JOB SPECIFICATION
FOR
OPERATIONS AND MAINTENANCE OF DM PLANT AT APGCL Namrup

1.0 INTENT OF SPECIFICATION:

This Job specification is intended to cover the technical requirements for Operation and Maintenance Services for DM Plant including completion of erection of balance equipment / components/ instruments / piping, repair / replacement of damaged / non-functioning items , calibration of instruments, commissioning of plant, supervision, operation, testing, monitoring performance for smooth, trouble free and non-stop functioning of 2 x 8.5 m3/hr capacity DM Plant for a period of 4 months at 1 x 100 MW Namrup Combined Cycle Replacement Power Project.

P&ID of the DM Plant is also enclosed.

2.0 PROJECT DATA

Project	:	1 x 100 MW Namrup Combined Cycle Replacement Power Project
Customer	:	M/s. Assam Power Generation Corporation Limited, Guwahati, Assam
Project Location	:	Namrup, Assam
DM Plant Capacity	:	8.5 m3/hr (2 streams) with one stream in operation and other standby

2.1 BRIEF SUMMARY OF PRESENT STATUS:

The DM plant, with capacity 2 x 8.5 m3/hr, is supplied and erected at the project site, at Namrup Assam.The mechanical erection of the DM plant is completed, and the both the streams of the DM plant are commissioned and tested manually for design output parameters. However, there are some minor repair, replacement and servicing issues, which are detailed under pending activities in subsequent sections of this document. The same are included in the bidder scope of supply.

The PLC is commissioned and operation of majority of drives and valves is cross checked. However, the operation of some pneumatic valves, control valves and some drives is to be established. The services of same are under the scope of the bidder.

The DM Plant is to be commissioned in automatic mode as per the BHEL approved control philosophy.

3.0 SYSTEM DESCRIPTION

The De-Mineralized water plant (DM water Plant) is envisaged mainly to cater the demand of power cycle make-up in condenser. The DM water Plant also caters to the once in a while requirements of power plant namely: initial fill of HRSG, de-aerator and to various chemical solution preparation system.

The source of raw water is existing clarified water reservoir. The clarified water from this reservoir will be pumped as feed water to DM water Plant.

3.1 Design inlet clarified water parameters:

Constituents Particulars	Unit as	Analysis Value
Cations		
Calcium	ppm as CaCO3	18
Magnesium	ppm as CaCO3	18
Sodium	ppm as CaCO3	11
Total Cation	ppm as CaCO3	47
Anions		
Bi carbonate	ppm as CaCO3	20
Sulphate	ppm as CaCO3	19
Chloride	ppm as CaCO3	08
Total Anions	ppm as CaCO3	47
Iron total	ppm as Fe	0.5
Silica total	ppm as SiO2	7.0
pH at 25 degC		7.1
Turbudity, NTU		10
Total suspended solids	Mg/l	25
Conductivity at 25 degC	µ Siemens/cm	60
Total dissolved solids	Mg/l	40
Dissolved CO2,	ppm as CO2	04

3.2 Design Output DM water parameters:

Sl. No	Parameters	Value
1.	pH	6.8 - 7.2
2.	Chloride	Nil
3.	Turbidity	Nil
4.	Total hardness	Nil
5.	Total Silica	<0.01 ppm
6.	Conductivity at 25 DegC, micro mho/cm	<0.1
7.	Total iron as Fe	<0.005ppm
8.	Total copper as Cu	<0.005ppm
9.	Permanganate	Nil
10.	Total Electrolyte	<0.1 ppm
11	Design outlet flow rate	8.5 m^3/hr per stream

3.3 Process Description:

The DM plant system consists of following major items, but not limited.

(i) Clarified water feed pumps to DM water plant (2X100%).
(ii) Dual Media Pressure Filters(2X100%).
(iii) Activated Carbon Filters (2x100%).
(iv) Backwash facilities for Dual media filters and Activated Carbon Filters.
(v) Strong Acid CationExchangers(2X100%).
(vi) Degassifier Towers and Degassed Water Storage Tanks & Pumps(2X100%).
(vii) Strong Base Anion Exchangers(2X100%).
(viii) Mixed Bed Exchangers(2X100%).
(ix) DM Water Storage Tanks with rubber lining (2 nos each 150 m3 of Capacity).
(x) Acid and Caustic unloading pumps, Re-gen system for SAC, SBA, MB etc.
(xi) DM Water Transfer Pump. (2X100%)

The schematic arrangement of DM water Plant has been detailed in the P&ID: P&ID of Diagram of DM water Plant1-38101-03629 (4 sheets).**[Enclosed as** Annexure –I**].**

The plant consist of two chains (2x100%) of 170 m^3/day (net) capacity, demineralisation streams along with necessary regeneration and storage arrangement. Both the streams shall be capable of continuous operation. Generally, one (1) stream shall be in operation and other shall remain as standby. Both of the streams shall be inter-connected with isolation valves at every stage so that any of the equipment can be used for any stream as shown in the P& I Diagram.

The clarified water is be used as feed water to DM water plant. The feed water pumps, located in clarified water storage tank area, are feeding clarified water to the DM water Plant.

4.0 BRIEF SCOPE OF WORK

As described above, the DM plant is being operated in manual mode continuously. However, minor pending activities are to be completed to commission the DM plant through PLC (in semi-auto mode) as detailed in the sections below.

The scope of work will include the following:

4.1 Operation and maintenance of the DM plant:

a) Initially, Operation and maintenance in Manual mode till commissioning of plant through PLC.
b) Operation and maintenance in semi-auto mode after commissioning.

Bidder should carryout the day to day operation activities and also the maintenance activities mentioned in Clause 5.0 below during manual mode initially and semi-auto mode later.

c) Bidder to include in his scope the following portable devices which are required for measuring the water parameter at the outlet of SAC, SBA and MB:
    1. Portable pH meter - 1 no.
    2. Portable conductivity meter - 1 no..

3. Portable hardness tester - 1 no.
4. Turbidity Meter - 1 no.

These are to be supplied by the bidder on the start date of O&M activity as the same are required for measurement of the parameters.

At the end of the contract, these are to be handed over to BHEL in working condition.

4.2 Commissioning of DM Plant through PLC (in semi-auto mode) including the pending activities:

The following commissioning / balance activities are in the scope of the bidder:

Sl. No.	Description of activity		Remarks
A	**Mechanical**		
i)	Arresting leakage in acid measuring tank (rubber-lined carbon steel tank)		AMT tank outlet line got punctured and there is a small hole of approx 6 mm dia at the neck-joint of outlet flange (32nb #150). Bidder has to be suitably plugged the same at site. Required material for repair will be arranged by BHEL.
ii)	Replacing of 4 no's of pneumatic diaphragm valves / parts. 1. 50 NB – 2 nos. 2. 32 NB – 3 nos.		Bidder has to carry out the replacement of valves/ spare parts and necessary material will be arranged by BHEL.
iii)	Servicing of 2 nos of air blowers for degasser water tank/tower(centrifugal blowers) Flow : 212 m3/h Static pressure : 100 mmwc		- One blower was commissioned and running smoothly for more than 4 months. However, the blower got jammed recently. - The second blower referred here is working fine. However, the discharge damper is not opening beyond 50 %. Bidder needs to carry out servicing of the both the blowers at site and material will be arranged by BHEL.
iv)	Replacement/ Fresh installation of the following items		
a	Replacement of faulty Air filter regulators for pneumatic diaphragm valves	20 nos	Installation by bidder. Material will be arranged by BHEL
b	Replacement of faulty Solenoid valves for pneumatic diaphragm valves	15 nos	Installation by bidder. Material will be arranged by BHEL
c	Replacement of faulty Limit switches for pneumatic valves	20nos	Installation by bidder. Material will be arranged by BHEL
B	**Electrical**		

i)	Remote operation of all DM plant drives from PLC, as per load list, to be established.	Entire cabling work is completed and all the drives are run from field (local). However, the remote operation of the drives has to be checked and established. Material if any required shall be arranged by BHEL.
C	**C&I**	
i)	Calibration of all field instruments (Press. Gauge, Level Switch, Level Trans. Flow Trans., DP Switch, Press. Switch, etc).	Refer P&ID and instrument data sheets for details. Required instrument for calibration will be arranged by BHEL. Calibration services are in bidder scope.
ii)	Checking and validating the operating interlocks and set points through PLC/SCADA	Refer Note-4
iii)	Checking and establishing feedback between valves, drives, control valves, and DM plant PLC. For example, limit switch of pneumatic valve has to be suitably adjusted to establish close and open feedback to PLC.	Feedback was established for more than 60 % valves and drives. Bidder has to check and establish the operation and feedback of remaining valves and drives of the DM plant. Material if any required shall be arranged by BHEL. Refer Note-4
iv)	Commissioning of control valves - 4 nos. of 50 nb pneumatic operated control valve based on level.	Valves are operated manually. However, remote operation and complete commissioning including interlock simulation as to be established by Bidder.
v)	Manual setting of the pneumatic valves in regeneration area, backwash lines of SAC, SBA, MB etc., to control the percentage of opening and thereby controlling flow as per process requirement.	Bidder has to establish design flow through the pneumatic valves by setting the position of “limit opening bolt/screw” as per requirement. (Refer valve data sheet attached)
vi)	Demonstrating the design flow and design output parameters of DM plant in semi Auto mode as per project control philosophy (enclosed)	The bidder should study the complete system, perform all required process tunings/improvements and troubleshooting to demonstrate the performance of the DM pant as per design output parameters as per clause 3.2. However, it is understood that the since the design of the DM plant is not bidder, no penalty shall be levied on bidder for any shortfall in the design output parameters.
vii)	Any other miscellaneous services like servicing and troubleshooting of pump, motor, blower, valves, etc. is in bidder scope.	Miscellaneous items like Gaskets, O-rings, plugs & fasteners which may be required during servicing and troubleshooting are in bidder scope and the same are to be arranged by bidder locally. Other items shall be arranged by BHEL based on requirement.

Notes:

1. Bidder to note the following:
   a) Time duration for O&M of DM plant as per specification mainly mentioned as per clause 4.1 above shall be 4 months from date of commencement of work at site.
   b) Time duration for Commissioning of DM Plant in Semi-automatic mode through PLC including completion of balance pending jobs shall be one month, which will be done in parallel with O&M once materials are supplied by BHEL to O&M contractor.
2. BHEL has already taken procurement action for supply of required materials for completion of the above activities. The materials are being made available at site by end of July-2019. Bidder has to plan and carry out the pending activities listed above including commissioning of DM plant through PLC (in semi-auto mode) accordingly.
3. For all jobs involving interfacing with PLC / SCADA, BHEL will liason and depute SCADA vendor. Bidder shall give utmost priority and complete the job during the available period of PLC / SCADA vendor at site.
4. Before submission of offers, bidders are advised to visit the site to get familiarized with the present DM plant status and also the facilities available at site.
5. Bidders are strictly advised to raise pre-bid queries for all technical / commercial clarifications and get clarified before submission of offer. Once offer is submitted, all the specifications requirements are to be adhered to by the bidder.

5.0 DM PLANT DAY TO DAY O&M ACTIVITIES:

5.1 Day to Day Operation Activities to be carried out by Bidder:

Bidder shall operate the DM Plant on regular basis in 2 shifts of 8 (eight) hours each. The scope of operation services shall include but not limited to the following.

1. Bidder must periodically measure the input raw water quality and the outlet water quality of to DM Plant and compare them with guaranteed parameters.
2. Sampling, testing, monitoring and maintaining as required for on continuous day to day basis.
3. Chemical Handing, chemical preparation& chemical injection for DM Plant
4. Bidder must provide shift coverage in three shifts (as per requirement of BHEL) for carrying out of the operation and maintenance of DM plant.
5. Testing and reporting of quality of water received at inlet of each possible unit as per all the plant scheme of DM Plant.
6. Reporting of consumption of chemicals on daily basis.
7. Monitoring of any other parameters to maintain uninterrupted operation of DM plant as per requirement.
8. Daily abnormality summary report (both softcopy in prescribed format of BHEL) of total plant including all equipment's health status is to be submitted to BHEL by shift in charge.
9. Bidder must maintain a Log book recording all above mentioned parameters and data.
10. Bidder must carry out prompt regeneration of resins in SAC, SBA and MB on daily basis including Chemical handling, chemical preparation & chemical injection as required

11. Regeneration being most important activity in DM plant for SAC, SBA and MB: utmost care has to be exercised for smooth operation and to keep the healthiness of all equipment in the existing arrangement.
12. Flow rate, concentration, and quantity of regenerate, and time of injection shall be as per followed as per the details provided by OEM/BHEL.
13. Success of each regeneration shall be ensured each time by calculating OBR as per ionic load of raw water to avoid wastage of costly chemicals.
14. For Measurement of Guaranteed quality parameters as specified, the Trend & online record of parameters as obtained from DCS system for the month will be used which will be compared with manual test carried out as per shift test schedule for correctness. Bidder shall submit both the records (online & shift test values) for evaluation of guaranteed parameters. In case of non-functionality of online test instruments, Shift wise test results will be used for evaluation.
15. Bidder shall conduct calibration test as per standard calibration procedure of online instruments used for guaranteed quality parameters every quarterly or as required.
16. Periodic cleaning & proper housekeeping in DM plants & its surrounding.

5.2 Day to Day Maintenance Activities to be carried out by Bidder:

Bidder shall carry out all maintenance works (routine, preventive and break down) maintenance of the entire equipment as per the relevant O&M manual and industrial standard practices. Replacement of materials if any will be arranged by BHEL, except fasteners, gaskets, plugs, oil seals, etc, which should be locally procured by bidder as and when required.

The scope of maintenance shall cover but not limited to the following:

1. Preventive Maintenance Job of pumps (centrifugal and dosing pump), motor and blower as per standard Preventive Maintenance check list of BHEL / OEM.
2. Pump, blower alignment, along with coupling, with respective drives.
3. Trouble shooting of all equipment including pumps, blower, motors, valves etc in case of break down. Bidder to carry out all service activities possible at site. However, in case of specialty services required from OEMs same shall be arranged by BHEL.
4. Attending all kind of flange leaks Pump & valve Gland leaks.
5. Replacement / repair of Valves as required.
6. Attending all kind of flange leaks including gasket replacement as and when required.
7. Lube Oil Flushing / replacement/top up as and when required or as per equipment maintenance schedule.
8. Greasing of Valves & other equipment's as and when required.
9. Replacement of defective bearing of pumps/motors.
10. Checking and greasing of bearing of Motors. Checking and maintenance of motor terminals. Re-lugging & re-glanding of motor cable terminal if required.
11. Replacement / cleaning of all strainer elements /Filter cartridges etc as and when required or as per schedule.
12. Replacement / refitting & maintenance of pneumatic actuators.
13. Replacement / refitting & maintenance of Ejectors / gauge glasses / sample pots.

14. Vessel internals inspection / replacement / refitting including removal / filling & top up of resin as & when required.
15. Checking healthy ness of rubber lining of tanks / vessels /pipes to
16. Hose repair / replacement of acid and caustic unloading system.
17. Checking, calibration and changing of PT, DPT & level transmitters if required.
18. Foot valves / sluice gate repair and replacement.
19. Checking, passing adjustment, servicing and calibration of valve and its actuators as required.
20. Checking, adjustment & replacement of limit switch if required.
21. Dismantling and box up of complete valve set.
22. Pressure switch & Level switch checking, calibration and changing if required.
23. Checking and leak arrest & marking as per TPM guide lines of level gauge.
24. Operation, Checking and calibration of PH, Silica & Conductivity analyzer.
25. Checking and noting the reading of transmitters.
26. Trouble shooting / fault diagnosis related to process loops & its rectification.

Note:

1. Miscellaneous items like Gaskets, O-rings, plugs & fasteners which are required for as part of O&M are in bidder scope and the same are to be arranged by bidder locally. Other items shall be arranged by BHEL based on requirement.
2. During O&M period, Bidder shall intimate in advance the requirement of replacement of damaged / faulty components where ever possible, so that the BHEL can arrange the same at the earliest.

6.0 Deployment of personnel

The minimum manpower indicated in a) and b) below are to be deployed by the bidder for O&M of DM plant and Commissioning including completion of balance pending jobs:

a) For successful operation and maintenance of DM plant, bidder shall engage experienced engineers, technicians, operators and helpers in requisite numbers. Bidder to deploy the man power as mentioned below for two (2) shift operation of DM Plant:

Sl. No.	Category of man power	No. of persons
1	Plant-In-Charge (Process Engineer)	Minimum 1 per shift
2	Mechanical, Electrical, C&I technician/ Operator / Helper	Minimum 2 nos. per shift

b) For successful Commissioning including completion of balance pending jobs, bidder shall engage experienced engineers, technicians, operators and helpers in requisite numbers. Bidder to deploy the man power as mentioned below for 1 shift for this activity:

Sl. No.	Category of man power	No. of persons for one shift
1	C&I Engineer for Commissioning of DM Plant	Minimum 1 No.
2	Mechanical, Electrical, C&I technician/ Operator / Helper	Minimum 1 No.

Bidder to note that manpower requirement may vary as per actual work requirement during O&M period based on the break-down. Based on site requirement, if additional man power is required, bidder to augment the same for both Commissioning (including completion of balance jobs) and Operation and Maintenance services. In such case, additional cost shall be paid as per agreed contract rate. In the event of any short deployment of manpower as stated above, BHEL shall reserve the right to make proportionate deduction from Bidder's invoice as per contract.

The Plant In-charge (Process Engineer) should have BE / B. Tech qualification with at least one-year experience in O&M of any DM plant.

Bidder should submit the qualification certificates of the proposed plant in-charge/process engineer & Mechanical, Electrical, C&I technician/ Operator / Helper for BHEL review and concurrence before deployment.

Notes:

i. It is explicitly informed to contractor that the present contract is purely works contract and laws relating to works contract shall be applicable and are to be adhered to.
ii. The contractor shall ensure payment of minimum wage to the various categories of worker such as skilled, semi-skilled and un-skilled as per rate notified by the Government of India's in this regard.

7.0 Recourse for failing engagement of minimum man power: In the event, the Contractor fails to make available the above minimum manpower; deductions will be affected from his monthly bill on pro-rata basis. The decision of the Purchaser shall be final binding on the supplier.

8.0 Spare & Consumables: Chemicals required for regular operation shall be supplied by BHEL free of cost from BHEL's store to the bidder and bidder shall arrange to transport the same to the work site. The bidder shall critically work out requirement of spares and consumables and shall intimate BHEL in advance so that procurement action can be initiated in time. At the end of every month the contractor shall submit an account of utilization of spares and consumables issued during the month to the Engineer-in-charge.

9.0 Tools & Tackles: All general tools and tackles required for maintenance shall be arranged by Bidder.

10.0 Safety and Insurance: The Contractor shall ensure all safety precautions for the personnel deployed by him as per requirement. BHEL shall have no responsibility whatsoever towards the Contractor's personnel for any loss/injury from any accident at the work place. For any such eventuality the responsibility lies solely with the Contractor. For safeguarding the workers against

such risk the Contractor shall maintain accident insurance for each worker as per the stipulations under workman's Compensation Act' 1923. For this purpose, the Corporation shall reimburse one-time annual insurance premium against production of documentary evidence.

11.0 Compliance of Regulation: The Contractor should strictly comply to statutory Regulations / Rules & Acts whatsoever of Central / State Statutory Body under labour law.

The Contractor shall at all times, during execution of the contract, obey & observe all directions and instructions given by the Engineer-in-Charge or his authorized representative.

The Contractor of his employees shall not use the Project premises allotted to him for any purpose other than for carrying the works as per the contract and shall not act in any manner as to cause nuisance or annoyance. The contractor shall not allow his employees to participate in any trade union activities in and around the Project premises.

12.0 ENCLOSURES

1. P&ID
2. Control philosophy
3. Design basis
4. Other miscellaneous design output documents

RECORD OF REVISIONS					
Rev. No.	**Date**	**Revision Details**	**Prepared By**	**Checked By**	**Approved By**
00	18.06.19	First Issue	DSK	AKS	MSSN