APEC EGNRET 50, Hawaii, U.S.A.

Capacity Building on Renewable Energy

and Update of New and Renewable Energy in Japan

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◆Capacity Building on Renewable Energy

◆Update of New and Renewable Energy in Japan

Capacity Building on Renewable Energy (1)

- Government Initiative (METI):
  "Machi-Ene(Town-energy) University"(Green Power Workshop)
  - Business school for starting up renewable energy business
  - For local residence/organization who is considering starting up new business using renewable energy

- Government Initiative (METI):
  - Geothermal, Small Hydro
  - For local residence understanding the renewable energy projects and related benefit for the communities

- Government (METI local offices)/Local governments Initiatives:
  - All renewable energy
  - For local business entities updating the information on renewable energy technologies and current legal system and so on

Capacity Building on Renewable Energy (2)

- Local government Initiative (e.g. Fukushima Prefecture)
  - Technologies for all Renewable Energy, Energy Efficiency, Energy Storage, Smart Community(BEMS, HEMS, etc)
  - For Local residences who will works for above energy industries
  - Trainings are held at National Research Center, Universities and colleges in Fukushima Prefecture

- Industry Initiative (Japan Photovoltaic Energy Association)
  - Establish licenses for PV Installation, Maintenance and so on in order to avoid low quality operation business.
  - Offering trainings for the licenses

- Organization's Initiative (New Energy Foundation):
  - Geothermal, Small Hydro, Wind, Commercialization
  - For newcomers, experiences(operators and engineers)'s better understanding
  - Part of the trainings programs are subsidized by METI

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FIT Tariff after FY2017

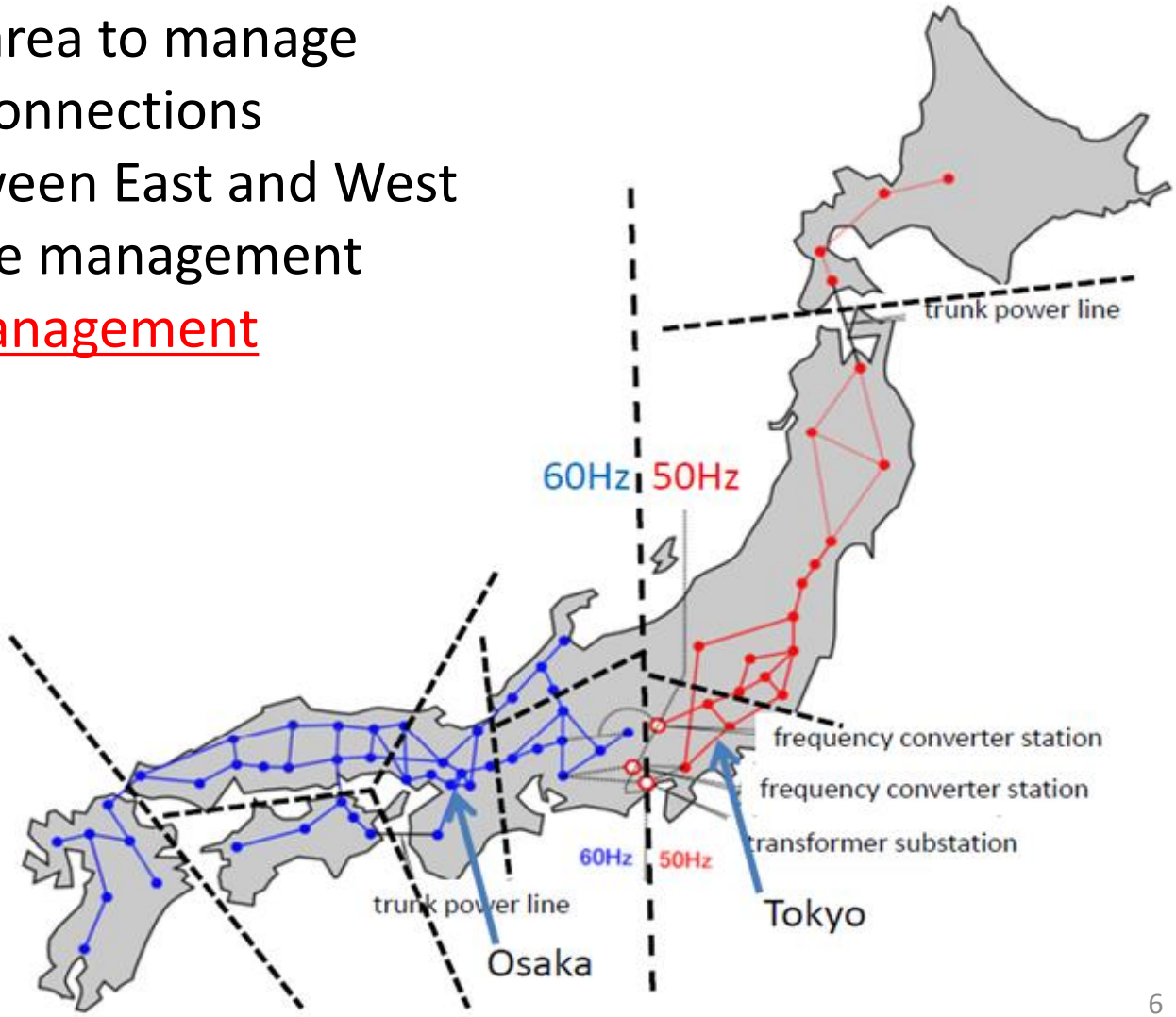
			Purchase prices (JPY/kWh)				Purchase period
			FY2017		FY2018	FY2019	
			Apr.-Sep.	Oct.-Mar.			
Solar	Less than 10 kW		28		26	24	10 years
	when output control system are required		30		28	26	
	Less than 10 kW (+ energy storage system)		25		25	24	
	when output control system are required		27		27	26	
	10-2,000 kW		21				20 years
	2,000 kW or more		Tender				
Wind	Less than 20 kW		55				20 years
	Onshore	20 kW or more	22	21	20	19	
		replace	18		17	16	
	Offshore	20 kW or more	36		36	36	
Geothermal	Less than 15,000 kW		40		40	40	15 years
		replace whole equipment	30		30	30	
		replace above-ground equipement	19		19	19	
	15,000 kW or more		26		26	26	
		replace whole equipment	20		20	20	
		replace above-ground equipement	12		12	12	
Hydro	Fully new facilities	Less than 200 kW	34		34	34	20 years
		200-1,000 kW	29		29	29	
		1,000-5,000 kW	27		27	27	
		5,000-30,000 kW	24	20	20	20	
	Utilize existing headrace channels	Less than 200 kW	25		25	25	
		200-1,000 kW	21		21	21	
		1,000-5,000 kW	15		15	15	
		5,000-30,000 kW	12		12	14	
Biomass	Wood (general)	Less than 2,000 kW	24		24	24	20 years
		2,000 kW or more	24	21	21	21	
	Forest residues	Less than 2,000 kW	40		40	40	
		2,000 kW or more	32		32	32	
	Wood waste from buildings		13		13	13	
	Municipal waste		17		17	17	
	Biogas		39		39	39	

- Announcement of FIT rate for multiple years in advance
- PV “graduated ” FIT from FY2017(1.5 GW in FY 2017&18)
- Wood Biomass will graduate from FY2018
- Other rate in FY2020 will be same as FY2019

Source: METI

Grid system in Japan (Background)

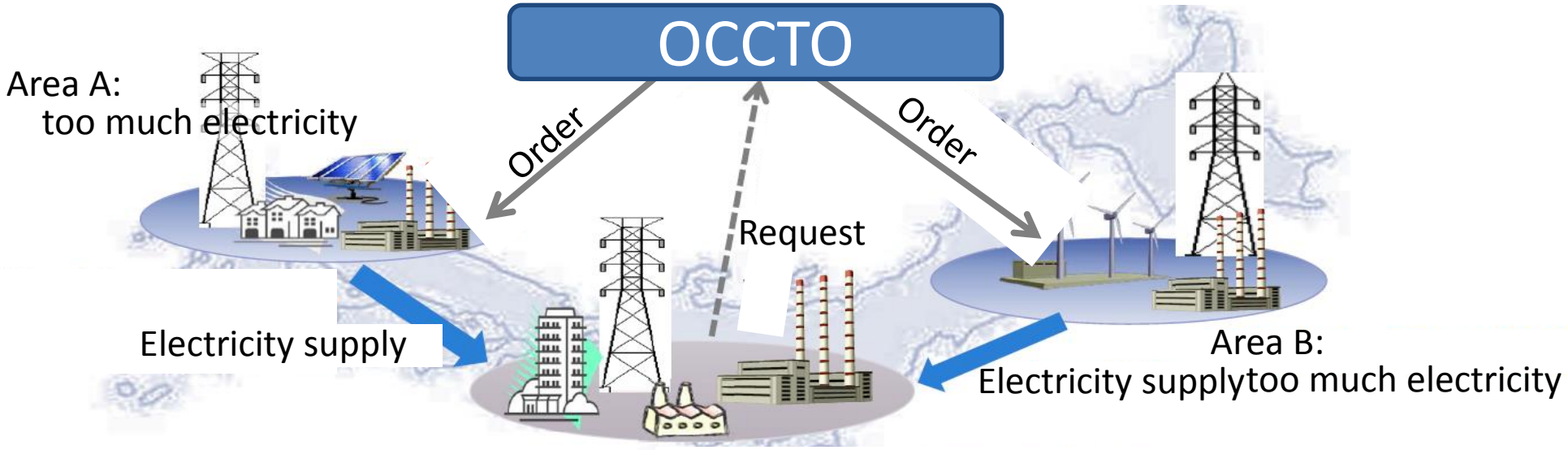
- There are 10 electric power companies in Japan. They are responsible for the electricity supply in each area.
  → Small and narrow land area to manage
- Insufficient interregional connections
- Frequency difference between East and West
  → Difficult nationwide management
  ⇒ Small-scale grid management



Nationwide Grid Management (FY2015-)

- OCCTO was established in 2015.
  (Organization for Cross-regional Coordination of Transmission Operators, JAPAN)
  - Electricity supply-demand balance
  - Frequency control for cross-regional operation

  ⇒ enables to connect more renewable electricity

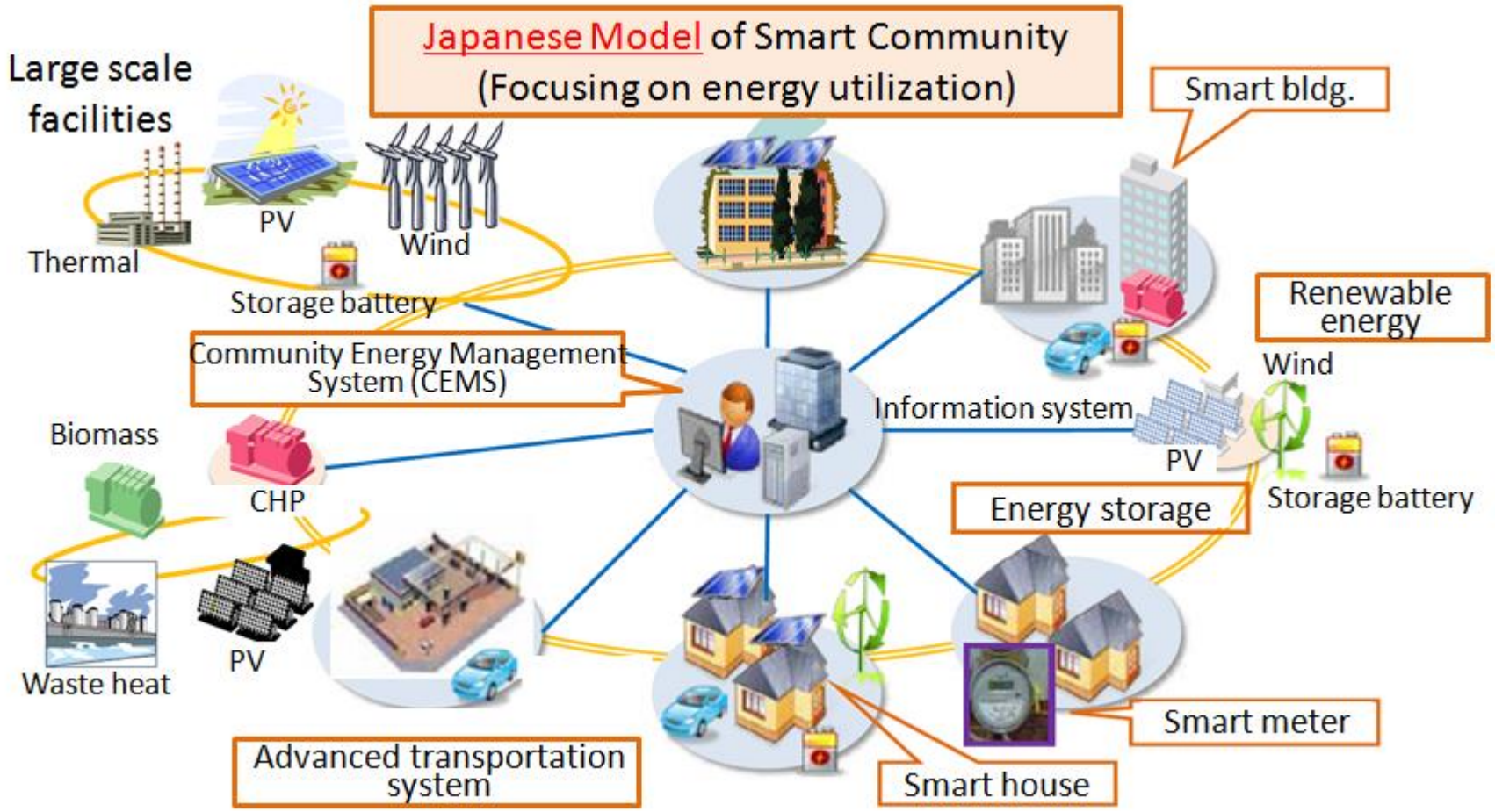


Source: OCCTO

Distributed and Smart Energy System (Smart Community demonstration projects FY2010-2014)

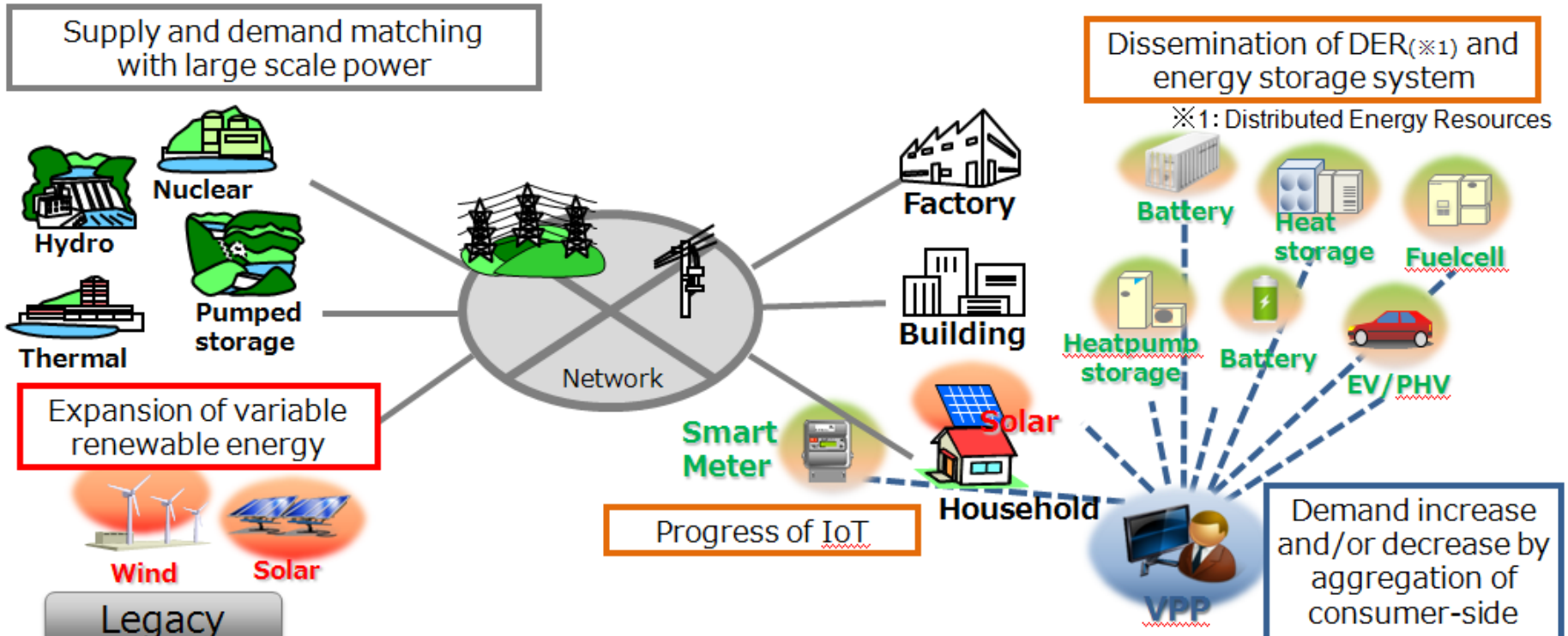
- Distributed renewable energy
- Efficient energy management (IoT, energy storage, etc.)

→ Energy system less dependent on nationwide grid



Source: JSCA (modified)

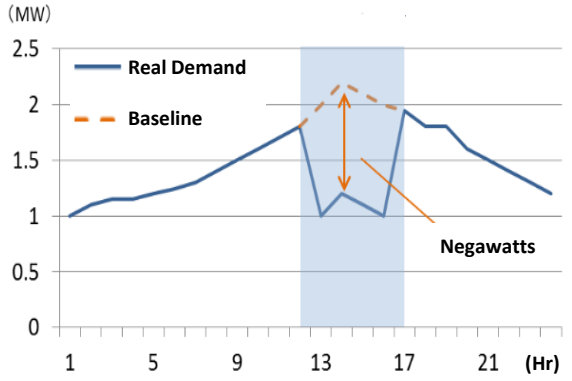
VPP(Virtual Power Plant) demonstration project (FY2016-)



Source: The Kansai Electric Power Co., Inc.

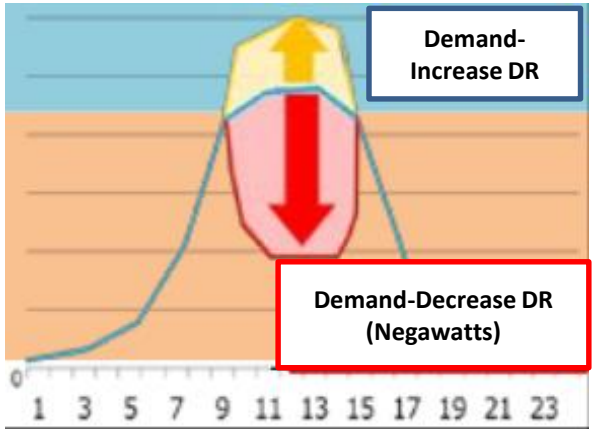
Guidelines for Energy Resource Aggregation Business

- "The Guidelines for Trading Negawatts" was established in 2015
  - Concept of "Negawatts": Power demand reduction from the baseline can be recognized as a kind of power supply
  - Design of trading the Negawatts power at the Negawatts trading market



- "Guidelines for Energy Resource Aggregation Business" was established in 2017
  - Revision of the "Guidelines for Trading Negawatts"
  - Concept of "Demand-Increase DR" is introduced
  - Compensation for Negawatts was established*

- ERAB : Energy Resource Aggregation Business
  - "ERAB" is a business framework in which businesses make use of VPPs and DR
  - Provide a variety of services for
    - ✓ Electricity adjustment,
    - ✓ Avoidance of supply-demand imbalance,
    - ✓ Electricity-rate cut,
    - ✓ Avoidance of output control and other measures to their customers



* Compensation for negawatts is a cost for adjusting the cost-benefit gap between electricity retailers supplying electricity to consumers who have controlled electricity demand and aggregators.

Current discussion toward more renewable energy deployment

More deployment of renewable energy is under discussion at "METI Subcommittee on Large amount of renewable energy integration & Next Generation Electricity Network (under both of Electricity & Gas committee and RE & EE committee) "

- Increase the grid operation capacity for renewable energy connection by reducing the slot for emergency use (Utilization of the emergency slot that is not actually used)

- Review of *Disconnection (Priority Dispatching) Rules from the viewpoint of economical operation (e.g. Only large facilities should be disconnected and be compensated by mid-small facility for fairness)

  *Disconnection/output curtailment (Priority Dispatching) Rules: Rules when PV/Wind output exceeds total demand

  ①Avoidance of generation at reservoir/adjustable type hydro power stations during daytime

  ② Absorption of excess power by pumped storage operation

  ③ Suppression of thermal power generation to the operational minimum

  ④ Exporting excess power through the interconnection lines by cross-regional system operation

  ⑤ Suppression of biomass power generation (direct combustion and local resource-based)

  ⑥ Disconnection of PV and wind power

- Discussion of benefit from "Demand-Increase Demand Response"

- Reduction of grid operation cost should be considered at the investment stage

- Promotion of offshore wind power generation

Thank you for your attention!