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Utilization of Distributed Energy Resources

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At the meeting of the Basic Policy Subcommittee on Electricity and Gas held on October 17, 2022, the Agency for Natural Resources and Energy announced that it will establish the Study Group on Distributed Power Systems for the Next Generation (tentative name) to make greater use of distributed resources and conduct specific studies. One of the reasons for establishing the Group was concern that, as more renewable power is introduced to make it a main power source, securing grid-balancing capacities may become an issue because the ratio of thermal power will decrease, and also that grid congestion and voltage spikes may occur in distribution grids since renewable power sources are often connected to distribution grids and local grids. Accordingly, there are expectations for the active use of distributed energy resources, such as storage batteries, EVs, and demand response sources located within distribution grids.

The biggest obstacle in utilizing distributed energy resources as a grid-balancing capacity is the installation of communication and metering devices for receiving commands and transmitting output values according to the requirements of each type of grid-balancing capacity. The communication and metering devices used by electric power businesses have been developed for conventional power plants, and there are no products yet for small, distributed energy resources. In a demonstration project conducted in Australia to show that an aggregated unit consisting of residential photovoltaic power and storage batteries can be used as a grid-balancing capacity, the PV-battery unit was metered using the metering function of the battery inverters to show that the unit was sufficiently responsive and trackable to serve as a grid-balancing capacity. However, the technical regulations for using the technology finalized in December 2021 did not allow the use of the inverters' metering function and it was decided that a new, dedicated metering device would be developed and installed at the power reception points. On the other hand, in February 2022, U.S. PJM produced a final proposal that allows metering using inverters that meet certain requirements (IEEE1547) based on the results of the demonstration project in Australia. Since PJM allows the use of individual devices for metering, it is only necessary to show how accurately the distributed energy resources responded. However, an obligation to avoid double compensation with other systems such as renewable electricity purchase

systems (e.g., net metering) has been put in place regarding metering. Perhaps PJM could decide to allow metering with individual devices partly because the organization is not responsible for the renewable electricity purchase system or for retail liberalization. The question of using individual devices such as inverters for metering has been raised in Japan as well, and the possible challenges associated with it include ensuring consistency with renewable electricity purchase systems and the imbalance fee system.

Transmission grid operator National Grid ESO is working with distribution companies UK Power Networks and Western Power Distribution on a demonstration project for a new framework to reduce the minimum unit of supply capacity to 1 MW in the supply-demand balancing mechanism (also used for power refeeding to resolve transmission congestion). In the United Kingdom, metering is allowed to be conducted every minute instead of every second for distributed energy resources connected to the power distribution system. The new product under consideration is grid-balancing capacity “downward,” in which the output is switched to zero when an order is received and is restored when the order is released. (The time between the order and the response must be within 2 minutes.) The company states that this is popular with stakeholders because it allows them to consider that a certain downward balancing capacity has been provided during the time period when an order is in effect, and it is also easy to distinguish the balancing capacity from the amount of imbalance associated with the electricity consumption by consumers. The National Grid ESO does not monitor the power sources on the distribution grid; orders are transmitted via the distribution companies’ systems, who apparently are also responsible for deciding the amount of grid-balancing capacity to be provided. In the U.K., to further utilize distributed energy resources installed on the distribution grids, discussions are underway on the idea of establishing a market for operating distributed energy resources by assigning the function of distribution grid operator to distribution companies.

As described above, various approaches are being taken to utilize distributed energy resources in the wholesale electricity market for grid-balancing and other capacities: Australia and U.S. PJM are applying the existing communication and metering requirements to distributed energy resources with as few changes as possible, while the UK is simplifying metering requirements and setting certain response requirements to ensure easy differentiation from the existing imbalance fee system. Because Japan has a system in which power transmission and distribution services are bundled together, when it comes to rolling out the utilization of distributed supply sources and deploying systems, it is in a better position than Europe or the U.S. where transmission and distribution services are separated and some countries have hundreds of distribution companies. We hope that Japan will create a system that can be marketed to other countries, while taking into account the situation in other countries as outlined earlier.