PCS-9617MG

Microgrid Controller

PCS-9617MG is a coordination control equipment specifically designed for microgrid (both grid-connected and islanded). It has the function of control, protection, measuring, monitoring, communication, etc. and carries out the coordinative control of DG (Distributed Generator), energy storage, diesel generator and controllable load to realize the safe, stable and economic operation of microgrid. This helps to increase the economic benefit for customers and enhance the penetration and utilization of DG and renewable energy.

Functions

Control

a) Control strategy for grid-connected Mode

- Interface tie-line power control
  In order to avoid the impact of large tie-line power variation, the output of energy storage systems and DGs should be under control to guarantee the power flow of the point of common

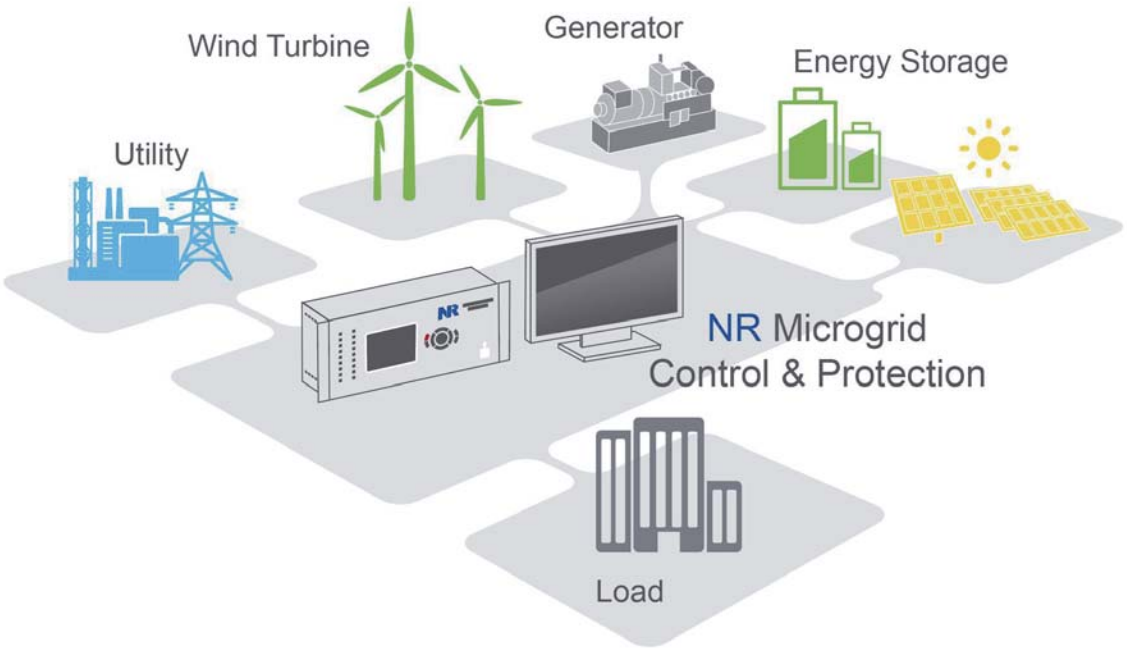

Figure 1 PCS-9617MG Microgrid Controller Application

coupling (PCC) within the acceptable range. This makes the microgrid operate as a controllable source/load for a friendly grid-connected distributed system.

- Energy storage management
  Fluctuation suppression: The intermittent feature of wind generation and solar generation impact the power quality and stability of microgrid greatly. However, the energy storage system has the capability to dynamically absorb or release the power depending upon grid needs. Special strategy is set in the controller to suppress the power output fluctuation of wind generation and solar generation and realize the smooth power output of wind generation and solar generation.

  Peak shaving: When microgrid operates in the grid-connected mode, it injects power into the distribution system during the peak-load period and absorbs power from the distribution system during the valley-load period. The peak-valley schedule curve function is set in the controller, which receives the schedule curve issued by the dispatching center and controls the power output to make the microgrid an excellent solution for the distribution system. A peak-valley power output curve can also be set locally to generate power during the peak-price period and absorb power during the valley-price period to obtain the benefit of peak-valley price difference which ultimately enhance the economic efficiency of the microgrid.

- Ancillary services
  For higher operation reliability and power quality, the output of ESS and DGs can be controlled to supply the ancillary services, such as frequency and voltage regulation, for power grid based on dispatch enter commands or real-time system operation condition.

b) Control strategy for islanded mode

- Frequency & voltage emergency control
  In islanded mode, the power deficiency or excess may lead to the sharp variation of frequency and voltage. This severely impacts the normal operation of micro-grid and causes the system breakdown. The frequency & voltage emergency control is set to balance the power demand within micro-grid and to recover the voltage and frequency within the allowable operating ranges by the energy storage output control, fast load shedding and DG disconnection.

- PV power limit control
  In order to avoid the automatic shutdown or damage of generator (diesel generator, gas engine) due to its too low power output, the PV power output is limited by the automatic generation control to maintain the power output of generator within an allowable range.

c) Transient process control

- Switching between grid-connected and islanded
  Switchover from grid-connected mode to islanded mode: When the grid is de-energized due to fault, overhaul, etc., the controller quickly detects the islanded condition, trips the circuit-breaker of PCC and sends the islanded signal to the energy storage and DGs for the switching between microgrid two operating modes.

- Synchronous grid-connection
  Switchover from islanded mode to grid-connected mode: The controller provides automatic synchronous switching-on function for a safe and reliable grid inter-connection of microgrid.

Protection

All the major protection functions according to grid codes needed including over-current protection, under/over voltage protection and under/over frequency protection are all inbuilt in the controller.

Monitoring and Measuring

a) Voltage, current, frequency, active power, reactive power, power factor and kilowatt-hour at PCC

b) Monitoring of circuit-breaker position, CT-wire disconnection, PT-wire disconnection, etc.

c) Up to 64 fault & action logs, 64 fault wave records, 1024 selfcheck reports and 1024 COS (Change-of-state) logs

d) The synch interface supports several GPS synchronization modes, including IRIG-B, SNTP, etc., as well as IEEE1588 V2 high-precision net synchronization mode

Communication

a) Up to 6 10/100Mbps electronic Ethernet ports, one 1000Mbps electronic Ethernet port and 6 RS-485/RS-232 serial ports are equipped for communicating with DGs and SCADA system. Additionally, it supports IEC60870-5-103, IEC60870-5-104, DNP3.0 and MODBUS (Master and Slave).

b) Up to 8 100Base-FX optical Ethernet ports are equipped for the fast communication with PCSs and supportsIEC`61850-8-1 GOOSE.

c) Hundreds of communication protocols are supported for communicating with subordinate DGs and other intelligent devices. The protocol module is easy and flexible for configuration and extension.

Features

- Based on the mature platform of UAPC, with relay-level response speed and reliability, capable of seamless switchover between different micro-grid operation modes.

- The control logic can be flexibly configured.

- Sufficient communication ports and protocols are supplied to realize the communication access of converters and inverters of different equipment and different manufacturers.

- The communication card and I/O module can be flexibly and optionally configured to meet the requirements of different microgrid capacities.