



ADVANCED POWER  
TECHNOLOGIES

# Microgrid Sustainable Energy Systems



## APTGrid Engineered Power Systems Solutions Brochure

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**SAFE SMART SERVICEABLE SWITCHGEAR &  
ENGINEERED POWER SYSTEM SOLUTIONS**



ALN: 561 Rev. 05

# APT Turnkey Microgrid Solutions

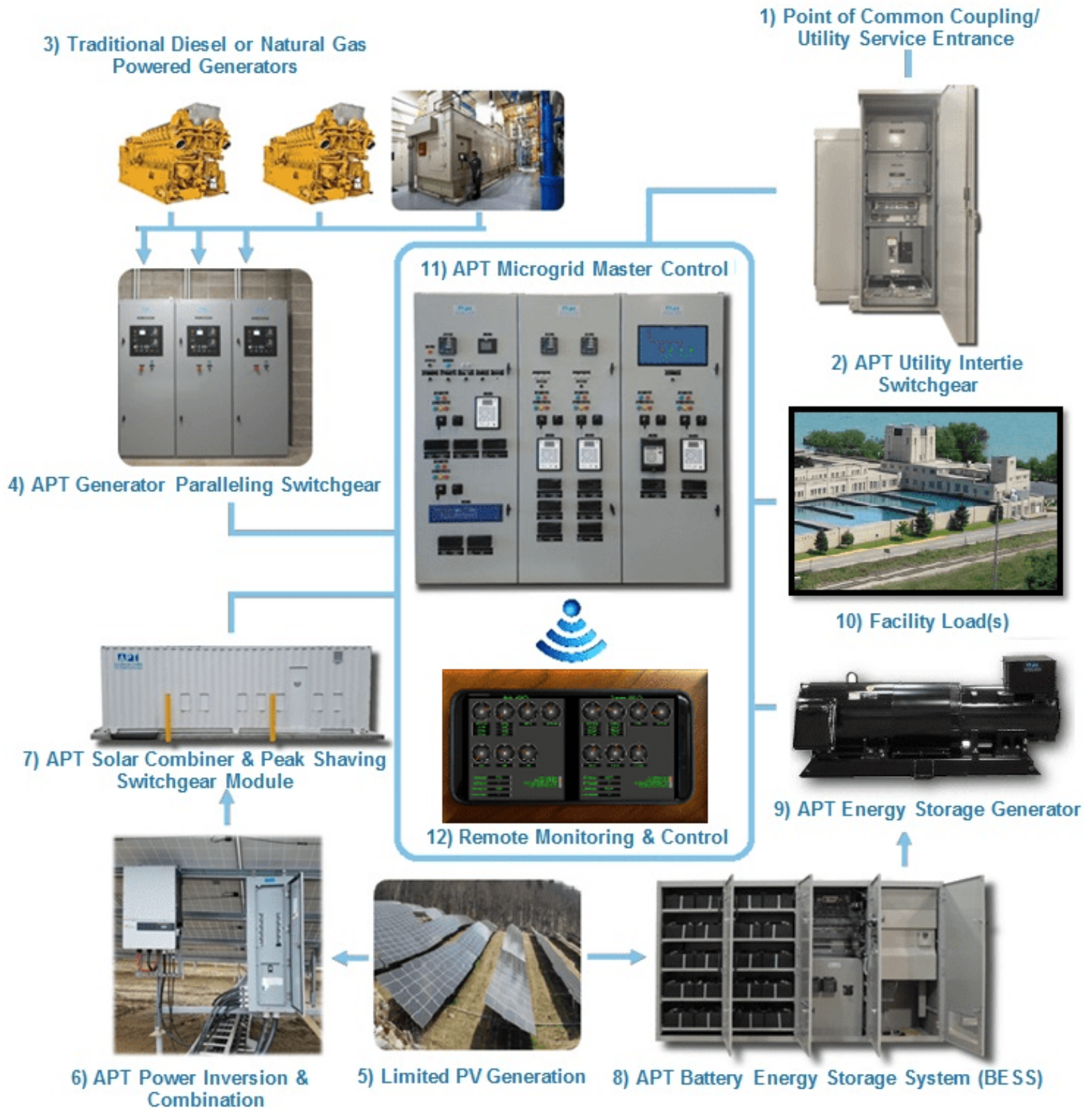


Figure 1: APT Microgrid Equipment & Microgrid Control Architecture



# APTGrid Applications



Figure 2: Power Producing Sources that are controlled by MMCP

## Microgrid Master Control Panel (MMCP)

- ⊙ APT's engineered microgrid solutions are a perfect fit for any utility, community power, and large-scale application
- ⊙ 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
- ⊙ DER and Energy Storage technologies supported:
  - Natural gas reciprocating engines
  - Natural gas turbines
  - Biogas and Landfill gas reciprocating engines
  - Biogas 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.

# Microgrid Master Control Panel Features



Figure 3: ArCryptM-Series Custom Arc Resistant Switchgear with Master Control Panel



Figure 4: Automatic Paralleling Switchgear Control Panel



Figure 5: Master Control Panel displaying APTView Trending Diagram

## Isolated or Line-up Integrated Switchgear Master Control Panel

- ⊙ One of our most popular items on our switchgear master control systems lineup
- ⊙ Operator Interface:
  - 20" Color touchscreen
  - Microsoft Windows
  - APT industrial computer (AiPC) equipped with the powerful APTView Control & Monitoring Software
  - Provides SCADA graphical user interface (GUI) for control and monitoring of the MCP functions
  - Allows MCP functions to provide the following:
    - System One-Line
    - Storage of all the monitored data every minute with date and time stamp
    - Emails can be sent upon any alarm condition
    - Free license remote monitoring and remote-control software
    - Capability of remote system troubleshooting
    - Adjustable setpoints and modes of operation to allow user to adopt the system operation to changing needs
- ⊙ Available in NEMA 1 indoor or NEMA 3R outdoor construction
- ⊙ Operation Overview:
  - MCP-Series Master Control Panel provides native interfaces to APT Automatic Paralleling Switchgear Control Panels, APT Master Control Panels, and most 3<sup>rd</sup> 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: 4-20mA, 0-20mA
    - Microprocessor controlled potentiometer
    - Digital Signals: 24VDC, 48VDC, 125VDC, 120VAC, etc.
  - Custom Interfaces to 3<sup>rd</sup> party devices are available upon request
  - APT MCP-Series provides Modbus TCP/IP Ethernet, over copper or fiber, SCADA interface to a higher level, DCS, or building management system

# APTView Features & Benefits



Figure 6: APTView Home Screen



Figure 7: APTView Touchscreen Human Machine Interface Cell Phone View



Figure 8: APTView Generator Monitoring & Menu



Figure 9: APTView Alarms/Event Log

## What is Remote Access Switchgear Control & APTView?

- ⊙ The concept of remote access switchgear control makes safety the top priority.
- ⊙ It isolates switchgear operation personnel from the live components of a switchgear and allows for the control of operation from a remote location or an isolated master control station.
- ⊙ Operators can have the peace of mind that they are utilizing the safest means of operating circuit breakers possible. This is done by eliminating the need for an operator to be anywhere near live or potentially live equipment.
- ⊙ APTView is APT's own Supervisory Control and Data Acquisition (SCADA) system.
- ⊙ It utilizes Human Machine Interface (HMI) systems to monitor and control both APT and 3rd party equipment via personal computers or your favorite web or network-connected mobile device.
  - Requires fast internet connection and Static IP.
- ⊙ Emails can be sent to notify the user of any occurring alarm or event.
- ⊙ All system alarms and events are logged and date/time stamped.
- ⊙ Equipment operating parameters are periodically stored for future record/retrieval.
- ⊙ Customer specified security features to limit access only to the people who need access for maximum security.



# Switchgear Control Interface



Figure 10: Stand-alone Fully Isolated Master Control Panel (MCP) with 20" Touchscreen Human Machine Interface Screen

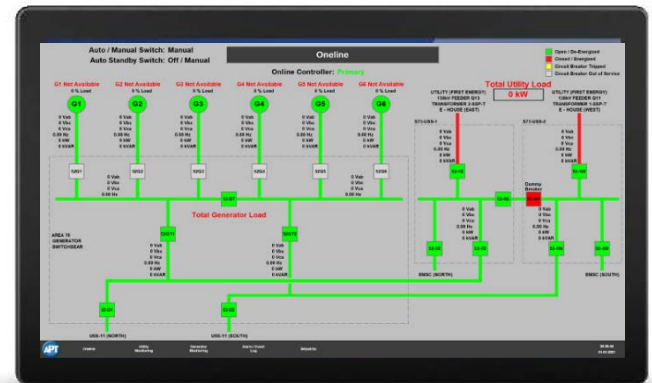


Figure 11: APTView System One-line Diagram with Industrial Personal Computer (AiPC) (top), AiPC Panel with APTView displayed on location (bottom)

## Human Machine Graphical User Interface PC

- ◎ Industrial Personal Computer (AiPC)
  - Windows10 Operating System
  - Minimum 8GB of RAM
  - Minimum 128GB Solid State Drive (SSD)
  - 20" LCD (Active matrix TFT) Touch Display
    - Shows state-of-the-art graphical display
    - Smartphone-compatible
  - Native resolution of 1920 x 1080
  - Wide angle aspect ratio 16:9
  - Viewing angle of 178°(h) x 178°(w)
- Horizontal Scan Rate 30 - 82 kHz
- Vertical Scan Rate 50 - 75 Hz
- Contrast 3000:1
- Number of colors 16.7 million
- 10 touch projected capacitive (PCAP) with Thru-glass capabilities that pass UL-60950 & IK-07 Impact testing
- Operating Temperature:
  - 0°C to 40°C (32°F to 104°F)
- Operating Humidity (non-condensing):
  - 20% to 80%

# APTView & Microgrids



Figure 12: AV – APTView Remote SCADA System with Cell Phone Controlling Microgrid Master Control Panel

## Functions & Features

- ⊙ SCADA interface with remote monitoring & control
- ⊙ kW and kVAR con 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

# About Advanced Power Technologies



Advanced Power Technologies (APT) is on the cutting edge of the latest engineered power system smart technologies, as it relates to microgrid & storage management, renewable & conventional energy source deployment, demand peak shaving, and facility back-up and co-generation power systems. Located in the central United States and headquartered in Lafayette, Indiana with solutions development engineers around the country, APT provides domestic and international products and services to industry leading companies from around the world. APT engineers have decades of power system experience from working with some of the largest companies in industry. Over the last two decades, we have produced successful solutions for hundreds of large-scale electric power projects involving utility/generator paralleling, transfer, peak shaving, and distribution. We pride ourselves in providing electrical power systems that are engineered and custom built, utilizing state-of-the-art technologies to fit our customer's exact needs. The core of our business is low & medium voltage engineered power systems for a wide range of indoor & outdoor applications, such as:

- ⊙ Utility(ies) and Generator(s) Paralleling/Transfer/Peak Shaving/Distribution Switchgear
- ⊙ Microgrids, Microgrid Master Control Panels, SCADA systems
- ⊙ Containerized Battery Energy Storage Systems (BESS)
- ⊙ Photovoltaic (PV) Solar Power Collection/Distribution & Renewable Energy Storage Systems
- ⊙ Low & High Resistance Grounding Systems, Grounding Systems for Photovoltaic Effective Grounding
- ⊙ High Efficiency Combined Heat and Power Switchgear & Control Systems (CHP, Co-generation)
- ⊙ Outdoor Walk-In Electrical Houses (E-Houses) & Skid-Mounted Switchgear
- ⊙ Motor Control Centers & Motor Control Switchgear
- ⊙ Automatic & Manual Load Transfer Switchgear
- ⊙ Bypass/Isolation & Power Distribution Circuit Breaker Switchboards
- ⊙ Generator/Loadbank Quick Connection Switchgear, Switchboards, & Tap Boxes
- ⊙ Industrial Control Panels

Please see our product webpages on [www.appt-power.com](http://www.appt-power.com) for product brochures and relevant information. Actual products may look different from images shown on the website and in brochures, based on actual specifications.

APT cares and understands that each power system is different. We will evaluate various solutions in order to develop the best solution for a site. APT focuses on our ability to a combine several traditional pieces of equipment/functionality into as little of a footprint possible. This saves on space, the cost of equipment, cost of installation, and accomplishes the most optimal/state-of-the-art design your facilities. APT's desires to foster and grow a culture of continued open communication with each customer. Let APT be your source to provide fully engineered power system equipment solutions for the full customer facility on time, on or under budget, and in the smallest footprint possible. We are always available to assist customers and engineers representing customers in the development of complex power solutions for all facility types.