

# Technical Scope Document

Presented To:

**PDVSA**

Barinas, Venezuela

2 ea. P&W FT4 TwinPac  
"Barinas I Plant"

By



DERWICK ASSOCIATES CORP.



Proposal No. T-1003 Rev. 4

October 20, 2011

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PDVSA

FINAL REVISION ACCEPTED  
(DRAWINGS PENDING)

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ERL 20/10/2011



## **Section 1.0 Introduction**

PDVSA desires to build a liquid fuel generating facility installed and operational within the schedule agreed upon. Contractor proposes to install (2) Owner Finished Pratt & Whitney FT4 TwinPac Gas Turbine Generators including the supply of the following major equipment items:

This turnkey proposal includes installing (2) Owner Furnished FT4 TwinPac gas turbine generators as well as the supply and installation of the following major items of equipment in the combined cycle power plant.

- One (1) Liquid Fuel Offload, Storage & Treating Plant
- Two (2) Owner Furnished Generator Step-up Transformers

This proposal also provides for the furnishing, on a turnkey basis, all engineering, balance of plant equipment, construction (with exception of the civil work as indicated herein), construction tools, equipment rental, project management, commissioning, start-up, and performance testing as described in the following sections.

Both, contractor and Derwick's subcontractors shall coordinate any construction activity or activities that might interfere with their work, especially in areas of congestion.

**THIS DOCUMENT IS CONFIDENTIAL. IT IS DESIGNED AND INTENDED FOR PDVSA USE. THIS DOCUMENT IS FOR THE SOLE PURPOSE OF EVALUATING PROENERGY EPC SERVICES' PROPOSAL FOR THE 2 x P&W FT4 Twin Paks.**

## Section 2.0 Scope of Work and Supply

The Scope of Work and Supply is comprised of the following outlined items:

### Major Generation Equipment

Installation of two (2) Owner Supplied Pratt & Whitney FT4 TwinPac gas turbine generator packages complete with auxiliary skids, modular control rooms, inlet filters and exhaust stacks.

Pratt & Whitney interface points are as follows:

Equipment System	Limits of P&W FT4 Scope
All supply piping, including Liquid Fuel, Cooling Water, Demineralized Water, Lube Oil, Instrument Air, Hydraulic Start	Flanged or threaded connection on TwinPac base plates.
Inlet Air-to-Filter	Atmosphere (non-standard duct by others)
Turbine/Generator Ventilation Air	Atmosphere (non-standard duct by others)
Turbine Exhaust	Flange & Expansion Joint for connection to Exhaust Stack
Instruments on TwinPac Base plate	Terminal box on base plate
Instrument wiring in Turbine Control Panel	Terminal in Turbine Control Panel
High Voltage Connections	Bus bar in TwinPac generator line side cubicle
Generator Ground Connections	TwinPac Neutral cubicle
Electric Motors	Terminal box on individual motors
Ladders and Platforms for Air Filter	Ladders and Platforms for Inlet Air Filter and Vent Fans

## **2.0 Balance of Plant**

The contractor will design and install the facility as described in the following sections of this document. The design will include the necessary Structural, Mechanical, Electrical, Instrumentation, and Control System to install the above Major Equipment.

The Balance of Plant scope of supply will be comprised of the following:

Derwick will remove existing foundations 2 x GE Frame 5 and existing base under 16 Engine Gensets, Storage tank foundation, etc. as described in drawings attached. Derwick will transport removed concrete foundations and Genset base material (up to 1132.6 cubic meters) for a distance up to 30 kilometers away from present plant location. Owner to provide permits to transport and dispose of waste concrete and Genset base material.

Derwick will remove and replace contaminated soil (up to 5,348.48 cubic meters) as described in drawings attached.

Derwick will transport contaminated soil (up to 5,348.48 cubic meters) for a distance to an owner provided dumping site up to 30 kilometers away from present plant location. Owner to provide permits to transport and dispose of contaminated soil.

Derwick will transport the 16 Engine Gensets up to 20 kilometers from present plant location to Owner provided remote Storage.

Contractor will provide complete design of the facility including civil, structural, buildings, mechanical, electrical, and instrumentation.

Derwick will provide concrete foundations and plant gravel.

Owner will provide a reasonably level graded site and additional 2 hectors adjacent to plant as shown on drawings attached. Derwick will grade, fence and gravel this area.

Owner will provide access roads to the site.

Contractor will provide Installation of the complete Power Plant with the inter-ties as described later in this document and including:

- o Mechanical installation of the various items of equipment with the associated inter-ties of raw water supply-storage-treatment, liquid fuel delivery-treatment-storage, and waste oil and water.
- o Electrical installation of the plant including installation of two (2) owner provided 11.5KV/115 KV Generator Step up Transformers, and Contractor provided two (2) new 115 KV SF6 Breakers and two (2) new 115 KV Disconnect Switches. Owner to provide connection to the existing substation.
- o Installation of Plant metering, Instrumentation and Control System

## **2.1 BOP Major Mechanical Systems**

### **2.1.1 Simple Cycle Exhaust Stack**

The Contractor will install the four (4) exhaust stacks provided by Owner with their purchase of the Pratt & Whitney FT4 gas turbines.

### 2.1.2 Plant Liquid Fuel System

The Contractor will design, provide and install the plant liquid fuel system outlined as follows:

Provide and install a Three -Truck Off- loading station for accepting truck delivery of Raw Diesel with measurement facilities located adjacent to Owner's existing liquid fuel storage area.

Provide and install three (3) DFO unloading pump skids each 1 x 100% pumps with 1 common spare, (4) block valves and (2) check valves.

Re-use of Owner's 660,000 gallon liquid fuel storage tank as raw fuel storage

Provide and Install one (1) new 660,000 gallon raw fuel tank

Provide and install two (2) 100% capacity liquid fuel forwarding pumps with (4) block valves and (2) check valves.

Provide and install three (3) new 100% centrifuges for liquid fuel treatment.

Provide and install one (1) new 550,000 gallon clean liquid fuel storage tank.

Provide and install two (2) 100% capacity liquid fuel forwarding pumps.

Install two (2) Owner provided Liquid Fuel injection Skids each with 1 x100% capacity liquid fuel pumps.

Install two (2) Owner provided Liquid Fuel filters.

Provide and install all plant liquid fuel carbon steel piping, valves and fittings from the plant liquid fuel Truck Off-Loading facility to each Gas Turbine liquid fuel filters

Provide and install all plant liquid fuel stainless steel piping, valves and fittings from the plant liquid filters to each gas turbine.

Derwick will provide and install all the foundations and civil work for the above equipment. Derwick will also repair existing tank dike and install a new liner or asphalt liner.

### 2.1.3 Water System

Owner has limited raw water supply at site.

Derwick will drill a water well on or near the plant site to satisfy the plant water requirements.

Contractor will design and install a water plant to treat raw water as required to meet Pratt & Whitneys' specifications for the water wash system as well as the liquid fuel centrifuge water requirements.

### 2.1.4 Oily Water Drain System

The Contractor will furnish and install the oily water drain system as follows:

One oily water separator system.

Furnish and install PVC or HDPE below ground piping and fittings from concrete oil containment units located at:

- 1) All Transformers
- 2) Liquid Fuel Treatment
- 3) Gas Turbine Generator Auxiliary Skids
- 4) Liquid fuel Truck Off-Loading area

Waste water will be disposed of by owner into a ditch

Waste Oily water will be stored in a 10,000 tank for truck disposal by Owner

Waste Sludge from Centrifuge will be stored for truck disposal by Owner

Derwick will supply and install the oily water separator concrete tank, including guardrail and also foundation for waste oily water tank.

### **2.1.5 Plant Fire Water System**

The Contractor will furnish and install a firewater system that includes:

A combination Raw Water / Firewater Storage tank

A firewater pump designed system with one (1) each diesel, electric and jockey pumps

An 8" diameter HDPE below ground and carbon steel above ground pipeline from the Fire Water pump shed and routed throughout the plant in accordance with NFPA Codes. Monitors and Hydrants to be installed in accordance with NFPA Codes.

Portable fire extinguishers

Contractor to supply and install the Foam System for the liquid fuel tanks, forwarding pumps and the truck offloading areas. A single tank wetting ring shall be installed on each of the three (3) tanks.

Contractor to supply and install the Foam System for the liquid fuel tanks, forwarding pumps and the truck offloading areas. A single tank wetting ring shall be installed on each of the three (3) tanks.

Derwick will provide and install all the foundations and civil work for the above equipment, except for excavation, backfilling and bedding sand for underground piping.

### **2.1.6 Instrument and Service Air Systems**

The instrument and service air systems will be as follows:

Furnish and install one (1) set of two (2) instrument and service air screw compressors with associated dryer and air storage tanks.

Furnish and install carbon steel piping, valves, fittings and instruments for instrument and service air systems from the air compressors to various required areas throughout plant for instrument air and service air. Furnish the appropriate quick connect connectors.

Install vibration and velocity instruments supplied with CTG Equipment.

## **2.2 BOP Electrical Systems**

### **2.2.1 13.8 KV System**

The Contractor will perform the following work on the 13.8 KV system:

Install two (2) 13.8 KV fused disconnect switches with key interlock for BOP Aux. Transformers.

Furnish and Install one (1) 13.8KV/480V 750 KVA BOP Aux. Transformer.

Furnish and install all 13.8 KV cabling, bus work, cable tray etc. from the generators to the generator circuit breakers.

Furnish and install all 13.8 KV cable via underground conduit from each Generator Breaker to the 13.8 KV terminals of the respective Gas Turbine GSU.

Derwick will provide and install all the foundations and civil work for the above equipment.

### **2.2.2 480V System**

The Contractor will provide the 480V system as follows:

Furnish and install one (1) 480 V distribution switchboard

Furnish and install cable tray / conduit with cabling from transformers to MCCs and from MCCs to plant 480V equipment and motors.

Furnish and install conduit, or overhead cable tray mounted on the pipe racks.

Furnish and install a Black Start generator with fuel tank.

Derwick will provide and install all the foundations and civil work for the above equipment.

### **2.2.3 120/208 System**

The Contractor will provide the 120/208 system as follows:

Furnish and install 480V/120/208V transformers, distribution panels and lighting panels as required with associated conduits, fittings and wire.

### **2.2.4 Plant Area Lighting**

The Contractor will provide the plant area lighting as follows:

Furnish and install area lighting consisting of eight (8) 45 ft galvanized metal poles with Four (4) 400 watt metal halide floodlights on each pole sufficient to illuminate both GTG's, liquid fuel truck supply road, off-loading facility and plant common areas.

### **2.2.5 Ground Grid**

The Contractor will provide the ground grid for the plant as follows:

Furnish and install plant ground loops in areas of new construction with associated ground rods and connections to plant equipment, buildings and fence. It will interconnect with existing plant ground grid.

### **2.2.6 Plant Electrical Cable Tray**

The Contractor will provide the plant electrical cable tray work as follows:

Furnish and install aluminum cable trays throughout plant. Cable trays to be mounted on pipe racks, or within buildings for routing plant cabling. A separate cable tray will be installed for each of the 15/5KV systems, 480V system, and instrumentation system cable

### **2.2.7 Underground Conduit and Cable Systems**

Derwick will provide the plant underground conduit system as follows:

Furnish and install rigid galvanized conduit or PVC encased in concrete for all power, control and instrumentation systems.

Derwick will provide and install all plant underground duct bank system including cable trenches, conduits, grounding, rebar, embedded or encased conduits, etc.. The contractor will provide all power, control and instrumentation cables.

### **2.2.8 Lightning Protection**

The Contractor will provide lightning protection as follows:

Furnish and install lightning protection on each gas turbine exhaust stack.

*Note: Owner to provide lightning protection on the 115 KV Substation.*

### **2.2.9 Batteries / Chargers / UPS Systems**

The Contractor will perform the following work on the batteries / chargers / UPS systems:

Furnish and install BOP UPS system for DCS and associated equipment.  
Furnish and install one (1) 125 VDC battery and charger for 115 KV substation breakers.

*Note: The Gas Turbine 24 VDC and 125VDC batteries and chargers are to be supplied as part of the P&W packaged control houses.*



## **2.3 Plant Instrument and Control Systems**

### **2.3.1 BOP Control System**

The Contractor will furnish and install a BOP control system consisting of:

- One (1) PLC BOP Control system.
- Three (3) PCs - (1 PC for BOP HMI, 2 PC's for the two (2) FT4 GTG's.(HMI).
- Two (2) printers.
- One (1) software package for plant PLC Control System.

### **2.3.2 Plant Instrumentation Devices**

Gas Turbine Control Panel is supplied with each FT4 gas turbine. The two (2) sets of Gas Turbine-Generator Control Panels will be mounted in a modular Control Room. Contractor to furnish and install instrument devices, both pneumatic and electric, consisting of meters, pressure, flow, temperature and level where required.

### **2.3.3 Electronic Wiring and Pneumatic Piping**

Contractor to furnish and install necessary instrument wiring and pneumatic piping with associated Swagelok fittings, etc.

## **2.4 115 KV Substation**

### **2.4.1 Generator Step-up Transformers (GSU's)**

Contractor to install two (2) Owner furnished generator step-up transformers with 13.8KV delta to 115 KV wye windings. Owner to furnish oil. Contractor to provide dressing, oil fill and testing of transformer, including associated, control protection and communication scope.

### **2.4.2 115 KV SF6 Circuit Breaker**

Contractor to supply and install (2) new SF6 Circuit breakers rated 115KV, 1200A.

### **2.4.3 115 KV Air Switches**

Contractor to supply and install (2) new 115 KV, 1200A, 3 phase Air Switches

### **2.4.4 115 KV Bus Work**

Contractor to supply and install all necessary aluminum bus work between the GSU to the disconnect switch in the high voltage substation.

#### **2.4.5 115 KV Bus Insulators**

Contractor to supply and install all necessary support insulators for the substation bus work

#### **2.4.6 115KV Support Steel**

Contractor to supply and install all structural steel to support the followings:

- o SF6 Breakers
- o Disconnect Switches
- o Bus Work and insulators

#### **2.4.7 Protective Relaying**

Contractor to supply and install protective relaying for the GSU transformers and the other substation equipment

#### **2.4.8 High Voltage Metering**

Contractor supply and install metering for the 115 KV outgoing system, including protection, maneuver and communication.

#### **2.4.9 Site Work**

Derwick to prepare the site and provide the following:

- o Foundations for the GSU transformers, SF6 Breakers, Air Switches and other Structural Supports.
- o New Substation Gravel in immediate area of substation equipment provided.

#### **2.5 Plant Communication System**

Contractor to provide communication and public address system for the new plant. Contractor to furnish temporary telephones and email capability for Contractor's staff for construction communication purposes. Permanent telephone lines for operation of the plant will be provided by Owner.

#### **2.6 Plant Civil and Structural**

Derwick to furnish and install all plant reinforced concrete foundations designed to IBC 2003. GSU foundation shall have 9" freeboard.

Derwick to furnish and install concrete containment curbs and equipment foundations, including fuel truck offloading area.

Derwick to furnish and install plant gravel and asphalt paving as shown on the Plot Plans.



Derwick to provide and install all the drain piping.

Contractor to provide structural steel pipe racks to support overhead piping and cable trays. Pipe racks to be located as shown on Plot Plan drawings. Derwick will provide and install all the foundations.

Derwick to furnish and install all the plant foundations including embedments, including, but not limited to foundations for the lighting poles, cable tray and piping supports.

Derwick to furnish and install all in-slabs and under slab conduit, draings, drain piping, pipe sleeves, pipe stub-ups, trench drains, etc. This include furnish and erect of all the grounding associated with any foundation.

The Contractor will be responsible for excavation, backfill and bedding sand for all underground piping other than the drain piping that will be by Derwick.

Derwick to inform the Contractor with reasonable anticipated time (to allow for enough time for inspection) of all cast in place concrete work, especially for the inspection of those related to embedded plates, anchor bolts and fixators.

Derwick will be responsible for site drainage during construction coming from rain conditions to allow construction work to proceed.

## 2.7 Plant Building

It is planned to utilize the Owners' existing Office, Control Room and maintenance building for these purposes. In addition, contractor will provide:

Furnish and install a prefabricated metal insulated building for the water treatment and Instrument Air Compressor equipment. An attached shed will be provided for the firewater pumps and controls.

A shed will be provided for the liquid fuel treatment

Derwick to furnish and install all foundations including embedments for the above structures.

Derwick to furnish and install all in-slab and under slab conduit, drains, drain piping, pipe sleeves, pipe stub-ups, trench drain, etc. This include furnish and erect of all the grounding associated with any foundation. Derwick will leave 10 feet of ground conductor from the foundation for the contractor to connect to the plant ground grid.

Guard House

## 2.8 Plant Equipment Erection

Contractor to unload all Plant equipment delivered to site.

Contractor will provide all cranes and support equipment and manpower as required to erect the gas turbine generators.

Contractor to provide for erection of all BOP equipment and storage tanks

## **2.9 Cranes, Equipment and Tools**

Contractor to furnish or provide for all plant construction required cranes, fork lifts, back hoes, hydraulic lifts, welding machines, air compressors, generators, temporary lights, trucks, pick-ups, etc for contractor's scope of work.

## **2.10 Transportation**

Contractor will furnish transportation to site of all Contractor furnished equipment.

## **2.11 Lubricants and Chemicals**

Contractor will supply and install all lubricants, lube oils and chemicals for furnished equipment.

## **2.12 Spares**

Contractor will make provision to supply, receive and store all commissioning spare parts furnished for equipment during start-up and commissioning.  
Contractor to provide Owner with recommended list of spare parts for Gas Turbine Generator and BOP equipment.

## **2.13 Construction Offices and Storage Facilities**

Derwick to provide (9) work space places for contractor's usage during construction. The contractor will provide up to six (6) construction offices for Contractor, Technical Representatives (3), if needed.

Derwick will be responsible for portable restrooms for their subcontractors.

Owner to provide lay down area and site for construction offices and construction utilities (electrical and potable water).

Derwick to provide fenced storage and a lay down area and around the construction site during construction.

Contractor to provide sanitation facilities for Contractor, & Owner personnel during construction for Contractor's scope of work. Contractor to provide communication facilities for construction for Contractor's scope of work.

## **2.14 Engineering and Project Management**

Contractor to provide detailed engineering and specifications for all disciplines involved for the power plant including civil and concrete foundations.

Contractor to provide project management complete with construction management, quality control / quality assurance, scheduling, administration, warehousing, and expediting including regular monthly reporting of all disciplines for Contractor's subcontractors.



Contractor to arrange for and provide fully qualified technical representatives during erection, testing, start-up, commissioning for the gas turbine generator units.

Contractor to provide startup, commissioning and testing of BOP associated systems.

Contractor to provide operator and maintenance training for Power Plant on the Gas Turbine Generator Packages and Balance of Plant Equipment.

Contractor to provide one (1) electronic and two (2) hard copies of the O&M manuals, training manuals, engineering calculations, commissioning and start-up manuals, test manuals, as-built drawings, design specifications and warranty manuals for plant equipment.

Derwick and Contractor (both) will coordinate all civil work with other disciplines to ensure that Derwick's scope of work for installing underground duct banks is schedule in accordance with the contractor's scope of work for underground piping as outlined in the master project schedule.

Derwick and Contractor (both) will release daily progress updates generated from contractor's master project schedule to Derwick and Contractor.

Contractor will have at least one Venezuelan engineer on site.

#### **2.15 Cathodic Protection**

Cathodic Protection will be provided for all steel underground piping.

Derwick will install the cathodic protection materials associated with the tanks. The Contractor will supply all the cathodic protection materials.

**2.16 Project Equipment List and Supplier**

Qty	Description	Responsibility	
		Owner	Contractor Derwick-DK
1	Power Plant Site with survey including 2 hectares area	XXX	
1 lot	Temporary construction power	XXX	
1 lot	Site permits if required (Environmental, etc.)	XXX	
1	Construction permit (if required)	XXX	
1	Black Start Generator with tank		XXX
1 lot	Import duties, sales taxes, VAT, etc. (if required)	XXX	
1 lot	Water supply at site for construction and operations –	XXX	
1 lot	Derwick will drill a water well per owner's direction		DK
1 lot	Construction Power	XXX	
1 lot	Plant construction and lay down area approx. 3 acres	XXX	
1 lot	Plant security during construction	XXX	
2	P&W FT4 TwinPac Gas Turbine Generator Packages equipped with a prepackaged, modular control house.	XXX	
2	Exhaust Stacks per FT4 package	XXX	
2	GTG Turbine Control Panels to be located in the FT4 prepackaged control houses		XXX
1 lot	Supply of all above ground conduit		XXX
1 lot	Supply of all underground conduit		DK
2	Sets of GTG batteries and chargers each set consisting of 2 ea. 24 volt batteries and 2 ea. chargers	XXX	



**PDVSA**  
**2 x FT4 TwinPac**  
**Barinas I Power Project**  
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Qty	Description	Responsibility	
		Owner	Contractor
			<b>Derwick-DK</b>
2	13.8KV Generator Circuit Breakers 3000 Amp NEMA 3R	xxx	
1 lot	Contaminated Soil removal p to 5,328.48 cubic meters		DK
1 lot	Foundation and Genset pad removal up to 1132.63 cubic meters		DK
1	Water Treatment, Instrument Air Building with Firewater Pump shed.	xxx	
1 lot	Liquid Fuel Treatment with shed	xxx	
1	Duplex Instrument / service air compressor with dryer and dual storage tanks	xxx	
1 lot	Site Preparation, drainage and grading as needed		DK
1 lot	Fencing on 3 sides of 2 Hectares area		DK
1 lot	All Concrete Foundations with embendments & Pads		DK
1 lot	Fixators for CTG foundation	xxx	
1 lot	Site Gravel and Paving		DK
1	480V Switchboard	xxx	
1 lot	Balance of plant (BOP) 480V/120/208V Transformer, Distribution Panels, Lighting Panels	xxx	
24	Pole mounted 400 watt Metal Halide Lights	xxx	
8	45ft Metal Poles	xxx	
1	Plant Ground Grid	xxx	
1 lot	Foundations for lighting poles		DK
1 Lot	Plant Instrumentation	xxx	
1	Power Plant PLC based BOP Control System	xxx	
1	Lot temporary fencing for construction and storage	xxx	
1 lot	Underground duct banks, hand and man holes, including conduit, rebar, and grounding.		DK
1 lot	Start up and commissioning spare parts	xxx	
1 lot	Plant Cathodic Protection of Buried Piping	xxx	
1 lot	BOP Equipment Erection	xxx	
1 lot	Transportation of all Contractor Furnished Equipment	xxx	
1 lot	Lubricants and Chemicals for gas turbine generator	xxx	
1 lot	Lubricants and Chemical for BOP	xxx	
1 lot	Construction Offices, Storage, Temporary Facilities and Utilities for Contractor's scope of work	xxx/DK	
1 lot	Construction Tools and Equipment for Contractor's scope of work	xxx	
1 lot	Temporary Power Distribution for Contractor's scope of work	xxx	
1 lot	Project Management, Safety, QA/QC, subcontracting for civil		DK
1 lot	Engineering and Project Management, Safety, QA/QC, subcontracting for mechanical, electrical, instrumentation & DCS system.		xxx



**PDVSA**  
**2 x FT4 TwinPac**  
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**2.17 115 KV Substation Equipment & Supply**

Qty	Description	Responsibility	
		Owner	Contractor
1	Substation with survey	xxx	
1	Perimeter Fence	xxx	
2	GSU Transformers 13.8 KV to 115 KV	xxx	
1 Lot	Transformer Oil	xxx	
2	115 KV SF6 Breakers		xxx
2	115 KV Disconnect Switches		xxx
1 lot	Aluminum Bus between GSU's to Disconnect Switches		xxx
1 lot	Transformer Dress-out		xxx
1 lot	Site Preparation and grading		DK
1 lot	Concrete Foundations (GSU's, SF6, & Disconnects)		DK
1 lot	Site Gravel and Paving (GSU's, SF6 & Disconnects area only)		DK
1	Soil Test		DK
1 lot	Supply of all above ground conduit		xxx
1 lot	Supply of all underground conduit		DK

## Section 3.0 Design Basis

### 3.1 Design Conditions:

#### Design Conditions (Assumed)

Site Elevation	926.2 feet
Air Temperature, Design	81° F
Maximum Wind Velocity	80 mph
Relative Humidity	70%
Selsmic Zone	4
Liquid fuel supply	180 gpm Raw
Water Supply	15 gpm
Raw/Fire Water Storage	350,000 gallons
Raw Liquid Fuel tank	660,000 gallons Existing
Raw Liquid Fuel tank	660,000 gallons New
Treated Liquid Fuel tank	550,000 gallons New
Demin Water Treatment Capacity	12 gpm
Demin Water Storage	21,000 gallons fiberglass
Plant High Voltage Interconnect	13.8 KV Underground Cable to Owner's step-transformers
Utility Connection	115 KV Disconnects
Instrument Air System	185 scfm compressor by Contractor

### 3.2 Interconnect Points with Owner Facilities

Liquid Fuel Delivery	Plant Three (3) Truck Off-Loading Station by Contractor
Oily Water	Pumped to 10,000 gallon tank for Owner's truck disposal
Waste Water	Pumped to Owner's ditch
Telephone	6 lines at plant battery limits
Water Supply	Derwick to drill well on Owner's property



## Section 4.0 Performance

### Barinas I

**Power Plant** Pratt & Whitney 2 x FT4C-1D Twin Pacs  
**Site Elevation** 926.2 Feet  
**Design Temperature** 81 F  
**Relative Humidity** 70%

### Simple Cycle

	1 x FT4C-1D Twin Pac	2 x FT4C-1D Twin Pacs
Gross Power KW	44,772	89,544
LHV Gross Heat Rate (Btu/kWh)	12,519	12,519
LHV Fuel Required (kBtu/h)	560,501	1,121,001
Liquid Fuel LHV (Btu/gal)	131,896	131,896
Liquid Fuel (GPM)	70.83	141.65
Demin Water Centrifuges (GPM)	10.00	10

**THE PERFORMANCE SHOWN IS EXPECTED BUT NOT  
GUARANTEED.**



**Section 5.0**

**Drawings**

**Plot Plans**

**1003-10-001  
1003-10-003**

**Overview General Arrangement  
General Arrangement**

**PFDs**

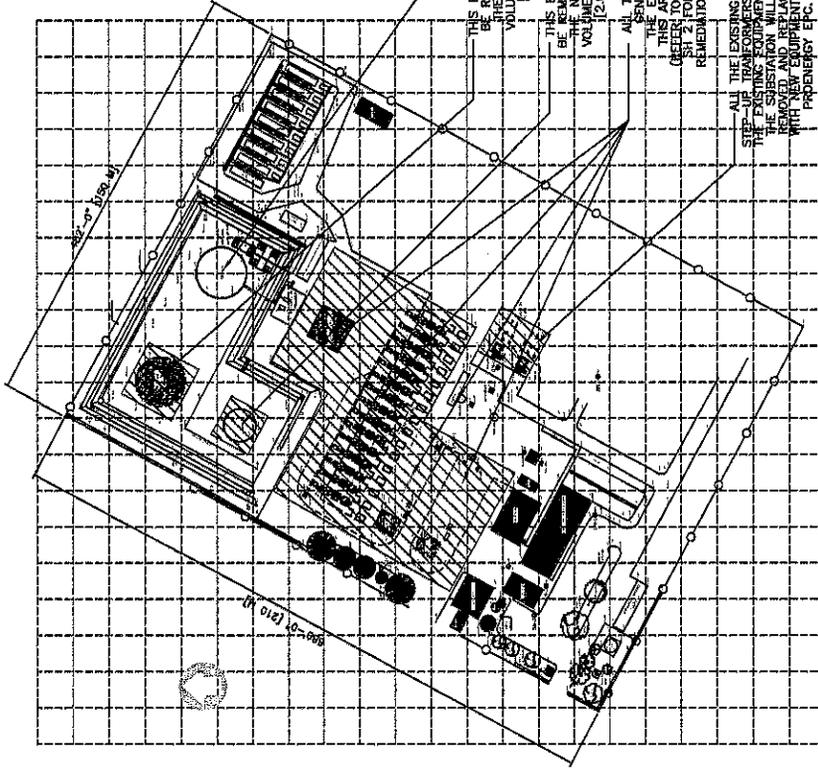
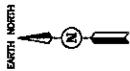
**1003-50-001  
1003-50-002  
1003-50-003  
1003-50-004  
1003-50-005  
1003-50-006**

**Twin Pac 1  
Twin Pac 2  
Water System  
Liquid Fuel System  
Instrument and Service Air System  
Oily Water Drainage**

**Electric One-Lines**

**1003-60-001  
1003-60-002  
1003-60-003  
1003-60-004**

**Overall One-Line  
480 V System  
480 V – MCC 1  
480 V – MCC 2**



THIS EXISTING TANK WILL BE RE-FURNISHED AND RE-USED.

THIS EXISTING CONCRETE WILL BE REMOVED AND REPLACED WITH THE NEW TANK WITH THE VOLUME SIZE 860,500 GALS (2,500,000 LITERS)

THIS EXISTING TANK WILL BE REMOVED AND REPLACED WITH THE NEW TANK WITH THE VOLUME SIZE 860,500 GALS (2,500,000 LITERS)

ALL THE EXISTING ENGINE GENERATOR UNITS AND THE EXISTING DIESEL GENERATOR UNITS IN THIS AREA WILL BE REMOVED. (REFER TO DWG. NO. 1003-10-001 SH 2, FOR THE QUANTITY OF THE REMEDIATION SOIL TO BE REMOVED).

ALL THE EXISTING DIESEL GENERATOR UNITS AND THE EXISTING DIESEL GENERATOR UNITS IN THIS AREA WILL BE REMOVED. (REFER TO DWG. NO. 1003-10-001 SH 2, FOR THE QUANTITY OF THE REMEDIATION SOIL TO BE REMOVED).

- THE GRID IS A 40'-0" (12 M) SQUARE.
- REFER TO DWG. NO. 1003-10-001, SH 2 FOR THE QUANTITY OF THE REMEDIATION SOIL TO BE REMOVED.
- REFER TO DWG. NO. 1003-10-002, SH 1 FOR THE GENERAL ARRANGEMENT PLOT PLAN DETAILS.

0 10M 20M 30M  
(METRIC SYSTEM - METERS)

0 20' 40' 60' 80' 100'  
(U.S.A. SYSTEM - FEET)

GRAPHIC SCALE

805 SOUTH DETROIT AVE  
SUITE 100  
TULSA, OKLAHOMA 74203  
PROJ. NO. 1003-10-001  
DATE: 10/12/01  
WWW.PROENERGYEPC.COM



DATE	10/12/01	BY	REC. D
DESIGNED		CHECKED	
DRAWN		APPROVED	
PROJECT MANAGER			
PROJECT ENGINEER			
PROJECT SUPERVISOR			
PROJECT COORDINATOR			

NO.	DATE	BY	APPROVED	REVISIONS
1	10/12/01			ISSUED FOR PERMITTING

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PROENERGY EPC SERVICES, LLC  
OVERVIEW GENERAL ARRANGEMENT PLOT PLAN  
TWO (2) PRATT & WHITNEY FT-4 GTG UNITS  
BARINAS I POWER PLANT

SCALE	1:1000
SHEET NO.	1
TOTAL SHEETS	1
DATE	10/12/01

PROJECT NO.	1003-10-001
PROJECT NAME	BARINAS I POWER PLANT
CLIENT	PRATT & WHITNEY
LOCATION	BARINAS I POWER PLANT
DATE	10/12/01

312'-0" (95.24 M)  
 640'-0" (195 M)  
 465'-0" (141.6 M)

**LEGEND:**

**PRIME MOTORS AND ASSOCIATE EQUIPMENT**

- 1 PRATT & WHITNEY FRAME TP1-F4C TWIN PAK UNIT CTG-100.
- 2 PRATT & WHITNEY FRAME TP2-F4C TWIN PAK UNIT CTG-200.
- 3 MODULAR CONTROL BUILDINGS.

**LIQUID FUEL TREATMENT**

- 4 REFINISHED 650,000 GAL RAW LFO TANK.
- 5 NEW 660,000 GAL RAW LFO TANK.
- 6 NEW 650,000 GAL TREATED FUEL TANK DIKE.
- 7 FOUR LANE FUEL UNLOADING TRUCK AREA.
- 8 UNLOADING FUEL PUMPS.
- 9 NOT USED.
- 10 CENTRIFUGES PACKAGE WITH SHEL.
- 11 TREATED FUEL FORWARDING PUMPS.
- 12 RAW LIQUID FUEL TRANSFER PUMPS.

**WATER TREATMENT**

- 13 RAW/FREE WATER TANK.
- 14 DEMIN TREATED WATER TANK.
- 15 WATER TREATMENT BUILDING.
- 16 RAW WATER FORWARDING PUMPS.
- 17 SLD FORWARDING PUMPS.
- 18 DEMIN WATER FORWARDING PUMPS.
- 19 AIR INSTRUMENT PACKAGE.
- 20 R/O WATER TANK.
- 21 FIRE WATER SYSTEM SHED.
- 22 FIRE WATER PUMPS.
- 23 FIRE WATER LOOP.
- 24 FOAM SYSTEM.

**WASTE AREA**

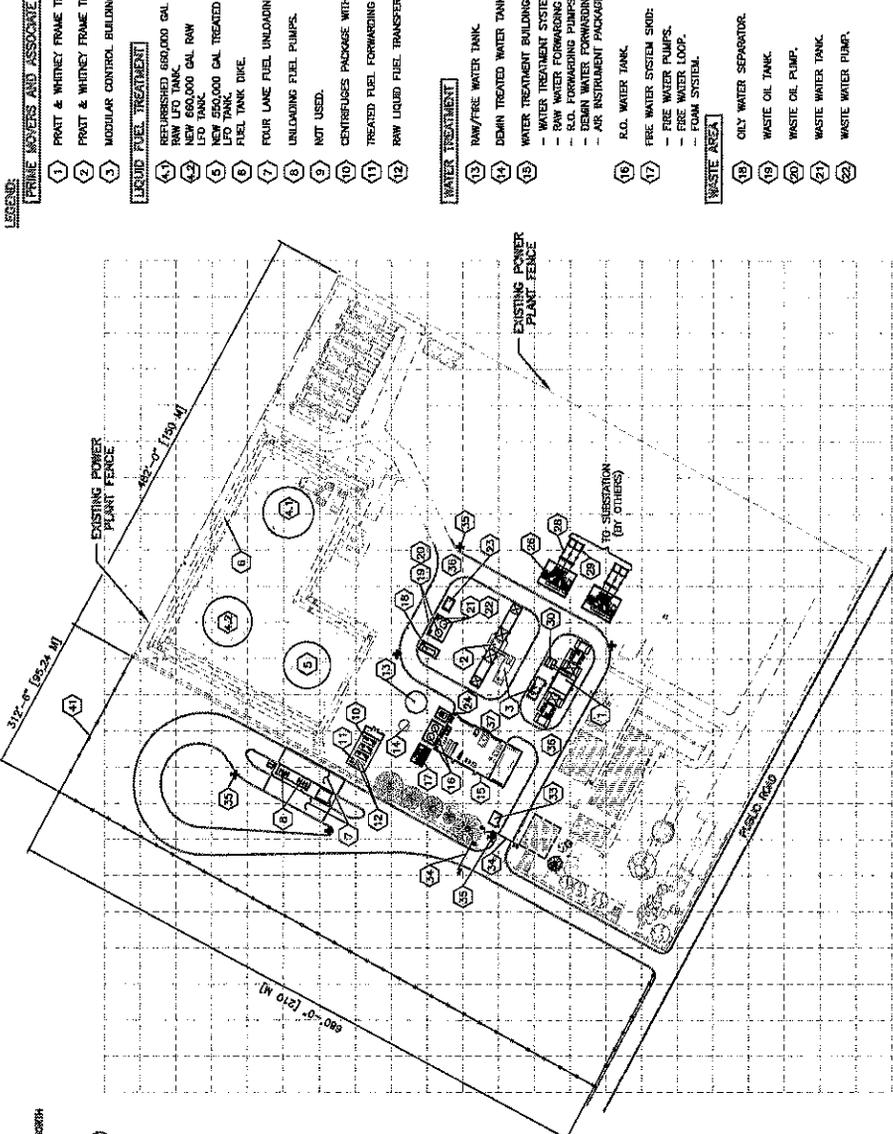
- 25 OILY WATER SEPARATOR.
- 26 WASTE OIL TANK.
- 27 WASTE OIL PUMP.
- 28 WASTE WATER TANK.
- 29 WASTE WATER PUMP.

**ELECTRICAL EQUIPMENT**

- 30 BLACK START GENERATOR.
- 31 AUXILIARY TRANSFORMER.
- 32 NOT USED.
- 33 STEPPUP TRANSFORMERS (SSU).
- 34 SFE BREAKER.
- 35 CURRENT AND VOLTAGE TRANSFORMER.
- 36 DISCONNECT SWITCH.
- 37 15 KV SWITCHGEAR.
- 38 NOT USED.
- 39 NOT USED.

**MISCELLANEOUS**

- 40 GUARD HOUSE.
- 41 SUBSTATION HOUSE.
- 42 GATE.
- 43 FLOOD LIGHT POLE (FOUR BULBS EACH).
- 44 ROAD.
- 45 PARKING AND SERVICES AREA.
- 46 NOT USED.
- 47 NOT USED.
- 48 NOT USED.
- 49 NEW EXTENDED FENCE FOR TWO (2) RECORDS UNLOADING FUEL AREA.



— THE GRID IS A 40'-0" [12 M] SQUARE.  
 — REFER TO PERS. NO. 1003-10-001, SH. 1 FOR THE OVERVIEW GENERAL ARRANGEMENT PLOT PLAN DETAILS.



**ProEnergy EPC Services, LLC**  
 GENERAL ARRANGEMENT PLOT PLAN  
 (2) PRATT & WHITNEY TP1-F4C TWIN PAK UNITS  
 BARINAS I POWER PLANT

DATE: 11/03  
 DRAWING NO.: 1003-10-003  
 SHEET NO.: 1  
 OF: 3

**ProEnergy EPC SERVICES**

NO.	REV.	DATE	BY	CHKD.	DESCRIPTION
1		11/03			ISSUED FOR PERMITS

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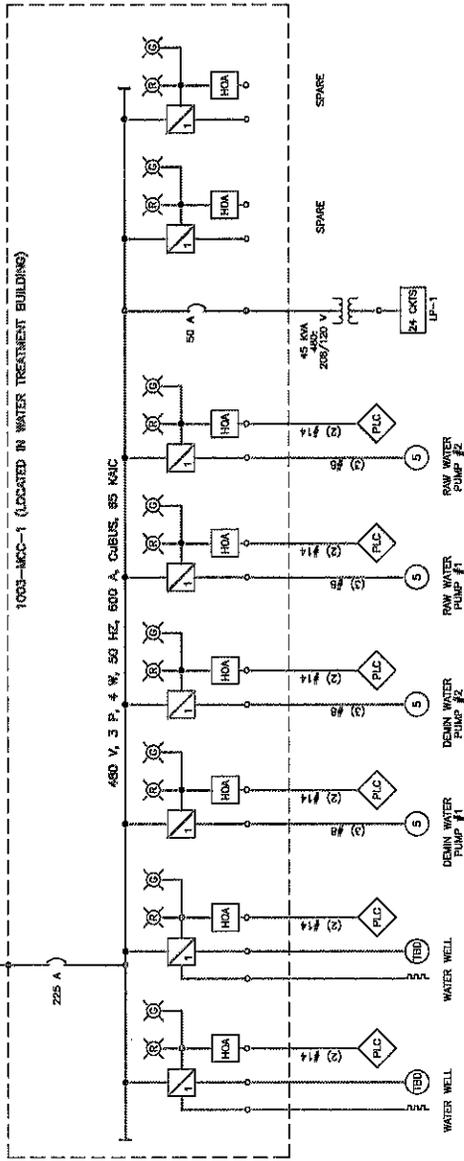








DWG NO.  
1034-50-002 SH 1



**LEGEND:**

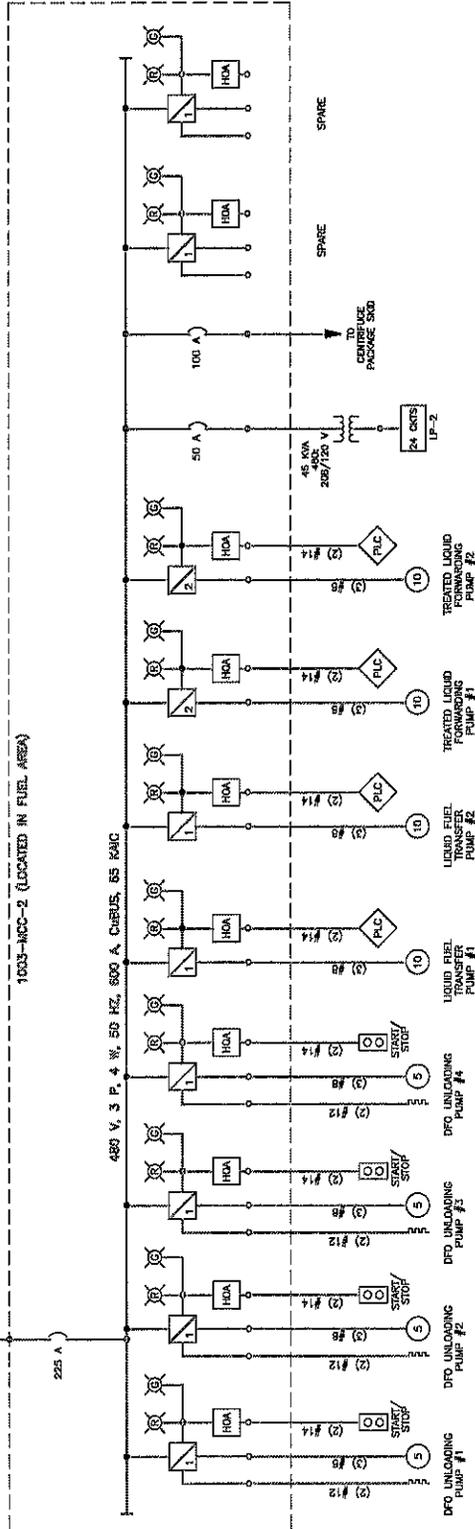
- COMBINATION STARTER/BREAKER (MOTOR OR LOAD)
- HAND-OFF-DRAW-AUTOMATIC SWITCH
- MOTOR
- MOTOR HORSEPOWER (HP)
- INDICATING LIGHT
- ORDER PANEL
- TEMPERATURE CONTROL
- MOTOR SPACE HEATER
- OVERLOAD RELAY 51 TIME
- BREAKER
- BREAKER - ELECTRICALLY OPERATED
- BREAKER - MANUALLY OPERATED
- BREAKER - DRAW OUT TYPE

		<b>ProEnergy EPC Services, LLC</b> ONE LINE DIAGRAM - 480 V-MCC-1 PRATT & WHITNEY FTAC-1D TWIN PACS BARRINAS 1 POWER PLANT	
807 SOUTH DETROIT AVE TULSA, OKLAHOMA 74106 PHONE: 918-439-1111 WWW.PROENERGYEPC.COM	807 SOUTH DETROIT AVE TULSA, OKLAHOMA 74106 PHONE: 918-439-1111 WWW.PROENERGYEPC.COM	SHEET NO. 1 OF 1	DATE 10/03-00-003 REV. NO. 1 C

DWG NO.  
1034-60-002 SH 1

1003-MCC-2 (LOCATED IN FUEL AREA)

480 V, 3 P, 4 W, 50 HZ, 800 A, CUBUS, 65 PAC



LEGEND:

- COMBINATION STARTER BREAKER (DRAWN TO IEC STANDARDS)
- BREAKER
- BREAKER WITH INSTANTANEOUS TRIP
- STARTER SIZE
- COMBINATION MOTOR STARTER (DRAWN TO IEC STANDARDS)
- MOTOR
- MOTOR OVER
- STARTER SIZE
- HAND-OFF-AUTO SWITCH
- ELECTRICALLY OPERATED BREAKER
- MANUALLY OPERATED BREAKER
- DRAW OUT BREAKER
- INDICATING LIGHT
- TEMPERATURE CONTROL PANEL
- TEMPERATURE SWITCH
- MOTOR SPACE HEATER

		<b>ProEnergy EPC Services, LLC</b> ONE LINE DIAGRAM - 480 V-MCC-2 (2) FREATT & WHITNEY FTAC-1D TWIN PACS BARINAS I POWER PLANT	
877 SOUTH DETROIT AVE TULSA, OKLAHOMA 74106 OFFICE WWW.PROENERGYEPC.COM	T1003 1003-60-004 SHEET NO. 1 OF 1	DATE: 04/24/10 CHECKED: [ ] DESIGNED: [ ] DRAWN: [ ] SCALE: AS SHOWN PROJECT: BARINAS I POWER PLANT SHEET: 1003-60-004	REVISIONS NO. DATE BY DESCRIPTION 1 04/24/10 [ ] [ ]