

Analysis of Regional Value-added Creation by Specific Transmission and Distribution System Operator and Conditions to Increase the Economic Efficiency of Regional Microgrids

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1. Research objectives and methods

In recent years, local governments in Japan have participated in the energy business and established a local power producer and supplier (Local PPS) as a means of revitalizing the region and increasing the need for climate change countermeasures. This is modeled on Stadtwerke meaning city public corporation in Germany. The Stadtwerke has made the energy business, such as the distribution system operating (DSO) of the regional monopoly, the largest source of revenue, and internally compensates for the other deficit business, infrastructure public works. The principle of self-government and self-government administration that manages problems on their own (Raupach, 2017).

In this study, I conducted a research question as to whether Local PPS could secure stable profits and obtain local financial resources, as in Stadtwerke, by conducting a DSO. I set three objectives for this study. (1) To create a regional value-added (RVA) model in the specific transmission and distribution system operating (Specific TSO/DSO) as a type of DSO and calculate the RVA amount. (2) Regarding the legal system for new entry of the DSO in Japan, it summarizes the overseas legal system and gives suggestions for the system design, and (3) to examine the strategies for economically operating regional microgrids and the role of local governments. (1) The RVA analysis was conducted for Higashimatsushima City, which operates a specific TSO/DSO business and a Local PPS retail business.

2. Results and discussion

(1) The total RVA value of the specific TSO/DSO and the local PPS in Higashimatsushima City was calculated to be about 26 million yen in 2017 and about 46 million yen in 2018. Of these, the RVA of the specific TSO/DSO was calculated to be 10% in 2017 and 6% in 2018, which was smaller than expected. The consignment fee for the specific TSO/DSO business in Higashimatsushima City is set to the

same amount as Tohoku Electric Power, and unless the consignment fee is raised, the company's net income was not generated. This suggests that the specific TSO/DSO may not generate large regional added value because it needs a high initial investment.

(2) The business environment of the DSO has changed significantly with the spread of Distributed energy resources (DER). Before the spread of DER, the DSO business was regional monopoly and the total cost method, so conducting the DSO in the region contributed to local employment and acquisition of local financial resources. However, after the spread of DER, it was necessary to reinforce the power distribution network to cope with reverse power flow and congestion, which increased the investment cost. Therefore, some countries reforms system to avoid investment costs in the distribution business by trading the flexibility value of DER in the distribution level market. In the direction of the future DSO business in Japan set out by the commission, even if local operators newly enter the DSO, investment costs may increase and network fees may continue to rise. In order to improve them, from the viewpoint of cost efficiency, it is necessary to consider the establishment of an organization that grants the right to operate the distribution network fairly and the establishment of a DER market on a local scale at the distribution level.

(3) Regarding strategies for economically operating regional microgrids; (i) establishing a DER market at the distribution network level and allowing DSO to function as market facilitators, (ii) forming partnerships between operators, and (iii) proposing that the infrastructure business be integrated in the region. The municipalities should play a leading role as a coordinator between the infrastructure projects in terms of integrating the third infrastructure business.

References

RAUPACH SUMIYA Joerg (2017), "The Changing Strategy of the German Stadtwerke in Response to the European Energy Market", *Economic Review*, Vol. 190, No. 4, pp. 13-38