

**WESTERN™**  
**ENERGY SYSTEMS**  
Power Systems Specialists

December 12, 2007

Mr. Mario Van Cleave  
Monterey Regional Waste Management District  
14201 Del Monte Boulevard  
P.O. Box 1670  
Marina, California 93933-1670  
Re: Marina LFG Project

Dear Mr. Van Cleave,

Western Energy Systems (WES) is pleased to present the enclosed proposal for a GE Jenbacher JGS 420 engine generator rated at approximately 1425 kW, 1.0 P.F., 4160 Volt, 3 phase, 60 Hz equipped for landfill gas operation. Our proposal is F.O.B. job site on open top trucks with rigging and removal required by others. The proposal includes all ocean and inland freight as well as U.S. Customs duty. No provisions are made for local taxes, permits, or fees.

The base package includes the auxiliary heat rejection equipment and silencer. The following presents our proposed scope of equipment and services for the Marina LFG project.

**GE Jenbacher JGS 420 engine generator basic package**

1. One (1) GE Jenbacher JGS 420 engine generator equipped for landfill gas operation
2. One (1) GE Jenbacher DIA.NE generator set control system
3. One (1) GE Jenbacher DIA.NE WIN communication package with software & firewall
4. One (1) Vibration sensor package
5. One (1) Seismic 4 tie down package
6. One (1) Horizontal remote radiator package
7. One (1) Radiator fan motor
8. One (1) Fan control panel with vibration controls
9. One (1) Radiator braid package
10. One (1) Radiator 3way thermostatic valve package
11. One (1) L/T circuit pump with disconnect
12. One (1) H/T circuit pump with disconnect
13. One (1) L/T expansion tank
14. One (1) H/T expansion tank
15. One (1) Critical grade silencer
16. Engineering integration services for equipment to be supplied.
17. Training
18. Startup and commissioning service

## Engine Generator Performance Guarantees

Ratings are per ISO-ICFN continuous power with the following standard reference conditions

- Barometric pressure 14.5 PSI, or 328 feet above sea level
- Air temperature 77 ° F
- Relative humidity 30 %
- Electric Output - 1419 kW @ 4160 volt 60Hz three phase 1.0 PF (tolerance +/- 5%)
- Fuel Input - 12,349,000 BTU/Hr @ LHV 365 BTU/CF (tolerance +/- 5%)
- Gas Volume - 33,832 SCFHR (tolerance +/- 5%)
- Proposed Guaranteed Emissions
  - NOx: .6 g/bhp-hr
  - CO: 3.0 g/bhp-hr
  - NMHC 0.2 g/bhp-hr

WES will draw fuel gas samples in January or February as well during startup and commissioning.

The equipment is proposed with a GE Jenbacher two (2) year warranty. Details follow for each of the equipment and services categories to be supplied. NOTE: All components shipped loose for installation by others.

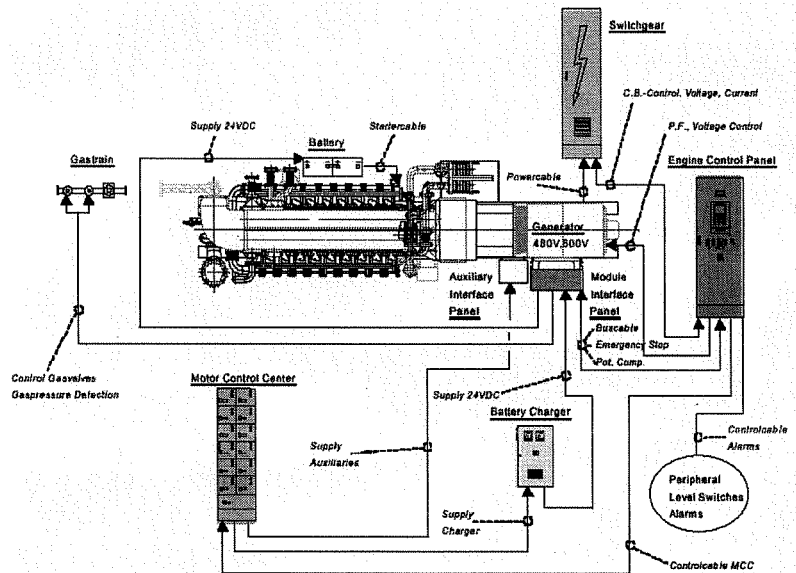
### The following presents the basic description for the JGS 420 engine generator package

- a. GE Jenbacher JGS 420 four (4) stroke LEANOX® gas engines incorporate state of the art technology, are designed specifically for gaseous fueled, stationary non-intermittent operation, and are characterized by extremely high degrees of efficiency, low exhaust gas emission rates, durability and a high level of reliability.
- b. GE Jenbacher generator sets are highly efficient machines. The **JGS 420** exhibits an electrical efficiency of 39.0%.
- c. A single piece crankcase and cylinder block constructed of a special high tensile casting with individual removable crankcase covers for inspection of the crankshaft, connecting rod, and crankshaft bearings.
- d. A drop-forged precision ground, surface hardened, statically and dynamically balanced crankshaft with drilled oil passages for pressurized lubrication of connecting rods. Main crankshaft bearings are high quality, three-component friction bearings.
- e. Pistons are of single piece, light metal alloy construction with piston ring carriers and oil passages for cooling. Individually replaceable wet cylinder liners are of chromium alloy gray cast iron construction. Engine piston and liner technology incorporates a scraper ring integrated in the cylinder liner. This design prevents carbon deposit on the piston crown, improves combustion and engine performance, provides stabilized lube oil consumption, reduces the risk of piston seizures, leads to reduced piston skirt, crown, and cylinder liner wear, and improves partial load performance. Connecting rods are of drop forged, heat treated design with diagonally split, serrated crankshaft journal ends for high load bearing capacity.
- f. The valve train camshaft, with replaceable bushings, is driven off the crankshaft intermediate gear train and splash lubricated via the rocker arms.
- g. The combustion air-fuel gas system includes a GE Jenbacher designed and engine mounted gas mixer featuring low-pressure losses and high efficiency at full load operation. The motorized carburetor adjusts automatically according to fuel characteristics and is integrated into the engine control system.

- h. The exhaust gas system includes a dry exhaust manifold, easily accessible for maintenance, and individual cylinder thermocouples. High efficiency turbochargers with electronically controlled turbocharger bypass valves. The electronic bypass valve provides for dynamic control throughout the operating range including isolated operations. This results in improved capacity for load add-load shed during varying load conditions.
- i. LEANOX® lean mixture combustion controls, developed and patented by GE Jenbacher, guarantees the correct air/gas ratio throughout operating ranges in order to provide lowest achievable gas emission rates while enabling stable engine performance at the same time.
- j. Microprocessor controlled ignition systems are connected from the engine to the GE Jenbacher DI.ANE control system via CAN bus. Firing points can be controlled and directed depending upon operating conditions and/or the type fuel used.
- k. Knock control systems are integrated between engine and DI.ANE controls to adjust engine performance and provide system protection through a series of specific firing point, engine output, and fuel mixture temperature controls.
- l. Engine-generator sets are skid mounted on heavy-duty base frames and provided with integral vibration isolation between the engine-generator assembly and the base frame. Machinery isolation pads are shipped loose for installation between the base and foundation.
- m. Engine cooling water circuits include a plate and frame heat exchanger for heat recovery of engine jacket water and intercooler heat; the engine jacket water pump, engine mounted intercooler and engine oil cooler, stainless steel flexible connections and steel flanges for the intercooler and engine jacket water circuits. Flexible connections and flanges will be shipped loose for installation by others.
- n. Engine jacket water preheating systems will be preinstalled with isolation valves.
- o. Electric starters are provided with engine starting batteries, battery racks, battery cables, and float-equalize battery chargers shipped loose for installation by others.
- p. The engine lube oil system includes a gear-type oil pump; pressure control valve, pressure relief valve, and full flow lube oil filters. Lube oil level inspection gauges will be installed with a float valve, minimum/maximum level switches, and a sight glass.

1. The GE Jenbacher generator set and control package provides an integrated electrical control system. This proposal includes all equipment and apparatus illustrated in the electrical system diagram shown herein. Installation, wire, cables, and terminations are by others.

- Generator sets
- Starting systems
- Interface panels
- Control panels
- Motor control centers
- Generator circuit breakers



The DI.ANE (Dialog-Network) freestanding control panel provides an engine-generator management system featuring a membrane touchpad display for interface and operation of the generator set equipment.

The DI.ANE system includes:

- Central engine and control module.
- An industrial grade computer with 10" VGA TFT color graphics display, 10 function keys, display selection keys, 10-key numeric keyboard for input of operating parameters, auxiliary keys for START, STOP, lamp test, and special functions. A RS485 serial port interfaces to the central computer and multi-transducer.

Dimensions for the DI.ANE panel are 87"high x 32" wide x 24" deep.

Main displays available from the DI.ANE panel include:

- Generator set interconnection electrical values:
  - Phase current
  - Neutral current
  - Voltage (Phase-to-Phase and Phase-to-Neutral)
  - Active power
  - Reactive power
  - Apparent power
  - Power factor
  - Frequency

(Options are available for generator winding temperature and generator bearing temperature display.)

- Engine oil pressure and temperature
- Jacket water circuit pressure and temperature
- Exhaust gas temperatures
- Engine controller
- Auxiliary PID controller
- Auxiliary status
- Operational data such as operating hours, service hours, number of starts, active power demand (kWh), reactive power demand (kVARh), and measured values required for the operational logbook.
- System set-up
- Graphical data logging and trending for up to sixteen (16) measured values
  - Long term trending of data for 30 second intervals up to one (1) month duration
  - Short term trending provides data for troubleshooting
- PLC base central engine management which controls the following:
  - Speed control in no load and isolated operation
  - Power output control in a parallel operation.
  - LEANOX® control system for control of boost pressure relative to generator terminal output and fuel mixture temperature via the GE Jenbacher engine driven air-gas mixer.
  - Knocking controls enable adjustment of the ignition point, power output, and potentially the mixture temperature in the event of a knocking condition.
  - Loadsharing between generator sets is isolated operations.
  - Proportional power reduction as a result of a fault
  - Generator set logic control
  - Generator monitoring of up to eight (8) functions simultaneously:
    - Overload/short-circuit [51], [50]

- Over voltage [27]
  - Undervoltage [59]
  - Asymmetric voltage [64], [59N]
  - Unbalance current [46]
  - Failure Excitation [40]
  - Overfrequency [81>]
  - Underfrequency [81<]
- Three (3) position lockable operation mode selector switch
  - “OFF”- Unit is disabled
  - “MANUAL”- unit is manually operable
  - “AUTOMATIC”- Full automatic operation is enabled via remote signal. A remote stop is enabled with a cooldown period following signal. Auxiliary equipment will continue to operate for a period following engine shutdown.
- Three (3) position demand switch
  - External demand OFF
  - External demand
  - Override external demand
- The following shut down functions are displayed:
  - Low lube oil pressure
  - Low lube oil level
  - High lube oil level
  - High lube oil temperature
  - Low jacket water pressure
  - High jacket water pressure
  - High jacket water temperature
  - Overspeed
  - Emergency stop
  - Gas train failure
  - Start failure
  - Stop failure
  - Engine start blocked
  - Engine operation blocked
  - Misfiring
  - High mixture temperature
  - Measuring signal failure
  - Overload/output signal failure
  - Generator overload/short circuit
  - Generator over/under voltage
  - Generator over/under frequency
  - Generator asymmetric voltage
  - Generator unbalanced power
  - Generator reverse power
  - High generator winding temperature (Optional)
  - synchronizing failure
  - Knocking failure
- The following alarms are displayed:
  - Low jacket water temperature
  - CPU battery failure
- Operational functions displayed:

- Ready to start
- Operation
- Generator circuit breaker “ON”
- Four (4) auxiliary contacts are available for remote start, shut down, operation, and a common alarm.
- Additional contacts are optionally available for start/stop controls, thermal processes, and electrical synchronization.

The GE Jenbacher DIA.NE WIN system provides for remote operation and monitoring of the generator set and related auxiliaries via a PC station as well as remote monitoring via I/P address. The DIA.NE WIN system enables:

- Remote monitoring of operating parameter and alarm displays, trend data.
- Management, starting and stopping of generator set and auxiliaries along with remote acknowledgement of error/alarm messages.
- Connection options include modem, Internet, and LAN.
- Remote host computers and monitors are optional. All I/P fees and costs are by others.

## **2. Integration services to be provided will include:**

- a. Development of sequence of electrical operations in association with GE Jenbacher and Marina Landfill for synchronizing, paralleling, and load sharing of the generator sets.
- b. Develop and customize engine, generator, and associated mechanical-electrical equipment drawings for all equipment outlined in this scope. Installation and interface drawings along with technical data will be prepared for use by others to develop integrated installation and point-to-point wiring diagrams required for installation of equipment.
- c. Coordinate with and provide engineering assistance for integration of the DIA.NE XT
- d. Provide emissions data and support for air permitting.
- e. Develop and customize DIA.NE panel operating systems for site specific conditions and parameters.
- f. Develop and provide six (6) sets of submittal documentation in hard copy and CD format for review by construction managers and sub-contractors.
- g. Develop and provide six (6) sets of as-built documentation, following final startup and commissioning, in hard copy and CD format for the owners use.

## **3. Startup and Commissioning Services and Training**

WES will provide delivery inspection, perform an installation review for installation services provided by others, and will provide the pre-commissioning, startup, and testing as required to support the new installation. Typical startup and training services are included for a maximum of ten (10) days per unit however we will provide additional services as required to support the installation.

Services will be scheduled after receipt of completed installation checklists. Services required beyond allowed time will be subject to additional, negotiated charges. In addition WES/Jenbacher personnel will provide 40 hours of operator training. The following presents an overview of our typical startup and commissioning plan.

## **1. Preliminary remarks, checking shock protection precautions and important syst. components**

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- 1.1 Other inspection and reporting documentation
- 1.2 General information on inspection procedure and completing this check list
- 1.3 Mechanical checks
- 1.4 Checking shock protection precautions

- 1.5 Wiring
- 1.6 Avoiding heat build-ups in switchgear cabinets
- 1.8 Interfaces to site or customer-supplied genset components
- 1.10 Software

## **2. Filling with fluids and lubricants** \_\_\_\_\_

- 2.1 Engine coolant
- 2.2 Lube oil
- 2.4 Mixture coolant system

## **3. Power supply** \_\_\_\_\_

- 3.1 480/277 V, 60 Hz - supply
- 3.2 Commissioning starter or control battery
- 3.3 Charger for starter or control battery (SIEMENS 40A)
- 3.4 Control memory (BSG-1240F, Bären)

## **5. Module control** \_\_\_\_\_

- 5.1 Important note
- 5.2 Start up of the PLC | CLC
- 5.3 Installation of DIA.NE WIN Server with standard application
- 5.4 Check Date | Time of all screen displays

## **6. Auxiliaries** \_\_\_\_\_

- 6.2 Preheating pump
- 6.3 Jacket water preheating
- 6.6 Recooling lube oil pump
- 6.14c IC922 – double ignition system (extended firing time)

## **7. Basic setting, parameterizing control and monitoring instruments** \_\_\_\_\_

- 7.1. Alternator circuit-breaker from customer
- 7.3 SEG-mains decoupling relay MRN3-11D
- 7.5 Servo amplifier for Heinzmann actuator StG10 and StG30 Fa. ALGE
- 7.6 GE Jenbacher gas mixer actuator
- 7.7 DIA.NE XT customer password
- 7.8 DIANE – Parameter for motortype 208 -620
- 7.9 SPM-D1040 Synchronizer (Woodward)
- 7.14 Turbobyypassvalve functional test
- 7.15 Flowtech (turbo bypass control)

## **8. Monitoring equipment (testing with engine stopped)** \_\_\_\_\_

- 8.1 Monitoring equipment general
- 8.2 Fail save current loop (genset-specific)
- 8.3 Faults that result in shutdown (operating current)
- 8.4 Faults that result in warnings

## **9. Manual start** \_\_\_\_\_

- 9.2 Adjustment of Pickups for IC922 ignitions
- 9.6 Setting of the ignition timing indication – dia.ne:
- 9.8 Check of generator protection equipment

## **10. Automatic start** \_\_\_\_\_

## **11. Mains monitoring with SEG-MRN3-1-relay** \_\_\_\_\_

- 11.1 Preparations

- 11.2 Overvoltage | undervoltage function
- 11.3 Overfrequency | underfrequency function
- 11.4 KU-Function

## **12. Synchronizing, power control, Leanox control** \_\_\_\_\_

- 12.1 Preparations | PLC
- 12.2 Synchronizing selector switch to position "0"
- 12.3 Synchronizing selector switch to position "Manual"
- 12.4 Synchronizing selector switch S1 to position "Automatic"
- 12.5 Monitoring systems (-----)
- 12.6 Power control
- 12.7 Leanox control

## **13. Monitoring equipment (testing while genset is running or under load)** \_\_\_\_\_

- 13.1 Monitoring equipment general
- 13.2 Closed safety current loop
- 13.3 Faults that result in shutdown (operating current)
- 13.4 Faults that result in warnings

## **14. Stand-by generating duty (isolated operation) and re-synchronization** \_\_\_\_\_

- 14.1 Stand-by generating duty
- 14.2 Re-synchronization

## **15. Alternator** \_\_\_\_\_

- 15.1 Checking voltage adjusting range
- 15.2 Checking basic setting of droop
- 15.4 Adjusting automatic voltage matching (NEWAGE)
- 15.5 cos $\phi$ -controller
- 15.6 Neutral conductor current
- 15.8 Adjusting knee-point voltage (only at sites with island mode)
- 15.9 Underspeed protection (only at sites without island mode)
- 15.10 Test alternator deexcitation

## **16. Concluding operations, measurements, recording** \_\_\_\_\_

- 16.3 Engine control recipes | parameters
- 16.4 Generator equipment
- 16.5 Earthing
- 16.6 Visualization screens
- 16.7 Recording changes carried out
- 16.10 Down load of Log files after test run
- 16.11 Down load of Log files after commissioning

All prices are quoted F.O.B. Job site on a truck with rigging and removal required by others. No provisions are made for local taxes, permits, or fees. This proposal is subject to Western Energy Systems Equipment Sales Contract and Terms and Conditions.

Delivery of equipment will be seven to eight months from receipt of approved purchase order. Submittals for non-Jenbacher supplied equipment will be 4 to 5 weeks from receipt of approved purchase order. Formal Jenbacher supplied equipment drawings, wiring diagrams, interface, alarm lists will require approximately sixty to seventy days from receipt of firm purchase order.

This proposal is valid until December 27, 2007. We will need a notice to proceed in writing from MRWMD.

Payment terms will be net thirty (30) days from date of invoice on the following basis:

1. Upon notice to proceed.....15%
2. Upon delivery of submittals and engineering documentation for installation design.....10%
3. Upon delivery of Equipment to MRWMD.....65%
4. Upon completion of startup and commissioning.....10%

WES will provide equipment and services identified in this proposal for a firm fixed price of \$736,126.00

We sincerely appreciate this opportunity to submit our proposal for your review. If you have any questions please don't hesitate to call me at 858-527-8982 or email shall@weesys.com

Sincerely Yours  
*Steven Hall*  
Steven Hall  
Sales Engineer