

Request for Proposals	RFP/GasEngine/Phase I/08Oct2010
Component:	Gas Engine Generator Sets (2 nos.)
Project:	Phase I – 0.5 Megawatt bio-methanation based Renewable Energy Power Plant
Location:	Jaipur, Rajasthan, India (coordinates 26 41 06.78 N, 75 43 22.32 E)
RfP Due Date:	EoD Thursday 20 th October 2010, Bid validity – 6 months
Last date for clarifications:	EoD Wednesday 18 th October 2010. Clarifications to be addressed to Mr S K Bhatnagar bhatnagarsubodh@gmail.com ; and Mr Anupam Jalote ajalote@greenoil.in (addressed to both)
Send response to:	psoni@greenoil.in ; bhatnagarsubodh@gmail.com ; ajalote@greenoil.in (addressed to all three)

1. Project Overview:

GreenOil Energy Sciences (Pvt.) Ltd. is establishing a chain of a grid connected anaerobic digestion based power plants totalling 10 Megawatts. The first pilot plant of one megawatt is being established in two phases. Phase I, commencing now will establish a 500 kW generation facility. Phase II will follow after the satisfactory establishment of Phase I, and is expected to come up about 8 to 10 months later. Successive plants will be commissioned over the next 5 years.

One 3500 m³ capacity digester will be constructed and two 315 kW generators will be installed in Phase I.

The input feed for Phase I will be 60 tons per day of a mixture of Fruit and Vegetable waste, cattle dung and other high energy agricultural by-products.

2. Caveats:

- This project is being designed with huge focus on being EROI (energy return on investment) positive. Therefore utilising waste energy within the system is critical, along with the use of solar and other renewables so as to have maximum energy available for export to the Grid
- Capital expense has to be kept at the very lowest. This plant is a pilot for low capex – high productivity gas and energy production and will be replicated to scale up to 10 MW in modules of 1 and 2 MW each in various locations in North India over the coming 5 years
- Fresh water requirement has to be kept at a minimum and maximum possible water should be recycled

- High technology will be used to maximise process efficiency at each step, and tight process controls will be deployed to ensure that the overall processes run continuously at a very high level of efficiency and productivity
- There is also a focus on high usage of indigenous components and low level of imports.
- We are looking for partners with an open mind, willing to offer innovative, high efficiency technology, with a proven track record in supplying to similar plants or similar processes
- GreenOil is focussed on being the first in India to bring low cost, high productivity bio-methanation into the mainstream of Renewable Energy and offers its partners a high growth path in the country

3. General Description

The lean-burn gas engine generator sets shall be capable of running on a variable quality biogas with a methane number more than 40 and shall produce an output of 315 kWe at 415V, 50 Hz having spark-ignited lean burn engine with turbo-charging and after-cooling. Genset shall be suitable to burn biogas having methane content generally 40-70%.

The Gas engine generator sets 2 nos, will be a complete package unit with single source responsibility of design, manufacture and testing of engine, alternator, control system and complete generating set that will be provided by the supplier. Packaged units shall be an integrated unit with control panel, starting system, switching, paralleling both sets, synchronising with grid and other accessories as listed and detailed in subsequent paragraphs.

4. Quantity : Two Gensets

5. Technical Specifications

5.1. Generator Specifications

Type	Synchronous drip-proof, single bearing
Rated output at 0.8 power factor	394 kVA(315 kW)
Rated current at 0.8 power factor	685 A
Frequency	50Hz
Voltage and phases	3 phase ,415 V
Rated speed	1500 rpm
Permissible Over speed	2250 rpm
Earthling	Solidly Earthed
Efficiency at Unity Power factor	Not less than 97%

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Insulation Class	F
Excitation	Brushless self excitation
Cooling	Air cooled
Temperature rise	Temperature rise within NEMA 105°C f or continuous duty above ambient temp of 50°C
Controls	With Electronic AVR & suitable for grid operation and remote monitoring. All controls shall be connected to SCADA to run on permissive from various process blocks and vice versa.
Operation	Machine operation to be on Auto from self start to synchronization with Option for Manual synchronization complete with relays and controls.
Protection	Conventional alarms for over speed, high winding ,over voltage,over current,earth faults, reverse power, breaker failures, AVR failure. Generator /unit lockout on Major protection operation.
Grid connection	Two Gensets to run in parallel with connection to grid through one 800 kVA, 0.415/33kV, YD1 Vector group Generator Transformer(Not in supply scope).

5.2. Gas Engine Specifications

Particulars	Specifications
Cylinder Configuration	Vendor to specify
Bore	Vendor to specify
Stroke	Vendor to specify
Displacement	Vendor to specify
Compression Ratio	Vendor to specify
Aspiration	Turbocharged, Intercooled, Lean burn draw
Speed	1500 rpm
Duty	Continuous
Cooling System	Radiator
Intercooler Water Temperature	130°F (54°C)
Electrical Output	415V, 3 PHASE, 50Hz
Capacity Electrical	315 kWe

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Efficiency Electrical	Vendor to specify
Efficiency Thermal	Vendor to specify
Efficiency Total	Vendor to specify
NOx	Less than 0.5 g/m ³ N
Bio Gas Pressure : 100 to 200 mbar (g)	100 to 200 mbar (g)
Bio Gas temperature at inlet : 100 to 200 mbar (g)	10 °C to 40 °C
Calorific Value of Bio Gas	3600 kcal/Nm ³ to 5000 kcal/Nm ³
Exhaust Gas Temp : 330°C Appx	Vendor to specify
Dimensions in mm(LxBxH)	Vendor to specify
Weight of Genset	Vendor to specify
Cooling Water requirement:	Less than 800 liters.

5.3. Equipment Detail

Air Cleaner	Two stage, dry panel type with rain shield and service indicator. Engine mounted.
Barring Device	Manual.
Breather	Closed system.
Connecting Rods	Drop forged alloy steel, angle split, serrated joint, oil jet piston pin lubrication.
Cooling System	Flanged connections for remote radiator cooling.
Crankcase	Alloy cast iron, fully ribbed, integral with cylinder frame.
Crankshaft	Drop forged alloy steel with induction hardened journals, dynamically balanced and fully counterweighted. Viscous vibration dampener.
Cylinder Heads	Individual, interchangeable valve-in-head type with deep section alloy casting. Two hard- faced intake and two hard-faced exhaust valves per cylinder. Replaceable intake and exhaust valve seats. Mechanical valve lifters with pivoted roller followers.
Cylinders	Removable wet type liners of centrifugally cast alloy iron.

Genset Base	Engine, generator is mounted and aligned on a welded steel base, suitable for solid or spring isolator mounting on a proper foundation. Base is equipped with lifting eyes.
Engine Protection, Shutdown Contacts	High water temperature, low oil pressure and overspeed.
Exhaust System	Water cooled, cast iron exhaust manifolds. Single vertical flexible stainless steel exhausts
Fuel System	Specially tuned for operation and running on Biogas. Other fuel system parameters to be specified by vendor
Mounting	Genset shall be mounted on the engine flywheel housing and have multiple steel disc flexible coupling drive.
Heaters and RTDs	Generator Space Heater for 240 Volts, Generator Bearing Temperature. Detector. Winding Temperature Detectors (Two per phase.) with RTDs or thermocouples.
Governor & Controls	Governor-Preferably 'Woodward' make electric actuator (mounted) and magnetic pickup with electric governor control preferably 'Woodward' make. High Water Temperature Warning with thermowell. Low Lube Oil Pressure Warning. High lube oil temperature shutdown with thermowell. Low fuel Pressure Shutdown. Low Lube Oil Level Shutdown Switch. Thermocouples, (total 8), individual cylinders plus pre turbine and post turbine for exhaust temperature. Wired to junction box. RTD temperature sensors. Includes mounting and wiring jacket water outlet, lube oil inlet, intake manifold, auxiliary water inlet and fuel gas RTD's.
Ignition System	Custom Engine Control electronic ignition system with coils, cables, and spark plugs. Non-shielded. 24V DC power required for ignition. 24V DC Batteries of adequate AH capacity included in scope of supply. Includes emergency stop/service engine protection switch for local override of remote controls.
Instrument Panel	Engine mounted, includes water temperature, oil temperature, oil pressure, intake manifold temperature, intake manifold pressure gauges and emergency stop pushbutton.
Intercooler	Air-to-water.
Junction Boxes	Separate AC, DC junction boxes for engine wiring and external connections.

Lubrication System	Gear type pump, full flow spin-on filters and industrial base type oil pan. Engine mounted plate type oil cooler. Lubrication Oil Level Regulator-
Pistons	Aluminum alloy, three ring with patented high turbulence combustion bowl. Oil jet cooled with full floating piston pin.
Starting Equipment	24 V DC electric starting motors, crank termination switch.
Turbocharger	Dry type
Voltage Regulator	Automatic type for voltage regulation of +/- 0.5%
Water Circulating System	Gear driven pump for inter cooler and oil cooler. Inlet temperature of 54°C.
Water Circulating System, Engine Jacket	82°C - 88°C thermostatic temperature regulation. Gear driven pump.
Generator Switch Board	Suitable 415 V Air Circuit breaker with associated isolating switch, metering and protection CTs , PTs and control panel complete with extendable 415 V Bus of adequate capacity included in scope of supply.

5.4. Operation and Maintenance Period

Genset Running	>8,000 hours per year.
Top Overhauling Period	>20,000 hours
Major Overhauling Period	>40,000 hours.
Lube Oil Consumption	<0.0002 – 0.002 lb/bhp-hr.
Lube Oil Change	>2100 hours as standard
Breather Element Change	2100 hours
Spark Plug Change	2100 hours
Air Cleaner Element Change	4200 hours
Valve adjustment Interval	2100 hours

5.5. SCADA and Networking

The vendor shall supply the necessary SCADA and networking tools for the reliable Web-based monitoring which shall be compatible with the main plant process SCADA.

It shall have an open protocol.

The features shall have

- View displays of voltages current alarms as well as alarm logs

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- Set three levels of system security
- Fully customized monitoring and control system
- Monitor up to 6 devices at a site
- Connect and communicate via an internet browser on a remote PC

5.6. Specific Requirements

- The Gas engine generator set will be a complete package unit with single source responsibility of design, manufacture and testing of engine, alternator, control system and complete generating set that will be provided by the supplier. Packaged units shall be an integrated unit with control panel, starting system, paralleling/synchronising with grid and other accessories as listed and detailed in Technical Specifications section.
- Genset shall be suitable to burn biogas having methane content generally 40-70%.
- Gas engine will be lean-burn to reduce NOx emissions, and to provide greater efficiency.
- Duty will be continuous-operation
- Radiator based cooling system, with access to coolant pipe - to allow passage through a heat exchanger, or a heat recycling system

6. Performance Test

The Vendor shall subject the Genset to a performance test in order to establish the hundred percent rated electrical output and the rated parameters of Genset at specified fuel system for a period of 72 hour continuously.

7. Documentation

The following items shall be supplied by the supplier as standard with the order:

- Electronic notification and access to drawings for review and or approval
- Engine operation/service manual
- Engine parts book
- Generator/Voltage Regulator instructions.
- Instructions on major special item
- Wiring and control circuit Diagram

8. Initial spares

The vendor may quote the price of initial spares required for one major overhauling with other anticipated replacement required for 5 years of operation/service.

9. Eligibility Criterion

1. Should have supplied this component of equivalent capacity and size to at least 3 to 5 similar applications in service

- a. Reference list needs to be provided
- b. Contact details of two references with whom GreenOil can make contact to validate installation experience and performance over time
2. Should have members in the team who have been part of supplying to other similar applications, and have hands on experience with supply / deployment and O&M
 - a. This is a matter of trust – however, we would appreciate names, designations as well as brief one paragraph experience summary of two such people
3. Except for supplier of design, should have a turnover of over ` 2 Crores (\$0.5 million) in any of the previous two years
 - a. Listed / Public companies can provide reference to where their annual reports can be viewed
 - b. Others may please attach self attested copies of their audited financials (scanned copies are just fine)
4. Should be familiar with Indian conditions and local materials and components available in India to facilitate a high indigenous content
 - a. Experience in India / local partner in India is desirable, but not necessary
 - b. For firms that do not conform to the above condition, a small undertaking will be needed stating that they will do whatever it takes to guarantee that their component will fit into Indian standards, conditions and local materials available
5. In case your firm is a young concern and fails to meet any one of the eligibility criterion, please feel free to apply, providing adequate justification how you will prove to be competent to deliver the level of quality and service that GreenOil expects

10. Points to be taken care of in the quotation

1. Please keep the proposal as brief as possible. Some necessary sections are:
 - a. A simple detailing of some past projects of a similar nature
 - b. Broad detailing of your organisation
 - c. Past financial performance (to show turnover)
 - d. Technical section, clearly highlighting your products quality parameters and the fact that it meets requirements
 - e. The performance guarantees of your component
 - f. The warranties inherently included
 - g. The Operational and Maintenance services included in the quote
 - h. Initial spares included in the offer
 - i. Quote for consumables / spares required in the first 5 years of normal operations should be provided
 - j. In case some of the information requested for us is too detailed or difficult for you to answer specifically, please state so, and give an approximate answer, but please do try and provide as many specific answers as possible. It will help us to comparatively evaluate your proposal better
2. Please make a two part quote

- a. Part one should be the quote for the detailed design of the digester and associated components mentioned in the previous section (Technical Specifications)
 - i. Please note that it should include a component of validation of the construction as per your specifications
 - ii. It should also include a component for testing and commissioning of the digester
- b. Part two should be the quote for the construction and commissioning of the digester
 - i. This is independent of the design cost and is the cost for construction, testing and commissioning
3. Please make the quotation in INR
 - a. In case your component is imported, or you are an international vendor with no presence in India, then the quote should be c.i.f. Mumbai
 - b. In case you have an Indian representative / branch or are an Indian company, then you should quote c.i.f. Site Jaipur
4. Please clearly specify the lead time to delivery on site in weeks from placing of formal order with you, and also specify the plant gestation time, or the time taken to make your component production ready
5. Please feel free to mention any specific requirements / conditions that you might have
6. Please do not hesitate to contact Mr Bhatnagar or Mr Jalote for any clarifications
7. Please accept our apologies for giving you such short notice for responding, but clearances for the project were just received, and our timelines are very tight – our target date for initiation of generation is July 2011
8. We will revert after 15 days from receipt of your proposal and bid

11. The Proposal

The manufacturers may send their price with technical details in a format of specifications, the sample of which is shown in Appendix-1. The technical specifications may have deviations and additional information which may also be provided by the Manufacturer.

Appendix 1 – FORMAT OF SPECIFICATIONS

Particulars	Specifications
Generator specifications	
Type	
Rated output at 0.8 power factor	In kVA and kW
Rated current at 0.8 power factor	
Frequency	
Voltage and phases	
Rated speed	
Permissible Over speed	
Earthing	
Efficiency at Unity Power factor	
Insulation Class	
Excitation	
Cooling	
Temperature rise	
Controls	
Operation	
Protection	
Grid connection	Confirm capability for grid connection with Two Gensets to run in parallel with connection to grid through one 800 kVA, 0.415/33kV, YD1 Vector group Generator Transformer(Not in supply scope).

Gas Engine Specifications

Particulars	Details
Cylinder Configuration	
Bore	
Stroke	

Displacement	
Compression Ratio	
Aspiration	
Speed	
Duty	
Cooling System	
Intercooler Water Temperature	
Electrical Output	
Capacity Electrical	
Efficiency Electrical	
Efficiency Thermal	
Efficiency Total	
NOx	
Bio Gas Pressure :	
Bio Gas temperature at inlet :	
Calorific Value of Bio Gas	
Exhaust Gas Temp :	
Dimensions in mm(LxBxH)	
Weight of Genset	
Cooling Water requirement:	

Equipment Details

Air Cleaner	
Barring Device	
Breather	
Connecting Rods	
Cooling System	
Crankcase	
Crankshaft	
Cylinder Heads	
Cylinders	

Genset Base	
Engine Protection, Shutdown Contacts	
Exhaust System	
Fuel System	
Mounting	
Heaters and RTDs	
Governor & Controls	
Ignition System	
Instrument Panel	
Intercooler	
Junction Boxes	
Lubrication System	
Pistons	
Starting Equipment	
Turbocharger	
Voltage Regulator	
Water Circulating System	
Water Circulating System, Engine Jacket	
Generator Switch Board	<p>Please confirm supply of 415 V Air Circuit breaker with associated isolating switch ,metering and protection CTs, PTs and control panel complete with extendable 415 V. Bus of adequate capacity included in scope of supply.</p>

Operation and Maintenance Period

Particular	Period in Running Hours
Genset Running	
Top Overhauling Period	
Major Overhauling Period	

Lube Oil Consumption	
Lube Oil Change	
Breather Element Change	
Spark Plug Change	
Air Cleaner Element Change	
Valve adjustment Interval	

SCADA and Networking

SCADA	
Networking	
Protocol	