

**BHARAT HEAVY ELECTRICAL LIMITED**

Boiler auxiliaries Plant

Ranipet

Vellore-632 406,TamilNadu, India

Enquiry No. :

BAP/CAPITAL/2012-13/OT-5

Due Date :

Supplier Qtn.No.:

Date :

**Annexure - C: SPECIFICATION CUM COMPLIANCE CERTIFICATE 1X1010KVA DIESEL GENERATOR SET SYSTEM****NOTE:-**

1. The "Offer" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/ requirements shall be treated as non-compliance.

2. The offer and all documents enclosed with offer should be in English language only.

**NAME & ADDRESS OF THE SUPPLIER :****TELEPHONE NOS.:****FAX NOS.:****E-MAIL ADDRESS :**

Part -1 Supply, Installation, Testing, Commissioning and proving the performance of 1010 KVA, 11 KV Diesel Generator, supplying standard accessories along with synchronising panel and 5No of VCBs with panels having AMF functionality.

Sl.No	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
	<b>SCOPE:</b>				
1	<b>GENERATOR SET</b>				
	1010KVA 11KV DG set comprising of : engine developing suitable power at 1500 rpm complete with standard accessories coupled to alternator mounted on a channel iron base frame , Under NTP conditions of BS :5514 with an over load capacity of 10% for one hour in every 12 hours operation.	Vendor to confirm			
1.1	<b>DIESEL ENGINE</b>				
1.1.1	<b>Make</b> Cummins/caterpillar/mitsubishi /Perkins/MTU	Vendor to confirm			
1.1.2	<b>Model</b>	Vendor to specify			
1.1.3	<b>Cooling system:</b> radiator cooled engine, mounted blower fan , engine mounted water pump, and thermo stat. <b>Initial filling of corrosion inhibitor coolant by vendor</b>	Vendor to confirm			
1.1.4	<b>Fuel system</b> : Two nos of 990 ltr capacity fuel tanks with connected pipes lines/hoses, stand for two fuel tanks , over flow pipes ,drain valves, air vent valves, strainers openings for inspection and cleaning with cover ,level indication in the tank with scale to indicate the fuel stored , common outlet of two tanks should be connect to engine), full flow spin-on filters to the engine, fuel pump, injectors. <b>Initial filling of fuel (high speed diesel )in BHEL scope .</b>	Vendor to confirm			
1.1.5	<b>lubricating system</b> : oil pump, strainer, spin-on filter, pipes ,intimate lube grade , capacity of sump, <b>intial filling of lube oil by vendor .</b>	Vendor to confirm			
1.1.6	<b>Air intake system</b> :dry type filter , air manifold with necessary connection ,turbo charger with after cooler .	Vendor to confirm			

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1.1.7	<b>exhaust system</b> : exhaust manifold, stainless steel flexible / pipe , canopy , residential silencer .heat resistance epoxy painting coat on pipe , insulation and hanger , support structure starting from engine to side DG room ( aluminium cladding, chicken mesh mineral wool up to canopy, etc ), provision for temperature and pressure, test and measurement for checking compliance with statutory requirement .	Vendor to confirm			
1.1.8	<b>PCB</b> : stack of required height as per pcb norms has to be provided.Emission shall be within norms specified by Pollution control board and environment protection rules . Room design to be given by vendor.Room construction by BHEL .	Vendor to confirm			
1.1.9	<b>Governing system</b> : electronic governor controller / class	Vendor to specify			
1.1.10	<b>starting system</b> :DC starter motor , battery charging alternator with in built regulator. suitable stand,suitable nos. of charged maintenance free batteries , with cable leads and terminal holders. battery make :exide/ amaron/cummins pulse / amco/prestolite/sf	Vendor to confirm			
1.1.11	<b>Spare parts</b> of filters Includes Lub Oil , Fuel& Air filter to be replaced up to 1000 hrs at free of cost whenever required.	Vendor to confirm			
1.1.12	<b>Motor</b> driven prime pump for lube oil	Vendor to confirm			
1.1.13	<b>Cylinders in the Engine is Maximum of 12 Numbers</b>	Vendor to confirm			
1.1.14	Fly wheel housing,flexible coupling,coupling guard, base frame :sturdy,fabricated, welded construction, channel iron frame for mounting the above engine and below alternator .	Vendor to confirm			
1.1.15	Battery charger from mains 230V AC	Vendor to confirm			
1.1.16	Starting	Electric & Battery Start			
<b>1.2</b>	<b>ALTERNATOR:</b>				
1.2.1	Power Rating (KVA) - 1010 KVA	Vendor to confirm			
1.2.2	Output Voltage & Frequency -11K V, 50 Hz	Vendor to confirm			
1.2.3	Frequency Regulation	Vendor to specify			
1.2.4	Power Factor (lagging) - 0.80	Vendor to confirm			
1.2.5	No.of Phases - 3 Phase + Neutral	Vendor to confirm			
1.2.6	Self regulated,brushless, horizontal mounted , single shaft with double bearing	Vendor to confirm			
1.2.7	Field	Vendor to specify			
1.2.8	Automatic Voltage Regulator suitable for parallel operation of generators	Vendor to specify			
1.2.9	Voltage Regulation (+/-1%)- no load to full load	Vendor to specify			
1.2.10	Insulation Class H	Vendor to specify			
1.2.11	Enclosure	Vendor to specify			
1.2.12	Make Kirloskar/Stamford/ToyoDenki/LeroySomer or equivalent	Vendor to specify			
1.2.13	Any other description	Vendor to specify			
<b>1.3</b>	<b>NEUTRAL GROUNDING RESISTOR</b>				

SI.No	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
1.3.1	Made of stainless steel of copper/Nickel alloy	Vendor to confirm with detailed specification			
	Indoor metal Clad,dust & Vermim Proof				
	Temperature riseup to 375 Deg.C above ambient temp				
	Panel- Thermostat, star formation bus bar and lamp indication				
	NGR Panel as per IS 8623,cubicle mounting type with front open arrangement with hinged door.				
1.3.2	<b>Neutral Isolator Vaccum Contactor 1no of 11kv, 400A</b>	Vendor to confirm with detailed specification			
<b>1.4</b>	<b>Microprocessor based control panel for Alternator and Engine for monitoring, metering, control and protection against fault.</b>				
1.4.1	All control cables & their wiring are in the Scope of the Vendor.	Vendor to confirm			
1.4.2	Battery Voltage Sensing & Monitoring and charging current	Vendor to confirm			
1.4.3	Push Buttons for Manual Start / Stop	Vendor to confirm			
1.4.4	Manual Test -Mode Selector Switch	Vendor to confirm			
1.4.5	Annunciation, Alarm & Trip Features	Vendor to confirm			
1.4.6	Indications for DG "ON/OFF"	Vendor to confirm			
1.4.7	Indications for MAINS "ON" for load	Vendor to confirm			
1.4.8	Indications for Over Current & Earth Fault	Vendor to confirm			
1.4.9	Coolant temp.	Vendor to confirm			
1.4.10	LOP	Vendor to confirm			
1.4.11	RPM indication	Vendor to confirm			
1.4.12	Service hour meter	Vendor to confirm			
1.4.13	<b>Protection</b>	Vendor to confirm			
1.4.14	High Water Temperature	Vendor to confirm			
1.4.15	Low Lube Oil Pressure	Vendor to confirm			
1.4.16	Over / Under speed	Vendor to confirm			
1.4.17	Air Filter Clog Indicator	Vendor to confirm			
1.4.18	Starting Failure	Vendor to confirm			
1.4.19	Generator Overload	Vendor to confirm			
1.4.20	Battery Voltage Low	Vendor to confirm			
1.4.21	Others	Vendor to specify			
	<b>EARTHING</b>				
1.4.22	Neutral ,Body earthing pits,including civil work in the scope of vendor	Vendor to confirm			
1.4.23	GI strip for DG set body earthing, copper strip for neutral earthing.	Vendor to confirm			
<b>2</b>	<b>TOOLS FOR OPERATION &amp; MAINTENANCE:</b>				

SI.No	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
2.1	Standard tools like Torque Wrench, Spanners, Keys, grease guns etc.for operation and maintenance of the DG Set should be supplied. List of such tools should be submitted with offer.	Vendor to Furnish			
<b>3</b>	<b>SPARES:</b>				
3.1	Itemised breakup of mandatory mechanical & Electrical spares as per recommendation of Vendor for 2 years of trouble free operation should be offered by vendor. <b>(Unit Price of each item of spare should be offered)</b>	Vendor to furnish list			
3.2	Complete list of spares for DG Set and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation with circuit diagram to be supplied with the machine	Vendor to confirm			
<b>4</b>	<b>DOCUMENTATION (To be furnished along with supplies):</b>				
	<b>Three sets of following documents (Hard copies) in English language should be supplied along with the machine</b>				
4.1	Operating & Maintenance Manuals & spare parts manual for the Diesel Engine	Vendor to confirm			
4.2	Operating & Maintenance Manuals for the Alternator	Vendor to confirm			
4.3	General arrangement plan of DG set.	Vendor to confirm			
4.4	Piping schematic diagram and engine control electrical circuit	Vendor to confirm			
4.5	Operating & Maintenance Manuals for synchronising panel & VCB panels	Vendor to confirm			
4.6	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to confirm			
4.7	Operation & Maintenance Manual for Batteries	Vendor to confirm			
<b>5</b>	<b>ERECTION &amp; COMMISSIONING at BHEL /RANIPET</b>				
5.1	Supplier shall be responsible for carrying out the Erection, start up testing and commissioning of the new DG Set and synchronising of existing 1000KVA, proving auto load sharing between the two gensets etc. Required technical personnel and labour required for the same shall be provided by the vendor. Tools, tackles, required for the same shall be arranged by the vendor. Crane, if required, will be provided by BHEL free of cost. Service requirement like power, air & water shall be provided by BHEL at only one point at free of cost.	Vendor to confirm			
5.2	Erection of the Stack and thermal insulation of the exhaust system is also the responsibility of the vendor.	Vendor to confirm			
<b>6</b>	<b>OPERATING CONDITIONS :</b>				
6.1	The DG Set should work trouble free and efficiently under following operating conditions:				
	Height above MSL: 195 m	Vendor to confirm			
	Ambient Conditions: Temperature = 20 to 50 degree Celsius Relative Humidity = 95% max.				
6.2	Weather conditions are tropical, Atmosphere may be dust laden during some part of the year.	Vendor to confirm			
<b>7</b>	<b>APPLICABLE CODES &amp; STANDARDS:</b>				
7.1	Rating Definition as per ISO 3046 / BS 5514	Vendor to confirm			
7.2	IS 4722	Vendor to confirm			
7.3	BS 5000	Vendor to confirm			

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7.4	IEC 34/1	Vendor to confirm			
7.5	ISO 8528	Vendor to confirm			
7.6	IS- 4889, 10000, 10002	Vendor to confirm			
7.7	Pollution Control Board directives with regard to exhaust stack height	Vendor to confirm			
7.8	Fuel conforming to IS 1460	Vendor to confirm			
7.9	Fuel consumption tolerance as per BS 5514	Vendor to confirm			
7.10	Environmental Protection Rules	Vendor to confirm			
<b>8</b>	<b>Tests/Activities to be carried out at supplier's works in the presence of BHEL Engineers before dispatch :</b>				
8.1	Verification of Original test certificates for engine, alternator, room enclosure, and all other bought out items.	Vendor to confirm			
8.2	Run test of DG Set	Vendor to confirm			
<b>9</b>	<b>Test /Activities to be carried out at BHEL works while commissioning the DG Set:</b>				
9.1	8 Hour Run Test	Vendor to confirm			
<b>10</b>	<b>Foundation:</b>				
10.1	BHEL will carryout the civil work for foundations if any. Vendor shall provide details of the foundation for this purpose immediately after placement of LOI/P.O	Vendor to Confirm			
<b>11</b>	<b>Guarantee</b>				
11.1	The DG set shall be guaranteed for a period of 24 months from the date commissioning or 5000 hrs from the date of commissioning whichever occurs earlier.	Vendor to confirm			
<b>12</b>	<b>Coordination for Approval from Statutory Authority</b>				
12.1	Coordination for Approval from Statutory Authority all Input like Drawing & other Supporting Document & Coordination with the agency Vendor Scope SEB, CEIG,CEA,CPCB etc approvals in the scope of the vendor	Vendor to confirm			
<b>Part-2</b>					
<b>1</b>	<b>Supply, Installation, Testing &amp; Commissioning SYNCHRONISING PANEL</b>				
1.1	Synchronising panel with facility to synchronise new DG set with existing 1000 KVA DG set, 1500rpm 11kV, KIRLOSKAR alternator frame size: 4AB450/8, Engine:Mitsubishi. Connection: STAR, Excitation voltage:86, Excitation Ampere: 2.65A, Phase sequence:IS4728, P.Code: FERT6598. Provision should be available to synchronise proposed 3rd DG set in the future. Synchronising logic panel comprising synchronising lamps, digital meters for generator/ Bus voltage/ frequency , synchroscope etc. as required. Vendor need to synchronise new DG set with existing old DG set and prove the performance of auto load sharing between them.	Vendor to confirm			
1.2	The existing genset and the new genset are to be placed approximately 35m apart.The incoming VCB panel to be placed in between the two gensets.The supply of power cables and adapter box for the connection between gensets and outgoing VCBs(via incoming VCB & synchronising panel ) is in the scope of the vendor.	Vendor to confirm with any related specifications			

Sl.No	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
<b>2</b>	<b>VCB Panel with AMF functionality</b>				
2.1	Supply and erection of VCB panel consisting of 5No of VCBs .3 No.s for incoming and 1No of VCB for outgoing, and 1No spare for future purpose. VCBs should be compatible with our requirement of synchronisation .	Vendor toConfirm			
	<p>The panel shall be made of sheet metal totally enclosed dead front pattern, free floor standing type to transfer the load from normal source to diesel generator emergency source. The transfer breaker shall be rated for continuous duty. The breaker shall be interlocked to ensure non-paralleling EB power supply and DG supply. All main contacts shall be protected by arcing contacts.</p> <p><b>Operation</b></p> <p>a) The normal source shall be constantly monitored by a mains voltage monitor.</p> <p>b) When mains voltage fails or drops below 70-80% of the rated voltage, the automatic control system shall give a starting signal to the two diesel generator sets.</p> <p>c) As soon as the two diesel generator sets reaches its operating speed and alternator its operating voltage, the load shall be transferred to the generator set and the breaker closing terminal shall be activated to operate the relay and close the breaker and operate all interlocks to ensure that normal supply input is activated and the main breaker trips.</p> <p>d) Upon the return of the normal source voltage of 90% of rated voltage for one minute the switch shall retransfer the load to the normal source and the interlock system described above reverses its operation.</p> <p>e) The automatic control system shall then reset itself and be in readiness to start the engine generator set upon the failure of the normal source(EB supply).</p> <p>f) If the diesel set fails to start or reach its operating speed in 40/50 seconds, in three attempts, the set shall automatically be disconnected and locked in isolated position. In such an event there shall be both a loud alarm and a visual indication.Meanwhile the other DG set should be connected to the load.</p> <p>g) A test switch to simulate a normal source failure shall be provided for routine testing of the transfer switch panel and DG set.</p> <p>h) Time delay of minimum 3 seconds shall be provided for change over of supply in both directions.</p> <p>i)Common auto/manual selector switch to be provided for selection of auto mode/manual mode of AMF function.</p> <p>j)Individual auto/manual selector switch to be provided for selection of individual DG sets on auto/manual mode.</p> <p><b>Construction:</b></p> <p>a)Panel shall be of sheet metal of minimum 2 mm thickness with adequate working space inside.</p> <p>b) Indication lamps shall be provided on the panel separately for grid supply and generator supply.</p> <p>c) There shall be facility for remote control of generator voltage and engine speed.</p>	Vendor toConfirm			

Sl.No	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
	d) Reverse power relay shall be provided for the generator.				
	e) Neutral switching facility shall be provided.				
<b>2.2</b>	<b>AMF, GENERATOR PROTECTION &amp; SYNCHRONISING PANEL:</b>				
2.2.1	PLC Based AMF, Protection & Synchronising Panel	Vendor to Confirm			
2.2.2	Rating of Switchgear	Vendor to Specify			
2.2.3	Make of Switchgear (Shall be of reputed make like L&T, Areva, ABB, Siemens etc)	Vendor to Specify			
2.2.4	Bus Bars of suitable rating for incoming & outgoing terminations	Vendor to Confirm			
2.2.5	Overcurrent & Earth Fault relay to be provided	Vendor to Confirm			
2.2.6	Supply Failure Timer	Vendor to Confirm			
2.2.7	Restoration Timer	Vendor to Confirm			
2.2.8	Automatic Start / Stop of Engine	Vendor to Confirm			
2.2.9	Generator Voltage, Current & Frequency Monitoring & Display	Vendor to Confirm			
2.2.10	Battery Voltage Sensing & Monitoring	Vendor to Confirm			
2.2.11	Push Buttons for Manual Start / Stop	Vendor to Confirm			
2.2.12	Manual / Auto / Test -Mode Selector Switch	Vendor to Confirm			
2.2.13	Annunciation, Alarm & Trip Features	Vendor to Specify			
2.2.14	Indications for DG "ON", Load on DG	Vendor to Confirm			
2.2.15	Indications for MAINS "ON", Load on Mains	Vendor to Confirm			
2.2.16	Indications for Over Current & Earth Fault	Vendor to Confirm			
2.2.17	KW & KWH Meter	Vendor to Confirm			
2.2.18	Meter for Power Factor	Vendor to Confirm			
2.2.19	Instrument fuses duly wired	Vendor to Confirm			
2.2.20	SMPS Based automatic Float cum Boost Battery Charger with DC Voltmeter & Ammeter, Selector Switch for Auto / Manual & Float / Boost	Vendor to Confirm			
2.2.21	Synchronising logic panel comprising synchronising lamps, digital meters for generator/ Bus voltage/ frequency , synchroscope etc. as required.	Vendor to Confirm			
2.2.22	Power and control cables for interconnection within the system	Vendor to Confirm			
2.2.23	Complete technical details of the Panel	Vendor to Furnish			
2.2.24	The Panels, VCB etc. to be housed in indoor type control room. Room construction under the scope of BHEL. Vendor to give layout and indicate the approx. size of the room.	Vendor to Furnish			

Vendors' signature with seal