Slide 1: Title Slide

- Title: Supply of Pratt & Whitney FT4C-1D Twin Pac Power Plants
- Subtitle: Refurbished, Warranty

Slide 2: Product Overview

- Title: FT4C-1D 50MW Twin Pac
- Description:
  - Outdoor, self-contained, automatic, gas-turbine powered electric generating plant.
  - Nominally rated at 50 MW @ ISO conditions.
  - Capable of local operation with remote-control panel option.
  - Built-in starting capability in event of AC power loss.
  - Assumes full load in less than ten minutes after start signal, providing "black-out" protection.

Slide 3: Key Components (General Arrangement)

- Title: General Arrangement & Description
- Components:
  - Electric Machinery Manufacturing Co. open cycle, air-cooled generator:
    - 57.3 MVA (Base), 61.1 MVA (Peak)
    - 13.8 KV, 0.90 power factor
    - Two-pole, turbine type with brushless exciter
  - Two (2) opposed, direct-connected Pratt & Whitney Aircraft FT4C-1D Gas Turbines.
  - Turbines coupled via diaphragm couplings to generator shaft.
  - Generator can operate at half power with one turbine decoupled.

Slide 4: System Details

- Title: System Features
- Lubrication Systems:
  - Gas turbines have their own lubrication systems with storage tanks.
  - Generator has a separate lubrication system with AC motor-driven pump and DC backup.

    - Both systems are air-cooled.
- Electrical Connection:
    - Generator top connected via 3000 amp, 15KV, 95 KV BIL bus duct.
    - Connects to high voltage metal clad switchgear with 1000 MVA, 3000 amp Air Circuit Breaker.
- Enclosures and Layout:
    - Turbines, generator, and controls are in painted steel enclosures.
    - Entire 50 MW plant occupies approx.

      106′×32′ space.

    - Unit set on a

      106′×20′ reinforced concrete pad on 3000 psf soil.

    - Diaphragm walls separate turbines from generator for cooling and fire protection.

Slide 5: Safety and Control

- Title: Fire Protection and Control Enclosure
- Fire Protection:
    - Automatic fire protection system for each gas turbine.
- Control Enclosure Houses:
    - Gas turbine control
    - Generator control panel
    - Motor Control Center
    - High voltage metal clad switchgear
    - Batteries

Slide 6: Equipment Included

- Title: Major Equipment Included
- Each Twin Pac includes:
    - Steel enclosure with inlet and exhaust stacks.
    - Gas Turbine Prime Movers, each with:
        - Lubrication system
        - Ignition system
        - Fuel system (including fuel control)
        - Starting system

        - Fire Protection
    - Open Cycle, Air Cooled Generators with brushless exciters and associated electrical equipment:
        - Voltage regulators
        - High and low voltage switchgear
        - Turbine and generator control panels
        - Sequencers
        - Protective Relaying
        - Motor Control Centers
        - Batteries and Chargers
        - Auxiliary Transformers
        - Master Terminal Strip

Slide 7: Operation Modes

- Title: Twin Pac Operation
- Designed for:
    - Local or optional remote automatic operation on utility distribution/transmission system.
    - Can operate as an "isolated" generating station (from local or remote HMI) during blackout.
- Five Modes of Operation:
    - 1. Parallel – Manual and Automatic (Remote – Local)
    - 2. Isolated – Manual and Automatic (Remote – Local)
    - 3. Isolated Precise – Manual and Automatic (Local Only)
    - 4. Idle – (Local Only)
    - 5. Test – (Local Only)

Slide 8: Instrumentation and Controls

- Title: Turbine Control System (TCS)
- Hardware:
    - Based on Rockwell Automation ControlLogix platform or equivalent.
    - ControlLogix CPU interfaces with Rockwell's Flex I/O for higher performance and flexibility.
- Functions:
    - Performs gas turbine control and unit sequencing (firing, acceleration, speed governing, shutdown, cool down).
    - Control tasks: close loop governor, unit start/stop sequencing, safety monitoring.

    - Mimics OEM control system functions with improved reliability, configurability, low maintenance.
    - Open platform for end-user code changes and maintenance.
    - Includes all hardware, engineering, software, drawings, assembly, and documentation.

Slide 9: Operational Overview

- Title: Operational Control
- Fuel Control & Sequencing:
    - Individual and tandem turbine operation.
    - Each turbine has PID control loops for N1, N2, N3 speeds, and TT7 (exhaust gas temperature).
    - Sequencing for individual and tandem engine start/stop.
- Operation Modes (Automatic/Manual):
    - Parallel / Isolated Droop / Isolated Precise / Synchronous Condenser
    - Single engine operation capable for any mode.
    - "Decoupled Mode Switch" for extended single engine operation (prevents wind-milling of non-running engine).
- Authority Modes:
    - Selected via MODE SELECTOR SWITCH (43-1) on local Operator's Control Panel.
    - All ESD push buttons active regardless of LOCAL/REMOTE/TEST switch position.

Slide 10: Operator Interface

- Title: Local and Remote Control
- Local Control:
    - Unit controlled only from Local Operator Control Panel.
    - View all switch positions, control modes, operating parameters, alarms, and shutdowns on local HMI.
- Remote Control:
    - Unit controlled from local HMI and/or control room HMI.
    - Local panel switches (Start/Stop, Raise/Lower, Load Select) disabled when 43-1 is in Remote position.
- System Operation Mode (External Control):
    - Sub-mode of Remote; Remote Mode must be active first.
    - Enables control room HMI and local HMI controls.

    - Control Room HMI or Local HMI can enable/disable System Operation Mode.
    - External Control cannot "take" control; all control buttons disabled when enabled (except disable button).
- Base turbine control system includes: hardware, engineering, software, drawings, assembly, system documentation.

Slide 11: Human-Machine Interface (HMI)

- Title: Operator Interface Details
- Local Operator Interface:
    - HMI based on Rockwell Automation FactoryTalk Product line.
    - Operates on a Panel PC, mounted in control cabinet door or 19" rack.
- Displays:
    - Seven project-specific graphic displays and four custom graphic displays.
    - Trending and alarm lists (standard).
    - Hardwired manual controls for start/stop, regime control, basic parameter monitoring.
- HMI Screens:
    - Developed using Rockwell FactoryTalk View Site Edition software.
    - Primary screens: Full-screen display of data and control elements for unit/system monitoring.
    - Secondary screens: Pop-up windows displaying specific information or action commands, called from Primary screens.

Slide 12: Monitoring Systems

- Title: Vibration Monitoring
- Vibration Monitor:
    - Vitec System using three channels (one GG, two FT) to monitor gas turbine and turbine.
    - HSI screen displays data from vibration probes.
    - Indicates probe locations, vibration levels, alarm, and shutdown levels.
    - Example screen with additional generator monitoring.

Slide 13: Engine Enclosure Fire Protection

- Title: Fire Protection System
- Detection Subsystem:
  - Three (3) 450°F thermal detectors: near right secondary Air Inlet, over burner, near enclosure cooling air exhaust.
  - Activation automatically actuates extinguishing system, closes fire valve(s) and dampers, signals emergency shutdown, alarms.
- Actuation:
  - Activated by thermal detection system.
  - Can be manually actuated by two releases: one in generator enclosure, one outside engine enclosure.
- Extinguishing Subsystem:
  - Total flooding type using carbon dioxide (CO_2).
  - CO_2 is odorless, colorless, electrically non-conductive, efficient for all fire classes.
  - Stored in five 75 lbs containers in racks outside each engine enclosure.
- Equipment provided for each engine enclosure:
  - Five 75 lbs CO_2 storage containers.
  - Three thermal detectors, two manual discharge stations.
  - Two fire dampers, two gas detectors (gas operation).
  - One turbine enclosure fire relay.
  - Additional pipe, conduit, wire, hardware.

Slide 14: Air Start Pac

- Title: Air Start Pac (Optional)
- Purpose:
  - Furnished if natural gas (100 PSIG and 2625 SCFM) is not continuously available for starting.
  - Provides energy for gas generator starter turbine.
  - Provides air injection for fuel atomizing for liquid-fueled engines.
- System Components:
  - Housed in a steel enclosure.
  - Consists of motor driven compressor(s) and air storage bottles.
  - Air stored at 485 PSIG.
  - Capable of furnishing 130 pounds per minute airflow.
  - Automatically recharges after each start attempt.

Slide 15: Proposal

- Title: Proposal Details
- Offer: Supply of three (03) zero (0) hours, factory refurbished Pratt & Whitney FT4C-1D units.
- Specifications: 50 MW each, dual fuel, 13.8 kV, 60 Hz.
- Location: Offered FOB CT.
- Condition: Subject to prior sale.
- Pricing: Price per unit, USD 14,800,000.

Slide 16: Terms and Conditions

- Title: Terms and Conditions
- General:
  - All equipment subject to prior sale.
  - Quotation valid for 60 Days.
- Payment Terms:
  - 50% upon receipt of Purchase Order.
  - 45% at time of shipment.
  - 5% post commissioning or 45 days from site arrival (whichever first).
- Ownership & Shipping:
  - Ownership transfers at WGPW's Bloomfield, CT facility.
  - Shipping Terms: Ex-Works Bloomfield CT.
  - Subject to WGPW Terms and Conditions Sales Agreement.
- Exclusions:
  - Pricing does not include equipment packaging and/or shipping costs.
  - Pricing does not include fees, taxes, custom duties, etc.
- Services:
  - Field Service Rates apply for site TFA's.
- Warranty:
  - One year or one thousand (1000) hours from installation, OR eighteen months from delivery date (whichever occurs first).