

Power system planning with a large amount of renewable energy sources in Japan

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Just after the Great East Japan Earthquake in 2011, there were power shortage in eastern Japan, despite of redundant energy remained in western Japan. In order to allow power dispatch of energy nationwide and enhance power system resilience, Organization for Cross-regional Coordination of Transmission Operators, Japan (OCCTO) was established as an authorized organization approved by the Government in April, 2015. It was the first step of Electricity System Reform in Japan. OCCTO monitors Supply-Demand balance condition of each electric power company and formulates long-term cross-regional network development plan.

In recent year in Japan, as global warming countermeasures, renewable energy sources (RES) like photovoltaic and wind power are now interconnecting more and more as well as other countries, and spare capacity of some transmission facilities has become very small. Unless power system is reinforced, more RES cannot be interconnected. On the other hand, power demand in Japan will increase very slightly in the future because of more energy saving and depopulation. If power network expands, its utilization factor decreases and facility cost increases, which leads to more expensive wheeling charge.

To solve such issues, it is required to make the most of the existing power network, to expand power network more efficiently as well as to interconnect the most RES to the network. OCCTO is proposing innovative agendas. These agendas include “Japanese” Connect & Manage scheme and Solicitation process for generator interconnection.

As for Japanese Connect & Manage, so-called “Japanese” means that it is not accompanied with real power system expansion or reinforcement although Connect & Manage in other countries like UK is accompanied with real power system expansion. Instead, Japanese Connect & Manage requests generation output suppression of newly interconnected generators especially in case of N-1 contingencies. Probabilistic evaluation of power flow based on possible generators operation is employed instead of conventional, pessimistic power flow evaluation for this scheme. This scheme will start formal operation in two years.

As for Solicitation process, efficient power system expansion plan for applicants trying to interconnect generators is realized. The expansion cost is shared by applicants. There are 5 Solicitation process going on and 31 processes completed so far.

Japanese power system has to be changed due to rapid and drastic change surrounding electric power industries. Innovative agendas stated here will make a contribution to solve the present issues.