Microgrid Master Control Panel (MMCP)

Energy Management System

ADVANCED POWER TECHNOLOGIES

Solution Brochure

PROVIDING A COMPREHENSIVE APPROACH TO RELIABLE POWER

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Applications

Figure 1: Power Producing Sources that are controlled by MMCP

Microgrid Master Control Panel (MMCP)

APT understands the need to have reliable monitoring and control of multiple renewable energy sources. The Microgrid Master Control Panel (MMCP) provides real time integrated control of power production and power consumption for large scale (500kW – 50 MW) microgrids. This involves the aggregation of control for various distributed energy resources (DER) in both grid-connected and grid-isolated modes of operation, instantaneous load matching, and active control of microgrid stability. MMCP provides optimization of use of the diverse DER in various modes of operation, as well as automatic islanding and active synchronized re-connection of the microgrid loads to the utility power grid. The MMCP is available in NEMA 1 indoor or NEMA 3R outdoor construction.

DER and Energy Storage technologies supported:

- Natural gas reciprocating engines
- Natural gas turbines
- Bio-gas and Landfill gas reciprocating engines
- Bio-gas and Landfill gas turbines
- Micro-turbines
- Battery storage
- Solar PV array generation
- Fuel cell generated power
- Hydro power
- Wind
- Battery Storage Driven Generators
- Other less common DER and Energy Storage such as combined cycle steam generators, flywheel, geothermal, etc.

APT Turnkey Microgrid Solutions

Start Building the Smart Communities of Tomorrow… Today with APT's Microgrid Control & Power Management Technologies

Figure 2: APT Microgrid Equipment & Control Ring Bus System

Advanced Industrial Computer SCADA System

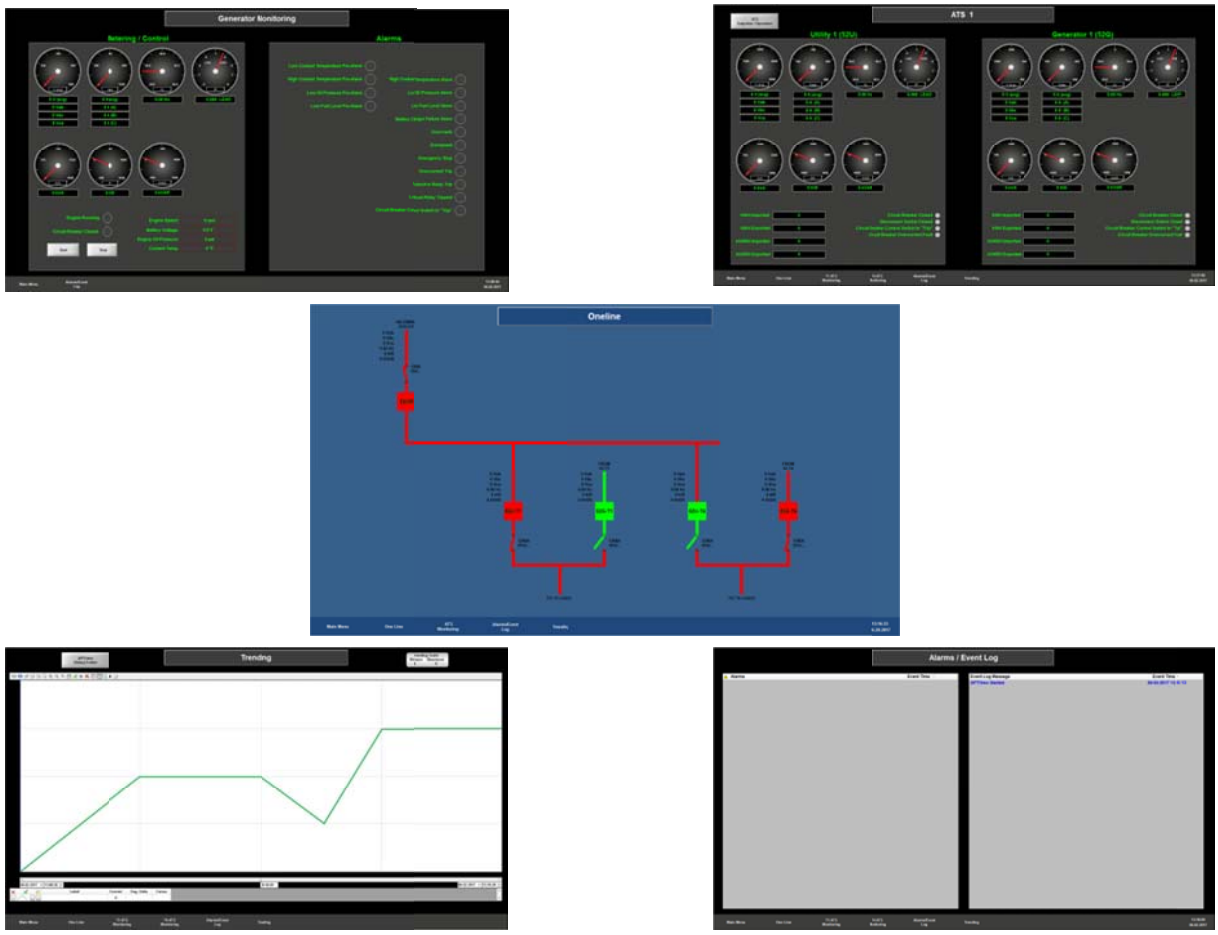

Figure 3: APT Microgrid System One-Line (Center), Generator Monitoring (Top Left),
ATS Monitoring & Control (Top Right), Trending (Bottom Left), Event Logging (Bottom Right)

- 20” Color touch-screen
- Microsoft Windows
- Advanced industrial computer (AiPC) equipped with the powerful APTView Control & Monitoring Software
  - Provides a SCADA graphical user interface (GUI) for control and monitoring of the MMCP functions.
  - Allows MMCP functions to provide the following:
    - Microgrid System One line.
    - Storage of all the monitored data every minute with date and time stamp.
    - Events log with date and time stamp.
    - Emails can be sent upon any triggered event condition.
    - **Free** license remote monitoring and remote control software.
    - Capability of remote system troubleshooting.
    - Adjustable setpoints and modes of operation to allow user adopt the system operation to changing needs.

Functions, Features & Control Interfaces

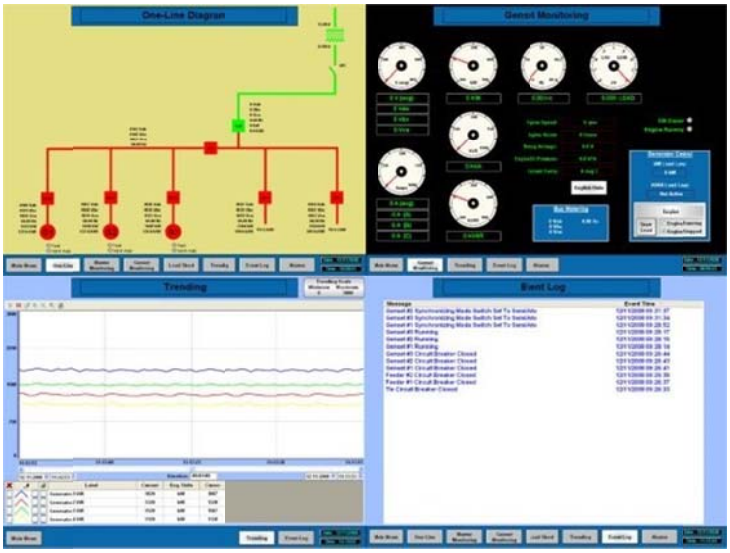

Figure 4: 2000kVA Solar Step-Up Power Transformer

Figure 5: Remote Monitoring & Control from Mobile Devices

Functions & Features

- SCADA interface with remote monitoring & control
- kW and KVAR control of DER load to achieve Microgrid system stability by matching the site active and reactive loads with DER active and reactive power production.
- Optimization of utilization of various DER in grid connected and grid isolated modes of operation to achieve optimal balance between the efficiency and reliability of power delivery.
- Control and optimization of spinning reserve as required for each mode of operation
- Bumpless synchronous load transfer between the DER and Utility Grid.
- Minimizing the diesel generators fuel consumption, while ensuring the microgrid system stability when operating in emergency standby mode of operation. Emergency operation time can be extended as much as 6 times with the same amount of on-site fuel storage.
- Peak shaving and renewable DER power production peak shifting control for Load Demand Management.
- Load shed, load add, and bus load optimization control.
- Grid frequency and voltage support control

Control Interfaces

MMCP provides native interfaces to APT Automatic Paralleling Switchgear Control panels and APT Master Control Panels as well as most 3rd party controllers via following native interfaces:

- Modbus TCP/IP Ethernet, Modbus RTU or Modbus ASCII serial (RS-485/RS-232)
- Analog voltage interfaces: 0-5 VDC, +/- 10 VDC, 0-3 VDC, 0-10 VDC, +/- 5 VDC, +/- 3 VDC, etc.
- Analog current interfaces: 4-20 mA, 0-20 mA
- Microprocessor controlled potentiometer
- Digital signals: 24 VDC, 48 VDC, 125 VDC, 120 VAC, etc.

Custom interfaces to 3rd party devices such as (Profibus, DNP, CAN, BACnet, SAE J1939, Caterpillar Data Link, etc.) are available upon request.

MMCP provides Modbus TCP/IP Ethernet, over copper of fiber, supervisory control and data acquisition interface to higher level SCADA, DCS or building management system.