BHEL::RC PURAM **ANNEXURE-I**
M&S – P&C SECTION

TENDER REF No:M&S/P&C/2020/47 Dated: 01.09.2020

SCOPE OF WORK

OPERATION & MAINTENANCE Works/Activities are broadly divided into Two categories viz.:

1. **Operation Activites**
2. **Maintenance Activities**

These are explained below:

1. Operation Activities :

1.(A). The agency should be responsible for Operation and Maintenance of Boiler House that consists of

a) 20 TPH HFO fired Boiler with heating surface 817 M^2 and its auxiliaries.
b) 30 TPH HFO/Gas (LPG) fired Boiler with heating surface 1280 M^2 and its auxiliaries.
c) 4 TPH LPG Gas fired boiler with heating surface of 103 M^2 and its auxiliaries.
d) DM (De-mineralized) plants of capacity 10 TPH and 2 x 20 TPH with Ion Exchangers.

1.(B). Normally any one of the above boilers will be under operation as per the requirement; two boilers are required to be operated occasionally based on the specific requirement.

1.(C). Vendor should be IBR approved agency (class-1 category IBR boiler repairer), familiarized with IBR formalities.

These are the basic activities which facilitate the O&M of Boilers to be performed by the contractor. The contractor has to strictly adhere to these and ensure complete compliance.

1.(D).Mandatory Staff to be deployed by contractor:

The Operation and Maintenance of boilers are required to be carried out as per applicable statutory IBR act (as per latest amendments).

Statutory compliance and mandatory staff to be maintained as detailed below including the number of operations to be deployed compulsorily by the contractor:

Following IBR statutory requirements, the Boilers are required to be operated by a qualified Ist class Boiler attendant, 2nd class Boiler attendant, and Experienced DM plant operators for running the DM plant. All mechanical Maintenance works are to be attended by IBR approved welder. Electrical works are to be attended by experienced Electricians. Instrumentation works are to be attended by Experienced Instrument technician. Sufficient number of Helpers are to be engaged for assisting in Operation and Maintenance works apart from housekeeping works as per the scope.

The above work force shall be utilized for uninterrupted 3-shift operation of Boilers, DM plant and for supply of Steam and DM water to testing and process departments for 254 days (as and when required).

Vendor should co-ordinate in deputing required work force in all the three shifts as per Operation and maintenance of Boiler House works as detailed below.

S.No	Details of staff (mandatory deployment)	No of working days per year
1	Ist class Boiler operators operations	762
2	2nd class Boiler operators operations	762
3	IBR approved Welding operations	254
4	DM plant operations	508
5	Electrician	254
6	Instrument technician	254
7	Helpers	1270

Note: One working day = 8 hrs. One Operation = One Month .Total 12 Operations/Year

1.(E): Operational activities and Other General activities:

1.E.(1). Operate the 4TPH,20TPH,30TPH Boilers following S.O.P. and supply the steam to testing plants.

1.E.(2). Operation of De-mineralization plant and supply the required DM water for Boilers and other shops.

Detailed operation activities as follows.

S.No	**DM plant operation**
1.	Raw water filling in MGF
2.	MGF back washing
3.	Raw water filling in DM plant vessels
4.	Filling LP dosing chemicals
5.	Filling HP dosing chemicals
6.	Operation of LP and HP dosing pumps
7.	Operation of raw water pumps
8.	Operation of De-gasifier pumps
9.	Operation of DM water pumps
10.	DM water supply to 04block/05block/01block/Turbo compressor/Turbine test/Rotor shop/Boilers
	Cation Regeneration
11.	Chemical filling in measuring tanks
12.	Back washing
13.	Acid injection
14.	Rinsing
15.	Taking into Service
	Anion Regeneration
16.	Chemical filling in measuring tanks
17.	Back washing
18.	Alkali injection
19.	Rinsing
20.	Taking into Service
	MB Regeneration

21.	Chemical filling in measuring tanks Acid/Alkali
22.	Back washing
23.	Alkali injection
24.	Acid injection
25.	Rinsing
26.	Taking into service
	Boilers Operation
27.	Operation of Boiler feed pumps
28.	Operation of flue gas gates
29.	Operation of HFO unloading pumps
30.	Operation of HFO transfer pumps
31.	Operation HFO pumps
32.	Operation of LDO pumps
33.	Operation of HFO steam heaters
34.	Operation of HFO electric heaters
35.	Operation of valves
36.	Light up of Boiler
37.	Operation of Boiler
38.	Logging of Boiler operation, DM plant operation, parameters, collection of samples and Submission of reports
39.	Preservation of Boilers during shutdown as per advice of Boiler House in charge.
40.	Preparation for hydraulic test and doing
41.	Natural Cooling of Boiler
42.	Shutting down of Boiler
	House Keeping,5S & Miscellaneous works
43.	Weekly floor cleaning of all Boilers and their surroundings
44.	Weekly cleaning of Old and New DM plant floors
45.	Weekly cleaning of Lab & Office rooms
46.	Weekly cleaning of control rooms and their surrounding areas of all boilers
47.	Weekly cleaning of HFO storage tank area
48.	External cleaning of Boiler, Boiler auxiliaries and DM plant equipment once in a month.
49.	Quarterly cleaning of DM storage water tanks and pumps.
50.	Miscellaneous minor painting works
51.	Grass cutting in Boiler House area once in 30 days.
52.	Daily cleaning Chemical storage areas.
53.	Unloading and handling of HCl, NaOH, HFO, LDO and DM plant chemicals with all safety precautions.
54.	Attending Minor furnace refractory works

2. Maintenance Activities

2.(1).The agency is required to carry out following mechanical maintenance works i.e:
Repairs of Boiler feed pumps (Excluding total over hauling of Boiler feed pumps)
FD fans, ID Fans
DM pumps

Chemical dozing pumps
Air driers (Excluding Total overhauling)
Boiler and DM plant auxiliaries
Minor Boiler and its tubes repair work
Running, Predictive breakdown & Preventive maintenance.
Consumable / spares will be supplied by BHEL.
(Note: Major breakdowns in which major IBR repair involves, for example, replacement of Super Heater Coils, replacement of Economizer coils, replacement of water wall tubes, steam line repair/modifications, alterations in the boiler will be separately attended by BHEL).
2.(2). No extra amount will be paid for any works/modifications related to improvement of Boiler House work area.

2.(3). **All tools and tackles** (Mechanical/Electrical/Instrumentation etc.) required for execution of contract is in the scope of the **Contractor**.

2.(4). All Spare parts will be provided by **BHEL**.

2.(4). The agency is required to provide PPE like safety shoe, helmet, Leather gloves, Nose masks, Uniforms to all contract work force.

2.(5). In addition to above, Gumboots, Rubber gloves, Apron and spectacles for DM plant operators to be arranged.

2.(6). In addition to above, welding helmet, goggles are to be arranged for IBR welder.

2.(7). The contractor should provide all the required safety items, tools and instruction to the staff working in plants. Special safety care shall be taken while working in critical areas like Furnace, ovens, LPG Equipment's..etc.

2.(8). The contractor and his manpower should take optimum care in handling the process instruments during repair /maintenance/Calibration and prevent any damage/misplacement/mishandling due to negligence

2.(9). The agency is required to arrange gate passes for their manpower for working days and holidays(if required) from time to time.

Detailed Maintenance activities are as follows

	Mechanical Maintenance Activities
1)	HFO pumps oil leakage arresting
2)	HFO pumps strainers cleaning
3)	Gasket replacement for oil steam heaters
4)	Steam line leaks in HFO station
5)	Oil heater coils replacement
6)	30TPH FD Fan coupling bush pins replacement
7)	20TPH FD Fan coupling spiders replacement
8)	20TPH FD Fan motor alignment
9)	20TPH FD Fan bearings replacement
10)	30TPH FD Fan bearings replacement
11)	30TPH FD Fan oil top up
12)	30TPH FD Fan balancing
13)	30TPH FD Fan and motor alignment

14)	30TPH FD Fan Power cylinder adjustment and freeing
15)	30TPH FD Fan dampers free movement
16)	4TPH,20TPH,30TPH Burners cleaning
17)	4TPH,20TPH,30TPH Burner vanes free movement
18)	LPG valves mechanical free movement
19)	BFP suction strainers cleaning
20)	All BFP glands replacement
21)	All BFP coupling removal and re-fixing
22)	All BFP bearings replacement
23)	All BFP and Motor alignment
24)	Feed water valves maintenance /replacement
25)	Steam valves replacement/repair
26)	Feed water, steam lines leaks arresting
27)	Minor insulation repairs
28)	Steam traps replacement
29)	Platforms Repair
30)	Staircase repair/replacement
31)	Boiler skin plate repair works
32)	Minor Boiler refractory repair works
33)	Boiler flue gas duct repair works
34)	Flue gas duct bellows repair/replacement
35)	Gauge glass repair works
36)	Guards preparation for couplings
37)	Maintaining 5S in work area
38)	Galvanized Sheds repair works
39)	Small New sheds arrangement
40)	Small Electrical panel preparation
41)	Structural alterations
42)	Glands ,Gaskets replacement
43)	Replacement of love joy coupling spiders
44)	Erection of small pipe lines
45)	Small structural supports for new equipment’s
46)	Air headers preparations, Alterations, Modifications
47)	Motor foundation bolts replacement
48)	Daily checking of Oil, Grease for all Motors & Bearings
49)	Arresting small boiler tube leaks
50)	DM plant valve diaphragms replacement
51)	DM plant vessels leaks arresting (Excluding rubber lining failures)
52)	DM plant valves leaks arresting
53)	DM plant pumps couplings replacement
54)	DM plant Stainless Steel bolts replacement
55)	Rubber Gaskets replacement
56)	Opening of vessels for resin replacement and fixing
57)	Laterals repair in DM plant vessels

58)	Water line repairs
59)	Miscellaneous works
60)	Doing Hydro test and Arresting leaks

2.(10). <u>Instrumentation Maintenance Scope of Work</u>

The following are the list of instrument maintenance activities in the Boiler House, which are to be executed

S.No	Activity	Description
a)	Replacement of Thermocouples/RTDs	When the thermocouples are due for calibration or malfunctioning or suspected to be out of accuracy, they are to be removed from the different types of mounting after taking the clearance from the operator. Spare thermocouples are replaced in the same place temporarily and due thermocouples are bought to department for onward submission to E&I lab to carryout calibration.
b)	Checking of level transmitters and flow transmitters	Defect or malfunctioning of level transmitters and flow transmitters are to be attended immediately. The system should be isolated from the rest of the system to safeguard the line.
c)	Repairing the pneumatic controlled valves and adjustments.	All the associative components such as I/P controllers, positioner transmitters, positioner, air regulator, air lock relay etc. are to be checked individually as well as after assembly. Relevant Signal cable connection as well as impulse lines are also to be fitted along with 5way or 3way valves. Regular calibration to be done for positioner and position transmitter.
d)	Signal cables and compensating cables maintenance.	All Signal cables and compensating cables to be checked regularly. If required replacing and proper routing from sensors (level, flow, temperature, pressure, vibration etc) to indicating instrument as well as controlling circuits or to control room ensuring proper isolation from hot steam pipes is to be done.
e)	Cleaning and removing of old Pressure gauges	Pressure gauges used in different points in various environments are to be removed and cleaned from dust, oil or dirt. They are to be handed over to different calibration agencies. It involves lot of manual labor and time in addition to care handling.
f)	Supporting/attending Breakdowns related to Instruments	Any complain in respect to defect or malfunctioning of instruments inside boiler house, is to be attended immediately which often during ongoing process also which needs skill work and vigilance.

g)	Signal wires connected to PLC and DCS.	Hundreds of signal wires are running from various sensors to I/P and O/P marshalling panels and further to control panels are to be taken care and identified as and when required while carrying our maintenance work.
h)	Installation of flame relay and flame sensor.	Flame relay and flame sensors are installed to detect the flame inside the furnace and signal is routed to PLC or DCS as required.
i)	Supporting/attending Breakdowns related to Communication cables	Communication cables in the DCS/PLC panels and between operator and engineer desk and panel need to be checked regularly and to be replaced if needed.
j)	Maintenance of display and control units	Sequence controllers, level, pressure, temperature display units to be maintained.
k)	Supporting/attending Breakdowns related to DCS/PLC/control system	Support to M&S Instrumentation Department/ External Agency or attend Breakdowns related to 30TPH DCS, 20TPH Boiler PLC and 4 TPH Boiler control system

2.(11).Instruments and Devices to be handled/maintained (Not limited to the list)

a) Sensors (Thermocouples, RTDs, etc)
b) Transmitters
c) Control valves
d) Positioners
e) Position transmitters
f) Air Regulators
g) I/P Convertor
h) Air Lock relays
i) Pressure Gauges
j) Pressure Switches
k) Flame Scanners
l) Sequence controllers
m) Flame Relays
n) Repeaters & Optical Isolators
o) Positioners

2.(12). Breakdown Maintenance

Contractor Should provide manpower in 1St and 2nd Shift in all working days and if required in 3rd Shift and holidays also.

2.(13). Manpower

2.13.a) The contractor Should depute adequate trained and experienced man power for attending all instrumentation works.

2.13.b) Minimum qualification required – Technicians should have at least ITI (Electrical/Electronics/Instrumentation) or higher qualification. Min qualification certificate has to be submitted along with offer.

2.13.c) All the manpower should be physically fit.

2.13.d) Total working days for which man power is to be engaged minimum **254** days in one year

2.(14).Electrical Maintenance Scope of Work

The following are the list of Electrical activities in the boiler house, which are to be executed

1	Operation OF MOVs and Electrical actuators.	Total MOVs (motor operating valve) and Electrical actuators are being operated and maintained.			
2	Maintenance of Lighting, power points, Lights, fans of boiler House	Preventive as well as corrective maintenance are to be carried out as and when required which covers general lighting, power supply, flood light, focus lights, and wiring replacement if required.			
3	Maintenance of Spark plug & Ignitors	Regular checking and maintenance of spark plugs and wiring from electrical transformer to spark plug and Ignitors			
4	Electromagnetic solenoid valves	Various connections are required to solenoid valves, operation to be checked from DCS and PLC and faulty valves to be repaired or replaced.			
5	Supporting/attending Breakdowns related to VFDs	Support to M&S Instrumentation Department/ External Agency or attend Breakdowns related to VFD			
6	Maintenance of Power supply to control panels, UPSs and Operator& Engineering Desk	Power supply to control panels, UPSs and Operator& Engineering Desk to be checked regularly and if required faulty cables to be changed			
7	Maintenance of MCC panels	MCC panels are to be checked regularly and replace/repair the defective cables, parts like contactors, relays, timers, MCCBs, push buttons etc			
8	Maintenance of Incoming supply and power distribution panels	Incoming supply and power distribution panels are to be checked regularly and replace/repair the defective cables, parts like contactors, circuit breakers, relays, timers, MCCBs, push buttons etc			

9	Maintenance of Star to Delta converters and other Electrical motors control and protection panels	Star to Delta converters and other Electrical motors control and protection panels are to be checked regularly and replace/repair the defective cables, parts like contactors, relays, timers, MCCBs, push buttons etc			
10	Maintenance of power cables and terminations	All the power cables (from Incoming to the loads) and termination at incoming and loads in boiler house to be checked regularly and replace/repair the defective cables			
11	Misc electrical works.	Minor modification to the existing electrical equipment and installation of new electrical equipment to be done.			

2.(15).Electrical Equipment and Devices to be handled/maintained (Not limited to the list)

a) Feed water Motors (around 225 KW)
b) FD & ID fan motors (around 100 KW)
c) DM Water pump
d) Condensate pump
e) HFO Pump
f) HP & LP dozing pump
g) Raw water pumps
h) De-gasifier pumps
i) Solar Heater pumps
j) Motor Operated valves
k) Electrical Regulating valves
l) Solenoid valves
m) MCC Panels
n) Star –Delta panels
o) Starter panels
p) Ignitors
q) Lighting and power supply points
r) Lights and fans
s) All power cables
t) Circuit breakers

2.(16) Type of Work to be Attended

The contractor has to support / Attend all type of problem related to the Electrical and Undertake repairs, replacements and modifications as required

2.(17) Breakdown Maintenance

Contractor should provide manpower in 1St and 2nd Shift in all working days and if required in 3rd Shift and holidays also.

2.(18) Manpower

2.18.1) The contractor should depute adequate number of trained and experienced man power for attending all the electrical related problems.

2.18.2) Minimum qualification required –Technicians should have at least ITI (Electrical) or higher qualification with 3 years' experience in similar field

2.18.3) All the manpower should be physically fit.

2.18.4) Total working days for which manpower is to be engaged minimum **254** days in one year.

2.18.5) Incoming & MCC complaints are to be taken care by the contractor.

3. BHEL's Scope:

3. (a) Water, Electrical Power, Consumables like Cotton waste, Lubricants, Electrodes, Chemicals, Paints for Boiler House auxiliaries & required spares will be supplied by BHEL on free of cost. Rubber lining, FRP coatings, HDPE lining works will be in scope of BHEL.

3. (b) Payment of fee for statutory requirement to boiler inspectorate for repair work will be in the scope of BHEL.

3. (c) Annual cleaning & arrangement for Inspection by Director of Boilers will be in the scope of BHEL.

3. (d) Supply of pressure parts like tube spool pieces in case of minor IBR repairs will be in the scope of BHEL.

Note:

1. All other works needed for smooth and efficient running of Boilers, DM plants, Compressors and its auxiliaries except above specific BHEL scope of works will be in the scope of O&M contract agency.

2. Before submitting the quotations, the agency should understand the scope of work and can visit the site for further clarifications if any.

3. No accommodation will be provided by M/s BHEL for the contractor manpower.

4. Any Loss/Damage to the Boilers and DM plants due to improper operation or maintenance will be recovered from the contractor bills.

4. Payment Terms:

Contractor shall claim monthly bills duly certified by executing agency enclosed with all the required documents and duly attested log sheets. Frequency of the bills shall be monthly.

Monthly Bill payment will be made by ensuring:

4.(a): Successful completion of Operational and Maintenance activities as per attached scope of work.

4.(b): Attending and completing the break down works in time

4.(c): Attending preventive maintenance works as per scope of work.

4.(d): Co-ordination with IBR officials and maintaining statutory requirements for smooth running of Boilers.

4.(e): Ensuring issue of PPE to all contract manpower.

4.(f): Ensuring required Tools & Tackles arrangement by contractor

4.(g): Ensuring monthly salary payment to workers. Bank salary payment statement to be attached along with monthly bill claim.

5. Penalty terms:

5(a). Penalty will be levied in case of non-deployment of workmen.

Following amount will be deducted against non-deployment of each staff for each working day.

S.No	Details of staff	No of working days per year (One working day means 8 hours)	Following amount will be deducted against non-deployment of each staff for each working day in rupees
1	Ist class Boiler operators	762	650
2	2nd class Boiler	762	600
3	IBR approved Welder	254	650
4	DM plant operator	508	600
5	Electrician	254	650
6	Instrument technician	254	650
7	Helper(s)	1270	550

5.(b). Penalty will be levied in case of not attending Operational and Maintenance activities as per scope, notwithstanding any of the conditions stated above will lead to deduction of appropriate Penalty amount from contractor bills as following.

S.No	Description	Number of working days per year	PENALITY
1	Interruption to supply of Steam & DM water as and when required (owing to not attending operational activities as per scope of work).	254	Rs.6600 per day
2	Interruption to Operation of Boilers, DM plant and auxiliaries in Boiler House (owing to not attending Maintenance activities as per scope of work).	254	Rs.3050 per day

5.c. Uniform Penality

The Contractor shall provide two pairs of stitched Uniform to each of his workmen and catering cap as specified by BHEL. The Contractor is required to submit proof of expenditure incurred and acknowledgement from his workmen for providing stitched uniform. If contractor fails to provide the said stitched uniform, Rs.1000/- will be deducted as penalty against each workmen engaged during the contract period. **BHEL shall not re-imburse any amount towards Uniform to the contractor. He has to consider the same in his quote.**

5.d. PPE Penality

The contractor shall provide Personal Protective Equipment including one helmet, one pair per year safety shoe of standard specified by BHEL safety department and two pairs of socks to all his workmen during the contract period. The contractor is required to submit proof of expenditure incurred in providing Personal Protective Equipment to his workmen. If contractor fails to provide the said PPE, Rs.800/- will be deducted as penalty against each workmen engaged during the contract period. **BHEL shall not re-imburse any amount towards PPE to the contractor. He has to consider the same in his quote.**