Microgrids for Renewable Energy
Sustainable Energy Systems

Solution Brochure

PROVIDING A COMPREHENSIVE APPROACH TO RELIABLE POWER

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

1) Point of Common Coupling/Utility Service Entrance

2) APT Utility Intertie Switchgear

3) Traditional Diesel or Natural Gas Powered Generators

4) APT Generator Paralleling Switchgear

5) Limited PV Generation

6) APT Power Inversion & Combination

7) APT Solar Combiner & Peak Shaving Switchgear Module

8) APT Battery Energy Storage System (BESS)

9) APT Energy Storage Generator

10) Facility Load(s)

11) APT Microgrid Master Control

12) Remote Monitoring & Control

Figure 1: APT Microgrid Equipment & Microgrid Control Architecture
Applications

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.
Advanced Industrial Computer SCADA System

- 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.

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