by the contractor. The parts to be replaced shall be provided by BHEL free of cost, provided the defect is not attributable to the contractor.
16.12	Pre-commissioning of oil lines, includes the flushing of the pipe lines till the entire system and the pipelines are accepted as satisfactorily cleaned after inspection of sediments in the centrifuge bowl and laboratory tests of the oil samples taken from the system. After declaration of completion of oil flushing, oil system including main oil tank and coolers shall be completely drained, thoroughly cleaned and refilled with fresh oil for putting the set on barring gear. Necessary manpower for bringing fresh oil from stores to site and filling the same in main oil tank and the system shall be provided by the contractor at his cost. The contractor shall provide in three shifts, requisite manpower like skilled, semiskilled workmen during oil flushing as a part of this contact without any extra charge. Before commissioning of oil system, the pipeline should be hydraulically tested using the special hydraulic test pump to the required pressure. During alkaline flushing of condensate /feed water system also, necessary skilled /semiskilled workmen shall be provided by the contractor in three shifts as a part of this contract without any extra charge.
16.13	During this period, though the BHEL's / clients staff will also be associated in the work the contractor's responsibility will be to arrange for the complete manpower and other services required till such time the commissioned unit is taken over by the BHEL's customer.
16.14	It shall be specifically noted that employee of the contractor may have to work round the clock along with BHEL staff, and hence, if any overtime payment is involved, the contractor's quoted rate shall be inclusive of all such contingencies.
16.15	During commissioning, opening of valves, flanges, joints etc changing of gaskets, attending to leakages, minor modification, rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower for servicing, all the three shifts.

16.16	The contractor within his quoted rate has to carry out Cleaning of various strainers, filters, Coolers, Different tanks, vessels, Condenser internals, condenser tubes, Self Cleaning Strainers and their components, Condenser On load tube cleaning system, Deaerator, Feed Storage Tank, level gauges and other equipment, system, Central Oil Purification System with connected equipment and piping coming under the scope of TG Auxiliary and TG piping till the unit is taken over by the customer will be in the scope of respective contractor. The exercise may have to be repeated till satisfactory acceptance by BHEL.
16.17	In case any re-work is required because of contractor's faulty erection, which was noticed during commissioning the same, it has to be rectified by the contractor at his cost.
16.18	In case BHEL requires expert services of OEM for commissioning support of equipment, BHEL will arrange the same.
17.0	**CLEANING OF PIPES, VALVES, ACTUATORS, BEARINGS, GEAR BOXES, AND OTHER EQUIPMENT / COMPONENTS OF THE SUPPLIED EQUIPMENTS AND THESE ARE TO BE DULY PROTECTED.**
17.1	The contractor shall arrange to dispose off the chemicals used after cleaning operation in a manner acceptable to BHEL / customer.
17.2	The contractor shall ensure that during the cleaning process the procedure adopted shall be such as to consume minimum amount of DM water.
17.3	The contractor shall clean inside of all tubes, pipes and fittings from dirt, sand and loose scales, mechanically and by air blowing before its erection. All pipelines will be thoroughly blown and / or flushed. The contractor shall ensure that no valves and valves actuators are left un-serviced. Whenever necessary, as required by BHEL engineer, the contractor shall arrange to lap / grind valve seats. A system of recording such cleaning, servicing shall be developed and maintained in a manner acceptable to BHEL engineer.
17.4	The contractor shall take necessary measures to see that all the machined surfaces are greased and covered.
17.5	After flushing with water, steam blowing or after chemical cleaning, as directed by the engineer, all parts of equipment (viz. Valves etc) shall be dismantled and checked for accumulation of dust, wear or damage cleaned rectified / replaced if necessary and reassembled by the contractor without claiming any extra cost. However the parts to be replaced in such case will be supplied by BHEL.
17.6	All the bearings, gear boxes etc. of the equipment, valves and electrical motors to be erected are provided with protective grease only. Contractor shall arrange, as and when required by the engineer, for cleaning the bearings, gears etc. with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing/lubricating them with recommended lubricants and for assembling back the dismantled parts.
17.7	The contractor shall thoroughly clean all the components before installation. The components whose surface are coated with protective coating and sent to site are to be thoroughly cleaned by sand blasting or with steam mixed with caustic soda as per the instruction of the BHEL engineer before erecting the same. The sand blasting equipment and the steam washing equipment required for the purpose along with consumables such as sand etc. and compressed air shall be the responsibility of the contractor at his own cost.
17.8	The contractor shall provide all labour for execution of work including installation and dismantling of temporary piping, strainers, valves and instruments required for conducting cleaning works. He shall also supply and erect the chemical cleaning pumps and strainers and arrange to commission the same, giving necessary electric connection from the isolation switch. Upon completion of the work, material given by BHEL for above temporary installation are to be returned to BHEL stores, failing which suitable recovery shall be made from contractors bills/ dues.
17.9	Chemicals required for chemical cleaning shall be supplied by BHEL free of cost.
18.0	**CHEMICAL CLEANING OF PIPING SYSTEM**
	This erection is intended to cover the procedure and scope of work for installation of all temporary equipment and material for chemical cleaning of the piping system

	as specified hereinafter.
18.1	The chemical cleaning specified herein is intended to remove grease, oil, oxides, silica, mill scale and other contaminate from the piping and equipment. After cleaning, the piping shall be free of visible mill scale and properly passivated without affecting the system material of fabrication.
18.2	The scope of chemical cleaning will cover installation of all temporary & by-pass piping, drain piping, supports, valves, blank plates, tanks, pumps, instruments & controls, chemicals and all other accessories and fittings and services to complete the cleaning process. The above mentioned materials including insulation will be supplied by BHEL free of cost. The chemical cleaning shall be performed by the contractor for the piping systems covered under the scope of this package and shall include off site disposal of wastes duly neutralized, site cleaner, normalisation, reinstallation of the cleaned piping system. All temporary piping, valves, fittings and equipment's used for chemical cleaning shall be dismantled and returned to BHEL.
18.3	Erection of tanks (including fabrication if required & temporary insulation) and its supporting structures (for which steel plates, insulation material sections will be provided by BHEL free of cost) shall be done by the contractor. Contractor shall fabricate bends at site from running meters of temporary piping for the above and lay the piping as per BHEL engineer's instruction.
18.4	Hydraulic test of the temporary piping is to be carried out as per BHEL engineer's instruction.
18.5	It is intended to clean deaerator, power cycle piping (except extraction & steam piping) and heater drains by this chemical cleaning process. Chemical cleaning of all the equipment and piping shall be done as per scheme/drawings/procedures furnished later.
18.6	During initial stages of work, trenches for draining water may not be available after alkali flushing or mass flushing for discharging or emptying the piping. Necessary low point drains and temporary piping for this will have to be provided by contractor from material provided by BHEL and on completion of work these materials are to be returned to BHEL stores.
18.7	Laying effluent discharge/drain line from mixing tank as per instructions of BHEL engineer and dismantling the same and returning after the work is over, are under the scope of this tender.

ANNEXIRE - A

TENTATIVE LIST AND WEIGHT SCHEDULE OF MAJOR EQUIPMENT

For Each Unit-Hardwar Supply

Turbine

S N	PkgNo	Description	Gross Weight (In KG)
1	501	SOLE PLATE PEDESTAL ANCHOR	2510
2	503	BASE PLATE ASSEMBLY	4500
3	504	BASE PLATE ASSEMBLY	2560
4	505	BASE PLATE L.P.CASING	2480
5	507	LP OUTER CASING PARTS	8085
6	508	LP OUTER CASING PARTS	8085
7	509	LPC OUTER CASING PARTS	2500
8	510	LPC OUTER CASING PARTS	2500
9	511/1	COMPONENTS OF LP CASING UPPER PART	495
10	511/2	L.P OUTER CASING PARTS	900
11	512	ASSEMBLY DEVICES	180
12	513	INSPECTION SHAFT FOR IPC	775
13	514	VALVE SUPPORT FOR HP OVERHAUL	800
14	515	COMPONENTS OF ASSY.FIXTURE FOR HPT	6864
15	516	COMPONENTS OF ASSEMBLY FIXTURE OF HPT	1800
16	517	COMPONENTS OF ASSY.FIXTURE FOR HPT	3352
17	518	COMPONENTS OF ASSEMBLY FIXTURE FOR H.P.TURBINE	3356
18	519	HP-IP BREARING PEDESTAL ASSLY.	13275
19	520/1	HP/IP BRG.PED.PARTS	438
20	520/2	HP/IP BRG.PED.PARTS	37
21	521	AUXILIARIES OF LP TURBINE	2100
22	522	AUXILIARIES OF LP TURBINE	1142

23	523	AUXILIARIES OF LP TURBINE	1142
24	524	LP JOINT COVERING	1041
25	525	ASSEMBLY TOOLS	520
26	526	CAP(SPRING SUPPORT)	400
27	527	CAP(SPRING SUPPORT)	400
28	528	CAP (COMPEN.ASSY)	3400
29	529	CAP (COMPEN.ASSY)	3512
30	530	CAP(OBLIQUE REDUCER ASSLY)	800
31	531	CAP (MITRE BEND ASSY)	670
32	532	CAP (COMPEN.ASSY)	3512
33	534	CAP (MAN-HOLE ASSLY)	750
34	535	CAP (MAN-HOLE ASSLY)	750
35	536	CAP(MITRE BEND ASSY)	670
36	537	CAP (MITRE BEND ASSY)	670
37	538	CAP (PIPE ASSLY)	645
38	539	CAP (MITRE BEND ASSY)	670
39	541	LONGITUDINAL GIRDER (LEFT)	15182
40	542	LONGITUDINAL GIRDER (RIGHT)	15182
41	543	LP FRONT WALL (TS)	10053
42	544	LP FRONT WALL (GS)	10053
43	545/1	LP SHAFT SEALING FRONT	2260
44	545/2	LP SHAFT SEAL COMPENSATOR ASSLY.(TS)	1456
45	546/1	LP SHAFT SEALING (REAR)	2260
46	546/2	LP SHAFT SEAL COMPENSATOR ASSLY.(GS)	1456
47	550/1	LP CASING ASSEMBLY (FASTENERS)	2653
48	550/2	LP CASING ASSEMBLY (PARTS)	4900
49	550/3	LP CASING ASSEMBLY (PARTS)	140
50	551	EXTRACTION PIPE LINE (LPC)	607
51	552	EXTRACTION PIPE LINE (LPC)	326
52	553	EXTRACTION PIPE LINE (LPC)	326

53	554	EXTRACTION PIPE LINE (LPC)	607
54	555	EXTRACTION PIPE LINE (LPC)	470
55	556	EXTRACTION PIPE LINE (LPC)	575
56	557	EXTRACTION PIPE LINE (LPC)	307
57	558	EXTRACTION PIPE LINE (LPC)	689
58	560	EXTRACTION PIPE LINE (LPC)	530
59	561	EXTRACTION PIPE LINE(LPC)	366
60	562	L.P. EXTRACTION PIPE SHEATHING	1290
61	563/1	INNER GUIDE PLATE OF DIFFUSER (TS)	2118
62	563/2	INNER GUIDE PLATE OF DIFFUSER (GS)	2118
63	564	DIFFUSER (TS)	3640
64	565	DIFFUSER (GS)	3640
65	566	AUXILIARIES OF I.P. TURBINE	390
66	567	AUXILIARIES OF I.P. TURBINE	204
67	568	AUXILIARIES OF I.P. TURBINE	204
68	569	LP-GEN. PEDESTAL ASSEMBLY	10200
69	570	IP-LP PEDESTAL ASSEMBLY	14600
70	574	LP INNER OUTER CASING (U/H)	21750
71	575/1	LP INNER OUTER CASING (L/H) & LP INNER INNER CASING (L/H)	30907
72	575/2	LP INNER CASING ASSY.FASTENERS	1760
73	576	LP INNER-INNER CASING (U/H) PARTIAL	11722
74	577	STEAM INLET PIPE (LPT)	840
75	578	L.P. ROTOR	62049
76	579	BEARING PEDESTAL ARRANGT.PARTS	1085
77	581	STUD HEATING DEVICE AND BREECH NUT HEATING DEVICE.	315
78	582	GROMMET SLINGS	280
79	583	IP TURBINE	58175
80	584	HP TURBINE	56100
81	585	HP INLET ASSEMBLY	45

82	586	H.P.EXHAUST ASSEMBLY	1378
83	587	HPT RELATED PARTS & EXPN MEASUREMENTS	190
84	588/1	HP FRONT BEARING PEDESTAL	12280
85	588/2	HP FRONT BRG. PEDESTAL PARTS	600
86	588/3	PARTS OF FRONT BRG. PEDESTAL	209
87	589	I.P TURBINE PARTS	285
88	591	RATING, COLLABORATION AND MONOGRAM PLATES	50
89	592	IP INLET PIPE ASSY	7088
90	593	OIL FLUSHING AND PRESSURE TEST DEVICE	130
91	600	STEAM BLOWING & HYD. TEST DEV.	2730
92	602	TOOLS AND PACKING DEVICES	684
93	603/1	SUSPENSION OF VALVES (IV)	2700
94	603/2	SUSPENSION OF VALVES (IV)	2700
95	605	FIRE PROTECTION VALVE ETC	480
96	606	ASSEMBLY DEVICE FOR VALVES	213
97	607	CHANGE OVER VALVE	49
98	608	ATT SOLENOID VALVE	90
99	609/1	ESV & CV CASING WITH VALVES	10490
100	609/2	ESV & CV CASING WITH VALVES	10490
101	610/1	IV & CV CASING WITH VALVES.	18696
102	610/2	IV & CV CASING WITH VALVES.	18696
103	611/1	ESV SERVOMOTOR WITH L/S MTG.	1662
104	611/2	ESV SERVOMOTOR WITH L/S MTG.	1662
105	612/1	IV SERVOMOTOR WITH L/S MTG.	1900
106	612/2	IV SERVOMOTOR WITH L/S MTG.	1900
107	614/1	HP CONTROL VALVE SERVO MOTOR	1900
108	614/2	HP CONTROL VALVE SERVO MOTOR	1900
109	615/1	IP CONTROL VALVE SERVO MOTOR	1880
110	615/2	IP CONTROL VALVE SERVO MOTOR	1880
111	616/0	CRH NRV WITH SERVO MOTOR	5860

112	616/1	STEAM BLOWING DEVICE CRH NRV	973
113	617/0	GOVERNING CONTROL RACK ASSY	4510
114	624/1	FRAME FOR SUSPENSION (IV)	765
115	624/2	FRAME FOR SUSPENSION (IV)	765
116	624/3	LOOSE ITEMS OF FRAME FOR SUSP.	300
117	625	EMERGENCY GOVERNOR	300
118	700	INJECTOR FOR SUC.PIPE NB 350	1029
119	702	MAIN OIL TANK & NOZZLE ARRANGEMENT ASSY.	9981
120	703	MAIN OIL TANK & NOZZLE ARRANGEMENT ASSY	402
121	704	OIL STRIPPER	133
122	705	OIL STRAINERS	468
123	708	VARIABLE ORIFICES THROTTLE VAL VES & FLUSHING PARTS	115
124	709	HOUSING FOR MS STRAINER	3000
125	710	HOUSING FOR M.S STRAINER	3000
126	711	STEAM STRAINER ASSEMBLY DEVICE MS & HRH	652
127	714	HOUSING FOR HRH STEAM STRAINER	3500
128	715	HOUSING FOR HRH STEAM STRAINER	3500
129	716	STEAM STRAINER (MS)	374
130	717	STEAM SRAINER (HRH)	485
131	718/1	BLANKING ARRANGEMENT FOR MS STRAINER HOUSING	490
132	718/2	BLANKING ARRANGEMENT FOR HRH STEAM STRAINER HOUSING	1090
133	718/3	BLANKING ARRANGEMENT FOR MS STARINER HOUSING	490
134	718/4	BLANKING ARRANGEMENT FOR HRH STAEM STARINER HOUSING	1090
135	719	STEAM STRAINER HOUSING GASKETS	50
136	720	COMPENSATOR	50
137	725	LEAKAGE OIL TANK	515
138	728	WASTE OIL TANK	515
139	729	INJECTOR FOR SUC. PIPE NB 400	922

140	730	OIL STRAINERS	568
141	731	STEAM STRAINER (MS)	374
142	732	STEAM STRAINER (HRH)	485
143		DELETED	
144		DELETED	
145		DELETED	
146		DELETED	
147		DELETED	
148		DELETED	
144		**Sub total (Turbine)**	**593779**

For Each Unit -Generator

S N	PkgNo	Description	Gross Weight (In KG)
1	201	FOUNDATION ITEMS OF GENERATOR	4656
2	202	FOUNDATION ITEMS OF GENERATOR	3374
3	203	CONSUMABLES FOR FOUNDATION	15
4	204	GENERATOR STATOR	220000
5	205	GENERATOR ROTOR	47742
6	206	END SHIELD (TE) LOWER HALF	6020
7	207	END SHIELD (EE) LOWER HALF	6020
8	209	H.V.BUSHING	590
9	209/1	LOOSE ITEMS OF WOUND STATOR	1010
10	213	GENERATOR ACCESSORIES	1546
11	214	GENERATOR ACCESSORIES (TERMINAL BUSHING BOX)	4075
12	215	GAS BAFFLE RING,INSERT COVER ETC.	4364
13	216	BEARING SHELLS	953
14	217	END SHIELD (EE) UPPER HALF	5620
15	218	END SHIELD (TE) UPPER HALF	5620
16	219	SEAL RINGS	73

17	220	DEVICE FOR ROTOR INSERTION INTO STATOR	1036
18	221	ERECTION DEVICES	997
19	222	WIRE ROPES	201
20	223	DRY AIR BLOWER	190
21	224	TERMINAL CONNECTORS	506
22	226	CONSUMABLES	30
23	230	BRUSHLESS EXCITER SET	22386
24	231	EXCITER FRONT COVER	4122
25	231/1	RR WHL.COVER & SEALING WALL DE FOR EXCITER	970
26	232	EXCITER REAR COVER	3909
27	233	EXCITER BED PLATE ACCESSORIES	3212
28	234	EXCITER ACCESSORIES	350
29	236	COOLER RACK ASSEMBLY FOR EXCITER	1551
30	250	SEAL OIL UNIT	9160
31	251	SEAL OIL STORAGE TANK	1460
32	252	GAS UNIT	1150
33	253	HYDROGEN DISTRIBUTOR	333
34	254	CO2 DISTRIBUTOR	247
35	255	SEAL OIL UNIT-2	3235
36	256	LIQUID DETECTOR RACK	450
37	258	LOOSE VALVES	959
38		DELETED	
39	260	CO2 VAPOURISER	225
40	291/1	GENERATOR PIPING	6374 (wt may change)
41	291/2	GENERATOR PIPING	1926 (wt may change)
42	291/3	GENERATOR PIPING	1615(wt may change)
		Sub Total (Generator)	**603694**

For Each Unit-Condenser

S N	PkgNo	Description	Gross Weight (In KG)
1	78001	HOTWELL	6913
2	78004	BOTTOM PLATE	6793
3	78005	BOTTOM PLATE	6793
4	78006	BOTTOM PLATE	8296
5	78010	BOTTOM PLATE	271
6	78012	CONDENSER SUPPORT	3650
7	78013	CONDENSER SUPPORT	3650
8	78014	CONDENSER SUPPORT	3650
9	78015	CONDENSER SUPPORT	3650
10	78018	CONDENSER SUPPORT	4775
11	78020	WATER CHAMBER (LHS)	6150
12	78022	FRONT WATER BOX (GEN SIDE)	15867
13	78023	WATER CHAMBER (RHS)	6150
14	78025	FRONT WATER BOX (TUR SIDE)	15867
15	78026	WATER CHAMBER (RHS)	6150
16	78028	REAR WATER BOX (GEN SIDE)	9576
17	78029	WATER CHAMBER (LHS)	6150
18	78031	REAR WATER BOX (TUR SIDE)	9576
19	78032	SIDE WALL(TUR.END)	1105
20	78033	SIDE WALL(TUR.END)	1645
21	78034	SIDE WALL(TUR.END)	1645
22	78035	SIDE WALL(TUR.END)	1645
23	78036	SIDE WALL(TUR.END)	1080
24	78038	LOOSE ITEMS(SIDE WALL-TUR.END)	782
25	78039	SIDE WALL(TUR.END)	550
26	78040	SIDE WALL(GEN.END)	1105

27	78041	SIDE WALL(GEN.END)	1645
28	78042	SIDE WALL(GEN.END)	1645
29	78043	SIDE WALL(GEN.END)	1645
30	78044	SIDE WALL(GEN.END)	1080
31	78046	LOOSE ITEMS(SIDE WALL-GEN.END)	782
32	78047	SIDE WALL (GEN. END)	550
33	78048	RODS (SHELL INTERNALS)	4780
34	78049	RODS (SHELL INTERNALS)	4780
35	78050	RODS (SHELL INTERNALS)	4765
36	78051	RODS (SHELL INTERNALS)	4765
37	78055	RODS (SHELL INTERNALS)	600
38	78056	RODS (SHELL INTERNALS)	4600
39	78058	AIR EXTRACTION PIPING	1200
40	78059	SUPPORT TUBE PLATES(SHELL INT ERNALS)	5400
41	78060	SUPPORT TUBE PLATES(SHELL INT ERNALS)	5400
42	78061	SUPPORT TUBE PLATES(SHELL INT ERNALS)	5400
43	78062	SUPPORT TUBE PLATES(SHELL INT ERNALS)	5400
44	78063	SUPPORT TUBE PLATE(SHELL INT ERNALS)	5400
45	78064	SUPPORT TUBE PLATES(SHELL INT ERNALS)	5400
46	78065	SUPPORT TUBE PLATES(SHELL INT ERNALS)	5400
47	78069	LOOSE ITEMS (SHELL INTERNALS)	7052
48	78070	LOOSE ITEMS (SHELL INTERNALS)	350
49	78071	LOOSE ITEMS (SHELL INTERNALS)	4928
50	78075	LOWER DOME WALL (TUR.SIDE) LOW ER PART	8822
51	78076	LOWER DOME WALL (TUR.SIDE) UPP ER PART	744
52	78078	LOOSE ITEMS (LOWER DOME WALL -TUR. SIDE)	270
53	78103	LOWER DOME WALL (GEN.SIDE) LOWER PART	8821
54	78104	LOWER DOME WALL (GEN.END) UPPER PART	764
55	78106	LOOSE ITEMS (LOWER DOME WALL -GEN. SIDE)	270
56	78109	LOWER DOME WALL (FWB SIDE) LOWER PART	6150

57	78110	LOWER DOME WALL (FWB SIDE) UPPER PART	1444
58	78112	LOOSE ITEMS (LOWER DOME WALL	795
59	78115	LOWER DOME WALL (RWB SIDE)	6727
60	78116	DOME WALL (R.W/B SIDE)	1427
61	78118	LOOSE ITEMS (LOWER DOME WALL RWB SIDE)	305
62	78121	PIPES(DOME INTERNAL STIFFENING	726
63	78122	PIPES(DOME INTERNAL STIFFENING	726
64	78123	PIPES(DOME INTERNAL STIFFENING	726
65	78124	PIPES(DOME INTERNAL STIFFENING	730
66	78125	PIPES(DOME INTERNAL STIFFENING	382
67	78126	PIPES(DOME INTERNAL STIFFENING	382
68	78127	PIPES(DOME INTERNAL STIFFENING	4993
69	78128	DOME INTERNAL STIFFENING	4114
70	78129	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	2566
71	78130	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	2448
72	78132	UPPER DOME WALL(TUR. SIDE)	1083
73	78133	UPPER DOME WALL(GEN. SIDE)	1083
74	78136	UPPER DOME WALL(FWB SIDE)	3635
75	78137	LOOSE ITEMS (UPPER DOME WALL -FWB SIDE	475
76	78138	LOOSE ITEMS (UPPER DOME WALL -FWB SIDE	410
77	78139	UPPER DOME WALL(RWB SIDE)	3702
78	78142	W/B REMOVAL DEVICE	2600
79	78143	W/B REMOVAL DEVICE (CONDENSER)	2135
80	78150	FRAME (W/BOX HINGE ARRGT)	650
81	78151	FRAME (W/BOX HINGE ARRGT)	650
82	78154	STEAM THROW DEVICE	1040
83	78155	STEAM THROW DEVICE	1040
84	78157	LOOSE ITEMS (CONDENSER)	30
85	78158	LOOSE ITEMS (CONDENSER)	377
86	78159	LOOSE ITEMS (CONDENSER)	275

87	78160	LOOSE ITEMS (CONDENSER)	1450
88	78161	LOOSE ITEMS (CONDENSER)	6
89	78162	LOOSE ITEMS (CONDENSER)	200
90	78166	STAND PIPE NO.1 (CONDENSER)	63
91	78167	LOOSE ITEMS (STAND PIPE)	69
92	78169	STAND PIPE NO.2 (CONDENSER)	66
93		DELETED	
94		DELETED	
95		DELETED	
96	78301	GLAND STEAM CONDENSER	816
97	78302	STAND PIPE/LOOSE ITEM (GSC)	200
98	78303	LOOSE ITEMS OF GSC (NON FRAGILE)	80
99	78304	LOOSE ITEMS OF GSC (FRAGILE)	100
100	78305	LOOSE ITEMS GSC(NON FRAGILE)	260
101	78310	DRAIN COOLER	3500
102	78311	LOOSE ITEMS (DRAIN COOLER)	100
103	78312	LOOSE ITEMS (DRAIN COOLER)	24
104	78313	LOOSE ITEMS (DRAIN COOLER)	6
105	78315	LP HEATER NO.1	11050
106	78316	LP HEATER NO.1&STAND PIPES	120
107	78317	LP HEATER NO.1 STAND PIPE	50
108	78318	LPH1 PANAL MOUNTED INSTRUMENT	259
109	78319	LOOSE ITEMS LP HEATER NO. 1	94
110	78320	TROLLEY FOR LP HEATER NO.11	315
111	78321	LP HEATER NO.2	11215
112	78322	LP HEATER NO.2&STAND PIPES(LOO SE ITEMS)	250
113	78324	LP HEATER NO.2, INSTRUMENTS	56
114	78325	LP HEATER NO.2, STAND PIPES	158
115	78326	LOOSE ITEMS, LP HEATER NO.2	110

116	78328	LP HEATER NO.3	11200
117	78329	LP HEATER NO.3&STAND PIPES(LOO SE ITEMS)	266
118	78331	LP HEATER NO. 3, INSTRUMENTS	133
119	78332	LP HEATER NO. 3, STAND PIPES	158
120	78333	LP HEATER NO. 3,INSTRUMENTS	200
121	78401	TUBRINE OIL COOLER	8200
122	78402	TUBRINE OIL COOLER	8200
123	78406	LOOSE ITEMS (TOC)	80
124	78407	LOOSE ITEMS (TOC)	60
125	78431	EXCITER AIR COOLER	892
126	78432	EXCITER AIR COOLER	892
		Sub Total (Condenser)	**350866**

For Each Unit- Hardwar BOI Items

ITEM ID	QTY SET	ITEM DESC
BG001	120 NO	EMPTY H2 CYLINDER
BG002	63 NO	EMPTY CO2 CYLINDER
BG004	1	PORTABLE GAS ANALYSER
BG005	1 ST	MOISTURE MEASURING SYSTEM
BG007	2 NO	VAPOUR EXHAUSTER
BG008	1 ST	MOTORISED TEMPERATURE CONTROL VALVE FOR COLD GAS
BG009	0 NO	H2 GAS ANALYSER CABINET
BG011	2 NO	REFRIGERATION GAS DRYER
BG018	1 NO	STARTING RESISTOR FOR DC S.O MOTOR
BG020	1 ST	SOUND ABSORBING COVER
BG023	1 ST	CONTIONUOUS INLINE PARTIAL DISCHARGE MONITORING SYSTEM

BG080	1 NO	STROBOSCOPE
BH001	1 ST	WELDED AUSTENITIC S.S. TUBES GR.304 (FOR CONDENSOR)
BH010	2 NO	CONDENSOR AIR EVACUATION PACKAGE (VACUUM PUMP)
BH012	2 NO	AIR EXHAUSTER WITH MOTOR (GSC AIR EXHAUSTER)
BT001	1NO	LIFTING BEAM
BT002	1ST	JACKING OIL PUMPS
BT003	1ST	AOP & EOP
BT004	1NO	DUPLEX FILTER (LUB.OIL)
BT005	1NO	DUPLEX FILTER (JACKING OIL)
BT006	1 ST	BUTTERFLY VALVES
BT007	1 NO	THREE WAY TEMP. CONTROL VALVE
BT008	1NO	DOUBLE THREE WAY VALVES
BT009	1 ST	NRV WITH ALUMINIUM FLAP
BT010	1 NO	PRESSURE LIMIT VALVE
BT011	1 NO	OIL PURIFICATION UNIT (OIL CENTRIFUGE)
BT012	2 NO	OIL VAPOUR EXHAUSTER
BT013	4NO	LEAD DIAPHRAGM
BT014	1ST	SPRAY NOZZLES
BT015	1 NO	DIRT CATCHERS
BT016	1ST	DAMPER
BT017	1ST	VARIABLE LOAD SPRING CAGES
BT018	1ST	FLEXIBLE BENDS
BT019	1 NO	VACCUM BREAKER VALVE ASSY. ALONG WITH SOLENOID VALVE
BT020	1 NO	THERMAL INSULATION OF TURBINE ***
BT021	1 NO	THERMAL INSULATION OF TIP ***
BT022	1 NO	TURBINE CLADING ***
BT023	1 ST	TURBINE OIL
BT024	1 NO	DRY AIR PRESERVATION SYSTEM
BT025	1NO	OIL PURIFICATION SYSTEM (CENTRAL)
BT026	1ST	GROUP CABLES

BT027	1ST	TURBINE INTEGRAL PIPING
BT028	1ST	H & S FOR TURBINE INTEGRAL PIPING
BT029	1ST	CALIBRATED FLOW NOZZLE ASSLY.
BT046	1ST	LP BYPASS STOP & CONTROL VALVE WITH EHA AND WATER INJECTION VALVE
BT065	1NO	GEAR PUMP (LUB. OIL RECIRCULATION)
BT068	1 ST	POWER CABLE FOR 24 V SOLENOID
BT075	1ST	SEAL STEAM SUPPLY & LEAKAGE STEAM CONTROL VALVE WITH PNEUMATIC ACTUATOR
BT087	1 ST	TEMP. TRANSMITTERS & ACCESSORIES

***Note: Insulation of BT020, BT021 & BTO22 will be done by BHEL HARIDWAR agency.

Approximate weight of T-G integral piping is 60 MT for single unit.

Approximate weight of Balance Insulation shall be 25 MT for each Unit.

Hyderabad Supply

	BFP & BOOSTER PUMP (BP) for 1 Unit of 250 MW			
S.N	DESCRIPTION	Unit wt. (kg)	Total qty. (Nos.)	WT. (Kg)
1	BFP skid (Pump assly. + Base plate+Tubing+seal coolers)	5770	3	17310
2	BP skid (Pump assly. + Base plate+Tubing)	2500	3	7500
3	Grillage	5050	3	15150
4	Hydraulic Coupling assly. and accessories	3560	3	10680
5	Hydraulic Coupling working oil cooler.	1475	3	4425
6	Hydraulic Coupling lube oil cooler.	775	3	2325
7	Hydraulic Coupling loose items	710	3	2130
8	Suction Strainer at BP Suction (DD)	900	3	2700
9	Suction Strainer at BFP Suction (DD)	900	3	2700
10	BFP Recirculation Valve	400	3	1200
11	DELETED			
12	DELETED			
13	Loose items	2000	3	6000
14	4600 KW BFP Motors	1500	4	6000

	Total (BFP) (Inclusive of Tools & Tackles 300 kg)			**78420**
CEP for 1 Unit of 250 MW				
S.N	DESCRIPTION	Unit wt. (kg)	Total qty. (Nos.)	WT. (Kg)
1	Condensate Extraction Pump Assembly	6150	2	12300
2	Canister	2700	2	5400
3	CEP Foundation Ring	600	2	1200
4	CEP suction Strainer	1000	2	2000
5	DELETED			
6	Loose items	210	2	420
7	DELETED			
8	650 KW CEP Motors	600	3	1800
	Total (CEP)			**23120**

BHOPAL SUPPLY

Sl.No.	Scope	Qty	Dimension MM	Unit Wt (MT)
1	**RE Joints PER UNIT**			
1.1	Pr Bal - Inlet Assy	2 / Unit	5675 x 4700 x 2800	17
1.2	Pr Bal - Outlet Assy.	2 / Unit	3785 x2950 x 2800	16
2	**H P Heaters PER UNIT**			
2.1	HP Heater No. 5	1 / Unit	2300 x 1500 x 10100	31
2.2	HP Heater No. 6	1 / Unit	2300 x 1500 x 11550	40
3	**Flash Tank PER UNIT**			
3.1	HP Drain	1 / Unit	2650 x 3000 x 3950	5
3.2	L.P. Drain	1 / Unit	1950 x 2200 x 2550	3
3.3	Unit	1 / Unit	1250 x 1350 x 2300	1
4	**Misc Tanks PER UNIT**			
4.1	Clean 60 M^3	1	6300 x 3300 x 4200	11
4.2	Dirty 60 M^3	1	6300 x 3300 x 4200	11
4.3	Oil Unloading 1 M^3	1	2250 x 1200 x 900	0.6
4.4	DMCW 10 M^3	1 / Unit	2500 x 2500 x 2000	4
5	**BF Valves FOR 2 Units**			
5.1	1800 Dia	8	2000 x 2500 x 900	2.65
5.2	700 Dia	12	930 x 1160 x 405	0.65
5.3	600 Dia	6	815 x 1000 x 300	0.55
5.4	500 Dia	14	700 x 865 x 300	0.375

FOR EACH UNIT-PEM BOI

14	BOUGHT OUT ITEM (PEM)				
SL.NO.	**ITEM DESCRIPTION**	**Qty**	**APPROX.Dimensions(LXBXH)**	**TOTAL WT. KG.**	**Remark**
1	CONTROL VALVES				21 nos. per unit (WT not available)
2	FLOW ELEMENTS				11 nos. per unit (WT not available)
3	**CHAIN PULLEY BLOCK / HOIST:**				
a)	ELECTRIC HOIST			20000	Total 10 Hoist each 2000Kg/Hoist
b)	CHAIN PULLEY BLOCK				
4	CHEMICAL DOZING SYSTEM				
a)	Hydrazine Dosing system	2	6m X 2m X 3.5m	4500	for one (1) number skid only
b)	Ammonia Dosing system	2	6.3m x 2m x 3.5m	5500	for one (1) number skid only
c)	NaoH Dosing system	2	2.0m x 1.5m x 1.5m	1500	for one (1) number skid only
d)	Phosphate Dosing system	2	6.5m x 2m x 3.5m	5500	for one (1) number skid only
e)	Bulk Ammonia Dosing system	1	5m x 3m x 2m	3000	for one (1) number skid only
5	LUBE OIL TRANSFER PUMPS			750	
6	AIR TRAPS				Qty very small
9	ME BELLOWS			4500	
10	STEAM TRAPS				Qty very small
11	**VALVES:**				
a)	AIR RELEASE VALVE			637	
b)	BALL VALVES				Qty very small
c)	GM Valve			432.35	
d)	Power Cycle Valves			2315	
e)	CS/Gate/Globe/NRV			36.2	
f)	Cast Iron Valve			4662.5	
g)	BUTTER FLY VALVES(WATER SERVICE)			6977	
12	AUX PRDS			1500	
13	COLTCS	4	3m x2.5 m 2.5m	14000	

15	DESUPERHEATER FOR WET STEAM WASHING			45	
	Plate Heat Exchangers	5	3 m x 2.5m 1.5m	27500	
	Sump pumps	3	1 m x1m	1500	
16	MISC. PUMPS	11	2.5m x 1.5m	17500	
18	SELF CLEANING STRAINER	2	3m x 0.6m	10000	
	TOTAL			**132.355 MT**	

NOTE:

1. 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. and no claim, whatsoever, will be entertained on account of this by BHEL.
2. 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 the package may be assembled together and send as a single assembly. Contractor may have to dismantle and erect or erect as single assembly as per the instruction of BHEL engineers without any extra cost.

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	Erection, testing, commissioning, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, piping, miscellaneous equipments etc for 4x250 MW, unit # 3 at BRBCL/Nabinagar Project, Aurangabad, Bihar.	
Ref	1.0	Tender no PSER:SCT:NBN-T1730:16
	2.0	BHEL's NIT, vide reference no PSER:SCT:NBN-T1730:4932 Date: 18-03-2016.
	3.0	BHEL's TCN-01, vide reference PSER:SCT:NBN-T1730:TCN-01, dated 29-03-2016.
	4.0	BHEL's TCN-02, vide reference PSER:SCT:NBN-T1730:TCN-02, dated 30-03-2016.
	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 offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

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