

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED



TECHNICAL CONDITIONS OF CONTRACT (TCC) CONTENTS

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Chapter - I: PROJECT INFORMATION

1.0	Project Information
	1) Purchaser : M/s. NTPC Mouda 1) Project Title : LP TURBINE OVERHAULING AND GENERATOR BEARINGS 5 6 7 INSPECTION AND ASSOCIATED WORKS AT NTPC MOUDA ST II 2X660MW 2) Railway Station : Nagpur 3) Nearest airport : Nagpur

The Agency shall visit site and get acquainted himself with the conditions prevailing at site before submission of the bid. The information given here in under are for general guidance and shall not be contractually binding on BHEL/ Owner. All relevant site data/information as may be necessary shall have to be obtained /collected by the Agency.

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Chapter – II: SCOPE OF WORK

Area of execution of work:

The work shall be carried out in Stage II Unit of NTPC Mouda 2 x 660 MW. The Make of units is M/s BHEL/ Siemens.

Intent of the Overhaul: Incident free 100% Safe Overhaul with the highest quality of workmanship and within scheduled duration.

The work under the scope of these specifications is broadly as follows.

PRE SHUTDOWN WORK

1. Mobilization of site.
2. Arranging Gate pass, insurance & Accommodations to the contract personnel.
3. Shifting of material store and T&Ps.
4. Shifting of special T&Ps to turbine floor.
5. Removal of Enclosures Cover if required and erect back after OH if available.
6. Shifting of special T&Ps to turbine floor.
7. Removal of Enclosures Cover if required and erect back after OH if available.

SCOPE OF WORK:

➤ GENERAL JOBS. (It is applicable and includes all turbine & Generator – Schedule- 01 to 18).

- 1) Agency has to provide manpower assistance to BHEL if required for pre outage survey of Turbine i.e. recording of turbine vibration and analysis, study of relevant operating parameters to be done. Proper analysis of vibration data by BHEL Vibration expert has to be carried out. The recorded Pre outage survey defects are to be compared with the post overhauling data.
- 2) Arrangement of turbine cooling after Unit taken out of bar. Removal of necessary dummy flanges from HPCV & IP inlet pipe for forced cooling of Turbine and extending of necessary help required for forced cooling of turbine
- 3) Removal of insulation, if required and carry out touch up insulation is in the scope of contractor. Insulation material shall be provided by NTPC.
- 4) Cleaning of removed scraps of insulation materials immediately after removal of insulation and any other scraps generated during the execution of the work is in the scope of agency. Scrap insulation or any other scraps generated is to be shifted to NTPC specified Scrap Yard by the contractor.
- 5) Agency must make an overhauling progress activity chart of total overhauling work with day-to-day work progress before start of unit shutdown, and it is to be submitted to EIC well in advance.

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- 6) Rotor system catenary checking at all bearings pedestals. Catenary checking of all bearing pedestals would be done during dismantling and assembly. Comparison of existing height of individual deck spring elements with erection value. Adjustment of deck spring height to achieve design /erection catenary values etc. Party must make necessary scaffolding if required in each column around deck springs to carry out above jobs.
- 7) Arrangement for deployment of expert from M/s GERB for measurement and setting of foundation spring during turbine dismantling & assembly is mandatory. Locking/unlocking of deck is to be done as per requirement.
- 8) Removal of all turbines bearing pedestal covers, assistance in removal of C&I connections and removal of bearing top halves of all turbine bearings 1 to 4.
- 9) Recording oil seal bore and reference readings (Axial as well as radial) during dismantling and assembly. TG Coupled run out and float of TG rotor system to be checked and recorded during dismantling and assembly. Swing check at journal no. 1 during dismantling & assembly.
- 10) Decoupling/ Coupling of HP-IP, IP-LP rotors to be carried out using hydraulic torque wrench. The deployment of hydraulic torque wrench shall be in the scope of the party. The party must bring 2 Nos of hydraulic torque wrenches along with experienced operators to avoid downtime due to breakdown.
- 11) Measure and record the HP-IP & IP-LP alignment during dismantling and carry out rough alignment by carrying out correction in bearing and pedestals.
- 12) Recording of seal bore reading at ped# 1 to 4 and axial reference readings during dismantling and assembly. HP/IP and LP FRO/ CRO, roll check and Bump check to be checked and recorded during dismantling.
- 13) Swing check at journal no. 1 during dismantling to be carried out.
- 14) TG deck springs locking as per requirement before lifting any heavy component from TG deck. Agency should also make necessary temporary platform & scaffolding in each column around deck springs for locking /unlocking of TG deck springs.
- 15) Lifting of LP outer casing (LP Exhaust hood) for Roll Check of LP Turbine Inner -outer Casing.
- 16) Decoupling, alignment, and inspection of Hydromantic Turning Gear. Checking of over running clutch and rectification is to be done.
- 17) Visual inspection & DPT of IP-LP Cross over pipes and all LP Extraction bellows / LP Turbine Front & Rear Compensators bellows/ LPT last stage guide blades moisture clits etc and carry out necessary minor repairing work as per requirement. Necessary bellow protection pipes shall be removed by the party for bellow inspection as per scope.
- 18) Carry out necessary visual inspection of Condenser dome wall stiffening structure inside condenser and carry out minor repairs if required.

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- 19) Carry out DPT of all critical welding joints in the condenser dome wall as per EIC instructions. Necessary rectifications by grinding / welding etc, to be done as per requirement of condenser neck joint is to be done and if found any crack, same is to be rectify.
- 20) Inspect all water/steam dumping nozzles (CEP RC line, Heater drip connection, Hot well make up, GSC min recirculation, D/A overflow, Boiler separator dump etc) inside the condenser and their baffle plates for any dislodging. Carry out modification/repair if direct impingement of water/steam on the condenser tubes is observed or if any dislodging is noticed.
- 21) Carry out necessary cleaning of LPT exhaust hood spray nozzles. Carry out DPT of LPT exhaust spray line Weld joints & rectification of same by welding.
- 22) Carry out the DPT of all coupling bolts.
- 23) Carry out the refinishing of oil guards as per the journal size and record the size for measurement.
- 24) Carry out the cleaning of stationary blades in the top and bottom half and carry out DPT.
- 25) Replacement of damaged LP Atmospheric relief diaphragm.
- 26) Turbine manual hand Barring gear inspection, repair/servicing of hand barring and assembly will be carried out.
- 27) Videoscope inspection through boroscope openings for HP, IP, LP casings and cross over pipe, the T&P required for opening/ Assembly of boroscopic openings shall be in the Scope of the party.
- 28) Catenary measurement after deck charging and CW charging to be carried out before alignment in the presence of M/s GERB Representative.
- 29) Carry out the Alignment of HP- IP and IP- LP and LP- Generator as per the standard procedure outlined by OEM/ OES and to be kept within the limits as specified by OEM/OED/ OES.
- 30) Horn drop check of HP & IP casing and necessary adjustment /rectification in packers etc., as per requirement, to be carried out.
- 31) Roll check of HP, IP & LP Turbine is to be carried out in assembled machine and making necessary correction in casing/Packers/Keys within design operating conditions as per guidelines of the OEM manual.
- 32) Carry out Bump check of HP and IP modules
- 33) Inspection of outer casing supports and alignment keys for HP & IP.
- 34) Coupling of HP- IP and IP- LP as per the standard procedure using hydraulic torque wrenches.

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- 35) Hydraulic tools should be supplied by renowned and NTPC approved vendor only. Reaming and honing of Coupling Holes and replacements of coupling bolts as well as machining of bolts is in vendor scope, and it is to be carried out without any extra cost if required. Two no of Reaming & Honing tools for smooth execution of job should be brought by Reputed and approved vendor (NTPC) in adequate quantity.
- 36) Carry out alignment of HP-IP, IP-LP, LP-Generator & Gen-Exciter coupling within the allowable limits by doing necessary corrections in bearing supports/Pedestal/Spring deck system etc.
- 37) Coupled run out (CRO) checks at the journals and couplings to be recorded and rectified, if required.
- 38) HP-IP, IP-LP, LP-Gen Faces trueness and correction are to be done if required.
- 39) Check coupling faces for convexity / concavity / face run out and correction to be done if required for obtaining coupled run outs and swing check values. Agency shall correct faces either by manual scrapping as per requirement by blue matching with surface plate and scrapping etc. to remove run out / convexity on coupling faces.
- 40) Final Coupled run out check of all Rotor system at journal/Bearing and at couplings/Neck Portion and is to be recorded and maintain within the allowable limit. Carry out swing check at HP front end journal after CRO.
- 41) Checking of control dimensions of the bearing assembly. DP test and UT of all turbine and Generator bearings is to be carried out for detection of any surface/sub-surface cracks and De-bonding. Blue matching of torus piece with spherical/Cylindrical support plate is to be carried out. DP & UT kit will be in Agency scope. Repair/Replacement of the bearings of the Defective part/assembly is to be carried out without any extra cost
- 42) **Replacement of any number of TG Bearings including corrections are included in scope and it is to be done without any additional cost.**
- 43) Thorough cleaning of bearing halves (Top/Bottom) and Its pedestal. Box up of bearings, Yokes, Bearing pads, Oil catcher etc for all bearings no 1 to 4. Maintaining necessary bearing clearances within design limit. Fixing/Locking the rotor in Zero position for calibration of C&I instrument (TSI) after bearing box up.
- 44) Remove all oil throttles from lube oil supply line to each bearing pedestal, fix line filters / blocking oil flow in individual lube oil supply line shall be agency responsibility.
- 45) Extend full support and carry out oil flushing with intermediate cleaning of line filters, lube oil duplex filter and mot basket strainers etc as per requirement (MOT basket strainers to be provided with cloth filter of correct size and fit.)
- 46) MOT Cooler cleaning to be done from Water side and/or Oil Side as instructed by EIC
- 47) Reset / refix oil throttles after completion of oil flushing (achieving oil purity values).

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- 48) Consumables like Diesel, petrol for cleaning will be in agency scope during oil flushing process.
- 49) Setting of JOP header pressure and checking of individual rotor lift at respective bearings before TG to be kept in Barring gear.
- 50) Checking and replacement of damaged atmospheric relief diaphragms of LP turbine.
- 51) Carrying out setting & adjustment of hanger in Turbine area of Power cycle piping (From 17 mtr to 0 mtr like MS, HRH, CRH, all extraction etc). Party shall engage piping hanger & support experts for the above job. Hanger cold & hot values are to be recorded. For reading of HOT values EIC will intimate to agency before 7-10 days prior to unit shutdown. Scaffolding must be made by the party for checking at any location as per requirement. Report for hot & cold value readings with correction to be submitted by the agency with report.
 - a. Checking of Freeness of hangers.
 - b. Checking of fouling of hanger with the structure/wall
 - c. Checking for any visual deviation of hanger elevation noticeable or looseness of hangers.
 - d. Adjustment of necessary hangers & supports as per requirement.
 - e. Experts' technician for hanger checking shall be deployed by agency.
 - f. Hanger Piping details will be given by NTPC.
- 52) DP test of all joints of Lube oil, jacking oil and control fluid line is to be carried out by agency from TG 8.5 metre to TG 17 metre and necessary corrections.
- 53) DPT of coupling bolts of HP-IP, IP-LP, LP-Gen is to be carried out.
- 54) The Party must deploy sufficient number of EOT crane operators for the job and party to ensure round the clock availability of the same.
- 55) **Anti-seize compound-KLUBER PASTE HEL 46-450 or TIODIZE 8TE_H is to be used as per BHEL Latest circular, and this is mandatory. However, for parting plane sealant Birkosit will be used, and all are to be supplied by agency.**
- 56) If any vibration of TG rotor train comes which is not permissible Post overhauling, Trim balancing is to be done and same is to be rectify without any extra cost. (Bidder shall provide necessary manpower assistance to BHEL vibration experts)
- 57) Removal of all scaffoldings & temporary supports after completion of job.
- 58) PUTTING MACHINE ON BARRING GEAR: After completion of above works, TG is to be put on barring gear. Agency must ensure continuous deployment of gang round the clocks consisting of MWF, Fitter, Welder, Rigger, Helper etc during rolling, synchronization, and full load operation of machine.
- 59) Post synchronization jobs: Rolling of the machine and synchronization of generator with grid after testing. During rolling and synchronization all parameters to be monitored and to be recorded. After synchronization, monitoring to be continued at least up to 72 hrs after achieving full load defects are to be attended arisen thereof. Other parameters like vibrations, various temperatures w.r.t. Turbine,

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generator and exciter should be within norms and preferably better than pre overhaul value. Bidder shall provide necessary manpower supports.

Note: - Above job is applicable and includes all turbine & Generator work (Schedule -01 to Schedule-18)

SCHEDULE: - 01: - TURBINE BEARING (BEARING NO-01 TO 04) INSPECTION

- 1) Cleaning all the bearing pedestal (Pedestal No-1 to 4) properly before starting of the job.
- 2) Ensure removal of all TSI probes and C&I instrument before opening of bearing pedestal covers.
- 3) Removal of all turbines bearing pedestal covers, Oil guard, Oil catcher and yoke for all turbine bearings.
- 4) Removal of all top and bottom halves of Bearings no-1, 2, 3, 4.
- 5) During dismantling of the bearing, all critical checks like TOC, SOC, yoke clearances, Side pad clearances, journal bedding, Blue contact between Bearing Torus and Support etc. for bearing is to be done in presence of NTPC and after satisfactory confirmation only same is to be assembled.
- 6) Checking of control dimensions of the bearing assembly. DP test and UT of all turbine and Generator bearings (TOP and BOTTOM halves) are to be carried out in presence of NTPC/FQA for detection of Surface/sub-surface cracks and white metal bonding. Blue matching of torus piece with base/support plate (Cylindrical/Spherical) to the extent possible is to be carried out at site as per OEM recommendation.

NOTE: DP and UT KIT will be in Agency scope. Repair /Replacement of the Defective part /assembly if required is to be carried out without any additional cost.

- 7) Correction of seal bore as per requirement before final assembly i.e correction of seal bore will be done after final alignment.
- 8) Replacement of all jacking oil hoses (Brg no: -1 to 4). Check performance of shaft lift oil system.
- 9) Replacement of oil guard fins if proper height is not maintained as per design dimensions. Oil guard ring and oil catcher clearances setting is to be carried out after cleaning for bearing no-1 to 4 pedestals.
- 10) Machining of oil guard as per dimensions provide by agency is in scope of NTPC/BHEL. Agency must arrange for vehicle for to and fro transportation of oil guards from site to workshop (NTPC Mouda) and provide necessary manpower for supervision.
- 11) Thorough cleaning of all bearing halves before assembly of bearing. Box up of bearings, Yokes, bearing pads, Oil catcher etc. for all bearings from 1 to 4 and maintaining necessary bearing clearances as per OEM Recommendation.

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- 12) Any other work which is not listed above but required for removal and assembly of oil guards as well as Bearing will be in the scope of agency.

Note: Replacement of any number of TG Bearings if required is to be done without any additional cost.

➤ EOT CRANE OPERATOR

1. EOT cranes (2 Nos.) shall be made ready by MPPGCL for round the clock working. The Agency shall get it checked prior to the start of the work.
2. Skilled and experienced crane Operators for two cranes shall be arranged by the agency for the round the clock's working.

Note: - Agency has to depute Reputed Testing Agency along with Test kit & accessories to carry out DP & MPI, Ultrasonic test in consultation with BHEL Site-In-Charge

SCHEDULE: - 02: - OVERHAULING /SERVICING OF LP TURBINE.

- 1) Making necessary scaffolding & approach platform for overhauling of LPT whenever required. Scaffolding Material will be in agency scope.
- 2) Removal of IP-LP Turbine Cross over pipe (COP) and LP exhaust hood after loosening the bolts.
- 3) Covering of condenser tubes inside the condenser and prepare the platform for LP casing joints plane on longitudinal girder.
- 4) Carrying out roll check for LP inner casing and Diffuser centring readings during dismantling and assembly.
- 5) Supporting the LP inner outer casing at the bottom by jack bolt, loosening the joint bolts and removal of LP inner outer casing top half.
- 6) Lifting of inner-outer casing & inner-inner casing after loosening the Stud and cap nut.
- 7) Checking the steam flow path reading of LP turbine during dismantling and assembly.
- 8) Removal of front and rear gland boxes of LPT, inspection of sealing strips in both halves as well as Rotor, carrying out necessary repair/replacement of fins etc as per requirement along with necessary adjustment in gland box key. Setting of gland boxes within design limit.
- 9) Checking Seal bore reading and reference readings of LP Rotor.
- 10) Lifting of LP Rotor and placement on Rotor support (Supplied by NTPC).
- 11) Preliminary inspection of LP Rotor by checking surfaces of coupling face, coupling Bolt holes, Rotor Journals, Rotor fins, Surface of rotor blades, inlet and outlet edges of blades, Locking of Blades for all stages etc.
- 12) Cleaning of LP Rotor, LP casing components by dry Alumina Blasting with ventilation system. Supply of White fused Alumina with ventilation system is in agency scope. Through cleaning of bottom half casing by manual cleaning. Before alumina blasting, Chemical analysis of deposits on LP turbine blades

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along with casing is to be submitted by agency to NTPC. Adequate quantity with good quality of alumina is to be arranged by agency.

- 13) Checking of axial & radial run out of coupling faces and radial run out of journal, coupling and any other places possible on LP Rotor. Carry out face correction on coupling faces as per requirement.
- 14) Measurement of convexity/concavity of LP rotor coupling faces and carry out necessary scrapping /polishing etc. to remove convexity/concavity/taper etc on coupling faces as per requirement.
- 15) Measurement of gaps between blades at shrouds and measurement of inlet & outlet edges of moving blades.
- 16) Cleaning of horizontal joints of LP casing and cord grooves. 100% Blue matching is to be achieved for horizontal joints of LP casing parting plane with surface plate or straight edge.
- 17) Checking of parting plane gaps before & after tightening of inner casing & outer casing without LPT rotor as well as to check the ovality of casing.
- 18) Ovality checking of LP inner-inner and inner outer casing and corrections by grinding/or any suitable method is to be done. Tightening and loosening of casing by Refrigerant based induction heating during assembly or dismantling preferably or Standard Electrical induction heating machine.
- 19) Placement of rotor in bottom half casing and checking for radial/axial clearances thereby carrying out necessary grinding/ scraping of fins etc. for maintaining proper radial /axial clearances.
- 20) Trim Balancing to be done if required. If replacement of LP rotor is required during overhauling and after replacement of same, if any vibration comes in any turbine, Generator and excitor rotor, same is to be rectify. (Bidder shall provide necessary manpower support to BHEL vibration experts during trim balancing)
- 21) Checking for parting plane deformation and making minor rectification of parting plane if required shall be in the scope of Agency. All the welding must be carried out as per welding schedule and all consumables, stress relieving, NDT will be in the scope of Agency.
- 22) Final boxing of LP inner-inner casing, inner-outer casing.
- 23) Roll check of LP Inner- Inner & Inner -outer casing and corrections is to be done.
- 24) Removal of barricading or erected platform and covering of tubes inside condenser after completion of job. After removal of all scaffolding and cover, Final inspection of steam space condenser is to be check and any debris found is to be removed.
- 25) Replace parting plane O-Ring, application of parting plane sealant for Final Box up of LP Turbine outer casing (Exhaust Hood) .
- 26) Before placing of IP-LP COP, Boroscopic inspection of Crossover pipe and steam extraction pipelines of LPT is to be done. Videoscope Machine/kit is in the agency scope.
- 27) IP-LP COP (cross over pipe) after thoroughly cleaning and after ensuring proper clearances
- 28) Box up of LP outer casing upper part and IP-LP Cross over pipe. Painting of LP outer hood is to be done. Paint and accessories will be in agency scope.
- 29) All T&P and general consumables required for LP Turbine overhauling job shall be supplied by Agency however turbine spares which will permanently fit in the LPT will be in NTPC scope.

SCHEDULE: - 03: - NFT OF LPT LAST STAGE FREE STANDING BLADES AND MPI OF LAST TWO STAGES LP ROTOR BLADES.

The Scope of Work (SOW) under this category is related to NFT (Natural Frequency test) of LP Turbine bladed Rotor free standing blades and MPI of last two stages blades for 660MW turbine at NTPC Mouda

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- 1) Removal of Last Stage free standing blades (FSB) from LP turbine rotor grooves in 5th Stage (Left & Right). Total No of Blades are to be removed from 5th Stage is 2X52 i.e., 104 Nos.
- 2) Natural frequency drop test of LP Rotor Last Stage FSB i.e 5th Stage is to be carried out after DPT and MPI of Blades(both Turbine & Generator side).NFT test kit along with accessories shall be brought by Agency.
- 3) Necessary De-blading, Re-blading and cleaning shall be done before NFT and MPI. Proper Cleaning of blade roots and rotor grooves is to be done. Fixing of blades with technological pieces to get the Desired NFT of the Blades (Technological pieces is to be brought by Agency).
- 4) Necessary blue matching between Blade Root and Rotor Grooves is to be done to achieve the NFT of the Blades.
- 5) Replacement of blades is to be done if required.
- 6) Fitment of blades on the rotor with new clamping pieces and locking strips/Plate. New clamping pieces and locking plates to be provided by NTPC.
- 7) All consumables, Technological pieces, and instruments for NFT shall be in the scope of Agency.
- 8) Carry out MPI (Magnetic Particle inspection) test of the last two stages (4th & 5th) Rotor blades along with grooves of LP turbine by Coil Method. MPI test kit along with accessories & consumables etc shall be in scope of agency. Blades will be removed for the last stages of the rotor (5th Stages i.e., FSB). Total no of blades is 214 (2x52+2x55). The length of longest blade in last stage is 1.25 mtr accordingly agency must carry the coil with sufficient length for doing the MPI test effectively.

Note: Bidder has to depute Reputed Testing Agency along with Test kit & accessories to carry out MPI and NFT test in consultation with BHEL Site-In-Charge.

SCHEDULE: - 04: SERVICING OF HPT STOP VALVES AND CONTROL VALVE FOR 660MW TURBINE

The scope intents for servicing of HPT stop valve/ESV and HPCV & Overload control valves (HPT Control valves) of 660 MW at NTPC, Mouda. The scope includes from dismantling to assembling of the valves including inspection and rectification in a safe manner. Satisfactory operation of the valves before and after synchronization of the machine is to be ensured.

1. Necessary preparation of Scaffolding and removal of insulation for HPT stop and Control valves before start of the work is to be carried out as per requirement. Removal of insulation and arrangement of scaffolding materials and put back of the same is in the agency scope.
2. Removal of associated oil pipes connected to valve actuator & decouple of valves from actuator. Actuator is to be kept in safe place. New Electrohydraulic actuator (EHA) for HPT stop and control valves are to be installed.
3. Cutting of drainpipes if required for the successful of the execution of job.
4. Dismantling of valve internals including strainers.
5. Mounting of devices for strainer jacking and removal of cover if required.
6. Removal of strainer from valve housing with proper support arrangement.
7. Removal of foreign element from strainer and Cleaning of strainer element and inside the housing properly with utmost care taken.
8. DP checking of weld joint between blanking plate & strainer mesh and repair of weld joint if any. If required, then new strainer element is to be installed.
9. Cleaning and surface/sub-surface checking of all components of valve like strainers, spindles, studs, cap nut etc. by DP and/or UT shall be carried out by Agency.
10. DP Test of welding joints and rectification if any.

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11. Blue matching is to be check for HP Stop and control valve plug with body seat by lapping or any other method which will be most suitable as per satisfaction of EIC.
12. Checking of all control and critical dimensions in presence of NTPC/FQA for valve before dismantling, during dismantling process and during final assembly is to be recorded. Machining of components, if required, will be carried out by agency.
13. Assembly of valves along with strainer in position with new seal ring (if required) is to be done by as per the OEM Procedure.
14. Restoration of all drainpipes. Welding of pipelines. Preheating and stress relieving of weld joints if required.
15. Mounting of new Electrohydraulic actuator assembly and coupling. Calibration of valves will be done in presence of OEM M/s Rexroth only.
16. Remove any scrap generated during execution of work time to time to maintain the safety of the manpower and equipment's.

Note:

1. Two nos of HPT stop valves/ESV and Two no of HP control valves along with Overload control valves are to be executed under this BOQ.
2. **OEM M/s. Resroth shall be arranged by BHEL/NTPC, Bidder has to provide necessary manpower assistance to M/s. Resroth with required general T&P and consumables.**

SCHEDULE: - 05: SERVICING OF IPT STOP VALVES AND CONTROL VALVES FOR 660MW TURBINE

The scope intends for servicing of IPT stop valve/IV and IPCV of 660 MW at NTPC, Mouda. The scope includes from dismantling to assembling of the valves including inspection and rectification in a safe manner. Satisfactory operation of the valves before and after synchronization of the machine is to be ensured.

1. Necessary preparation of Scaffolding and removal of insulation before start of the work in valve is to be carried out as per requirement. Removal of insulation and arrangement of scaffoldings material and put back of the same is in the agency scope.
2. Removal of all oil pipes connected to stop and control valves hydraulic actuator & Decoupling of valves from actuator. Actuator is to be kept in safe place. New Electrohydraulic actuator (EHA) is to be installed.
3. Cutting & welding of Steam drainpipes if required.
4. Dismantling of valve internals including strainers.
5. Cleaning and checking of any surface/sub-surface Crack of all components of valve by DPT. If required UT shall be carried out.
6. Replacement for spares of valve like spindle, gland and U seal ring etc as per requirement, spares will be provided by NTPC.
7. Blue matching of valve plugs, and body seat is to be ensured. If blue-matching is not up to satisfactorily, Agency is to do for the same for 100% blue matching by any suitable method.
8. Checking of all control and critical dimensions in presence of NTPC/FQA for valve before dismantling, during dismantling process and during final assembly is to be recorded. Machining of components, if required, will be carried out by agency.
9. Assembly of valves along with strainer in position with new seal ring (if required) by hot tightening of stud bolts as per the OEM Procedure. Induction heating machine and Gas heating device for loosening /Tightening of IP stop valves are to be arranged by Agency and this is mandatorily.

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Note No:1: Replacement of IPT Stop and Control valve studs(A783) with cap nuts are to be done with modified one(X12)

Note No-2: MPI/Eddy current test for all A783 and X12 stud and cap nut of IP Stop and control valves are to be done.

Note No-3: MPI/eddy current testing of HP Module support bracket studs are to be also done, and this is mandatory.

10. Restoration of all Oil/ drainpipes. Preheating and stress relieving of weld joints as per requirement.

11. Mounting of new Electrohydraulic actuator assembly and coupling. Calibration of valves will be done.

12. Remove any scrap generated during execution of work time to time to maintain the safety of the manpower and equipment's.

Note: Two no of IPT stop valves/ESV and Two no of IP control valves are to be executed under this BOQ.

13. Checking, replacement and servicing of hydraulic actuators HP Stop & control valves, IP Stop & control valves and Overload control valves and its servo and Control Fluid HPSU unit.

13.1. Servicing of oil supply unit of Control Fluid will cover the following points:

- a. Checking and setting of PRVs
- b. Oil Flushing of lines.
- c. Accumulator Healthiness Checking.
- d. Calibration of HP control valves 1 & 2, IP control valves 1 & 2 and Overload control valve.
- e. Checking/Setting of KP values (Operating points) of HP control valves 1 & 2, IP control valves 1 & 2 and Overload control valve as per requirement.
- f. Checking/Setting of closing times of HP control valves 1 & 2, HP stop valves 1 & 2, IP control valves 1 & 2, IP stop valves 1 & 2 and Overload control valve.
- g. Checking/Setting of position feedback of HP control valves 1 & 2, HP stop valves 1 & 2, IP control valves 1 & 2, IP stop valves 1 & 2 and Overload control valve.
- h. Leak test of HP control valves 1 & 2, HP stop valves 1 & 2, IP control valves 1 & 2, IP stop valves 1 & 2 and Overload control valve at barring speed 60 rpm at 100 Bar and 480 deg C.
- i. ATT of HP control valves 1 & 2, HP stop valves 1 & 2, IP control valves 1 & 2, IP stop valves 1 & 2 and Overload control valve should be performed at barring speed 60 rpm.
- j. To perform the test/setting/checking mentioned in the above points,

Note: - OEM M/s. Resroth shall be arranged by BHEL/NTPC, Bidder has to provide necessary manpower assistance to M/s. Resroth with required general T&P and consumables.

SCHEDULE: - 06: LPBP VALVE OVERHAULING

UoM: No.; One No. means overhauling of one stop & one control valve (complete one set)

1. Removal of insulation and cladding from the valve body (wherever necessary, preferably from the valve bonnet area) and put back the same after completion of work.
2. Scaffolding & approach platform erection whenever required as necessary for stop / control valve servicing.
3. Removal of grills and canopy whenever required. Hard barricading surrounding the opening.

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4. Mounting of Valve support fixture for LP Bypass Valves (Both Stop & Control valves), casing as supplied by OEM.
5. Decoupling of servomotor from valve and removal of servomotor from position.
6. Loosing of studs / cap nuts of valve cover using Hydraulic torque Wrench and removal of valve cover from valve casing.
7. **Note: Heating by induction machine / Electrical coil / gas blowtorch as required.**
8. Dismantling of valve internals and cleaning of all internals. Cleaning of valve components like spindles, studs, valves cones etc. as required.
9. Replacing the defective components and assembly of all internals after lapping etc. Lapping of the valve seats / discs to obtain adequate blue contact.
10. Measurement of all control dimensions / clearances and repair / replacement if any as per requirement. NDT (DPT/UT/MPI) of valve components
11. Clearance measurement between guide bush and valve cone, gland bush and spindle. Removal of gland bush / guide bush and machining / replacement as required. Machining in NTPC scope. However, assistance and supervision and follow up to be provided by the agency.
12. Re-assembly of the valve internals in position. Tightening of threaded ring / tightening of cap nuts of valve cover.
13. Coupling of servomotors with valve.
14. Charging of system and attending of defects if any.
15. Hot tightening of fasteners after charging whenever required.
16. Commissioning of the system and attending of defects if any. Removal of temporary platform & scaffolding and placing of grills & canopy.

SCHEDULE: - 07: OVERHAULING OF CRH NRV OF 660 MW UNIT

1. De-Coupling of CRH NRV and its pneumatic actuator.
2. Removal of insulation and cladding from the valve body and put back the same after completion of work. Installation of Chain Pulley Block over the NRV bonnet for Lifting.
3. Remove the Pneumatic actuator from the position.
4. Barricade the Floor Opening.
5. Dismantling of CRH NRV by opening its bonnet studs, hinge etc.,
6. Removal of Valve Disc and Carry out the lapping using Lapping plate or Glass.
7. Cleaning, checking and NDT as per requirement, Repair/ Replacement of components.
8. Lapping of Seat and disc as per requirement
9. Assembly of valve and tighten the bonnet studs. Replace the gasket.
10. Coupling of Valve with the pneumatic actuator
11. Commissioning of Valve and attend defects, if any.

SCHEDULE: - 08: OVERHAULING OF EXTRACTION NRVS OF 660 MW UNIT

1. Decoupling and removal of pneumatic actuator from Extraction NRV
2. Removal of insulation and cladding from the valve body and put back the same after completion of work.
3. Dismantling of NRV cover
4. Dismantling of internals like disc, spindle, bush, lever etc.
5. Inspection of internals for defects and DPT to detect cracks if any.

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6. Blue matching / lapping of disc and seat
7. Replacement / repair of damaged items
8. Checking of freeness of disc movement
9. Box up NRV and tighten all the bonnet studs.
10. Coupling of actuators with valve
11. Assistance in commissioning of NRV.

GENERATOR WORKS:

SCHEDULE: - 09: GENERATOR OVERHAULING: - DECOUPLING & COUPLING, ALIGNMENT, CRO OF LP-GEN, GEN-EXCITER AND SWING CHECK AT EXCITER END AND BEARING INSPECTION OF 5,6,7

1. Dismantling of exciter covers, exciter coolers, exciter flaps, and diode wheel top cover.
2. Removal of bearing 5, 6 and 7 top half.
3. Measurement and record SOC and TOC of bearing 5, 6 and 7 during dismantling.
4. Measurement of LP-Gen and Gen- Exciter CRO and Exciter swing check during dismantling.
5. Decoupling of LP- Generator and Generator Exciter and measurement of dismantling alignment readings.
6. Measurement of Generator and Exciter rotor coupling face run out and correction as per the CRO/ swing and face run out values.
7. Measurement of Generator Rotor Free run out.
8. Removal of bearing 5, 6 and 7 bottom halves.
9. Measurement of bearing bore and journal dia for bearing 5, 6 and 7.
10. Carry out DP and UT of bearing 5, 6 and 7.
11. Carry out bearing and support matching and ensure proper bearing contact with journal. Carry out the DPT of Coupling bolts of both LP- Generator and Generator – Exciter coupling. IR measurement of bearings and seal bodies.
12. N2 leak test of CC bolts
13. Placing of Bearing bottom half in position and replacement of jacking oil hoses.
14. Fixing of bearing-7 bottom half.
15. Carry out LP- Generator Alignment and Gen- Exciter alignment
16. Carry out Generator- Exciter CRO
17. Carry out Gen- Exciter swing check.
18. Carry out coupling of LP- Generator and Generator- Exciter as per the standard procedure.
19. Box up top half of bearing 5, 6 and 7 after measurement of SOC and TOC.
20. Assembly of brush holder assembly for rotor E/F detection.
21. Box up bearing yoke and maintain proper oil catcher clearances.
22. Assembly of brush holder assembly for rotor E/F detection.
23. Assembly of exciter coolers
24. Assembly of air guide covers of exciter. Assembly of flaps, diode wheel cover exciter outer covers after replacement of outer cover gaskets
25. All enabling works required to do the Face matching of Exciter-Generator Coupling like Removal of Components in Exciter Assembly and re-assembly of the same after successful face matching is inclusive in this BOQ.
26. If replacement of the exciter rotor is required, the same needs to be carried out without any extra cost. Testing to be carried out on the new rotor shall be as per the optional works.

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Note: - Bidder shall arrange reputed/experienced agency for Mechanical and electrical test in consultation of BHEL site Incharge.

OPTIONAL WORK: -

SCHEDULE: - 10: - TD BFP TURBINE OVERHAULING

(Overhauling of 1 drive turbine, 2 ESV, Main control valve and its Servomotors shall be booked as 1 qty.)

A. Drive Turbine:

1. Remove Insulation from Drive Turbine.
2. Remove Top Half Bearing Pedestal (Front and Rear Journal Bearing) cover of Drive Turbine.
3. Check Coupled Runout during dismantling and decouple the Drive Turbine from both ends.
4. Check alignment thrust float before commencing the dismantling work.
5. Check interference between Yoke and bearing shell of both Front and rear journal bearing.
6. Dismantle and remove the top half of FJB and RJB. Remove thrust bearing from position.
7. Open the Parting Plane bolts, inlet piping bolts and Lift the top half Casing.
8. Record the steam flow path readings after keeping the rotor at the centre.
9. Taking out the Rotor from the bottom half of the Casing.
10. Inspection of Turbine Casing and Rotor to be carried out followed by thorough cleaning of Turbine Internals.
11. Alumina blasting of rotor to be done.
12. Check Horizontal Parting Plane of casing and blue matching to be done if required.
13. Check and adjust the Clearances of Gland Seal (Front and Rear). For the machining of gland fins and balanced drum to finished dimensions, Agency has to arrange necessary fixture.
14. Check the condition of Bearings (Front and Rear Journal Bearing) as well as Thrust bearing. Carry out DPT and UT of all the 3 bearings to check the condition of the Babbit metal. Check and rectify the bedding of the bearings if required.
15. Measure and record the Bearing clearances and if the readings are not within limit, bearing(s) to be replaced.
16. Replacement of Bearing will be done without any additional cost.
17. Placement of rotor to the position after alumina blasting.
18. Centering of Casing w.r.t rotor is to be done.
19. Take Run Out and steam Flow Path readings and rectify if required.
20. Checking of Overspeed Governor and rectification/replacement.
21. Placement of Top half Casing and Box Up.
22. Check and rectify the front and rear Oil Guard Clearances, Replace Oil Guard fins If required.
23. Pipe Support and Hangers to be checked and adjusted as per requirement.
24. Alignment and coupling of the TDBFP (Drive Turbine to Main Pump, Drive Turbine to Gear Box and Gearbox to Booster Pump) to be done.
25. Re-Insulation of Turbine as and where required as OEM guidelines is to be done by the agency.
26. Painting of the top half casing and Both bearing pedestals.
27. Complete protocol with all critical dimensions measured during dismantling, machining and assembly shall be prepared by the agency as per OEM Manual instructions and submitted to the EIC.

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B. Main Stop Valve

1. Decouple and dismantle the Main Stop Valve Servomotor with Valve.
2. Checking, Blue matching and Rectification of Valve plug/stem, Seats and Cone to be done.
3. Checking the valve clearances and carrying out NDT(DPT) of Stem/Plug And valve Seat.
4. Repair/replace the worn out and damaged parts if required.
5. Re-assemble the valve and its Servo motor.

C. Main Control Valve

1. Decouple and dismantle the main control valve servomotor with valve.
2. Open bolts of steam chest and remove the chest cover.
3. Take out the control valve beam.
4. Cleaning, checking, blue matching and rectification of valve plug/stem, seats and cone is to be done.
5. Checking the valve clearances and carrying out NDT of valve plug/steam and seat.
6. Repair/replace the worn-out and damaged parts if required.
7. Assemble and adjust the lift of the individual control valve.

D. Revisioning of stop and control valves Servomotors:

1. Dismantling of the Servomotor.
2. Cleaning of the internals and checking of the same and measure the control dimensions.
3. Repair/replace the worn-out and damaged parts if required.
4. Reassemble the servomotors.

E. Recommissioning of TDBFP

1. Check the Governing Characteristics and Setting to be done as per requirement.
2. Oil Injection Test and Overspeed Testing of Solo Drive Turbine to be carried out.
3. Coupling of the TDBFP (Drive Turbine to Main Pump, Drive Turbine to Gear Box and Gearbox to Booster Pump)
4. Cleaning of oil filters during oil flushing, commissioning etc. to be carried out. Successful Load Trial for 72 Hours and Agency to attend defects if any.

Note: Exclusive gang along with foremen shall be arranged by bidder for the completing the job in all respect.

SCHEDULE: - 11: - TD BFP TURBINE (TURB ROT) BALANCING

UoM: Slow Speed Balancing of one BFP drive turbine rotor shall be booked as 1 No.

1. Mobilisation of the slow-speed balancing machine along with skilled personnel to the site is required for the on-site dynamic balancing of the TDBFP drive turbine rotor. The scope includes transportation, installation, alignment, trial run, execution of balancing activity, and subsequent demobilisation after completion of the job.
2. Party shall make necessary arrangements for fixing and setting of balancing machines in TG hall at Mouda site on normal broad-gauge rail available at site.
3. Party shall bring necessary fixtures such as Extension shaft / Coupler etc required for mounting the TDBFP Drive turbine rotor on balancing machine.

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4. Placement of Drive turbine rotor on balancing machine and coupling with the Drive.
5. Measurement of axial & radial run outs at various points of turbine rotor on balancing machine.
6. Carry out slow speed balancing of TDBFP Drive Turbine rotor on balancing machine to the prescribed limits as per the standard ISO 1940 Gr. 2.5. Adding of balancing weights and carry out balancing until above standards are achieved.
7. NTPC will provide rail track (broad gauge rail) in TG hall along with EOT crane & required balancing weights required for the above work. Details of TDBFP Drive turbine rotor:
 - a. Weight of the rotor: 4500 Kg.
 - b. Shaft end to end distance: 3800 mm.
 - c. Centre line distances between bearings: 2645 mm.
 - d. Journal diameters of the rotor: 220 MM & 200 MM (Both ends).
 - e. Journal width (approx.) Rear end: 400, front: 180mm
 - f. Maximum diameter of bladed rotor: 1200mm.

SCHEDULE: - 12: - HP CONTROL VALVE/STOP VALVE / OVERLOAD CONTROL VALVE SEAT REPLACEMENT

UoM: No= 1 No. Any one of the HP stop or control Valve or Over load control valve Seat replacement.

1. Remove the Cylindrical locking pins by grinding and/ or drilling.
2. Remove the old worn-out HP Stop or Control seat from position by cutting or gouging.
3. Clean the inside Surface of the Valve Casing thoroughly.
4. Note the measurements of dia and length.
5. Clean the new seat provided by NTPC for replacement.
6. Measure the dia, length, etc and prepare for machining of the same.
7. Prepare GO- NOGO gauges for installation of valve seat.
8. Put the new seat (after machining) in a liquid nitrogen to get the desired shrinkage. Container to Put the new seat in liquid nitrogen to be brought by the party. In case it is not available, the same is to be fabricated at site.
9. Fabricate a device to insert the seat horizontally inside the valve casing.
10. Arrangement for heating the valve body using resistance heating, shall be in the party's scope.
11. Insert the new valve seat inside the valve casing.
12. Insert the locking pins.
13. Take the blue impression of the seat and cone. Minor lapping, if required, to be done.

Note :- Bidder shall arrange reputed & experienced agency for valve seat replacement work in consultation with BHEL site incharge.

SCHEDULE: - 13: - LP HEATER (EXTRCN BELLOW) REPL

UoM: Lump Sum (LPS)= 1 No. Extraction bellow replacement as per below SOW.

1. Making Scaffolding up to the bellow for carrying out the cleaning and DP test.
2. Removing the protection shield of bellow, as per the requirement.
3. Removing the damaged bellow from the position after giving proper support to both end pipes
4. Edge preparation of both pipe ends for welding and assistance in transportation of the bellow from central stores to site

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5. Positioning the new bellow in its place.
6. Welding the bellow root by TIG welding.
7. Welding the remaining welding as per the approved welding procedure
8. Carrying out the DP Test of the root and Radiography of the weld joint.
9. Removing the bellow locking plate.
10. Removing all the T&P from site & taking out all scaffolding material.

SCHEDULE: - 14: - ATTENDING TO CC BOLT LEAKAGE OF GENERATOR ROTOR

1. Dismantling of the old CC bolt with gaskets and insulating ring.
2. Cleaning of the CC bolt housing.
3. Box up of the cc bolt by replacing gaskets & worn-out parts.
4. Gas tightness test
5. Fixtures and Consumables are to be provided by Vendor.

SCHEDULE: - 15: - REPLACEMENT OF MULTI CONTACT BAND

- 1) Isolation of coupling.
- 2) Removal of insulation plate.
- 3) Dismantling of old Multi Contact band.
- 4) Reassembly with new band.
- 5) Measurement of DC resistance and IR before and after assembly

SCHEDULE: - 16: - GENERATOR SEAL RING REPLACEMENT

- 1) Assistance to be provided to draw the Seal Ring and spares of Seal Body Assembly from central stores.
- 2) Dismantling of the Seal Body Assembly and Seal Rings.
- 3) Dimensional Check of dismantled Seal Rings and New Seal Rings.
- 4) DPT and UT of Old and New Seal Rings.
- 5) Dimensional check of Oil Deflectors and Oil Catchers. Replacement of Fins if required.
- 6) Assembly of Seal Body with Old Seal Ring / New Seal Ring as per instructions of the EIC.
- 7) All other associated works for Seal Ring Replacement like Bearing Removal etc shall be done as required.

UOM: 1 LPS refers to the execution of dismantling and assembly of one seal assembly, either at the turbine end or the exciter end.

SCHEDULE: - 17: - ELECTRICAL TEST OF EXCITER SYSTEM

PMG & Main Exciter:

- IR test on Armature & Field winding
- DC resistance on Armature & Field
- Impedance test on Field winding
- Pole drop test on Field
- IR & Resistance test on Quadrature axis coils

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Diode Wheels:

- IR test on diode wheel heat sinks.
- Blocking capability test on rectifiers.
- Fuse checking with resistance measurement with micro-ohm meter.

Note: - Bidder shall arrange reputed/experienced agency for Mechanical and electrical test in consultation of BHEL site Incharge.

SCHEDULE: -18 - DEPUTATION OF TG/OTHER ASSOCIATED AREA EXPERTS

One (01) Expert of Turbine or Governing or Valves or Generator are to be deployed by the contractor as per site requirement in consultation with BHEL Site-In-Charge.

➤ OTHER REQUIREMENT DURING OVERHAULING: -

1. Insulation, wherever removed, shall be put back by the party without any extra cost to BHEL. However, the insulation material shall be provided by NTPC on Free of Cost basis.
2. The opening of IPSV/PCV studs to be opened using stud heating device/ induction heating machine. All required nozzles, gas and attachments shall be in the scope of the party.
3. Party to put all efforts to ensure that the post overhaul vibration levels must improve (or be close to) with respect to the pre-overhaul values. Party must bring trim balancing equipment along with expert for carrying out the trim balancing, in case of requirement. **(Agency Shall provide necessary manpower support to BHEL Experts.)**
4. Party to ensure their Quality control mechanism to prevent any repetition of work. The possibility of poor workmanship, negligence to be avoided strictly.
5. Prior to applying for gate pass, the ESIC and group insurance of all the workers to be completed. All contract labour of the party to undergo Medical test and safety induction training at NTPC Mouda notified centre /place. Any medically unfit person, so found during the medical test/ safety induction training, shall not be allowed to work at site and shall be returned immediately.
6. The party shall arrange sufficient No of EOT crane skilled operators (in rotation) to operate crane in TG Hall for 24 hours for loading/unloading/shifting of Turbine and its components. The crane operators should have work experience of minimum three years in TG overhauling work. The Crane operator must be certified by Site In-charge.
7. Daily work planning, scheduling & reviewing of work will be done by the party every morning & evening and programme for next day must be submitted by 5 pm on daily basis to EIC. Party is also required to submit the progress exception report.
8. . Party shall fix a Liaison officer at OEM works for Proper liaisoning related to technical information and Material, as per requirement, before 7 days of start of Overhaul.
9. Party must arrange new water-proof Tarpaulin in sufficient quantity to cover the turbine components such as casings, bearings, pedestals etc.,
10. For carrying out UT, DPT and RT etc party should engage competent certified personnel / vendors along with calibrated instruments / equipment's etc. and their calibration certificates along with the Personnel Qualification records must be submitted to site FQA for Verification. Necessary equipment for carrying out the DPT, UT and RT shall be in the scope of the Party.

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11. Any minor job, which has not been included in the scope of work and is required to be done for the completion of work, shall be executed by the contractor without any extra payment as per the instruction of Engineer-in-charge.
12. Party must engage his manpower for round the clock work in all working days/ holidays as per the instruction of Engineer-in-charge headed by responsible and experienced Engineers / Supervisors. The party must submit detailed manpower deployment program for round the clock work before commencing overhauling works. However, no idle charges shall be paid to the party.
13. The party's / Subcontractor's representative should meet the EIC at the plant premises to receive work related instructions every day.
14. The party / sub-contractor shall have to take utmost care of spares parts / materials during dismantling, assembly, storage, and handling of equipment's etc as applicable.
15. After completion of work, the area shall be cleaned up to the satisfaction of EIC without any extra charge. Scrap materials must be disposed to the scrap yard as per instruction of EIC.
16. The contractor must carry out the work as per the details given in "Scope of work" in general. However, the Manufacturer's maintenance catalogue, technical details and standard Engineering practices and NTPC COS-ST guidelines also need to be adhered to and arranged by the party, if required.
17. The contractor must engage competent / skilled manpower as per the requirement of the respective jobs. NTPC/BHEL reserve the right to disallow any worker to continue the work, if found unsuitable for the specific job. The party shall submit list of proposed skilled / semiskilled manpower to be deployed for the above job indicating field experience and grade in the organization. This list shall be approved by EIC before commencement of overhaul.
18. The agency shall make the bar chart along with resource and manpower deployment chart for carrying out the job.
19. The contractor shall erect approach platform with ladder as per requirement and dismantle the same.
20. Party must mobilize necessary skilled / semiskilled / unskilled manpower required to complete job as per schedule.
21. The contractor shall provide all necessary assistance while commissioning back the Turbine & aux systems mentioned above and shall rectify if any problems encountered during commissioning without any financial implication to BHEL
22. . The agency shall submit labour license, provident fund registration number, ESIC from competent authority to the Engineer – in-charge. The agency shall comply all statutory rules and regulations and all provisions of Contract labour (R&A) Act 1970 and other applicable Labour Laws and rules made there under from time to time.
23. The work shall be inspected / measured as directed by Engineer – in – charge, FQA representative and entered in the measurement book with signature of contractor, Engineer – in – charge & FQA or their representatives as token of acceptance. Measurement and record of all readings including the reference control readings as per TG logs shall be maintained on daily basis and shall be produced as and when asked for by NTPC. A workstation with PC, printer and scanner to log all the on-going works shall be set up and maintained by the agency.
24. The contractor shall be fully responsible for erection of rigid and stable (enough) scaffolding for the safety of persons carrying out work in the extraction bellows and radial keys of LPT. The proper ladder (with handrail) must be provided for safe ascend/ descend to and fro the work location.
25. All measuring instruments required for assembly of the turbine.
26. Amount linked to Safety/Compliance of safety rule: 2% of contract value is linked to safety and it will be released after full compliance of safety as mentioned in contract and certification of EIC.

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27. Two (2) Nos Safety Engineers are to be deployed by the contractor for complete duration of Overhaul in consultation with BHEL Site-In-Charge. Safety Engineer should be qualified from approved institute. Certificate shall be produced at the time of deployment.
28. Agency has to fulfil all HSE related requirement at site.
29. **The Contractor shall necessarily take Third Party Liability Policy. Value to be insured shall be “Total/ Aggregate amount during the currency of Contract: Rs. 50.00 Lakhs or 110% of Contract value (Excluding GST)’ whichever is lower”. For any one occurrence: 50% of Total aggregate amount” of value to be insured.**

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Chapter –III: SPECIAL TERMS AND CONDITIONS

3.1 **SPECIAL TERMS AND CONDITIONS:**

1. **Agency to strictly follow all the necessary guidelines issued by Customer, District Magistrate, State Government and Central government to control Covid-19 outbreak.**
2. The agency shall submit following documents to the BHEL Engineer in charge before starting of the work at site: -
 - a) Valid labour license of total Nos. of labours.
 - b) Valid labour Insurance policy to cover all the workers.
 - The Contractor shall necessarily take Workmen Compensation Policy and if required Third Party Liability Policy shall be taken by agency.
 - **Third Party Liability Insurance Policy- Total/ Aggregate amount during the currency of Contract: Rs. 50.00 Lakhs or '110% of Contract value (Excluding GST)' whichever is lower, For any one occurrence: 50% of Total aggregate amount of value to be insured.**
 - c) **Medical Fitness Certificate of each worker issued by registered medical practitioner with Covid-19 test report.**
 - d) A photocopy of employment card issued to each worker as per format prescribed in factory rules.
 - e) List of safety appliance provided by the contractor to their workers with receipt.
 - f) Valid test certificate issued by competent authority as per factory rules for the T&P (like pulling / lifting devices, slings, machines etc.) to be utilized at site.
 - g) List of personnel's and workers deputed / deployed along with their full address proof, Police verification etc., shall be get done of his workers by the contractor.
 - h) Submission of Indemnity Bond.

Subcontractor should assure that the repair of the equipment covered in the scope of this offer will be conducted with the best of skills and know how available with Subcontractor and in conformance with the clearances and adjustments set forth in manufacture's drawing instruments and other information's furnished to Subcontractor.
3. Agency shall visit site well in advance for identification & to ensure availability of required special T&P as well as other infrastructure required.
4. During execution of site it may be required to close the site temporarily, In this case De-Mobilization & Re mobilization charges shall not be payable.
5. All consumables required for the overhauling will be agency's scope.
6. The various setting, clearances, adjustments and benchmarks will be restored to the extent possible during rectification to the condition as per the erection and commissioning log sheets

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available with customer. If however we are not able to produce erection / commissioning log sheets, efforts will be made to attend the best possible parameter or the conditions as observed at the time of dismantling of the equipment in consultation with us.

7. Subcontractor must prepare PERT CHART/BAR CHART. Daily monitoring will be done jointly and log sheets of important activities should be noted down and signed jointly.
8. Daily work planning, scheduling & reviewing of work will be done by the party every morning & evening and daily programme must be submitted on daily basis to EIC. Party also to submit the progress exception report. Agency should also submit filled protocol duly signed every day/after completion of work.
9. All the works shall be carried out as per the instructions and to the satisfaction of the Engineer In-charge.
10. The contractor will attend contributory to faulty and poor workmanship during commissioning and trial run of the equipment.
11. Round the clock working under expert supervision shall be ensured by the contractor deploying two equal parallel strength of groups in 12 hrs. Shift with equal T&P for all the jobs so as to complete the work in stipulated period or earlier.
12. Agency has to engage his manpower for 24-hour work in all working days/holidays as per the instruction of Engineer-in-charge headed by responsible and experienced Engineers/Supervisors. The agency has to submit detailed manpower deployment program for round the clock work before commencing overhauling works
13. It is the responsibility of contractor to keep the plant, equipment, machinery and surrounding area clean.
14. Removal of insulation from turbine, stop and control valve, associated pipe lines and through cleaning of subjected area is in the scope of agency.
15. Agency has to engage competent/skilled manpower as per the requirement of the respective jobs. BHEL reserve the right to disallow any worker to continue the work, if found unsuitable for the specific job.
16. The names of working persons like Site in-charge, supervisors, foreman, main fitters to be deployed during the job with full details has to be submitted stating their area of work and experience and specialization of the work to site in-charge before the start of work. BHEL may ask to change/delete the person not found suitable for the work at any point of time during execution of job. For any addition and deletion of the working person prior permission from BHEL shall be taken.
17. Subcontractor has to ensure that all the key persons must continue till completion of job i.e. machine comes on load. Subcontractor manpower (adequate) should remain at site for a period of **03 days after machine comes on full load.**

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18. **Mobilization of full strength manpower and T&P shall be done immediately within 03 days after receipt of LOI or as per Intimation from BHEL.**
19. Work distribution sheet for all the workers/supervisors deployed shall be submitted to BHEL one day in advance on daily basis.
20. Subcontractor should mobilize additional resources such as plant, equipment's, material as may be required by site in-charge to improve the progress of the work if the progress of the work is not satisfactory.
21. Subcontractor should get registered under relevant sales tax and or work contract Act (VAT) where the jobs are executed.
22. Party has to quote lump sum rate for all activities mentioned in the price bid as the actual quantities may vary during overhauling of the unit for which the contractor is not permitted to raise any dispute or claims. Items mentioned as optional will be taken up depending on condition, availability of spares and requirement.
23. Radiography and stress relieving of the joints are in the scope of the contractor.
24. **Removals of insulation are in the scope of the contractor.**
25. Scrap & insulation etc. is to be shifted to scrap disposal area as indicated by the Site-in-charge.
26. One administrative personnel to control the resources and attendance of the workers to be ensured.
27. Contractor shall arrange certified HP welder for welding job as required whose welding test will be conducted.
28. Free electricity shall be provided by customer but duties if any as applicable shall be paid by contractor.
29. Argon, Oxy- Acetylene gas shall be arranged by the contractor with cutting/welding set / argon welding set and other welding appliances.
30. Enerpack make close height Hydraulic jacks of 50T and 100T capacity - 4 nos. each shall be arranged by the contractor in 100 % working conditions.
31. If the duration of work continues beyond stipulated period due to any reason, no claim for compensation will be entertained.
32. The work details are brief & for Subcontractor knowledge only. Subcontractor will have to do all the related works as per requirement.
33. The contractor will be responsible to pay the damages to the property of Board or individual caused by his worker during the course of contract. If the contractor fails to pay the same it will be recovered from his bill.
34. No compensation claimed for idle labor for any reason will be entertained by BHEL.
35. All general tools and plants for execution of the work will have to be arranged/ maintained by the contractor at his own cost & risk.

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36. In normal course, the interpretation of the under signed on any matter or decision given by him on any disputable points will be final and binding on the contractor.
37. Successful agency is to obtain labor license before the start of the work.
38. Successful agency is to obtain necessary “No Dues” certificate before de-mobilization from site.
39. Successful agency has to arrange Site mobile recharge till the site closing.
40. LAP-TOP with latest configuration, DVD/CD writer/pen drive, its peripherals including printer-scanner and one USB Modem for Internet connectivity to be provided for BHEL site office.
41. Barring Gear is the essence of the contract.
42. Sufficiently adequate man power T&P and other resources should be mobilized by the contractor to operate round the clock work progress with standby technicians to be deployed immediately if need arises. Offer should be submitted considering these requirements.
43. Accommodation for the sub-contractor’s manpower will be provided if made available by the customer as per the applicable charges.
44. Contractor shall arrange vehicle for his manpower transportation.
45. Magnetic base drilling machine along with drill/reamer is required (Wherever Applicable) for dowelling of cylindrical support of bearing in case of their replacement.
46. Taper reamer along with drill is to be arranged for dowelling of MOP (Wherever Applicable).
47. The agency shall erect approach platform as per requirement and dismantle the same.
48. The agency shall be fully responsible for maintenance of records of his employees.
49. The agency shall start the work only after instruction by contract operating authority.
50. **Scaffolding pipes, clamp, aluminium planks, Jallies &, 40 mm thick wooden planks are to be arranged by Sub-contractor for various platforms as required for the and Safety will be taken on priority basis.**
51. **Agency has to arrange certified person to approve scaffolding erected before use.**
52. Contractor reconciles the material and submits along with the bill. To credit the balance spares worn out articles/spares and scrap in the main store.
53. Contractor shall clean the surrounding working area within three days immediately after completion of work/ Machine taken onto barring.
54. Give proper assistance to maintain the readings at site for the protocol.
55. Condenser tube bundles shall be covered properly with wooden planks/scaffolding boards, tarpaulins etc at the top of tube bundle to prevent falling of foreign material on condenser tubes from top of condenser/LP turbine.
56. Cast iron plates shall be first matched with calibrated surface plate by manual scrapping & matching and then above cast-iron plates shall be used for scrapping coupling faces to correct convexity/ concavity/taperness of coupling faces.
57. Adequate numbers of tarpaulin are to be arranged by the sub-contractor for covering of various equipment during insulation removal / application.

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58. For carrying out MPI, NFT, UT, DPT etc. agency should engage competent certified personnel/vendors along with calibrated instruments/equipment's etc.
59. Ultrasound test kit, MPI, DP Test kit of standard makes like ITW SIGNODE / CHECK MATE / ORION 400 ml Aerosol cans and suitable colour paint to repaint the weld joint after DP test along with required accessories and consumables
60. Transportation of material required during overhauling from central work shop to site is in the scope of agency. Tractor & trailer, hydra, crane shall be arranged by agency for shifting of materials.
61. Once Turbine Rotors are removed from their casings, high spots on their coupling faces shall be removed & they will be placed on the turbine bearings. The rotors will be coupled with complete loose/fitted coupling bolts & stretched to full value for measurement of coupled run-out & swing value. Necessary correction by scraping etc. shall then be done, if required, in order to achieve acceptable run-out/swing values. This process of correction may require more than one attempt. Similar process shall be applied to Gen-Exciter coupling for achieving exciter end swing value.
62. The agency/sub agency shall have to take utmost care of spares parts/materials during dismantling, assembly, storage and handling of equipment's etc as applicable.
63. The contractor shall be fully responsible for erection of rigid and stable (enough) scaffolding for the safety of persons carrying out work. (Scaffolding material shall be arranged by agency).
64. The agency shall be fully responsible for the safety of his personnel during the work at site, and shall ensure the use of safety appliances by his workmen.
65. Preheating/post heating, stress relieving and RT will be arranged by agency.
66. Agency has to give necessary assistance for drawn of spares from stores & returning the damaged spares to store.
67. Any fixture required for the above job shall be fabricated by the agency.
68. IBR qualified welder for use in welding of high-pressure pipes etc., as applicable.
69. Machines, T&P's required for reaming & honing of coupling holes shall be arranged by agency.
70. To & fro transportation of their entire team on their own from place of stay to airport/station, from place of stay to site and to meet other essential requirements.
71. All testing equipment required as per above scope of work shall be in the scope of agency.
72. The agency shall provide all necessary assistance while commissioning back the Turbine, Generator & aux systems mentioned above and shall rectify, if any, problems encountered during commissioning.
73. The agency shall provide all necessary assistance during commissioning of T/G Set
74. **Hydraulic torque wrench with operator shall be arranged by agency for decoupling & trial coupling, final coupling.**

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75. All Casing and Valves fasteners should be loosened / tightened by Induction Heating Method. Suitable capacity Induction Heating Machine shall be in the scope of agency. In addition to this gas heating arrangement should be kept ready for emergency.
76. Blast cleaning shed erection and dismantling and cleaning of scrap alumina and alumina dust around the blast shed.
77. Alumina blasting work of turbine rotor, blades, guide blade carriers, valve cone, valve stem etc. should be carried out at two places round the clock, Agency shall observe safety precaution while carrying out alumina blasting.
78. Required white fused Alumina powder shall be arranged by agency.
79. Removal of thermal insulation wherever required for working.
80. Sufficient Halogen Lamps shall be in the scope of agency.
81. Skilled EOT Crane operators, for round the clock working for Two cranes are in agency's scope.
82. Reaming & honing of coupling holes if required shall be carried out by the agency.
83. Agency has to fulfil all HSE related requirement at site.

NOTE:

1. The specific (minor) work which is not mentioned in the scope of work but required to be carried out for completion of subject work is in the agency's scope.
2. Decision of BHEL site in charge regarding interpretation of the scope of work shall be final.

LIAISON WITH ALL STATUTORY AUTHORITIES:

- Compliance of statutory provisions, whether mentioned in this contract or not shall be binding on the contractor.
 - a) If there is any change in labour laws after the contract has been awarded, then the new law shall automatically be binding on the contractor.
 - b) No additional financial compensation shall be paid by BHEL to the contractor on account of increased expenditure caused by a) and b) above.
 - c) Liaisoning with local commercial tax dept. to obtain Coml. Tax exemption certificate.

PAYMENT TO WORKERS:

- Payment to workers shall be done in the presence of BHEL representative or through bank account only.
 - a) The contractor shall intimate the day of payment at least three days in advance in writing along with copy of the pay sheet and attendance cards.
 - b) All workmen shall be covered by PF Rules irrespective of their period of employment.
 - c) Payment shall be made inside the plant premises and during office hours.

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SUBMISSION OF DOCUMENTS:

- The contractor shall submit following documents at appropriate time either before or during the execution of the work and as directed by Site in-Charge.
- 1. Test certificates of Pulling and Lifting machines and appliances.
- 2. Details of workers to be deployed with name, address, category.
- 3. Details of supervisory staff to be deployed.
- 4. Authorization for receipt of materials and for signing of Measurement Books etc,
- 5. Labour license specific to the contract.
- 6. List of T&P brought into plant premises along with their serial numbers and dates/years of purchase.
- 7. All the Staff/Workers deputed for the Job should have Insurance Cover and document in this regard should be submitted along with 1st RA Bill.
- 8. List of consumables brought into plant premises along with their serial numbers and dates/years of purchase, along with test certificates wherever applicable.
- 9. Insurance policy for the workers to be deployed in this contract.
- 10. Safety undertaking.
- 11. Copy of ESI certificate to be furnished.
- 12. Proof of Payment of GST.

(Sl.No.11 to 12 are required before final bill is processed).

The contractor shall submit following documents in report form within 15 days from commissioning of unit after the overhaul/shut down work is completed:

- Details of work executed.
- Measurements against different schedules in compiled form.
- Material issue details.
- Material consumption details.
- Material returns details.
- Details of retrenchment benefits given to workmen.
- Details of issue of PF slip to workmen.
- Details of settlement of accident benefits if any to workmen
- Copies of pay sheets to workmen.
- Details and proof of remittance of PF to workmen (before final bill).
- No dues clearance from different stores of customer
- Valid labour license

Statutory Inspection

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- Please refer General and Special Conditions of Contract. In addition to it the scope includes getting the approvals from the statutory authorities (like IBR, smoke nuisance inspector, anti-pollution authorities, labour officials). This includes arranging for inspection visits of such authorities periodically as per requirement, submitting documents etc. and payment of fees connected with it.

3.6 Safety:

Contractor should engage at 01 no. Qualified Engineer in each shift during the contract period. Strict Safety measures have to be followed at Site. Contractor shall also adhere to all the safety provisions of our customer. In case violation of any provision at site fine of Rs.500/- to Rs.2000/- at the discretion of our site in-charge shall be imposed for each of such occasion and shall be recoverable from the contractor's bill.

1. The contractor should ensure the use of 24 volt hand lamps and 24 volt transformer by his workers. The all electrical gadgets shall have plug top & proper earthing.
2. All T&P like pulling and lifting machine, chain pulley blocks, slings, D-shackles should be maintained in proper working condition. Necessary test certificate has to be submitted by contractor for lifting tools & tackles. Third party testing certificates is also must in C.G.
3. The contractor shall be fully responsible for the safety of his workers.
4. The Use of ISI mark safety helmet, ISI mark safety shoes, Goggles, hand gloves, ear plugs and nose mask is a must. In addition to this, a full body (safety) harness, face shield must be provided to workers carrying out work at height & cutting/ welding/ grinding respectively. Gas cutting set with flash back arrester etc. should be provided by the contractor and should ensure the use of these safety equipment's, all PPE by his worker while working.
5. Scaffolding should be erected properly and strong enough with hand rails and it should not be used before getting it checked by Engineer-in-charge. it can be used after green tag from safety department.
7. The contractor shall be solely responsible for the safety of his workers & employees. The contractor must ensure that the persons working in site/nature jobs/ skilled jobs/ working with the welding machines, grinders, cutting set & other special T&P shall be having experience & expertise to perform that job. Contractor should engage physically and mentally fit manpower. The electrical connection / repair jobs shall be done only by the electricians.
8. The contractor shall ensure that prior to start of work all his workers shall get the safety training.
9. The contractor shall also take care for the safety of the equipments & persons working in the vicinity.
10. Customer at its own discretion may decide to recheck / retest some or all of the T&P / machines of the contractor inside the plant premises.
11. The helmets, safety shoes and safety belts issued by the contractor shall be conforming to relevant IS standards.
12. The contractor shall maintain the first aid box at site.

PROVISION OF PPEs

- Personnel Protective Equipment (PPEs), in adequate numbers, will be made available at site & their regular use by all concerned will be ensured
- The following matrix recommends usage of minimum PPEs against the respective job.

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Sl.NO	Type of Work	PPEs
1	Concrete and asphalt mixing	Nose mask ,hand glove ,apron and gum boot
2	Welders/Grinders/Gas cutters	Welding/face screen, apron, hand gloves, nose mask and ear muffs if noise level exceeds 90dB. Helmet fitted with welding shield is preferred for welders
3	Stone /concrete breakers	Ear muffs, safety goggles, hand gloves
4	Electrical Work	Rubber hand glove, Electrical Resistance shoes
5	Insulation Work	Respiratory mask, Hand glove, safety goggles
6	Work at height	Double lanyard full body harness, fall arrestor (specific cases)
7	Grit/Sand blasting	Blast suit, blast helmet, respirator, leather gloves
8	Painting	Plastic glove, Respirators (particularly for spray painting)
9	Radiography	As per BARC guidelines

- The PPEs shall conform to the relevant standards as below and bear ISI mark.

Relevant is-codes for personal protection

IS:2925-1984	Industrial safety Helmets
IS:4770-1968	Rubber gloves for electrical purpose.
IS:6994-1973(Part-I)	Industrial safety Gloves(Leather & Cotton Gloves)
IS:1989-1986	Leather Safety boots and shoes.
IS:5557-1969	Industrial and safety rubber knee boots.
IS:6519-1971	Code of practice for selections care and repair of Safety foot wear.
IS:11226-1985	Leather Safety footwear having direct molding sole.
IS:5983-1978	Eye protectors.
IS:9167-1979	Eye protectors.
IS:1179-1967	Eye & face protection during welding
IS:3521-1983	Industrial Safety Belt and Harness
IS:8519-1977	Guide for selection of industrial Safety equipment for body protection
IS:9473-2002,14166-1994, 14746-1999	Respiratory Protective Devices

The list is not exhaustive. The safety officer may demand additional PPEs based on specific requirement.

NOTE: All employee of vendor should wear company uniform along with company logo at work place. Please follow strictly. Otherwise it may lead to penalty under safety provision.

AGENCY SHALL ALSO FOLLOW NTPC SAFETY NORMS AT SITE (REFER ANNEXURE-I)

3.7 Important Safety Conditions: -Agency has to ensure utmost safety at all associated workplace/s. Penalty for non-compliance of safety rules each time.

- Non using safety shoes per person per occasion —Rs.1000
- Non using safety helmet per person per occasion —Rs.1000
- Non using safety belt per person per occasion —Rs.1000

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3.8 OTHER TERMS AND CONDITIONS

- 1.0 Successful agency has to extend manpower assistance for minor cleaning/scrapping, etc.
- 2.0 ~~A copy of tender document with each page duly signed and stamped shall be submitted along with your offer as a token of your unconditional acceptance to this tender condition.~~ Also any deviation to the tender conditions shall be submitted in a separate paper duly signed by the agency, any overwriting / correction by the agency on the tender will not be recognized and the offer may be rejected on this ground.
- 3.0 General and special conditions of contract' enclosed herewith will be fully applicable, except otherwise stated in this enquiry. In case of any conflict, the conditions specified in this enquiry letter will prevail over that of the 'General and special conditions of contract'.

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Chapter – IV: T&Ps and MMEs to be deployed by Contractor

4. LIST OF MANPOWER REQUIRED

Sl.No	Manpower	Category	No. of Persons
1.	Site-in charge	Highly Skilled	1
2.	Foreman	Highly Skilled	4
3.	Supervisor	Skilled	4
4.	Store Keeper	Skilled	2
5.	HP Welder	Highly Skilled	1
6.	Welder (Non IBR)	Skilled	2
7.	Gas cutter	Skilled	2
8.	Millwright Fitter	Highly Skilled	4
9.	EOT Crane Operator	Highly Skilled	4
10.	Sarang	Skilled	4
11.	Fitter	Skilled	10
12.	Electrician	Semi-Skilled	2
13.	Jr.Filter	Semi-Skilled	12
14.	Ins.n.Lagger / Carpenter	Semi-Skilled	1
15.	Grinder Man	Skilled	2
16.	Rigger	Semi-Skilled	4
17.	Helper	Un-Skilled	25
18.	Office Boy	Semi-Skilled	2
19.	Safety Engr	Safety officer	2
20.	Expert Manpower	Turbine, Generator, Governing Valves, & Associated Experts	1
Total manpower required			90 Nos.
Except Engaged Agency Manpower			Approx 10 nos.

This is an indicative list; the sub-contractor shall deploy adequate manpower to carry out the work round the clock and as per requirement of the site during execution of the Job.

Note: Site in-charge should be qualified Engineer, B.E. (Mechanical) and all the supervisors should have diploma in engineering.

Successful agency has to arrange suitable mobile communication facility for BHEL site-in charge

4.1 Man power & T&P:

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Chapter – IV: T&Ps and MMEs to be deployed by Contractor

- Adequate manpower along with T&P should be deployed at site. All the T&P required for the work shall be arranged by the contractor. All the measuring instruments shall be duly tested / calibrated and valid certificate to that effect should be submitted to our Site In-charge before start of the work.
- 1. A deployment plan along with experience and name of the Site In-charge, Engineers, Supervisors, Foreman and main technicians to be submitted on per shift basis.
- 2. LAP-TOP with latest configuration, DVD/CD writer, its peripherals including printer-scanner and one USB Modem for Internet connectivity to be provided for BHEL site office.
- 3. One office boy in each shift is to be provided for BHEL site office.
- 4. Well experienced experts (at Least 25 years' job experience) shall be arranged by agencies.

4.2 LIST OF TOOLS AND PLANTS TO BE ARRANGED BY CONTRACTOR

List of minimum Tools and Plant :

1. All necessary T&Ps and measuring instruments, etc., required for these jobs:

a) Handheld Tools: (4 Sets each)

Standard sizes of ring, D-spanner, Slogging spanners from M6 to M55, Pipe Spanners of Size M8 to M24. Hack saw frame with HSS Blades for pipe cutting, Flat and Needle files, Scraper. Slide and Pipe Wrench of size 350 mm and 600 mm, Allen Keys of size 3 mm to 32 mm. Socket spanners of size M8 to M36. Ball peen hammer, Claw hammer, Teflon and Brass head hammers.

b) Lifting Tools: (3 Set each)

Chain Pulley blocks of 2T, 5T and 10T with Huck-Chuk arrangement, Polyester/ Nylon or metal slings of 2T, 5T and 10/15 T along with suitable type of D-shackles. The party must submit the Load test certificate for above items before deploying at work. Hydraulic jacks of capacity 100 T, 50 T, 20 T.

c) Measuring Instruments: (3 Set Each)

Dial gauge (10 Nos per Set), Magnetic stand (10 Nos per Set), Micrometers, Inside Micrometer (0 to 2500 mm), Filler gauge (0.03 mm to 1 mm), Measuring tape, SS Scale, bore Gauge, Slip gauge set, Verniers of different sizes and ranges. Party shall submit calibration certificate for all measuring instruments.

d) Power Tools: (2 Set each)

Grinding machines i.e, of size 4"/5" and 7" with cutting/ grinding/ buffing wheels (sufficient qty), Single phase and Three Phase Welding machines with accessories, Gas cutting sets, heating torch, Induction heating machine, hydraulic torque wrench of suitable size and capacity.

The above-mentioned T&P are indicative only, however, if any other T&P required for the completion of the above-mentioned jobs, shall be in the scope of contractor. Party must bring these T&P- 5 days prior to the commencement of Overhauling.

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OTHER COMMON T&P

01. Taper gauge, slip gauge set, depth gauge and depth micrometer.
02. Feeler gauge sets, feeler strips of 0.03 to 0.10 mm size.
03. One set of 2-meter-long feeler gauge strips (0.05 to 1.0 mm).
04. Dial indicators New with magnetic bases (12 dials of diameter 40 mm travel – 5 mm).
05. Micrometers (inside and outside up to 300 mm, 450mm, 600mm & 1000mm).
06. Telescopic gauge (2 sets). Bevel protractor and combination sets.
07. Try square.
08. Straight edge for coupling and bearing checking.
09. Set of parallel blocks/ V blocks.
10. Vernier calipers, (150 and 300 mm), measuring steel tapes and 5 meters steel rulers.
11. Precision spirit level (with micro head).
12. 2 sets of D.E. and Ring spanners (6-36mm).
13. 2 sets of box spanners (6 to 20mm and 22-50mm).
14. Allen keys of various sizes (from 2mm. onwards).
15. D.P.Test Kit (with consumables).
16. Crowbars tin cutters, pliers (cutting plier, nose plier grip plier circlip-outside and inside).
17. Screw drivers and sledge hammers – 10 lbs – 1 lbs.
18. Adjustable wrenches, pipe wrenches and heck saws.
19. Single ended spanners (36 mm and above).
20. Flat, half round, triangular bearing scrappers-8", to 12".
21. Files flat round, half round and square, rough and smooth (sizes 6", 9" and 12").
22. Bench Grinders, straight grinders GQ4 and GQ6, Angle grinders.
23. Reamers upto 30 mm. Taper reamers.
24. Drilling machine with magnetic stand upto –30 mm with drill bits.
25. Flexible grinders with grinding stones and cutters of different Shapes and sizes, Angles Grinders and Sander machine.
26. Number punch, letter punch, centre punch and hole punches etc.....
27. Steel wire brushes, wire brush wheels, nylon wire brushes and Painting bushes.
28. Reamers and honing tools with proper jigs and fixtures for carrying out coupling hole Reaming /honing.
29. Lifting devices eye bolts, D-shackles, slings of various sizes Guide rods etc.....
30. Chain pulley blocks upto 10 tons-4,5 tons-4, 2 tons-4 pull/lift.
31. Copper/Brass rods dia. ½" to 1 ½"X450 mm.
32. Tap and die sets 6 to 36 mm.

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33. Surface plate 450 X 450 mm.
34. Torch light/hand lamps with cables, 230/24 V transformer.
35. Torque wrench and torque multiplier.
36. Wooden mallet, Nylon Mallet.
37. Hand glover-asbestos, Manila rope, asbestos cloth leather and Rubber gloves.
38. Set of needle files.
39. Air blower – electric.
40. Electric drills – ¼", ½", and 5/8".
41. Ball pen hammer of various sizes.
42. Gas cutting and heating set with torches regulators, hoses and cylinder minimum two sets).
43. Arc welding generator/rectiformers with regulator, cables, Electrode holders and shields, TIG welding holders.
44. Pneumatic – grinders.
45. Hose pipes for compressed air.
46. Bench vices.
47. Hydraulic jacks 5, 10, 25, 50 & 150 tons capacity and screw jacks- 5 to 10 tons.
48. Hydraulic pump for testing coolers and 500 V megger.
49. Electric switchboards with RCCB and flood light arrangements with fuse boxes and isolating switches, Plugs and sockets.
50. In addition to above T and P contractor will be required to fabricate fixtures such as pullers etc. for removal of any other equipments related to the scope of work.
51. Pedestal fans/air coolers.-04 nos if required
52. Wooden sleepers.
53. Wooden Planks.
54. Magnifying glass.
55. Plastic helmets, Fiber helmet.
56. Gas cutting/welding goggles, grinding goggles.
57. Bearing pullers.
58. Tarpaulin.
59. Insulation testers and Meggers 500 V and 1000 V at least 1 No. each.
60. Any other T and P as per requirement and as per our General and special conditions of Contracts.
61. Digital Multimeter
62. Analogue multimeter of Motwane make
63. Scaffolding materials
64. heating torch-4 nos, , Pneumatic / cutter.

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Chapter – IV: T&Ps and MMEs to be deployed by Contractor

NOTE:

1. The above list is only indicative for work in one unit; and not exhaustive. Arrangement for any other T and P required for completion of the job shall be the responsibility of the contractor and shall be arranged by him.
2. All the tools and tackles/measuring instruments shall be duly tested/calibrated and valid certificate to that effect should be submitted to our site in-charge before the start of work.

4.3 CONSUMABLES TO BE ARRANGED BY CONTRACTOR

(The list is indicative only and not exhaustive)

01. Kerosene oil.
02. Rustolene.
03. Petrol/white Petrol/Benzene/CRC/CTC/WD-40-% litre.
04. Grease/Graphite Grease.
05. Hacksaw Blades.
06. Waste cloth/Cotton.
07. Marking/lint free cloth/Muslin.
08. Asbestos cloth/Asbestos cord.
09. Prussian blue.
10. Graphite (flaked) powder/Molykote/Mosil.
11. Cardiom compound.
12. Holdtite/shellac/Gasket sealing compound.
13. Lead wire 1.0 m/1.5 mm/0.5 mm.
14. Liquid soap.
15. Carborandum grinding paste coarse/fine/Diamond lapping paste.
16. Emery papers/Rolls.
17. Cutoff wheels.
18. Grinding wheels.
19. Oil stones, Mounted wheels, rotary cutters.
20. D. P. test chemicals.
21. Gas Cylinders for cutting/welding.
22. Chalk pieces, marking pens, thermoschalks upto 400c
23. Insulation tape, Johnson Tapes.
24. Sander discs and wheels.
25. Polyethylene sheets.
26. Araldite, M. Seal, Instabond, Dendrite.

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27. CRC 2-26, white spirit.
28. Electric fuse wire, cables for the connections
29. 2.5 mm² Cu cable (flexible) of 200 mtr. length.
30. Ortho phosphoric acid
31. CRC Lectra-clean.
32. plastic sheet general purpose electrodes for welding purpose, industrial oxygen, acetylene, Nitrogen gas cylinder, epoxy gel red (make Dr. beck), Dilutenet, thinner, Hardener, EH 411/Metallon, E-2082, Bectol Red, Araldite, glass tape.
33. Infrared Temperature gun for breech nut opening.

NOTE:

The above list is only indicative for work in one unit & not exhaustive. Arrangement for any other consumables required for completion of the job shall be the responsibility of the contractor & shall be arranged by him.

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Chapter – V: Quality Requirements

QUALITY REQUIREMENT

- Various inspection/ quality control / quality assurance procedure/ methods at various stages will be as per BHEL/ customer quality control procedure/ codes/ IBR and other statutory provisions and as per BHEL Engineer's instructions.
- Preparation of quality assurance log sheets and protocols with customer's engineers, welding logs, other quality control and quality assurance documentation as per BHEL Engineer's instructions, is within the scope of work/ specification.
- A daily log book should be maintained by Area In-charge of contractor on the job incorporating erection / alignment / welding clearance /radiography / progress of work etc. and the same shall be submitted to BHEL. Also, daily reports shall be submitted to BHEL.
- All the important measurements like pre-assembly checking of alignment leveling/ centering work etc. shall be recorded in the daily log book with sketches based on BHEL drawings indicating readings/ measurements actually taken and signed by BHEL/ Customer/ Contractor representatives.
- The inspection/measuring and testing equipments should be of brand, quality and accuracy, as specified by BHEL engineer and should have valid calibration certificates traceable to national/international standards.
- Total quality is the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He will follow the instructions as per BHEL drawings and quality standards.
- The welder's performance will be reviewed from time to time as per the BHEL/ IBR standards and any welder not performing to the standards set by BHEL/ IBR standards will be removed from working, Contractor shall arrange for the alternate welders immediately.
- **STAGE INSPECTION BY BHEL / CUSTOMERS ENGINEERS**
Apart from day-to-day inspection/ stage inspection of equipments by BHEL engineers, the equipments may be checked at various stages by customer's engineers and quality assurance teams. Contractor shall arrange all labour, tools/tackles etc. for such inspections free of cost.

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Chapter-VI: Time Schedule

6.1 TIME SCHEDULE & MOBILIZATION

6.1.1 INITIAL MOBILIZATION:

After receipt of fax LOI, Contractor shall discuss with Project Manager / Construction Manager/BHEL Site In charge regarding mobilization. A Full-fledged team with T&P shall be mobilized **within 03 days on receipt of LOI or BHEL intimation.**

6.1.2 MOBILIZATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING, OVERHAULING ETC.

The activities for Overhauling shall be started as per directions of Site In-charge of BHEL. Contractor shall mobilize further resources (in addition to those required for activities under clause no. 6.1.1) as per requirement to commence LP TURBINE OVERHAULING AND GENERATOR BEARINGS 5 6 7 INSPECTION AND ASSOCIATED WORKS AT NTPC MOUDA ST II 2X660MW and progressively augment the resources to match schedule of the project.

OVERHAULING TIME SCHEDULE IS THE ESSENCE OF THIS CONTRACT. SUBCONTRACTOR SHOULD COMPLETE ALL WORK WITHIN 35 DAYS (FROM BAR TO BAR) OF TIGHT SCHEDULE.

As informed by NTPC, Overhauling of U-4 is scheduled w.e.f. 20.09.2026.

Validity of Contract: - 12 Month from the date of LOA.

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Chapter-VII: TERMS OF PAYMENT

Payment Terms: -

FOR SCHEDULE -01 to 09: -

1. 40% on completion of mobilization of site, completion of dismantling work. **Documents like Insurance & Labour License to be submitted along with first bill.**
2. 40% on completion of assembly work & machine put on barring gear.
3. 10% after synchronization of machine.
4. Final 10% on completion of defect liability period and payment of all dues and submission of all the documents like No Dues certificate from Customer/ HR clearance if required, EPF challan, Insurance, Labour License, Labour Payment sheets, proof of payment of GST, **Indemnity Bond to be submitted along with final bill** etc.

FOR OPTIONAL WORK (SCHEDULE-10 to 18):-

1. 90% after completion of work.
2. Final 10% on completion of defect liability period and payment of all dues and submission of all the documents like No Dues certificate from Customer/ HR clearance if required, EPF challan, Insurance, Labour License, Labour Payment sheets, proof of payment of GST.

Note:

1. **Amount linked to Safety/Compliance of safety rule: 2% of contract value is linked to safety and it will be released after full compliance of safety as mentioned in contract and certification of EIC**
2. **For final bill:** -If required documents are not submitted by agency within 90 days from the date of commissioning, then Penalty of 1% per week of the total contract value will be levied & it is subject to maximum 5% of the contract value shall be deducted from contractor 's bill.
3. Penalty of 1% per day of the total contract value will be levied for improper mobilization of man power and 1% per day for T & P and consumables separately subject to maximum 5% of the contract value shall be deducted from contractor 's bill
4. While submitting the invoices, Agency should mention their Bank Account No. on each of their invoices for the purpose of making e-payment.
5. The bill due for payment shall be submitted to the Engineer in-charge of BHEL **along with documentation of Refund of Retention Money Format No. F24 (Rev 00)** (revised format is attached in VOL I BCD 'forms and procedure') at site for necessary verification and processing through proper channel.
6. **Indemnity bond shall be submitted on first bill.**

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VIII: TAXES AND DUTIES

TAXES, DUTIES, LEVIES (Rev 14 dated 09/10/2020)

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- 1) All taxes excluding GST, GST Cess & BOCW Cess but including, Royalties, fees, license, deposits, commission, any State or Central Levy and other charges whatsoever, if any, shall be borne by you and shall not be payable extra.
- 2) Any increase of the taxes excluding GST, GST Cess & BOCW Cess, at any stage during execution including extension of the contract shall have to be borne by the contractor. Quoted/ accepted rates/ price shall be inclusive of all such requirements. Please note that since GST on output will be paid by BHEL separately as enumerated below, your quoted rates/ price should be after considering the Input Credit under GST law at your end.
- 3) **GST** :
The successful agency shall furnish proof of GST registration. GST along with Cess (as applicable) legally leviable & payable by the successful agency as per GST Law, shall be paid by BHEL. Hence Agency shall not include GST along with Cess (as applicable) in their quoted price.
- 4) GST charged in the Tax Invoice/Debit note by the contractor shall be released separately to the contractor only after contractor files the outward supply details in GSTR-1 on GSTN portal and input tax credit of such invoice is matched with corresponding details of outward supply of the contractor and has paid the GST at the time of filing the monthly return
- 5) E-invoicing under GST has been implemented with effect from 1st October 2020 for all the taxable persons having turnover more than the threshold limit in any preceding financial year from 2017-18 onwards. Therefore, for all the taxable persons falling under the purview of E-invoice, it is mandatory to mention a valid unique Invoice Reference No. (IRN) and QR code as generated from E-Invoicing portal of the Government for the purpose of issuing a valid Tax Invoice. Only an E-invoice issued in the manner prescribed under rule 48(4) of CGST Rules shall be treated as valid invoice for reimbursement of GST amount.
If the successful Agency is not falling under the purview of E-Invoicing then he has to submit a declaration in that respect along with relevant financial statements.
- 6) Agency shall note that the GST Tax Invoice complying with GST Invoice Rules (Section 31 of GST Act & Rules referred there under) wherein the 'Bill To' details will as below:
BHEL GSTN – As per **Annexure -1**
NAME -- Bharat Heavy Electricals Limited
ADDRESS – Site address
- 7) Agency to immediately intimate on the day of removal of Goods (in case of any supply of goods) to BHEL along with all relevant details and a scanned copy of Tax Invoice to below email ids to enable BHEL to meet its GST related compliances :-
Email id ---- to be intimated later on.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VIII: TAXES AND DUTIES

In case of delay in submission of the abovementioned documents on the date of dispatch, BHEL may incur penalty /interest for not adhering to Invoicing Rules under GST Law. The same will be liable to be recovered from the successful agency, if such delay is not attributable to BHEL.

- 8) In case of raising any Supplementary Tax Invoice (Debit / Credit Note) Agency shall issue the same containing all the details as referred to in Section 34 read with Rule 53.
- 9) Agency shall note that in case GST credit is delayed/ denied to BHEL due to delayed / non receipt of goods and /or tax invoice or expiry of the timeline prescribed in GST Law for availing such ITC, or any other reasons not attributable to BHEL, GST amount shall be recoverable from the vendor along with interest levied / leviable on BHEL, as the case may be.
- 10) Agency shall upload the Invoices raised on BHEL in GSTR-1 within the prescribed time as given in the GST Act. Agency shall note that in case of delay in declaring such invoice in your return and GST credit availed by BHEL is denied or reversed subsequently as per GST Law , GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from the agency along with interest levied / leviable on BHEL.
- 11) Way Bill: Successful Agency to arrange for way bill / e-waybill for any transfer of goods for the execution of the contract.

The Agency has to make their own arrangement at their cost for completing the formalities, if required, with Issuing Authorities, for bringing materials, plants & machinery at site for execution of the works under this contract, Road Permit/ Way Bill, if required, shall be arranged by the contractor and BHEL will not supply any Road Permit/ Way Bill for this purpose.

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

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

In case any new tax/levy/duty etc. becomes applicable after the date of agency's offer but before opening of the price bid, the agency must convey its impact on his price duly substantiated by documentary evidence in support of the same before opening of the price bids. Claim for any such impact after opening the price bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.

- 13) For transportation work, agency shall declare in his quotation whether he is registered under GST, if yes, whether he intends to claim GST on forward charge basis. In absence of this declaration, BHEL will proceed further with the assumption that agency intends not to claim

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VIII: TAXES AND DUTIES

GST on forward charge basis. However, in case of GST registered transporter, the amount to the extent of goods and service tax will be retained till BHEL avails the credit of GST. Further, transporter shall issue tax invoice which inter alia includes gross weight of the consignment, name of the consigner and the consignee, registration number of vehicle in which the goods are transported, details of goods transported, details of place of origin and destination, GSTIN of the person liable for paying tax whether as consigner, consignee or goods transport agency, and also containing other information as mentioned under rule 46.

- 14) **TDS under Income Tax shall be deducted at prevailing rates on gross invoice value from the running bills unless exemption certificate from the appropriate authority/ authorities is furnished.**
- 15) **TDS under GST shall be deducted at prevailing rates on applicable value from the running bills.**
- 16) **TCS under Income Tax 1961 has been implemented with effect from 1st October 2020 for every seller having turnover more than threshold limit during financial year immediately preceding financial year in which the sale of goods is carried out, who receives any amount as consideration for sale of any goods of the value or aggregate of such value exceeding threshold limit other than export of goods or who is already covered under other provision of section 206C, collect from the buyer, TCS as per applicable rates of the sale consideration exceeding threshold limit subject to following conditions**
- B**
- i. **uyer shall be as per clause (a) of section 206C- (1H)**
 - ii. **Seller shall be as per clause (b) of section 206C- (1H)**
 - iii. **No TCS is to be collected, if the seller is liable to collect TCS under other provision of section 206C or the buyer is liable to deduct TDS under any provision of the Act and has deducted such amount.**
- If Successful Agency is falling under the purview of TCS then he has to submit a declaration in that respect along with relevant financial statements before the start of work or if agency is falling under preview of TCS during the work in progress then agency is compulsorily required to submit relevant financial statement in the beginning of the respective FY.**
- For TCS claim, vendor has to submit relevant documents required as per Income Tax Act.**
- 17) **Refer Annexure – 2 for BOCW Act & Cess Act.**

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VIII: TAXES AND DUTIES

ANNEXURE-1

State wise GSTIN no.s of BHEL

Sl. No	Projects under state	GSTIN
1	Andhra Pradesh	37AAACB4146P7Z8
2	Bihar	10AAACB4146P1ZU
3	Chhattisgarh	22AAACB4146P1ZP
4	Gujarat	24AAACB4146P1ZL
5	Jharkhand	20AAACB4146P5ZP
6	Madhya Pradesh	23AAACB4146P1ZN
7	Maharashtra	27AAACB4146P1ZF
8	Orissa	21AAACB4146P1ZR
9	Telangana	36AAACB4146P1ZG

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IX: Schedule of Rates and Quantities

Sch no.	Description of Work	UOM	QTY	Percentage w.r.t total lumpsum price quoted in the price bid
1	TURBINE BEARING (BEARING NO-01 TO 04) INSPECTION	LS	01	14.29%
2	OVERHAULING /SERVICING OF LP TURBINE	LS	01	12.79%
3	NFT OF LPT LAST STAGE FREE STANDING BLADES AND MPI OF LAST TWO STAGES LP ROTOR BLADES.	LS	01	4.36%
4	SERVICING OF HPT STOP VALVES AND CONTROL VALVE FOR 660MW TURBINE	Nos.	04	5.85%
5	SERVICING OF IPT STOP VALVES AND CONTROL VALVES FOR 660MW TURBINE	Nos.	04	5.85%
6	LPBP VALVE OVERHAULING	Nos.	02	1.46%
7	OVERHAULING OF CRH NRV OF 660 MW UNIT	LS	01	0.73%
8	OVERHAULING OF EXTRACTION NRVS OF 660 MW UNIT	Nos.	04	2.18%
9	GENERATOR OVERHAULING: - DECOUPLING & COUPLING, ALIGNMENT, CRO OF LP-GEN, GEN-EXCITER AND SWING CHECK AT EXCITER END AND BEARING INSPECTION OF 5,6,7	LS	01	12.16%
	OPTIONAL.			
10	TD BFP TURBINE OVERHAULING	Nos.	01	8.83%
11	TD BFP TURBINE (TURB ROT) BALANCING	Nos.	01	7.62%
12	HP CONTROL VALVE/STOP VALVE / OVERLOAD CONTROL VALVE SEAT REPLACEMENT	Nos.	02	15.32%
13	LP HEATER (EXTRCN BELLOW) REPL	Nos.	01	1.25%
14	ATTENDING TO CC BOLT LEAKAGE OF GENERATOR ROTOR	LS	01	1.34%
15	REPLACEMENT OF MULTI CONTACT BAND	LS	01	0.67%
16	GENERATOR SEAL RING REPLACEMENT	NOS.	02	3.16%
17	ELECTRICAL TEST OF EXCITER SYSTEM	LS	01	1.18%
18	DEPUTATION OF TG/OTHER ASSOCIATED AREA EXPERTS	NOS.	01	0.96%
TOTAL Lump-sum value to be quoted by the agency in VOL II Price Bid			100%	