

Microgrid Systems Using Renewable Energy for Remote Islands

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Keywords : (several keywords to be listed)

Microgrid, renewable energy, renewable power generator, remote island, remote island, demonstrative research

Abstract

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There are many inhabited remote islands in the world and most of these operate with independent power systems. Recently, on the other hands, serious environmental issues throughout the world are accelerating introduction of renewable power generators, wind power generation and photovoltaic power generation for example. Especially in remote islands, renewable power generators can bring two merits, reduction of environmental impact and improvement of cost effectiveness, since fossil fuel with relatively high carbon dioxide emission factor is used for conventional generators and transportation fee of the fuel is much more expensive. Because such power systems, however, located on remote islands are small in size and their existing generators have small inertial energy, they are sensitive to fluctuations in the output of renewable power generators.

To solve this problem, we, Fuji Electric, has studied the configurations of microgrid systems for remote islands and has also studied the challenges for remote power systems when introducing a large amount of renewable energy as well as the way to address those challenges.

We already started two demonstrative researches on the microgrid systems. One for small-scale islands, started in July 2009 and will expire in March 2013, is carried out at six islands in Kyushu area. The other for middle-scale islands, started in August 2010 and will expire in March 2014, is carried out at three islands in Okinawa area. The microgrid systems consist of photovoltaic power generation system, wind power generation system and storage batteries or capacitors, which are connected with existing power systems, and are specially designed for independent power systems in remote islands to maintain quality of electricity and to keep reliability of power supply.

In the demonstrative researches, we have developed control methods for the microgrid system based on the high-speed demand and supply management, the power stabilizing technology for renewable power generators and the know-how of operation and control technology for storage devices. Furthermore, the know-how for selection of storage devices and the quick detection equipment of frequency have been developed at the same time.

So far, we continue to operate the systems and have succeeded in stabilizing the power systems with the renewable power generators.