

Test Equipment for Examining the Multiple Interconnection Characteristics of PCS

Background

The amount of photovoltaic generation systems (PV) interconnecting with utility power systems is rapidly increasing due to the introduction of FIT. Problems associated with a high number of PVs are voltage fluctuation in power distribution systems, coordination of protection systems (preventing islanding, etc.) and simultaneous stops in the event of faults. The evaluation of PV systems by testing with a high number of

PV systems is necessary in order to grasp these phenomena and study measures. As such, we installed equipment to simulate operation of PV arrays with high precision and to test many PCS of PV systems operating simultaneously in Akagi Testing Center. The equipment will be used effectively in order to extract problems caused in power systems in the future and to develop countermeasures.

Outline

The test equipment has 10 sets of high performance DC sources for simulating transitional phenomenon and 10 sets of DC sources for simulating steady phenomenon, making it capable of simulating a total of 20 PV systems. The equipment is equipped with 81kW low voltage source with sufficient capacity to test under the condition of reverse power flow and can simulate system turbulence such as instantaneous voltage drop and shifting voltage angle. Moreover, the equipment has RLC load systems equivalent to a low voltage source in capacity, grinder load used as low voltage motor load at attestation

examination and impedance to simulate a low voltage distribution line. The equipment is connected to an existing experimental distribution system and BTB systems in order to evaluate interrelated influence between distributed generations (DG) interconnecting to middle voltage and/or low voltage systems and system turbulence caused by faults in transmission system. Using the above test equipment, the behavior of multiple PCS of PV in various conditions can be simulated, through which problems can be extracted and countermeasures can be studied.

Specifications

- (1) DC Source : Capacity 4kW, Max Voltage 400V, Max Current 30A, Response Speed 100 μ s
- (2) Low Voltage Source : Capacity 81kW (3P3W), 54kW (1P3W), Response Frequency 1kHz
- (3) Load Equipment : R Load 63kW, L Load 30.6kvar, C Load 30.6kvar, Grinder Load 12 sets
- (4) Low Voltage Line Impedance : 3 sets (R:30m Ω /set, L:45 μ H/set)
- (5) Measuring System : 1-cycle Interval root mean square value (Voltage, Current), Power (Active, Reactive), Frequency, Measuring instrument : Resolution 16-bit, 1MHz Sampling,
- (6) Power Conditioning Subsystem : New type (Method of Frequency Feedback with Step Injection function) 14 sets, Conventional Type 20 sets or more
- (7) Real PV Array : 5kW

[Installed location and date]

Akagi Testing Center / November, 2012

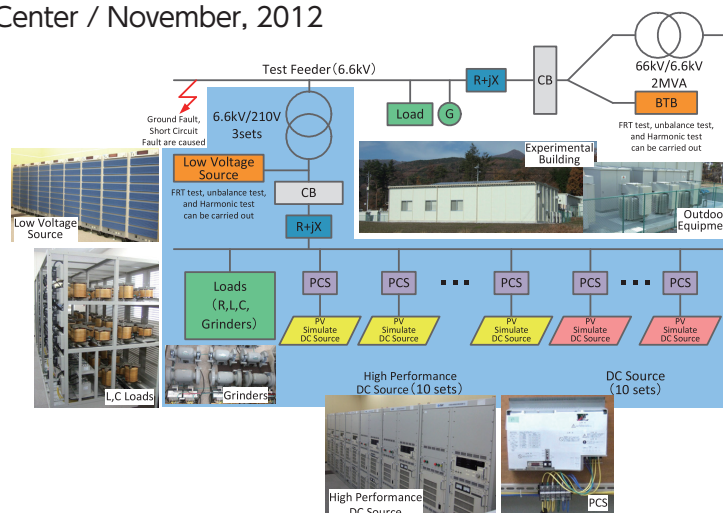


Fig. 1: Summary of Test Equipment for Interconnecting A Large Number of PCS