

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

Purpose:

CRIEPI's Power System Simulator has been a powerful tool for comprehending various abnormal phenomena through realizing severe faults in power systems and for finding solutions to 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 a power system.
- 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 sub-transmission systems will be especially important in Japan. Therefore, PCSs (power conditioners) for PVs, DC power supply emulating photovoltaic cells, new frequency control equipment (air conditioners possessing frequency self-regulating characteristics), and rotor angle measurement equipment were newly installed in the simulator.

Specifications:

- (1) PCSs for PV (12 units)
Commercial PCSs (around $4 \text{ kW} \times 12$ units) by four manufactures
- (2) DC power supply emulating photovoltaic cells (3 units)
DC power supply that emulates volt-ampere characteristics of photovoltaic cells
- (3) Air conditioners with/without frequency self-regulating characteristics (2 units)
Air conditioners that can change its active power load in response to a large deviation in AC frequency in addition to widely-used commercial air conditioners.
- (4) Rotor angle measurement equipment (2 units)
Phasor measurement equipment that captures the angle difference between internal induced voltage of a generator and voltage of an infinite bus

Location and Date of Installation:

Komae Area, March 2010



Photo 1 DC power supply emulating photovoltaic cells



Photo 2 Rotor angle measurement equipment