

## Efforts to Smart Grid in Mitsubishi Electric

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### Abstract

Mitsubishi Electric Corporation has built an in-house smart grid demonstration facility to establish smart grid technologies [1]. This smart grid facility is equipped with a 7 kilometer power distribution line, 4 MW photovoltaics, large batteries, electric vehicles, 700 smart meters, and control systems. Using these facilities, we are researching and developing technologies for supply and demand control in transmission systems, distribution voltage control in power distribution systems, and advanced metering infrastructure for consumers.

For future power outage management of a power distribution system, a smart meter is expected to be used. Disconnection of a high-voltage power distribution line during a power outage runs the risk of a major disaster, so it needs to be detected quickly. Therefore, we developed a power outage management system as a part of an in-house smart grid demonstration test for detecting disconnections of high-voltage power distribution lines. Then we propose and validate a disconnection detection method that does not need information of connection phases of pole transformers.

Large penetration of renewable energy causes serious power quality problems such as frequency fluctuation, surplus generation and voltage rise. We have developed demand-supply control and distribution voltage control using battery system in our smart grid project. Two types of battery are used; one is short term Lithium-ion battery for frequency and voltage control, and the other is long term sodium-sulfur battery for surplus problem. Three demonstration projects in Japan are also introduced.

### Reference:

[1] M. Marmioli, M Koshio, and Y. Tsukamoto, "Japanese Test Facilities for Smart Grid," IEEE International Conference on Smart Grid Engineering, pp. P<SGE12-OS5-Paper 15>\_1-7, Aug. 2012.