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COUNTRY :	JAPAN	PREF. SUBJECT :2
REGISTRATION NUMBER : 7326		QUESTION N° : 2.4

***Question 2.4**: Are there any actual cases of flexibility utilization, including local flexibility? For what kind of power grid status, what types of control method, what issues or challenges were addressed? For local flexibility, it is expected that the location and the volume of flexibility resources would be harmonized with the characteristics or specification of power grid, which can be called "right resources at the right place". Are there any use cases where the concept of the "right resources at the right place" have been investigated and evaluated? Are there any new challenges found or lessons learned from the activities related to the concept of flexibility?*

In Japan, due to the expansion of the introduction of photovoltaic power generation facilities, some local grids (154kV, 66kV transmission grid) need to be reinforced on a large scale to solve the shortage of available capacity, making it difficult to efficiently introduce and expand power sources. Therefore, TEPCO Power grid have been discussing with the government about the application of non-firm connection (NF) to the local grid.

After that, it was decided at the national council that TEPCO would start applying NF on a trial basis in the local grid as part of the NEDO demonstration project. Based on the above arrangement, TEPCO will apply "non-firm type connection" on a trial basis to the local grid with a large scale of reinforcement. With the NF, new power generation facilities can be connected with local grid by agreeing to power generation output will be controlled when the system is congested and available capacity of a system comes to zero.

Regarding the development of the output control execution system in the NEDO demonstration project, TEPCO aim to establish it by the end of FY2023, including the technology development for realizing non-firm connection in the local grid. Specifically, we have been conducting FS since FY2019 toward the development of a system that supports non-firm type connections, and from FY2020, we are considering the development scale of the demonstration system, the introduction area, and the details of the field test. is being implemented.

When connecting to the NF, on the premise of uncompensated output control (online control) when the grid is congested, the PV business company must install the devices necessary for output control (the output control unit linked to output control instruction, power conditioner (PCS) that supports output control. Congestion predictions calculated based on information from 48 frames per day every 30 minutes are provided to non-firm business operators, and the business operators reflect the results of the congestion predictions in their final plans.

On the other hand, as described in paper 10595, regarding the application of NF to the 6.6 kV distribution system, which is the mainstream in Japan, although the current system has a large available capacity, the application of NF connections to distribution systems requires sensor installation and network monitoring in each feeder of distribution systems, since equipment and distribution lines within a distribution system have different allowable current. Furthermore, under the current system in Japan, there are operational challenges, such as the need to review distribution lines to which NF connections will be applied due to changes in the default system configuration.

Also the cost estimation was conducted based on present information and assumptions, and the results may change due to future changes in the situations. Furthermore, with the expected introduction of renewable energy resources such as storage batteries and heat pumps to distribution systems, if curtailment amount of renewable energy can be reduced by fully utilizing flexibility provided by such renewable sources, flexible Connect and Manage in distribution systems can be realized. It is important to note that the estimation results in the study do not deny the possibility of applying NF connections to distribution systems in the future.