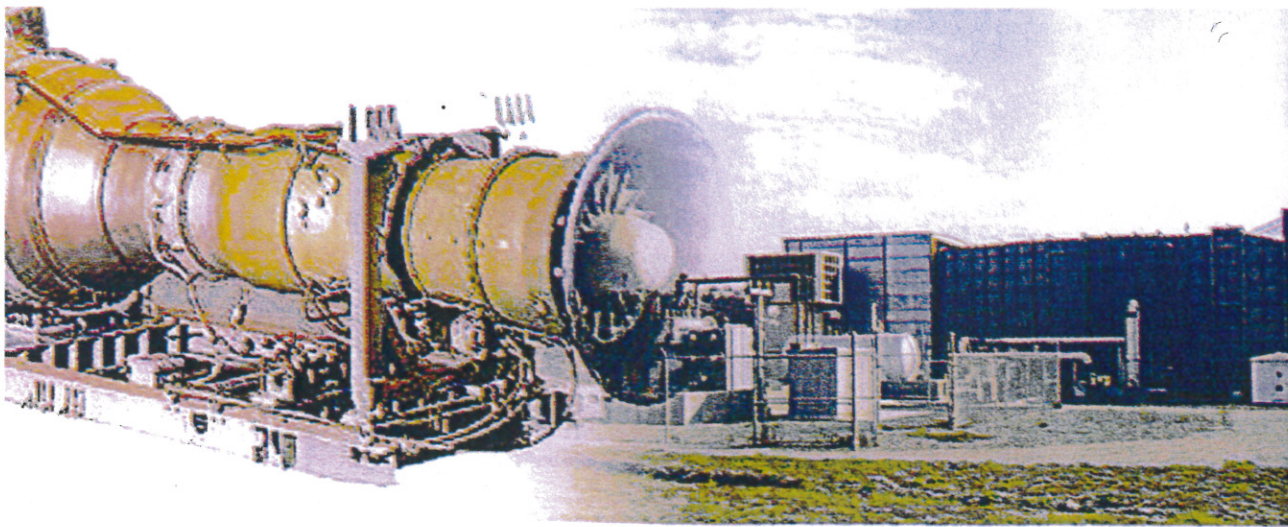




**DERWICK ASSOCIATES, S.A.**  
**PDVSA SUPPLIER CODE: 350015280**  
**REQUEST FOR QUOTATION (RFQ): 6000335081**  
**2 x Pratt & Whitney Twin Pac FT-4**

**Technical:**  
Equipment Data Sheets/Specification/Configuration

• Simple Cycle Performance	60Hz60Hz
• Simple Cycle Performance	
• Serial Numbers	686625-686626-600538-600630
• Output	52 MW
• Heat Rate	11,600 Btu/kWh (8,795 kJ/kWh)
• Efficiency	34%
• Mass Flow	981 lb/sec (445 kg/sec)
• Turbine Speed	3600 rpm
• Exhaust Temperature	805°F (429°C)
• Model Designation	GG4
• Fuel Consumption	242 (Liters/Mw-hr)
• Gallons/hr	4,343
• Liquid Only	



## FT4 SCOPE OF SUPPLY

- Pratt & Whitney Dual Fuel FT-4 / Turbine Gen/Set
- Baseplate with supports for Gas Turbine, & Foundation Bolts
- Main Generator 13.8/11kv 60/50hz .85 P.F.
- PLC Turbine Controls
- Complete Local/Remote Control and Supervisory System for the Gas Turbine and Expander, including all necessary control switches and alarms
- The Generating Plant is Auto : Start, Synch & Parallel
- Water Injection for Power Boost & Exhaust Emissions Control
- Exhaust Silencer
- Exhaust Stack
- Intake Silencer /Screen
- Coupling between the Turbine and the Generator.
- Generator
- Generator is a Self Ventilated Turbo and designed for Open Air Cooling.
- Exciter is located at the Non-Driven End of the Generator.
- Inlet Suction Duct for the Gas Turbine
- Thermal and Acoustical Insulation

### Governing And Lubricating Oil System

- Turbine comes with an Integral Governing and Lubricating Oil System which includes all necessary safety and supervisory devices.
- Generator has a separate lubricating system as well as the Load Governor and Over Speed Trip Mechanism.
- Oil is cooled by a radiator located at the side of the unit.
- Fan Cooled Radiator.
- DC Battery is supplied to provide power in case of an emergency and unit power is lost

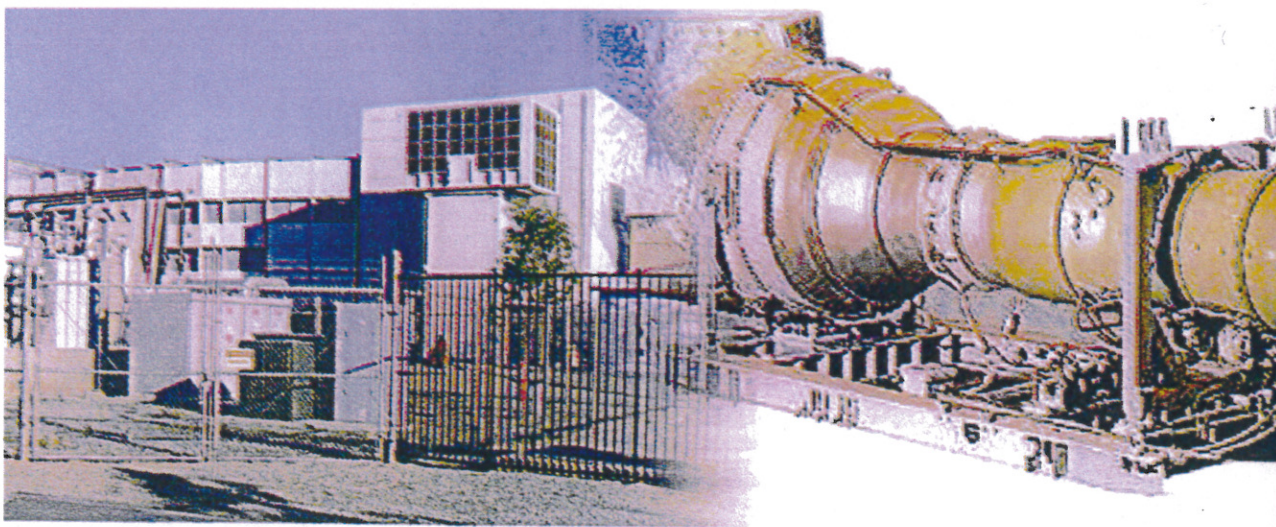
### Fuel System:

- Liquid Fuel/Gas Fuel
- Fuel Connections are located at the side of the unit

### Vibration Supervisory System

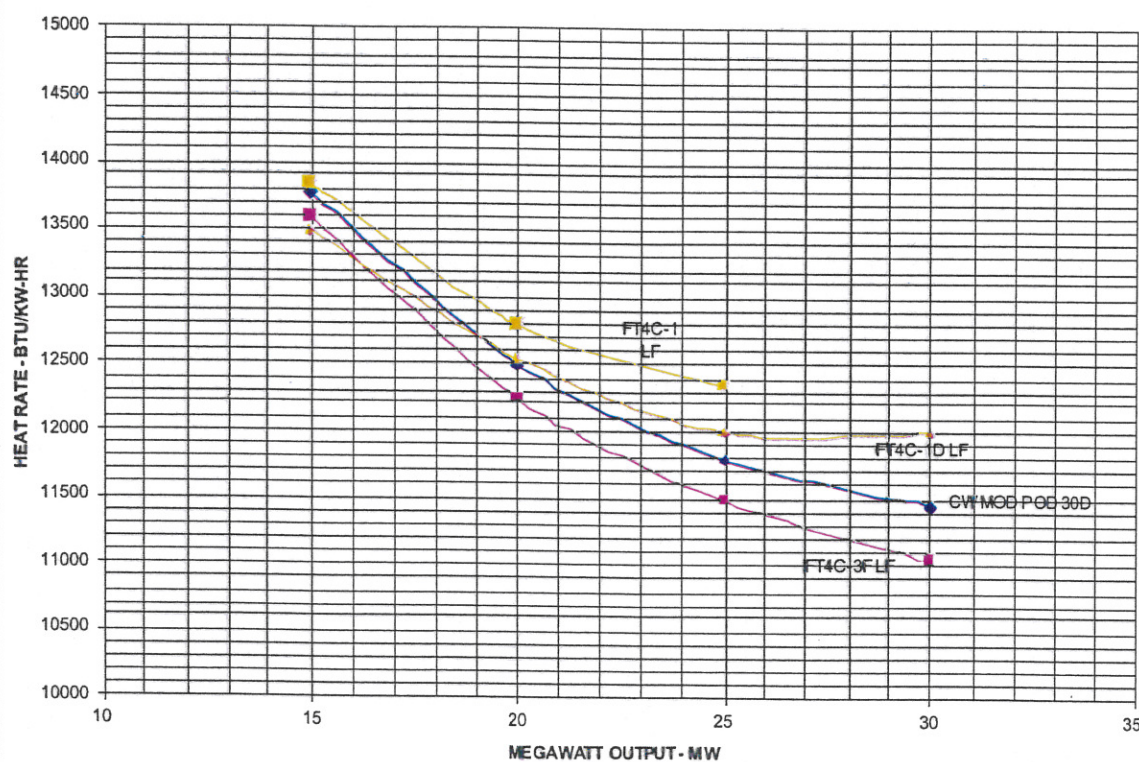
- Noise Level: the noise level measured at 400 Ft will be 85db or lower





## FT4 FACT SHEET

HEAT RATE COMPARISON OF CW MOD POD 30D WITH VARIOUS FT4C 'S WITHOUT WATER INJECTION



### Turbine (Simple Cycle)

Generator Frequency	50 Hz	60 Hz
Generator Effy. Assumed / Gearbox Effy. Assumed	.980 / N/A	.980 / N/A
Output (kW)	24,300	29,400
Heat Rate (Btu/kWe-hr)	13,200	11,500
Power Turbine Speed (rpm)	3,600	3,600
Exhaust Temp. (deg. F)	570	690

## **Descriptive Equipment Information/Configuration:**

### **THE PW FT4C-1D TWIN PAC**

#### **GENERAL DESCRIPTION**

The FT4C-1D Twin Pac is an outdoor, completely self-contained, automatic, gas turbine powered electric generating plant, nominally 50 HZ rated at 51 MW at 15\* C. The unit contains all the equipment required for local unattended operation and provisions for interconnection to a remote control panel. It has the capability to start-up in the event of loss of purchaser-provided AC electrical power when the unit is in a stand-by condition. This built-in starting capability, plus the ability of the unit to assume full load in less than four minutes after initiation of the start signal, provides excellent protection in the event of a “black-out”.

The FT4C-1D Twin Pac consists of five primary modules; two gas turbines, the electric generator, the control enclosure and a high voltage switchgear enclosure. Each gas turbine unit consists of a Pratt & Whitney aero-derivative FT4C-1D gas generator and a two stage free turbine. The gas turbines provide high energy gas to the free turbines, which in turn, convert this energy into useful work when mechanically coupled to a driven load through flexible couplings. The electric generator is an Electric Machinery air-cooled, two pole, turbine type generator with a brushless excitation system. The control enclosure contains the gas turbine control, generator control, motor control center, low voltage switchgear, batteries and charger, engine fuel controls, an upgraded digital PLC sequencing system, protective relays, auxiliary transformers and a master terminal board. The high voltage switchgear enclosure contains the main circuit breaker and high voltage transformers.

The gas generators and free turbines are provided with low pressure lubrication systems including oil storage tanks and filtration. The electric generator has a separate lubrication system with AC motor driven lube oil pump with a DC pump backup. All systems are air cooled.

The electric generator is an Electric Machinery synchronous generator nameplate rated at 74,500 kVA , 59°F, 0.9 power factor, 60 HZ, 3 phase, 2 pole 3600 RPM, open air cooled, two sleeve bearing bracket type. Generator excitation is provided by a 250 V, 150 kW, direct connected brushless exciter with permanent magnet generator pilot exciter.

The gas turbine inlet stacks are acoustically treated and are fitted with sound attenuating baffles. The exhaust stacks are constructed with “corrosion resistant” steel and sound attenuating baffles. The turbines, generator and controls enclosure are of painted steel construction.

**Two FT4C-1D packages will be provided for a total of 104 MW generating capacity Gas Turbine**

The control enclosure contains the gas turbine control, generator control panel, Motor Control Center, high voltage metal clad switchgear and batteries.



## **SCOPE OF SUPPLY**

### **Gas Turbine Generator Set Scope Of Supply**

Derwick Corporation offers the delivery of Two (2) Refurbished FT-4C-1D Gas Turbine Power Generation Packages, designed in accordance with the specifications outlined in this proposal, comprising of:

### **PRATT & WHITNEY 2 X FT4C-1D TWINPAC 108 MW ELECTRIC GENERATING PLANTS**

#### **Equipment**

The major equipment included in the TP4-2 TWINPAC consists of:

- a) A steel enclosure with inlet and exhaust stacks fitted with sound attenuating devices.
- b) Gas Turbine Prime Movers, each equipped with the following systems:
  - (1) Operating Controls
  - (2) Lubricating System
  - (3) Fuel Control and Fuel System, including Booster Pump and Filter
  - (4) Starting Turbine
  - (5) Ignition System
  - (6) Automatic Anti-Icing
  - (7) Flexible Coupling
  - (8) Mounts and Base
- c) Open Cycle, Air Cooled Generators with brushless exciters and associated electrical

Equipment including:

- (1) Voltage Regulators
- (2) High and Low Voltage Switchgear
- (3) Turbine and Generator Control Panels

- (4) Sequencers
- (5) Protective Relaying
- (6) Motor Control Centers
- (7) Batteries and Chargers
- (8) Auxiliary Transformers
- (9) Master Terminal Strips

### **3. Operation**

The TP4-2 TWINPAC is designed for either local or remote automatic operation on the distribution or transmission system of an electric utility. In the event of a blackout of a main power station, the unit also may be started and operated as an “isolated” generating station from either the local or remote control station.

The TWINPAC has five (5) modes of operation:

(1) Parallel – Manual and Automatic (Remote – Local)

#### **(2) Isolated – Manual and Automatic (Remote – Local) Generator Rotor Withdrawal tool**

- Freight FAS, Port of Export
- MCC / UPS
- Inlet Chiller Coil

(3) Isolated Precise – Manual and Automatic (Local Only)

(4) Idle – (Local Only)

(5) Test – (Local Only)

Mode 1 provides the capability of achieving any desired load level either automatically or manually. When the “normal” loading-unloading rate is selected, the unit can be brought to full load within five (5) minutes from breaker closure, or similarly from full load to breaker opening within five (5) minutes of initiation of stop signal. When the “fast” loading-unloading rate is chosen, these same actions can be accomplished in fifteen (15) to twenty (20) seconds.



When used to compensate for peak-load periods, the TP4-2 TWINPAC is normally operated unattended from a remote control station in the Automatic-Parallel Mode. In this mode, the load selection – Peak, Base Load, or Minimum Load – is made at the control panel by setting the Power Programming Switch to the desired load level. Upon actuation of the Start Switch, the unit will automatically start up, sequence, and synchronize with the line, and go immediately to one of the selected load levels and remain at this level. While in operation, the unit can be automatically shifted from one load level to another by actuation of the power Programming Switch. If the unit is first brought on the line in the Automatic Parallel Mode to any one of the above four programmed load levels, it may be placed in the Manual-Parallel Mode and the load level may be manually adjusted to any desired value between any programmed load level (Maximum, Peak, Base Load or Minimum Load) and zero power by actuation of the speed governor switch.

When the service of the TWINPAC is no longer required, actuation of the remote Stop

Switch will automatically unload the unit, sequence it to the “Idle” and “Cool-Down” phases to a complete stop. This same sequence of events can also be accomplished locally at the Control Room.

The unit can also be manually brought on the line from the local control room by selecting the Manual-Parallel Mode of operation. In this mode, actuation of the module Start Switch will automatically start-up and sequence the module to its idle speed condition (3550 rpm free turbine speed) from where it can be manually synchronized and loaded. This feature can also be incorporated into the remote control panel at additional cost.

This TWINPAC can also be used for blacked-out station start-up or “isolated” operating

condition by selecting “Isolated Mode”. In this mode, the unit can be started and automatically or manually (depending upon selection) close onto the purchaser’s dead bus. On actuation of its Start Switch, the module will automatically sequence to 2950 rpm generator speed at which point the breaker is closed manually or

automatically depending on the method chosen. The unit will load within its capability, governing along a 4% droop slope. Frequency may also be controlled by actuation of the governor switch.

When the unit is the only available source of power, it may be operated in the Isolated Precise Mode from the local control room or remote control panel if this extra equipment is provided. When in this mode, actuation of its Start Switch will automatically sequence the unit to 3600 rpm and maintain the speed. The main breaker can be closed, either automatically or manually, after reaching this speed and governing will be isochronous with load demand. When either the “Isolated” or “Isolated-Precise” modes are selected, “deadbus” relay will prevent closure of the main breaker on a “live-bus”.

To ensure the FT4’s capability to start and provide power when operating in these isolated modes, should purchaser-provided electrical service to the unit become unavailable, a battery pack and station auxiliary transformer are provided. All electrical equipment involved in starting or tripping is designed for direct-current operation. The station auxiliary transformer is energized as soon as the generator is producing power and the main breaker is closed, thus supplying station power, including D.C. through a rectifier, preventing further drain on the battery.

For testing and “trimming” the unit, Idle and Test Modes are provided. In the Idle Mode, the unit will automatically sequence to idle speed (approximately 6000 rpm N2 speed) on actuation of the Start Switch. The Test Mode, with its associated Test Panel, provides direct individual engine speed control and permits manual breaker closure and loading for test and trim purposes.

The TWINPAC has two basic operating controls: a Speed Governor Switch to adjust speed or load, and a “Voltage Adjust Rheostat” (VAR Switch) to adjust terminal voltage or vars. When the unit is in the Isolated Mode, the VAR Switch controls the terminal voltage and the Speed Governor controls the frequency. However, when the unit is in the Parallel Mode, the Speed Governor Switch will

change the load on the machine and the VAR switch will change the reactive power from a preset value. Both switches can be used locally or remotely.

The unit can be restarted, if so desired, after the Stop Switch has been actuated, provided the shutdown sequence has not progressed to the fuel cut-off stage, at which point the engine must be allowed to come to windmilling speed before restarting (this requires approximately one {1} minute). Protective relays will prevent restarting during this phase of shutdown sequencing.

In an emergency, the TWINPAC can quickly be brought to the shutdown condition by actuation of either one of the Emergency Stop Buttons located in the Remote or the Local Control Room. Actuation of these buttons, or any of the shutdown relays, will cause the quick acting fuel shut-off valves to close, thus by-passing the normal shutdown sequence and stopping the unit in the shortest time interval.

In the event that an electrical or mechanical fault should occur in one of the units, protective relays will automatically energize an alarm signal if continued operation is permissible, or take the unit off the line if necessary and bring it directly to the shutdown condition. Annunciators are provided in the Control Room to indicate the location or cause of the fault.

## **FT4C-1 TWINPAC Control System Description**

### **A. Control System Description**

#### **1. Woodward NetCon 5000**

This system has a central processing unit (CPU) for unit sequencing and fuel governing. It is a 32 bit CPU with high speed and great accuracy, utilizing conventional analog and digital input/output devices. It also includes a final driver for the fuel control valve. A new liquid fuel control valve and integral shutoff valve are provided. The NetCon 5000 is considered to be the best state-of-the-art control available for this type of generating unit. It

represents the maximum system integration available at this time. The NetCon 5000 is powered from the 125 VDC batteries.

An industrial 19-inch color CRT is provided and can be used to start/stop, load the unit, and select power levels. Displays are selected by use of a mouse. The CRT provides the operator with all alarm and trip indications. Additionally, sensors, transducers, or I/O are provided to digitally display and record all parameters including the following for each engine:

- q Speed: N1, N2, N3
- q Pressure: PS4, PT7, P AMB, Fuel Pressures, Lube Pressures
- q Temperature: TAMB, TT2, TT7 Individual, Average and Spread
- q Megawatt Output, Megavar Output, Generator Voltage
- q Performance: Corrected Values of N1, N2, PS4/PT2 (Compressor Pressure Ratio), PT7/PT2 (Engine Pressure Ratio, Wf (Fuel Flow), Ww (Water Flow), TT7 Avg. and Generator Load

## 2. Special Design Features and Options

The following is a list of special design features, which are included in the control equipment:

- a) The DCS has logic to improve reliability and availability by using dual speed sensors and switching from a failed sensor to a good one without tripping, but with an alarm. Also, sensor signal arrangement on I/O boards is such that a degree of fault tolerance is achieved. Operation can continue with some boards out of service while an alarm is displayed.
- b) All set points will have digital accuracy to eliminate the drift of analog controls.
- c) The digital set points and accuracy eliminates many of the tedious calibration procedures performed by the technicians during maintenance, startup, and load trimming of analog controls.



- d) The design philosophy is one that eliminates adjustments and is as self-diagnostic as possible. All alarms are individually printed out and not ganged into one alarm window which helps pin down the cause of a problem to the specific engine parameter involved and therefore contributes to less down time. The "first out" feature identifies the cause of a shutdown.
- f) Start Ramp with Fuel Limit - Eliminates the need for seasonal winter/summer start ramp trim or adjustment.
- g) Black Start - The DCS is DC powered and the vibration monitor is DC powered. A small inverter powers the MMI CRT and computer but black start is still possible with these out of service.
- h) Metal oxide varistor transient suppressors are installed for auxiliary control relays and fuel solenoid valves to protect DCS and vibration monitor electronics from high speed, high amplitude, inductive spikes.
- i) The water wash sequence is integrated into the DCS.
- j) The fuel shut off valve test logic is integrated into the DCS.
- k) Lite-off flow test logic is built into the DCS.
- l) Standard industrial inlet air temperature sensors and transmitters are provided to improve accuracy. Both engines can continue to run if one sensor fails.
- m) Automatic performance calculations are provided to simplify performance trend monitoring.
- n) Improved load sharing between gas generators is provided with digital accuracy and with no adjustments required.

- o) The system documents operator action automatically as an aid to problem diagnosis.
- p) A remote monitoring modem will be provided so that operating history, alarms, operating parameters and performance can be viewed. This requires a dedicated phone line which is to be provided by the Owner. ESI provides the remote monitoring for the warranty period.
- q) Energy control center remote SCADA operation for remote start/stop and load control is an available option.
- r) Local plant office master monitor is also an available option to permit alarm monitoring and group start mode.
- s) All fuel and lube pressures are automatically monitored by new solid-state pressure transducers with plus or minus 0.25 percent accuracy. All transducers are equipped with three way test valves.

## 2. Control CRT

The Control CRT is an industrial color CRT which is used by the operator to start/stop load and select power level, is icon driven, and has a 19" color screen. It provides the operator with alarm and event lists and built in trending capability for approximately 30 days of operational data storage. All analog parameters can be displayed in groups in a trend format.

## 4. Operator Control Panel

Operator Control Panel has indicating lights and switches for operator control in addition to control functions on the CRT.

## 5. Vibration Monitor

Vibration Monitor is a rack-mounted digital device for gas generator vibration

monitoring. High temperature accelerometers are used. The signals are processed by the separate vibration monitor and sent to the DCS where the alarm and trip functions are processed, and additionally are made available for trend history. Vibration monitoring of the free turbine is accommodated.

6. NetCon 5000 Main Unit has a single Central Processing Unit (CPU) which is programmed for both the sequencing and the fuel governing function of the control system. It is a 32 bit CPU. The Woodward NetCon 5000 uses a single chassis in order to house all of the circuit boards required for both engines. It contains the maximum system integration that is available at this time.

7. The Main Chassis houses some of the input/output circuit boards (I/O) for the main unit and is located in one of the 19" racks. Other I/O cards are locally mounted in the control panel.

8. Power Supply is a 125 VDC powered unit that provides controlled voltage DC to the rest of the DCS system. It provides system logic during a coast-down following a major power loss.

9. Printer is a unit that is used to print all alarms and events and to provide CRT screen copies in color.

10. I/O connections to the NetCon 5000 are made with plug-in connectors at the I/O cabinets in the control room. The I/O cabinets are standard 19" wide equipment rack mounts. These cabinets have interface terminal boards which are used to terminate all field I/O and connector harnesses to the NetCon control panel terminals.

11. Operator Interface Displays: Numerical data is displayed for alarms. Digital displayed data and analog trend displays are used by the operator to determine equipment status, as well as to control the unit, start/stop, load, etc. Trending is stored for thirty days of operation in the MMI System.

12. The AVR is a new digital device that has independent manual backup voltage control.

### 13. Water Injection System for NOx Control

The water injection skid provides water injection flow to four (4) engines (two (2) TWINPAC units). The skid is located in the turbine auxiliary room which is heated, ventilated and insulated. Maintenance clearances are provided around the skid.

The skid contains all pumps, control valves and shutoff valves for automatic water injection operation. A second pump provides redundancy and both pump motors operate at 480 V supply voltage. The motor starters are located on the skid. Two (2) TEFC 40 HP 480V boost pumps and two (2) TEFC 100 HP 480V main pumps are provided for redundancy. The boost pumps have discharge filters to protect the downstream control valves and engine systems. Either boost pump and either main pump can be valved in to provide full water injection flow to the eight engines. Normally one pump is the main and the other is the backup. Transfer is accomplished manually. The design does not require both pump outputs to run in parallel. The backup pump can also be used for future inlet fogging to provide an evaporative cooling effect to the gas generator air inlets to boost power output on hot days if inlet fogging nozzles, controls and piping are installed.

The boost pumps also serve a dual function as they are used to supply water wash to the engine bellmouth wash nozzles.

The logic for the control of the water injection valves and the protection of the engines is built into the Woodward NetCon digital integrated control system. Common pump services are controlled by a MicroNet NetCon subsystem mounted in a panel in the control room. The NetCon control system uses fuel flow for ratio control purposes within the EPA accuracy limits of five percent. Fuel flow totalization and heat rate calculations are included. Water flowmeters are included for each engine and are located on the skid. Water flow is also totalized in the NetCon.

The system automatically air purges the fuel nozzles of water in the engine at each shutdown. An instrument air supply is provided to the skid to operate the control valves and to the engine base for nozzle air purging purposes.

The engine interface consists of an ESI-patented water and fuel mixing block and necessary piping to accept the interface check valve and mixer. The mixer passes water into the liquid fuel manifold when operating on gas fuel.



Water injection is turned on during the start sequence at minimum power, and it is turned off at minimum power during the stop sequence. Megawatt output can be varied from minimum power to full load while maintaining the appropriate water to fuel ratio. The required water to fuel ratio is different for each fuel and it is automatically controlled by the DCS. Flameout detection monitoring, automatic EGT spread detection, and automatic load limiting are also provided in the DCS. The inlet fogging option is automatically sequenced on if provided

## **BILL OF MATERIAL**

Two (2) FT4C-1 TWINPAC Generating Units

Each remanufactured Model FT4C-1 TWINPAC Generating Unit includes the following equipment:

### **1. COMBUSTION TURBINE PACKAGE**

a) Two (2) weatherproof, prime painted steel enclosures, each including:

- (1) Inlet Air Silencer, Two-Stage Filter
- (2) New Exhaust Stack with Sound Suppression Treatment
- (3) Fire Protection system
- (4) Ventilation System
- (5) Low Voltage Heaters
- (6) AC and Emergency DC lighting system

b) Two (2) P&WA Model FT4C-1 industrial combustion turbines including:

- (1) Operating Controls
- (2) Lubricating System
- (3) Fuel Control and Fuel System, including Booster Pump and Filter
- (4) Starting Turbine
- (5) Ignition System
- (6) Automatic Anti-Icing System
- (7) Flexible Coupling
- (8) Mounts and Base

c) Pratt & Whitney Free (Power) Turbine

## **2. GENERATOR – EXCITER PACKAGE**

a) Weatherproof, acoustically-insulated, prime painted steel enclosure including:

(1) Sound Treated Air Inlet and Exhaust

(2) Two (2) Side Mounted Filters

b) One (1) Synchronous Generator, 57,300 KVA; (base rated at 80 F. and 1,000 feet), 0.9 power factor, 60 Hz, 3 phase, 13,800 volts, 2 pole, 3600 RPM, open, air-cooled, two (2) sleeve bearing, bracket type, complete with the following accessories:

(1) A 300 VDC direct-connected brushless exciter.

(2) One (1) completely assembled generator lubrication system module; consisting of one (1) AC motor driven oil pump, one (1) DC motor driven oil pump for start up, shutdown and emergency use, three (3) oil pressure switches, one (1) AC motor driven cooling fan, two (2) oil level switches, one (1) 250 gallon oil tank, one (1) vapor extractor fan.

(3) One (1) neutral grounding transformer 25 KVA.

(4) One (1) Bus Duct, 15 KV, 95 BIL, 3000 amp. Enclosed bus suitable for throat connection at each end, including terminations and support structures.

## **3. CONTROL AND SWITCHGEAR PACKAGE**

One (1) Pre-fabricated metal control enclosure, NEMA 3 design, prime painted steel, capable of withstanding the following loads: 100 MPH steady, 120 MPH gust wind loads (40 PSF) and 30 PSF snow and/or ice loads.

The enclosure will include electric heating and air conditioning with thermostatic control to maintain an inside ambient temperature of 70 F. The enclosure will also include fluorescent lighting, 125 volt D.C. emergency lighting, and 110 VAC receptacles.

The control enclosure will house the following equipment:

a) One (1) Generator Control Panel – Panel #1, 46”W x 90”H free standing, NEMA

construction, hinged for access to interior components with sufficient strip heaters (480VAC) to preclude condensation and interior lights with switch. The panel will be primed and finish painted.

b) One (1) Breaker Panel – Panel #2, 46”W x 90”H free standing NEMA construction, hinged for access to interior components, with sufficient strip heaters (480 VAC) to preclude condensation. Interior lights will be provided with switch. The panel will be primed and finish painted.

c) One (1) Relay Panel – Panel #3, 46”W x 90”H free standing NEMA construction, hinged for access to interior components, with sufficient strip heaters (480 VAC) to preclude condensation. Interior lights will be provided with switch. Panel is also hinged for back access and provided with suitable structural support for rigidity. The panel is to be primed and finish painted.

d) One (1) Motor Control Center, 600 V, NEMA 1, Class 11, Type C Construction; primed and finish painted.

e) Auxiliary components consisting of the following:

(1) One (1) Station battery, 60 cell 125 VDC, 100 ampere-hour at eight (8) hour rate, C&D Model DCU-9 lead-calcium or equal with free standing battery rack in heated and ventilated compartment.

(2) One (1) set direct-burial, quick-connect cables for interconnections between gas turbine/generators and air start pack enclosure and the local control and switchgear enclosure.

(3) One (1) 150.0 KVA auxiliary Power transformer.

## **ACCESSORY EQUIPMENT**

- a) One (1) Air Start Pac with two (2) 15 HP motor driven air compressors and storage capacity for four (4) TWINPAC starts or eight (8) single engine starts housed in a painted steel enclosure for two (2) TWINPACs.
- b) External Winslow liquid fuel filter assembly for two (2) TWINPACs.
- c) One (1) 3" A.O. Scott fuel meter and one (1) 3" fire valve per TWINPAC.
- d) Standard engine water wash and drying systems.
- e) One (1) fiberglass tank (10,000 gallon) for storage of demineralized water for two (2) TWINPACs.
- f) Water injection system for NO<sub>x</sub> control for two (2) TWINPACs.
- g) Bus from control house to transformer for two (2) TWINPACs.
- h) Remote panel
- i) Liquid fuel forwarding skid for two (2) TWINPACs.

## **5. CONSTRUCTION AND TRAINING SERVICES**

- a) Erection, checkout, and startup
  - b) Paint units.
  - c) Operator and maintenance training.
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### **Equipment Origin**

The FT-4 is manufactured in Hartford, CT USA

All the refurbishes of this unit was done in PW plant in Ma.

We certify that our quotation complies with all your inquiry, documents and specifications except for the following:

### **EXCLUSIONS**

**Derwick Associates, S.A. does not accept responsibility for items or aspects of equipment which are outside the Scope of Supply defined above. The following items are excluded from this proposal, unless offered as an option.**

- Site grounding
- Lightning protection
- Compressed air supply
- All auxiliary power supplies
- All first fills
- All fuel supplies, fuel supply and treatment
- Water supply and treatment
- Installation & commissioning labor
- Demolition and/or removal of any existing equipment, structures and concrete.
- Installation tooling
- Instrumentation for site Performance Testing
- Site facilities
- Fire sprinklers or other fire protection devices which may be required by insurance regulations.
- Motor Control Center (Budgetary Option)
- Battery Back Up System (Budgetary Option)
- Switchgear
- Transformers (Auxiliary & Main)
- Control system housing, external to gas turbine package enclosure mounted equipment
- Control System integration with existing DCS
- Black Start Diesel GenSet
- AC Generator Rotor Withdrawal
- Fiscal metering
- Site facilities
- Operating and strategic spares
- Civil engineering design, embedment and works
- Grout
- Erection of equipment
- Civil engineering design of any kind
- All interconnecting pipe work and cabling, beyond termination points, including:

- 
- All wiring and piping to and from skids
  - Local Lighting
  - Stack Lighting, Grounding Protection System
  - Unloading at site
  - Import Duties and Taxes

Any and all permits or special clearances required by any government agency. This includes air pollution permits as well as Local building permits, construction permits

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## Drawings



LEGEND:

- 1

PRATT & WHITNEY FRAME FT4 GTG.

2

STG BUILDING (FUTURE).

3

HRSG (FUTURE).

4

EXHAUST GILLOTINE.

5

TURBINE REMOVAL AREA.

6

GENERATOR REMOVAL AREA.
- 7

OVERHEAD CABLE TRAY.

8

GSU TRANSFORMER.

9

MODULAR CONTROL BUILDING.

10

FUEL GAS FILTER/REGULATOR.

11

WATER TREATMENT EQUIPMENTS AREA.

12

PARKING AREA.
- 13

PIPE RACK (FUTURE).

14

STG COOLING TOWER (FUTURE).

15

OFFICES/CONTROL/MAINTENANCE BUILDING.

16

OFFICE CONTROL ROOM.

17

WAREHOUSE AREA.

18

EMERGENCY GENERATOR.
- 19

WATER TREATMENT BUILDING.

20

FIRE WATER SKID.

21

AIR INSTRUMENT PACKAGE.

22

AUXILIARY TRANSFORMER (480 V).

23

GATE.

24

RAW/FIRE WATER TANK (300,000 GALS).
- 25

OILY WASTE TANK (5,000 GALS).

26

OILY WASTE OFF LOAD PUMP.

27

OILY WATER SEPARATOR.

28

LIQUID FUEL DAY TANK (CLEANED-50,000 GALS).

29

LIQUID FUEL CENTRIFUGE PACKAGE.

30

DEMINWATER TANK (2-21,000 GAL EACH).

31

LIQUID FUEL TANK (RAW-100,000 GALS).
- 32

LIQUID FUEAL TRANSFER PUMP.

33

LIQUID FUEL FORWARDING PUMP.

34

LIQUID FUEL OFF-LOAD PUMP.

35

LIQUID FUEL OFF-LOAD AREA.

36

ROAD.

37

GAS METER RUN.

38

ESD VALVE.
- 39

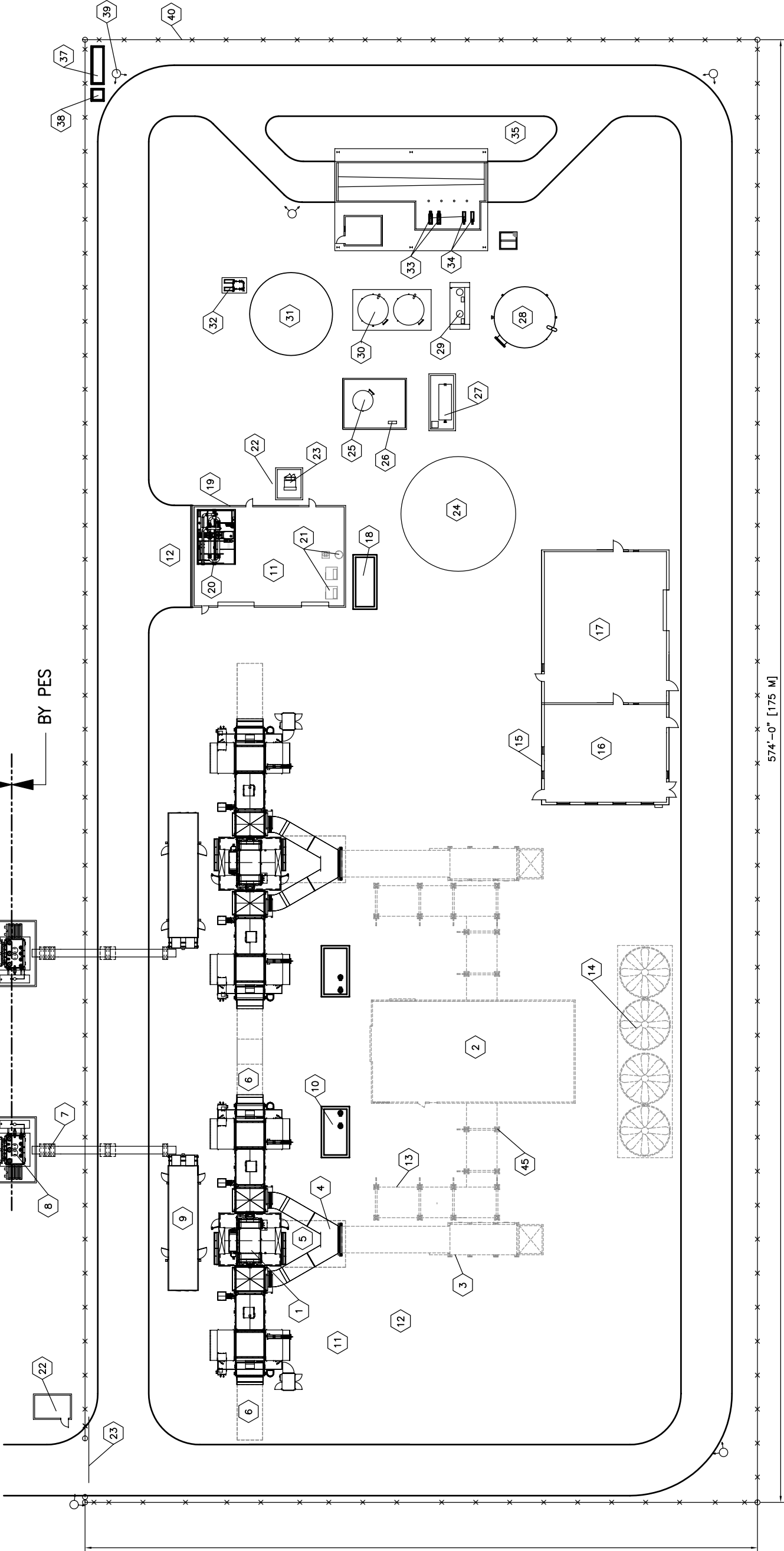
LIGHTING POLE.

40

PLANT FENCE.

41

GUARD HOSE.



574'-0" [175 M]

264'-0" [80.50 M]



GRAPHIC SCALE

REVISED		CUSTOMER INFORMATION										DRAWN				09/21/08				ProEnergy EPC Services, LLC			
												CHECK								GENERAL ARRANGEMENT PLOT PLAN			
												DESIGN								TWO (2) FT-4 CIRCLE CYCLE GTG UNITS			
												PROJ ENGR								FUTURE COMBINED CYCLE			
												PROJ MGR								XXXX			
												QA MGR								JOB NO.			
												NO.				DATE				TXXXX			
												BY				APP'D				DWM NO.			
												DESCRIPTION				SCALE				SK			
												REVISIONS				1"=20'				1			
																SIZE				A			

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