

**BHEL::HYDERABAD
M&S-P&C DEPARTMENT**

TENDER REF.M&S/P&C/2019/100 DT.17/02/2020

**NAME OF THE WORK: OPERATION & MINOR REGULAR MAINTENANCE OF 6MW DG
SET, 1000 KVA DG SETS AND 166 KVA DG SET FOR 2 YEARS**

SCOPE OF WORK

Annexure II

**WORKS TO BE ATTENDED BY THE CONTRACTOR IN ROUND THE CLOCK
SHIFTS :**

- The staff of the agency has to operate and attend the minor maintenance of the 166 KVA (1 No.) Cummins make DG set, 1000 KVA (3Nos) Cummins make DG Sets and 6 MW (1 No.) Wartsila make DG Set simultaneously as per the instruction of the Engineer Incharge in round the clock shifts including on Sundays and all holidays.
- The staff should follow BHEL shift timings of 06:30 AM to 02:45 PM, 02:45 PM to 10:45 PM and 10:45 PM to 06:45AM. A minimum of an electrician, a Diesel Mechanic and a supervisor should be available in every shift. The supervisor should be capable enough to handle any electrical, mechanical rectification. The roles and responsibilities of the supervisor, electrician and Diesel mechanic are mentioned in detail.
- The contractor has to attend all the A and B Checks for all the 3 Nos of 1000 KVA DG Sets and 1No. of 166 KVA DG Set as per the recommendation of the manufacturer and the instructions of the Shift Incharge. The agency has to attend both mechanical and electrical checks as per the instructions of the OEM and site Incharge.
- The staff of the contractor shall check all the related parameters (Electrical and mechanical) in each and every shift and record the data for further evaluation. Party has to provide basic tools (Spanners, multimeter, 1000Volts Megger etc) to attend the maintenance activities. Special tools will be provided by BHEL. Apart from regular operation of DG Sets, the staff has to coordinate with the staff of OEM for attending scheduled (Minor) maintenance checks also.
- The agency shall prepare daily / weekly / monthly generation reports.
- Agency shall monitor engine performance and attend specific works issued by BHEL.
- Agency shall maintain Inventory records for consumables and spares, Fuel and Lube oil etc and inventory for overhauls and preventive maintenance and maintenance of proper records and also maintenance of special tools etc., required for overhauls.
- Agency shall maintain the records for Receipt of fuel oils.
- Agency shall attend the condition monitoring of raw water, cooling tower sump water and engine jacket water and its treatment and maintenance of proper records.
- Agency shall prepare daily and monthly efficiency reports of Power plants, Engine History Cards, Log sheets, recording of Engine parts and inspection measurements during overhauls.
- Agency shall attend condition monitoring of auxiliary systems and recording the parameters (Fuel oil and lube oil separators, etc.) of 6 MW DG Set and condition monitoring of 1000 KVA & 166 KVA DG Sets.
- Agency shall attend minor overhauls of the auxiliary systems like Booster unit, Feeder Unit, Supply system, Fuel Transfer system, Water pre Heater, NTC, Heat exchangers, Charge Air filer unit as per the instructions of OEM/Site Incharge. Also shall extend the support to OEM Engineers to compete their works (Separators -Alfa laval, Compressor - Ingresoll Rand and others).
- The maintenance of 6 MW DG Control panels, AVR Panels, Battery chargers will be attended by OEM/BHEL/Wartsila and party has to support the staff of OEM.

- Ensure battery terminals are clean and electrolyte levels of battery chargers. The condition of the batteries, battery chargers to be monitored in every shift and charge the batteries to meet the requirement. (Repairing of the chargers will be taken up by the OEM and party has to coordinate in repairing the sets.)
- The agency has to attend the following activities to keep the system in healthy condition:
 - Checking of Alternator terminal and cleaning of Alternator filters regularly.
 - Checking the terminals of all motors, auxiliary panels and tightening of the terminals.
 - Maintaining the drawings for 6 MW DG Set auxiliaries.
 - Ensure all cable and wire connections are clean and firm.
 - Ensure contacts in all LT Breakers are clean and mechanical operation is smooth.
 - Check all meters of auxiliaries periodically to ensure proper functioning and replacing if defective.
 - Ensure battery terminals are clean and electrolyte levels of battery chargers.
 - Maintain the earthing system to ensure earth continuity at all points in the electrical system up to the main distribution board in each area / zone and maintain all earthing pits with necessary watering etc. The party shall note down the earth pit values for every three months.
 - To ensure proper maintenance of all indicators, panels and alarms of Auxiliaries.
 - Party has to regularly check the values of heat tracing system of all the lines and tanks to maintain the temperatures of the oils and lines. The control panel has to be checked for loose contacts and currents shall be noted regularly. In case of failure of any heat tracer same shall be intimated for necessary repair by the OEM/Supplier.
 - The agency has to attend the maintenance of interior and exterior lighting at DPH.
 - All the mechanical and electrical spares / consumables and special tools will be issued by BHEL free of cost.

Exclusions and special instructions:

- AMC of 6 MW DG Set will be awarded to OEM, Wartsila and agency shall co-ordinate in the execution of the works.
- The major overhauls of 6 MW DG Set, 1000 KVA DG Sets, 166 KVA DG Set will be carried out by engaging OEM and the works will be taken up separately by Department.
- The AMC/Breakdown/Major Maintenance of auxiliaries like Ingersoll Rand compressors, Alfa Laval Separators, Water Softening plant, Heat Tracing systems, Cooling Tower and Ventilation system will be taken up separately by BHEL and agency shall assist the OEM Engineers to complete the work.
- Maintenance of Insulation works, Heat tracing works, additional piping works if any will be taken up by the Department separately.
- Motor rewinding/ engine starting motor repairs will be taken up by BHEL.
- BHEL will takeup the testing of protection relays installed in the HT & LT panels through other agency.
- All the spares, consumables will be issued by BHEL at free of cost.

ELIGIBILITY CRITERIA FOR THE STAFF OF CONTRACTOR:

- The supervisor shall have Diploma with minimum 1 year of Experience or ITI with 3 years of experience in operation and maintenance of (capacity 1000KVA and above) DG Sets.
- The Electrician shall have ITI with minimum 2 years of experience in operation and maintenance of Wartsila/Cummins/Other make (capacity 1000KVA and above) DG Sets.
- The Diesel mechanic shall have ITI with minimum 2 years of Experience in operation and maintenance of Cummins/ Wartsila/Other make (capacity 1000KVA and above) DG Sets.

THE ROLE AND RESPONSIBILITIES OF CONTRACTOR STAFF:

THE SUPERVISOR

- Inventory records for consumables and spares, Fuel and Lube oil etc. and inventory for overhauls and preventive maintenance and maintenance of proper records.
- Receipt of fuel oils and maintenance of records.
- Maintenance of special tools etc., required for overhauls.
- Condition monitoring of raw water, cooling tower sump water and engine jacket water and its treatment and maintenance of proper records.
- Prepare daily and monthly efficiency reports of Power plants, Engine History Cards, Log sheets, recording of Engine parts and inspection measurements during overhauls.
- Maintain the records of engine parameters and evaluation of equipment performance and condition.
- Evaluation of the logbook data from engine readings and reports on fuel and lubricating oil.
- Condition monitoring of auxiliary systems and recording the parameters (Fuel oil and lube oil separators, etc.).
- Preventive maintenance of the auxiliary systems as recommended by the manufacturers.

B) ELECTRICIAN

- Electrician will be in each shift to attend the electrical problems and operation of DG Sets including the synchronization of 1000 KVA and 6 MW DG Sets.
- Shall be responsible for recording, Monitoring of engine parameters during the shift and checking the operation of all auxiliaries.
- Responsible for panel operations and recording and monitoring the panel parameters and communicate the engine loads to MRS.
- Ensures proper operation of engines.
- Attends day-to-day maintenance activities.
- Ensures proper operation of L.O. separators / H.F.O. separators, cooling towers, ventilation systems and raw water pumps etc.
- Receipt of HSD / H.F.O. tankers under the supervision of BHEL.
- Maintains all settling tanks, day tanks and cooling tower sump levels.
- Maintaining the heat tracing system records and attending minor breakdowns at panel side like replacement of fuses, relays and thermostats.
- The Electrician shall monitor and report the failure of Heat tracers and coordinate for the replacement by OEM/BHEL.

C) DIESEL MECHANIC:

- Diesel mechanic in each shift shall attend mechanical problems & operation of DG Sets.
- Ensures proper operation of engines.
- Attends day-to-day maintenance activities.
- Ensures proper operation of L.O. separators / H.F.O. separators, cooling towers, ventilation systems and raw water pumps etc.
- Receipt of HSD / H.F.O. tankers under the supervision of BHEL.
- Maintaining of all settling tanks, day tanks and cooling tower sump levels.
- Shall be responsible for recording, Monitoring of engine parameters during the shift and checking the operation of all auxiliaries.
- Attend all the breakdown calls, Check peak pressures and record and cylinder tightness.
- Keeping all pumps, gearboxes clean and ensure proper functioning.
- Keeping spare cylinder head / fuel pumps / injectors etc ready for using in emergency.

Operation and breakdown Time

1. Records

- 1.1 DG will be operated on the instructions given by MRS – DG staff will receive the call for a specified MW level. The time of Call will be recorded in the DGlogbook.
- 1.2 It is a 24-hour operation.
- 1.3 Every operation will be recorded in the Register with MRS.
- 1.4 Once the call is received from MRS, the DG should be started within 15 Minutes. Beyond 15 minutes will be noted as Downtime.
- 1.5 The time of start of DG sets will be recorded on achieving the said MW capacity by MRS.
- 1.6 MRS will maintain the Time record of request to the DG set, the instance of start of DG and drawing power, the instance of tripping of DG or stopping of DG set.
- 1.7 In case the DG set Trips, it will be accounted as Breakdown.
- 1.8 A minimum labor to be deployed in every shift of Operation.
- 1.9 The time of start of DG, breakdown time will be recorded in the DG log book. Payment will be made based on the Breakdown time

2. Breakdown/Down Time

- 2.1 The following will constitute Breakdown time
 - 2.1.1 Time between Tripping of DG set during operation and running it again.
 - 2.1.2 Late start of DG beyond 15 minutes period.
 - 2.1.3 Breakdown maintenance of DG at the time of requirement given by MRS
 - 2.1.4 Non availability of required staff to operate DG.
- 2.2 The following will not constitute Breakdown time
- 2.3 If the breakdown is due to non-availability of Spares.
- 2.4 Preventive Maintenance of DG sets.

3. Penalties for Breakdown

- 3.1. The following are the penalties for Breakdown
- 3.2. Breakdown percentage will be calculated as downtime / total no. of running hours of DG sets.
- 3.3. Breakdown Percentage should be less than 5%. Otherwise, Penalty will be applied @5% of the total monthly bill, thereof for every increase of Breakdown percentage by 1%; additional penalty of 1% will be levied. Penalty will be on Monthly operation.
- 3.4. In case, the required staff is not available to operate the DG and start the DG within 15 minutes the downtime will be calculated for the total days DG operation.

4. Penalties on Preventive Maintenance

- 4.1 PM to be carried out as per Daily, Monthly and Quarterly operation of the DG as instructed by BHEL.
- 4.2 Non completion of PM activities will constitute of delay and the delay will be calculated.
- 4.3 The total delay will be calculated and penalty levied as per standard Penalty clause.