

**Scope of TG AOH for HEL**

**Bearing inspection:**

- I. Inspection of 4 TG bearings (bearing no. 1, 2, 7 and one bearing of Generator) and the thrust bearing. Bearing inspection includes the followings:**
  - a) Dismantling of bearings,
  - b) Measuring and recording 'as-found' readings including bearing clearances, seal bore, bridge gauge reading, oil seal clearances, slope, pedestal interference etc.
  - c) Measuring and recording thrust float, reference position of thrust bearing and adjustment of float as required.
  - d) Health assessment of bearings by NDTs (DP and UT),
  - e) Necessary bedding, as required,
  - f) Measuring and recording 'as-left' readings including bearing clearances, seal bore, bridge gauge reading, oil seal clearances, slope, pedestal interference, oil guard clearances etc.,
  - g) Final assembly,
  - h) Cleaning of pedestals and connected supply and drain lines.
  - i) Replacement of any one (1) no bearing and Thrust Pads, if required, will be under the job scope.
- II. Measurement of final axial float and assistance in rotor position instrument setting.**
- III. Swing check at bearing 7 and necessary correction, as required, to achieve desired swing value.**
- IV. Exciter pedestal bolt tightness checking.**
- V. Bearings Pedestal oil baffle and Bearing oil guard clearance checking and repair. Pedestal Oil Fins and Bearing Oil Glands (rings) will be replaced, as required, for Brg Pedestal Nos 1, 2, 5, 6 and 7 including the Thrust Bearing.**

**Other TG related Jobs:**

- I. Arrangement for Forced air cooling (FAC) including shifting of FAC equipment, hoses, assembly of hoses with air inlet points and subsequent disassembly after completion of turbine cooling.**
- II. Leak test of LP rupture disk and replacement of diaphragm if required. Renewal of LP manhole cover gaskets.**
- III. Inspection of LP rotor last row blades and bolts of LP diffusers including arrangement of proper scaffolding. Inspection of LP inner casing thermal shield and necessary repair, if required.**
- IV. Cleaning and Greasing of Front pedestal base plates, LPT turbine base plates and HIP Cylinder supports paws (4 legs), as required.**
- V. Cleaning and flushing of all bearing pedestals including disassembly and assembly of related pipework including JOP lift setting.**
- VI. Assistance for Air Tightness Test of Generator and necessary repair including Tite-seal injection as required to achieve permissible test result. The contractor will also arrange Pneumatic pump for Tite-seal injection into end shields.**

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- VII.** Inspection and overhaul of barring gear including backlash measurement, inspection of oil seals, chains and rectifications if required.

**Complete Overhauling of all Turbine Main Steam and RH Steam Stop and Governing Control valves and strainers:**

- I. Complete overhauling involving dismantling, inspection, repair and reassembly of RSV 1& 2, IV 1& 2, GV 1, 2, 3, 4, TV 1& 2 involving**
- a) Removal of actuators after decoupling from valve stem,
  - b) Dismantling of valves,
  - c) Cleaning of valves and its components,
  - d) Measurement of clearances and valve stem runout,
  - e) Replacement/refurbishment of valve components, as applicable,
  - f) Ensuring proper blue contact between valve cone and valve seat,
  - g) Assembly of components,
  - h) Inspection and refitting of actuators including replacement of actuator filters.
- II.** NDT of valves. The Job includes Dye penetrant test and Ultrasonic test of valve stem, disc, pocket, coupling and Dye penetrant test of valve bonnet, seat and steam chest.
- III.** MS and Reheat strainer inspection, cleaning and NDT as required. NDT of strainer includes Dye penetrant test of strainer body and weld joints.
- IV.** Replacement of strainer will have to be done, if required.
- V.** Assistance during Stroke adjustment/ Functional tests of TV, GV, IV & RSV valves.

**Offer will also include Cost towards following Optional Jobs (if required):**

- 1. Replacement of more than 1 no. bearing,
- 2. Inspection of additional bearings as stated above

**Note:**

**Vendor will also have to arrange the following tools & tackles:**

- a) Pneumatic pumps for Tite-seal injection into end shields.

**Other Exclusions:**

- 1. Turbine insulation removal & re-application.
- 2. Application of Paint.

**Other Conditions of Contract**

- 1.1. The contractor will have to visit the site before shutdown in order to record all pre-shutdown parameters including vibration signatures, abnormalities and defects of the Turbo Alternator set. These abnormalities and defects are to be rectified during the course of AOH/COH.
- 1.2. All mechanical jobs mentioned in the annexures have to be carried-out during AOH/COH. However, if unforeseen major findings are observed requiring major repair / refurbishment jobs which are normally not 'associated with the scope of work' mentioned in the annexures, and which will require additional resources and time, same shall be paid extra on prior approval of Owner's Engineer-in-charge.
- 1.3. All findings, materials damaged, materials required and readings captured during AOH/COH has to be submitted by end of each day.
- 1.4. All final protocol sheets for relevant measurement reading related to AOH/COH and Box-up protocols of Turbine Cylinders/Generator and associated components i.e. valves, bearing pedestals etc. will be duly signed by the Contractor and Owner's Engineer-in-Charge.
- 1.5. The contractor shall submit all inspection reports, the brief field survey report, and copies of signed protocol sheets, duly signed by both the contractor and the Owner's Engineer-in-Charge, to the Owner's Engineer-in-Charge before leaving the site. Furthermore, a Minutes of Meeting (MOM) must be signed by the contractor and the owner upon completion of the job and prior to leaving the site.
- 1.6. Contractor will have to submit detailed report with observations and photographs of AOH/COH within 30 days from the completion of job. The report of AOH/COH will include the following as applicable:
  - 1.6.1. All Electrical and other Test reports of Generator,
  - 1.6.2. All NDT reports of the bearings,
  - 1.6.3. NDT reports of all turbine modules including HP & IP or HIP and LP Turbines and their blades as applicable,
  - 1.6.4. All relevant measurements, both as found and as left reading format, to be recorded in relevant protocol sheets, and

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- 1.6.5. All observations including photographs are to be submitted within 30 days from completion of overhauling.
- 1.7. Job will be carried out round the clock. Hence the contractor will have to depute required manpower both in the Day and Night shifts.
- 1.8. Ensure Permit to Work is in place with proper isolation of turbine lube oil, generator seal oil, barring gear, control oil system, generator hydrogen purging, generator and exciter cooler cooling water lines, generator circuit breaker, exciter circuit breaker, and generator stator earthing as applicable, before commencing any job. Actual work shall begin only after discussion with the Owner's Engineer-in-Charge for proper coordination of parallel activities without affecting others.
- 1.9. Maintain proper records of all quality parameters and ensure the same are witnessed by the Owner's Engineer-in-Charge.
- 1.10. Carry out any required corrections, modifications, refurbishments, etc. along with all electrical tests of the Generator, only after prior discussion and approval from the Owner's Engineer-in-Charge.
- 1.11. Perform all visual inspections and NDTs (DPT, UT, etc.) in the presence of the Owner's Engineer-in-Charge.
- 1.12. Contractor shall provide all required NDT services, ensuring that the NDT team with all instruments and resources is available as and when required.
- 1.13. Refurbishment or replacement of defective parts found during visual inspection, DPT, UT, etc., shall be done by the contractor after discussion with the Owner's Engineer-in-Charge.
- 1.14. Inform in advance to Owner's Engineer-in-Charge if any resources under Owner's scope or inter-departmental coordination are required during AOH/COH, to ensure timely availability without affecting the work schedule. However, Owner's Engineer-in-Charge will co-ordinate and provide prior intimation to the contractor for sparing EOT crane for other requirements.
- 1.15. Assist in removal and refitting of instruments from the work area, ensuring all instruments are removed prior to starting work and refitted after completion.
- 1.16. Ensure adequate tarpaulin is available to cover all components after disassembly.
- 1.17. Loose clothes, cloth lumps, gunny bags, jutes etc. must not be used for covering open oil lines and steam lines. Preferably large tarpaulin sheets are to be used, and these sheets must be properly bound to external part of the oil/steam line. If any metallic or wooden

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cover is used, the same has to be properly secured. Contractor has to ensure no metallic wire or pieces of metallic cover goes into the lines. During working on these open ports for any activities including cleaning, special care must be taken to ensure no foreign object goes into the oil/steam line.

- 1.18. Before any final box up, visual and videoscopic examination of the internals and connected pipelines of turbine, generator, bearings, valves, MOP have to be done to ensure there are no foreign materials inside. Contractor must also ensure all related works have completed before box up to avoid rework.
- 1.19. Service air source will be provided by Owner; contractor shall arrange the required flexible hoses.
- 1.20. Owner will provide single-phase and three-phase power supply as per requirement and availability in the plant. Contractor shall arrange suitable distribution boards. General illumination is available. However, additional illumination requirement for carrying out AOH/COH jobs, is to be arranged by contractor.
- 1.21. Owner shall provide rubber mats and wooden sleepers for placing dismantled turbine parts. Contractor shall ensure the availability of adequate rubber mats prior to component removal.
- 1.22. Required spares will be provided by Owner.
- 1.23. Any damage to equipment, surrounding equipment, or spares while carrying out AOH/COH activities will result in penalties to the contractor. Special care will have to be taken to protect the turbine instrumentation cables/ cable harnessing.
- 1.24. Owner will provide pedestal grease, gaskets, general-purpose grease, ISOVG-32/46 oil, thick oil, RTV/silicone sealant, Stag-B, gasket adhesive, Molykote, Loctite adhesive, thread locker, special electrodes.
- 1.25. Gaskets other than special types, shall be cut and installed from appropriate gasket sheets.
- 1.26. Contractor shall provide general electrodes (E7018, E6013) as required. Special electrodes will be in Owner's scope.
- 1.27. Contractor shall provide all consumables such as marking cloth, cotton waste, rustolene, cleaner, DPT kits, lapping paste, emery papers, lead wires, wheat flour, etc.
- 1.28. Contractor shall arrange all types of tools and tackles including general and heavy-duty spanners, hydraulic jacks, portable power tools and their consumables, gas cutting sets

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with cylinders, welding machines, Allen key sets (metric and inch), tap sets, drill bits, reamers, etc.

- 1.29. All measuring tools with valid test and calibration certificates shall be arranged by the contractor.
- 1.30. Owner shall provide the special tools and tackles.
- 1.31. Contractor shall arrange transportation of spares, consumables and special tools and tackles from Owner's store to the site and return.
- 1.32. Upon work completion, the contractor shall clean the work area to the satisfaction of the Owner's Engineer-in-Charge. Disposal of scrap, waste, insulation, and debris generated during AOH/COH shall be done at the designated location, including transportation.
- 1.33. Contractor shall bear the cost for any damage or loss to Owner's property due to improper handling, storage, or fitting.
- 1.34. Contractor shall erect and dismantle approach platforms as required. Scaffolding material shall be arranged by the contractor.
- 1.35. Contractor shall submit a detailed work plan including bar chart and manpower deployment plan (category wise including IBR welders and EOT operators).
- 1.36. Safety Requirements: Contractor will comply with the safety norms followed by the Owner. Contractor will also ensure all of their workmen strictly follow these safety norms. To ensure safety of its employees also lies solely with the contractor.
- 1.37. Contractor will comply all the statutes and laws of the land. They will also ensure none of their employees/ engaged workforce involve in any unlawful activities.
- 1.38. Contractor shall provide all necessary IS-standard safety gears to workmen including helmets, goggles, shoes, gloves, and safety belts, etc. and ensure proper usage. Contractor shall ensure that safety awareness training is provided to all workmen before work begins.
- 1.39. A qualified safety supervisor shall be deployed exclusively for overseeing the safety of contractor's personnel and preventing hazards to nearby people or equipment.
- 1.40. All lifting tools and tackles must have valid test certificates from a competent authority under Factories Act, with proper identification marks, and contractor will submit the certificates to the owner.
- 1.41. All heavy liftings are to be done strictly following the lifting diagrams.
- 1.42. Contractor must comply with all gate pass procedures and safety training requirements, and shall report on-site prior to the start of overhauling for necessary formalities.

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- 1.43. If any machining is required, the same will have to be done at a competent workshop outside the plant. Supervision of machining to achieve design clearances at site and to and fro transportation from the workshop will be in the scope of the Contractor. Cost of machining will be under the scope of Owner.

**Annexure # A**

With reference to Other Conditions of Contract

Point No - 1.1 of Other Condition of Contract - The contractor will have to visit the site before shutdown in order to record all pre-shutdown parameters including vibration signatures, abnormalities and defects of the Turbo Alternator set. These abnormalities and defects are to be rectified during the course of AOH/COH.

In addition to contractor's pre-shutdown assessment, the below Observations & Defects are listed from our side for your rectification during AOH Period.

1. GV: 1 & 3 - Gland Leak
2. GV: 2 & 4 - Gland leak & Valve stem rubbing observed
3. GV: 2 - Coupling pin Damaged & Additional clamp placed over the coupling
4. RSV 1(L) - Struck once (During GT event – Restoration)
5. TV1/TV2 - Suspected Passing (Not comes to Barring)
6. **Generator** - Stator bar high temperature (Presently managed with Double pump operation & Reverse flushing)
7. TG#2 - Bearing No: 2 - Temp. increased post SD of 13.3.25 (both Gov & Gen end 5-6 Dec C increased)
8. TG#2 - T Brg, Rear Pad Temp is slightly on higher side than the TG:1 (61.0- 64.0 Dec C)
9. HRH LHS - Hanger support found disturbed & Misaligned at 12.0 Mtr
10. Diaphragm valve - Oil leakage (12.0 Mtr)

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<b>TG Auxiliaries Scope of Work</b>			
<b>Sl. No.</b>	<b>Job Description</b>	<b>Period of Activity</b>	
1	H <sub>2</sub> & CO <sub>2</sub> system maintenance & associated defects attending	Survey	
2	DEH & HP-LP Bypass Hydraulic System Maintenance & associated defects attending	Survey	
3	LP Piping Hanger Support Inspection	Pre Survey &	
		During Survey	
4	Turbine IBD Flash Tank Inspection & associated defects attending	Survey	
5	GSC, GSC fan, Gland Steam Header filters & Desuperheater Spray Nozzle Inspection & associated defects attending	Survey	
6	HPLP Bypass Valve Maintenance & Other Critical Valves: Assistance To Valve expert Technicians with Necessary Tools & Tackles	Survey	
7	TG Force Cooling Line Erection & Restoration	Pre Survey & Post Survey	
8	ACW Valves Servicing	Survey	
9	Seal Oil Skid and vapor extraction System overhauling & associated defects attending	Survey	
10	Stator Coolant System overhauling & associated defects attending	Survey	
11	Vacuum Pump with PHE A&B Overhauling & associated defects attending	Survey	
12	MOT Inspection, All 3 Pumps maintenance with cooler cleaning & vapor extraction fan maintenance & associated defects attending	Survey	
13	Condenser & Flash-box Inspection & associated defects attending	Survey	
14	CEP 2A & 2B O/H, suction strainers checking & associated defects attending	Survey	
15	Both Units BFP-A, B, C Overhauling & associated defects attending	Pre & Post Survey	



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16	DMCW-2A & 2B Overhauling, Suction Strainers checking & associated defects attending	Survey	
17	Deaerator Internal Inspection & associated defects attending	Survey	
18	HPH & LPH Inspection & associated defects attending	Survey	