Paris Session 2022

Evaluation of imbalance reduction by battery utilization and aggregation

SCC5 PS3 Q4

Are other jurisdictions experimenting with the potential for wind and solar PV (distributed), BESS and EVs in providing ancillary services directly or via aggregators? Are there existing business cases for this and is hybridization a viable option?

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Introduction

- Renewable energy generation installed with FIT: 61.4 GW, 91% is PV*
- From 2022, FIT will shifts to the FIP system
  Renewable energy power producers bear 1) market risk, and 2) imbalance risk

* From 2012 to the end of March 2021 in Japan

- Tried to evaluate how much the imbalance risk can be reduced by utilizing the storage battery or by aggregation under the FIP system in the demonstration project** in FY 2021 (10 TSO areas, with 17 aggregators, PV 669.7MW, BESS 1.26MW, Wind 270.6MW, etc.)
- In Japan, there is a balancing market product called RR-FIT that covers the FIT forecast error (imbalance).
  This contribution provides information for the prospect the commercial value and scale of Japan‘s RR-FIT as well.

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$$\text{Imbalance MAPE} = \frac{1}{N}\sum_{t=1}^{N}\left|\frac{I_t}{L}\right| \times 100,\ It = Rt - Pt,$$

It: the amount of imbalance in a certain 30 min. at t
Rt: Final power supply (kWh) in a 30-min. at t
Pt : Planed amount of generation (kWh) as of the previous day in a certain 30 min. at t
L : Installed capacity (kWh in 30 min.)
N : Number of (Evaluation period)/(30 min.)

MAPE: Mean Absolute Percentage Error

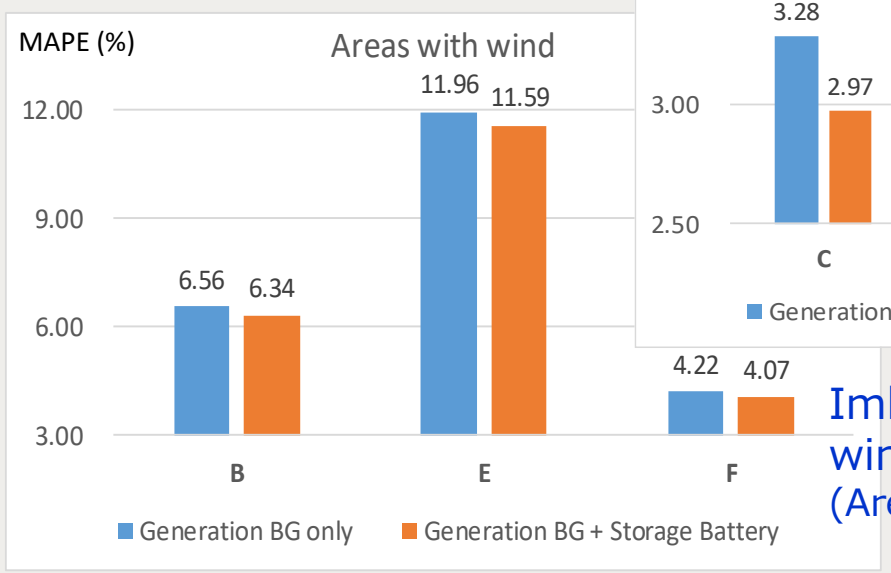
** Publicly solicited by the Ministry of Economy, Trade and Industry in Japan

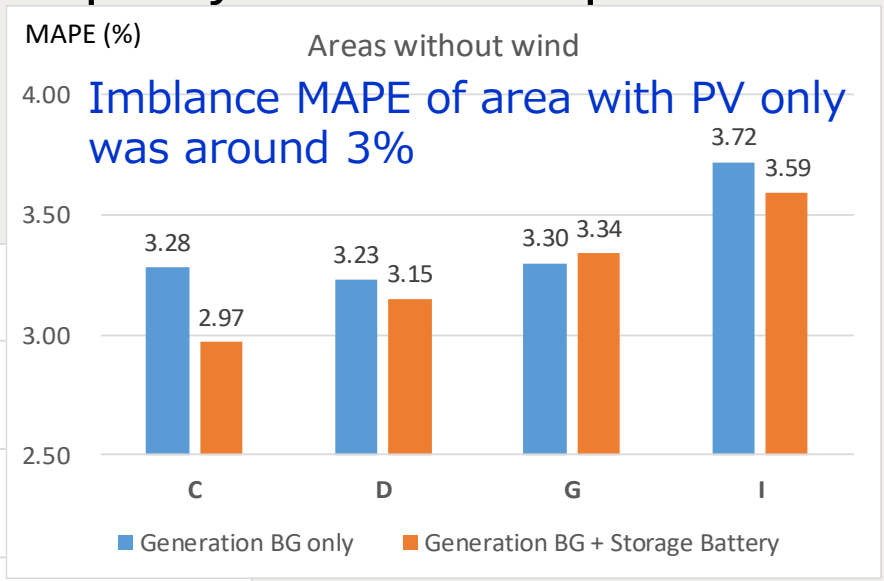
FY2021 Subsidy for Demonstration Project for Establishing Next-Generation Technologies Using Distributed Energy Resources such as Storage Batteries
(Renewable Energy Aggregation Demonstration Project within the Renewable Energy Generation Aggregation Technology Demonstration Project)

1) Imbalance reduction by storage battery

- Data from102 resources in 7 TSO areas
- Storage battery is assumed to be 1h rated and same capacity with total output of the generation resources

Area	No. of res.	Wind in BG	Total capacity of renewables (MW)
B	12	Yes	76.16
C	25	No	97.71
D	5	No	3.74
E	11	Yes	15.34
F	7	Yes	67.70
G	10	No	9.11
I	32	No	64.28





Imblance MAPE of area with PV only was around 3%

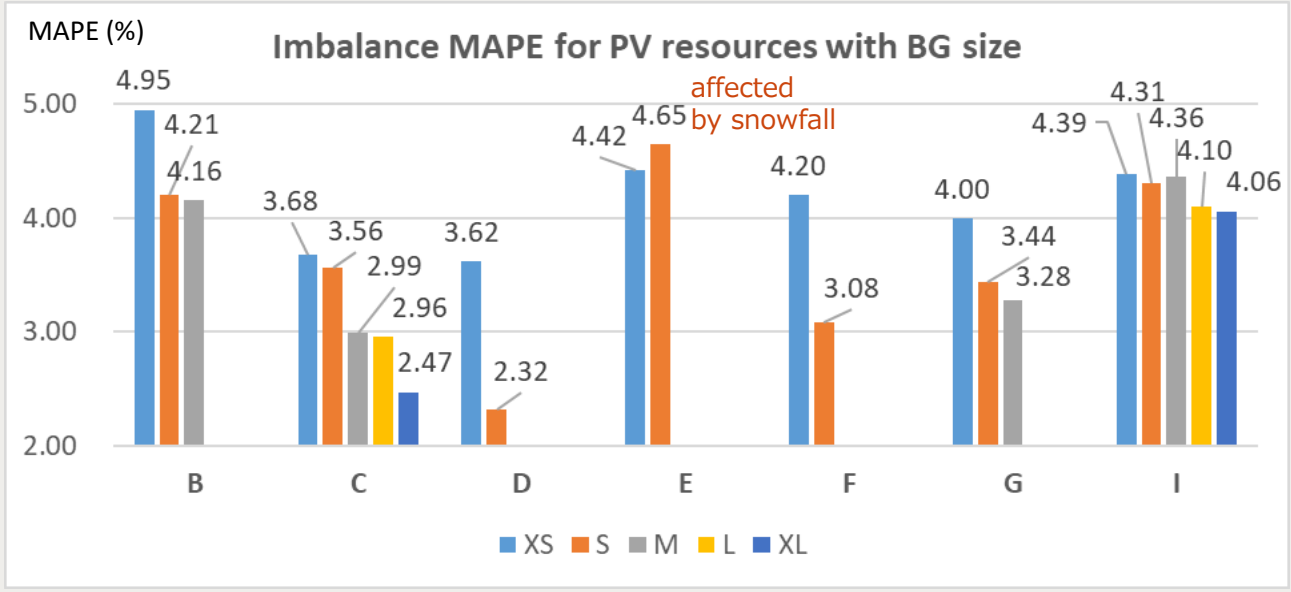
Imbalance MAPE of areas with wind power tended to be large (Area E has many wind power sites)

- ✓ Storage battery generally reduced MAPE by about 0.1-0.3%
- ✓ Charge / discharge plan of battery can be optimized, MAPE will be further improved

2) Imbalance reduction by BG size

– Data from 119 PV resources (from Dec.15 to Jan.14) in 7 TSO areas

Area	Max. no. of PV res.	Total capacity (MW)	BG Size (No. of res)				
			XS	S	M	L	XL
B	16	102.26	8	11	16	—	—
C	35	128.71	5	9	18	24	35
D	5	68.74	3	5	—	—	—
E	7	22.82	4	7	—	—	—
F	6	67.70	3	6	—	—	—
G	18	18.07	4	9	18	—	—
I	32	80.28	8	12	16	24	32



✓ By increasing the BG size, the imbalance MAPE decreases

➢ Imbalance of renewable energy generation can be reduced by optimal control of storage battery, or by increasing the scale of BG by the aggregator

Thank you for attention !