Reinforcement of CRIEPI's Power System Simulator (Second Phase)

Purpose:

CRIEPI's Power System Simulator has been a powerful tool for comprehending various abnormal phenomena and for resolving various stability problems. The simulator was expanded for the following two purposes:

1) Understanding the influence of high penetration of photovoltaic power generation (PVs) on rotor angle stability, frequency stability and voltage stability of power systems.
2) Developing numerical models of PVs for dynamic time-domain simulations:

Through these studies, we will develop technologies that can realize high penetration of PVs without hampering power system security.

Outline:

Understanding influence of high penetration of renewable energies such as PVs and wind power in transmission systems will be especially important in Japan. Therefore, PCSs (power conditioners) for PVs, DC power supply emulating photovoltaic cells, and other equipment were newly installed in the simulator.

Specifications:

(1) PCSs for PV (modified) (4.5kW×3phases×8set (Total 24))
They have the following functions: low-voltage-ride-through capability (specfied by an external signal), active/reactive power control by an external signal, switching on/off of island detection functions
(2) Invertor that can emulate load, battery, etc. (±20kW(3phases)×10)
(3) Control system for (1) and (2) (DSP×16)
(4) Solar cell simulator (11kW×3phases×11set (Total 33))
DC power supply that emulates I-V characteristics of photovoltaic cells
(5) Model 66kV transmission line (40km×6set)
(6) Model distributed generators with a synchronous generators (14kVA×2set) and their control systems
(7) Model wind power generator (doubly fed machine) (25kW×1set) and their control systems Doubly fed machine with low-voltage-ride-through capability (specfied by an external signal)
(8) Load (resistive load 50kW×3set, 30kW roting type load)
(9) Transformer (1650/220V, with tap switch, 60kVA×3set)
(10) Emulator for adjacent power system (±200kW)
(11) Communication equipments (1 set)
(12) Measurement unit (1set, 512ch)
(13) Others: monitoring equipment, connection board, disconnectors, etc.

Location and Date of Installation:

Komae Area, October 2011

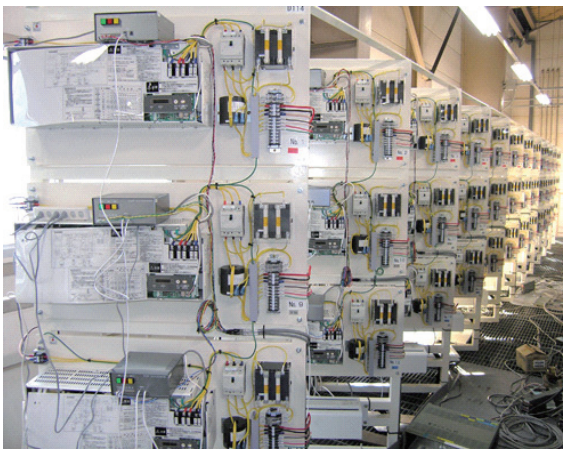

Photo 1 PCSs (modified) for PVs

Photo 2 66kV transmission line emulator