

## **PART III**

### **TECHNICAL SPECIFICATION**

#### **FOR TECHNICAL SUPPORT FOR 1x3.5 MW DG SET FOR GURU GOVIND SINGH REFINERY, BATHINDA FOR HPCL MITTAL ENERGY LTD.**

##### **1. *Scope of work:***

BHEL is executing 1 x 3.5 MW DG set for GGSR, Bathinda. Diesel engine and auxiliaries shall be supplied by reputed vendor like Wartsila, GE, Kirloskar. Other balance auxiliaries and electrical equipment shall be supplied by BHEL. The scope distribution between BHEL and Engine vendor is enclosed as per Annexure – I. This specification is for consultancy services for balance of plant and electrical system packages for above DG set. Please refer annexure II for drawings to be prepared by consultant.

##### ***Scope of work:***

Consultant has to study the complete system by visiting the site, collect the data and interact with final customer /consultant for assessment of work.

The scope of work includes interaction with BHEL, customer at site & Head Office, customer's consultant, preparation of technical specifications, design memorandum, design criteria, BOQ and price estimate for floating tender for procurement of equipments / services for BHEL scope of supply.

Consultant has to prepare the Layout of Power Plant, Layouts of individual package/ system/ equipment, drawings required to procure the equipments, single line diagrams, schematic diagrams, basic design calculations, QA plans, data sheets etc required to complete the work.

The complete drawings/ documents including piping layouts, piping isometrics on PDMS/ PDS , fabrication drawings, cable tray layouts, cable schedule etc. required for mechanical & electrical erection by mechanical/ electrical contractor shall be prepared by consultant based on inputs from equipment vendors.

3D drawings shall also be prepared by consultant, wherever required.

Consultant has to finalize battery limit of each package/system such that no work/supply is left unaccounted i.e. system integration & interfacing between each package has to be taken care off completely.

Consultant will provide information on established suppliers/ contractors of equipment/ package and services. He will also help BHEL to evaluate technical & quality capability assessment of vendors, if felt necessary for any vendor/vendors. Consultant will provide technical clarification to BHEL if so desired by BHEL.

Consultant has to prepare drawings, field quality plan with inspection report formats for procurement, erection and commissioning, check list for each package/system of complete scope of work. Various checks required

beginning from receipt & storing of material to commissioning of system shall be mentioned in field quality plan.

BHEL may depute its engineers to associate during detail preparation of specification, drawings etc. by consultant. Consultant will discuss all design parameters, drawings, layouts etc with BHEL engineer. However, all expenses like traveling allowance, daily allowance, local transport etc of BHEL engineers shall be borne by BHEL.

## **2.0 DOCUMENTATION**

- 2.1 All Specifications and Design Documents shall be prepared in MS-Office and shall be neatly typed on A4 size paper. The format of design document shall be got approved by BHEL, Bhopal.
- 2.2 All drawings shall be prepared on AutoCAD or any other approved CAD software. Piping isometrics / 3 D drawings shall be prepared using PDMS / PDS. All drawings shall be prepared on standard sizes (viz. A0, A1, A2, A3, & A4). The 'Title Block' shall be as per BHEL, Bhopal's approved design. All prints of the drawings shall be clear and legible. The drawing format shall be furnished by BHEL. A key plan shall be incorporated in all drawings. The technical specifications /drawings shall be prepared taking into account customer / consultant tender specs.
- 2.3 Upon completion of construction, the design drawings shall be revised to reflect accurately the Plant facilities as built. The drawings shall be issued under the appropriate revision and marked "AS BUILT".
- 2.4 The number of copies of design documents and drawings required to be submitted shall be decided as per BHEL contract with customer.
- 2.5 Transmittal of soft copies (in MS-Office or AutoCAD) through electronic media & hard copies by post need be undertaken.
- 2.6 All drawings/ documents furnished by consultant shall be property of BHEL
- 2.7 Metric unit of measurement shall be used in the drawings / documents

SIGNATURE OF BIDDER WITH SEAL

**ANNEXURE - I****Distribution of Scope between BHEL and DG Set Vendor -**

<b>SPEC Sr. no.</b>	<b>DESCRIPTION</b>	<b>DG Set Vendor</b>	<b>BHEL</b>	<b>Remarks</b>
<b>A</b>	<b>Power Generation</b>			
<b>A.1</b>	<b>Generating set</b>			
<b>A.1.1</b>	<b>Diesel engine</b>			
	Diesel Engine, 1000 / 750 rpm,	✓		
<b>A.1.2</b>	<b>Alternator</b>			
	Alternator -6.6 KV, Leroy Somer / AVK	✓		
<b>A.1.3</b>	<b>Base Frame</b>			
	Base frame - Common for Engine + Alternator	✓		
<b>A.1.4</b>	<b>Elastic mounting</b>			
	Flexible mountings- Anti Vibration Mounts	✓		
<b>A.1.5</b>	<b>Coupling</b>			
	Flexible coupling	✓		
	Flywheel guard	✓		
<b>A.1.7</b>	<b>Flexible connections</b>			
	Flexible connections(Set)	✓		
<b>A.1.8</b>	<b>Maint. platform</b>			
	Maint. Platform		✓	
<b>A.2</b>	<b>Mechanical systems</b>			
<b>A.2.1</b>	<b>Fuel oil system</b>			
<b>A.2.1.1</b>	<b>High Speed Diesel Oil system</b>			
	HSD StorageTank (1 x 10 kl)		✓	
	Equipment for HSD tank		✓	
	Transfer pump unit(1W+1S)-		✓	
	Day tank(1 x 990L)		✓	
	Equipment for day tank		✓	
	Piping inside DG house		✓	
	Piping outside DG house		✓	
<b>A.2.2</b>	<b>Lub oil System</b>			
<b>A.2.2.1</b>	<b>Engine Lub oil system</b>			
	Lub oil cooler	✓		
	Pre lub pump set	✓		

	Lub oil filter	✓		
	Thermostatic valve	✓		
	Centrifugal type bypass filter	✓		
	Crankcase Breather piping		✓	
<b>A.2.2.2</b>	<b>Plant Lub oil system</b>			
	Unloading/Transfer pump unit (mobile)		✓	
<b>A.2.3</b>	<b>Compressed air system</b>			
<b>A.2.3.1</b>	<b>Starting air system</b>			
	Starting air compressor unit -( 30 m3/hr) - 1 <b>E+1D</b>		✓	
	Starting air bottle(1 x 1000L)		✓	
	Piping inside DG house		✓	
<b>A.2.4</b>	<b>Cooling system</b>			
<b>A.2.4.1</b>	<b>Engine cooling system</b>			
	Expansion vessel		✓	
	Radiator cooler package		✓	
	Preheating unit	✓		
	Thermostatic valve	✓		
	Piping inside DG house		✓	
	Piping outside DG house		✓	
<b>A.2.4.2</b>	<b>Plant cooling system</b>			
	Water treatment for raw water make-up (Softning Plant)		✓	
	DM Plant for separators, engine jacket water & turbine washing		✓	
	DM water storage tank		✓	For DM water Storage
	Chemicals for closed circuit water		✓	First fill only
	Chemicals for make-up raw water treatment		✓	First fill only
	Piping inside DG house		✓	
	Piping outside DG house		✓	
<b>A.2.5</b>	<b>Charge air system</b>			
	Intake air filter(s) - Baggie & Spin type filters	✓		
	Intake air ducting	✓		
	Expansion bellow(s)	✓		
<b>A.2.6</b>	<b>Exhaust gas system</b>			
	Exhaust gas silencer(s) with spark arrestor , residenital type, 35 dB(A)	✓		

	Exhaust gas ducting (from engine to stack w/o Provision WHRB)		✓	
	Expansion bellows, inside/outside DG house	✓		
	Exhaust gas steel stack- .( 30 Mtrs each, Common structurally supported )		✓	Height considering HSD operation only
<b>A.2.8</b>	<b>Station Support Systems</b>			
<b>A.2.8.1</b>	<b>Fire Fighting system</b>			
	Fire fighting system including Fire extinguishers for class 'B' and 'C' fires & Sand Buckets		✓	
<b>A.2.9</b>	<b>Steel structures</b>			
	Supports for charge air ducting		✓	
	Supp. for exhaust gas duct-inside DG house		✓	
	Supp. for exhaust gas duct -o/s upto stack without provision for WHRB		✓	
	Supports for pipes inside DG house		✓	
	Supports for pipes outside DG house		✓	
<b>A.3</b>	<b>Electrical systems</b>			
<b>A.3.1</b>	<b>Main Switchgear (MV)</b>			
	Generator cubicle- 1no.		✓	
	-Outgoing cubicle- 1 no.		✓	
	-Station transformer cubicle-1no.		✓	
	Busbr measuring cubicle 1 -no		✓	
	NGR with nutral point cubicle - 1 No.		✓	
	MV Cables			
	- From generator to generator breaker / NPC		✓	
	- From DG switchgear to substation		✓	
	- Cable trays for the cables		✓	
<b>A.3.2</b>	<b>Station service system</b>			
	Station service transformer ( 750 KVA ) - 1 No.		✓	
	Station low voltage switchgear		✓	
	local Auxiliary control panel		✓	
	Aux. MCC for lighting		✓	
	Aux. MCC for LT power distribution		✓	
	LV power & control cables			
	- Inside DG house		✓	
	- Outside DG house		✓	

	Cable Trays for LV power & control cables			
	- Inside DG house		✓	
	- Outside DG house		✓	
<b>A.3.3</b>	<b>DC system</b>			
	Batteries ( 100 Ah / 110 VDC) Lead Acid		✓	
	Battery charger		✓	
	DC Distribution board		✓	
	Cables		✓	
<b>A.3.4</b>	<b>Earthing &amp; lightning protection system</b>			
	Earthing inside DG house		✓	
	Earthing outside DG house		✓	
	Lightning protection (For DG house & Chimney)		✓	
<b>A.3.5</b>	<b>Outdoor Switchyard (Power Evacuation)</b>			
	Step-up /step-down transformer		✓	
	Sub Station switchgear		✓	
	Outdoor Switchyard		✓	
	Cables		✓	
<b>A.3.6</b>	<b>Emergency DG set (Black start)</b>			
	125 kVA with AMF panel		✓	
<b>A.3.7</b>	<b>Heat tracing &amp; insulation</b>			
	Insulation of exhaust pipes		✓	
	DG control panels	✓		
<b>A. 4.4</b>	<b>Automation Control and Supervision System (Basic)</b>			
	Central Control Panel, Synchronising section - 1 No. For Synchronisation with the Grid		✓	
	Central Control Panel, Engine section - 1 no	✓		
	Engine Local Control Panel - 1 Per Engine	✓		
<b>A.4.9.1</b>	<b>Cables/Accessories</b>			
	Set of Control & Instrumentation Cables		✓	
<b>A.7</b>	<b>Tools</b>			
	Tools for engine and turbocharger	✓		
<b>B.</b>	<b>Power Plant Building &amp; Utilities</b>			
<b>B.1</b>	<b>Power House</b>			
<b>B.1.1</b>	<b>Power Plant -Civil construction &amp; Design</b>			
	DG building with wall panels for noise attenuation		✓	
	DG Foundation		✓	

	Piling		✓	
	Tank farm -tank fdns., dyke wall, etc.		✓	
	Exhaust gas stack foundation		✓	
	Radiator foundation		✓	
	Pipe Pedestals		✓	
	Transformer foundation		✓	
	Fuel oil pump house		✓	
	Water treatment plant		✓	
	Unloading ramp/pump house		✓	
	Maintenance space / O &M operator's office		✓	
	Toilet		✓	
	Roads around power plant buildings		✓	
	Gates/Fencing		✓	
	Security office		✓	
<b>B.1.2</b>	<b>Sewage and Drainage</b>			
<b>B.1.3</b>	<b>Ventilation &amp; Air conditioning</b>			
<b>B.1.3.1</b>	DG hall ventilation, dry type		✓	
<b>B.1.3.2</b>	Auxiliary bay ventilation		✓	
<b>B.1.3.4</b>	<b>Air conditioning system</b>			
	WIndow air conditioner for control room		✓	
<b>B.1.4</b>	<b>Building Electricals</b>			
<b>B.1.4.1</b>	<b>Lighting system</b>			
	Lighting -DG hall		✓	
	Lighting -HT switchgear & control room		✓	
	Lighting-storage area		✓	
<b>B.1.4.4</b>	Lighting cables		✓	
<b>B.1.6</b>	<b>Lifting system</b>			
	EOT crane - 2 tons		✓	
<b>C</b>	<b>Services</b>			
<b>C.1</b>	<b>Engineering</b>			
<b>C.1.1</b>	Preliminary engineering.	✓	✓	Limited to respective Scope
<b>C.1.2</b>	Basic engineering	✓	✓	Limited to respective Scope

<b>C.1.3</b>	Detailed engineering	✓	✓	Limited to respective Scope
<b>C.2</b>	<b>Supervision</b>			
	Supervision of installation	✓	✓	
	Supervision of testing and commissioning	✓	✓	
	Supervision of civil work		✓	
<b>C.3</b>	<b>Erection &amp; Installation</b>			
	Erection		✓	
	Execution of civil work		✓	
	Flushing oil & other consumables (during installation, commissioning & trial run, performance test)		✓	
	First fill of lubricants, & grease (during installation, commissioning & trial run, performance test)		✓	
<b>C.4</b>	<b>Testing and commissioning</b>			
<b>C.4.1</b>	Workshop tests	✓	✓	Limited to respective Scope
<b>C.4.2</b>	Tests on completion at site	✓	✓	Limited to respective Scope
<b>C.5</b>	<b>Training</b>			
	Training at supplier's factory for 2 persons	✓		
	Training at site	✓		
<b>C.6</b>	<b>DOCUMENTS</b>			
<b>C.6.1</b>	Preliminary engineering	✓	✓	Limited to respective Scope
<b>C.6.2</b>	Basic engineering	✓	✓	Limited to respective Scope
<b>C.6.3</b>	Detailed engineering	✓	✓	Limited to respective Scope



## **ANNEXURE – II**

**The following drawings / documents are envisaged to be prepared by consultant.**

### **A. Civil**

- i) Design calculation, GA and fabrication drawing of chimney.
- ii) GA and foundation drawing of DG set
- iii) Civil input drawing for different equipment in DG hall and first floor giving wall opening, foundation details, insert plate details
- iv) GA and civil input drawings of building other than DG hall.
- v) Civil input drawing for pipe pedestals
- vi) Civil input drawing for chimney foundation
- vii) Civil input for electrical equipment foundation

### **B Mechanical**

- i) Layout of DG set / site layout
- ii) Master layout of DG building, plan and section, equipment layouts
- iii) Piping layout including pipe supports drawing and isometrics with BOM for piping for different system like fuel oil, Lube oil, water, compressed air, charge air and exhaust system giving details of pipes, pipe fittings, valves, nut / bolts etc.
- iv) GA and fabrication drawing of HSD day tank.
- v) GA and fabrication drawing of expansion tank.
- vi) GA and fabrication drawing of engine maintenance platform, radiator operating platform
- vii) Pipe supports and clamps GA and fabrication drawing
- viii) GA and fabrication drawing of charge air and exhaust gas ducting with supporting structure
- ix) BOQ for mechanical erection contract
- x) Purchase specifications for mechanical equipment in BHEL scope

### **C Electrical**

- i) Electrical equipment layout, single line diagram
- ii) Cable and cable tray layouts with BOM
- iii) Earthing and lightning protection layouts with BOM
- iv) Cable and interconnection schedule
- v) Lighting layout with BOM

- vi) BOQ for electrical erection contract
- vii) Purchase specifications for electrical equipment in BHEL scope

Essentially, all systems & work of a DG based power plant shall be covered. The list above is only tentative. Any work which is envisaged as per specifications and during discussions with customer / engineering stage and required to complete work will be included in the scope.

SIGNATURE OF BIDDER WITH SEAL