Japan Demand Response Market Overview

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OUTLINE

- History of DR and VPP in Japan
- National Framework of DR / VPP
- Communication Architecture and Deployment of OpenADR
- Application to VRE Control
- Implementation Guide in Japan
- Application to upcoming the Balancing Market

History of DR/VPP in Japan

- 2011.3.11 Great East Japan Earthquake,
  Fukushima Nuc.-Accident
  → Rolling Blackout in TEPCO Area,
  Nation-wide campaign for saving kWh

- 2012.6 (METI) DR Initiative :
  "Smart House & Building Standardization and Business Study Committee"
  - ✓ DR Use Cases
  - ✓ Communication Standards :
    ECHONET Lite (HAN),
    OpenADR(TSO-Aggregator)

- 2016.1 (METI) "Energy Resource Aggregation Business Study Committee"

METI's Official Announcement

@ 3rd Meeting of "Smart House & Building Standardization and Business Study Committee" (May 15, 2013)

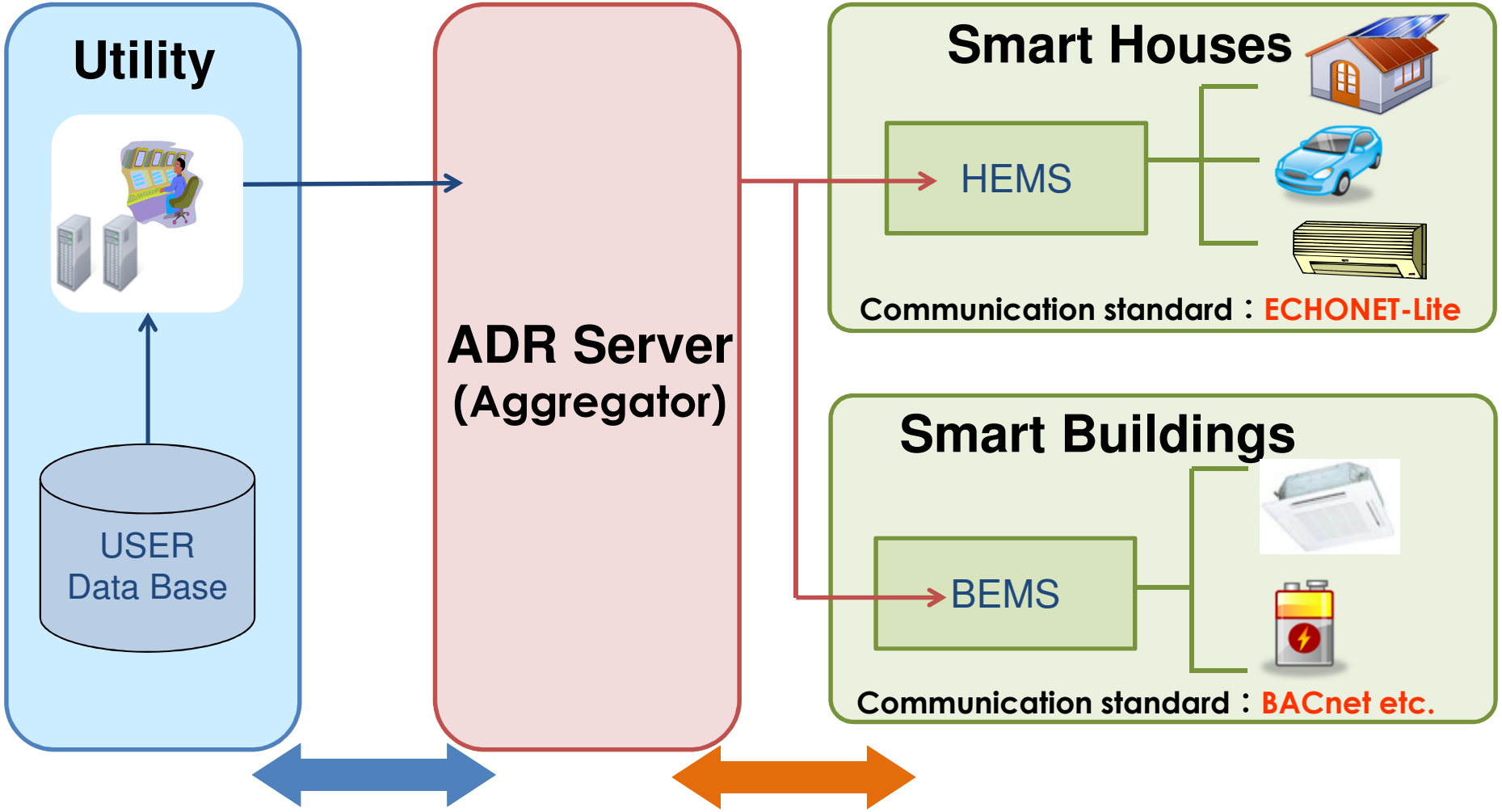
✓ DR Technology and Standard

- Summarize use cases of demand response (DR) and prepare a standard method for automated DR between power utilities and aggregators based on OpenADR
- Establish test facility at Waseda University

✓ Specification and Policy

- Summarize "Specification for DR interface, Ver1.0" which covers OpenADR 2.0a and a part of 2.0b.
- In this framework, vendors are supposed to develop their soft or hard wares in compliance with the conformance rule determined by OpenADR Alliance (Spec. 2.0a and/or 2.0b).

Standardization of Communication Interface for DR (2013-)

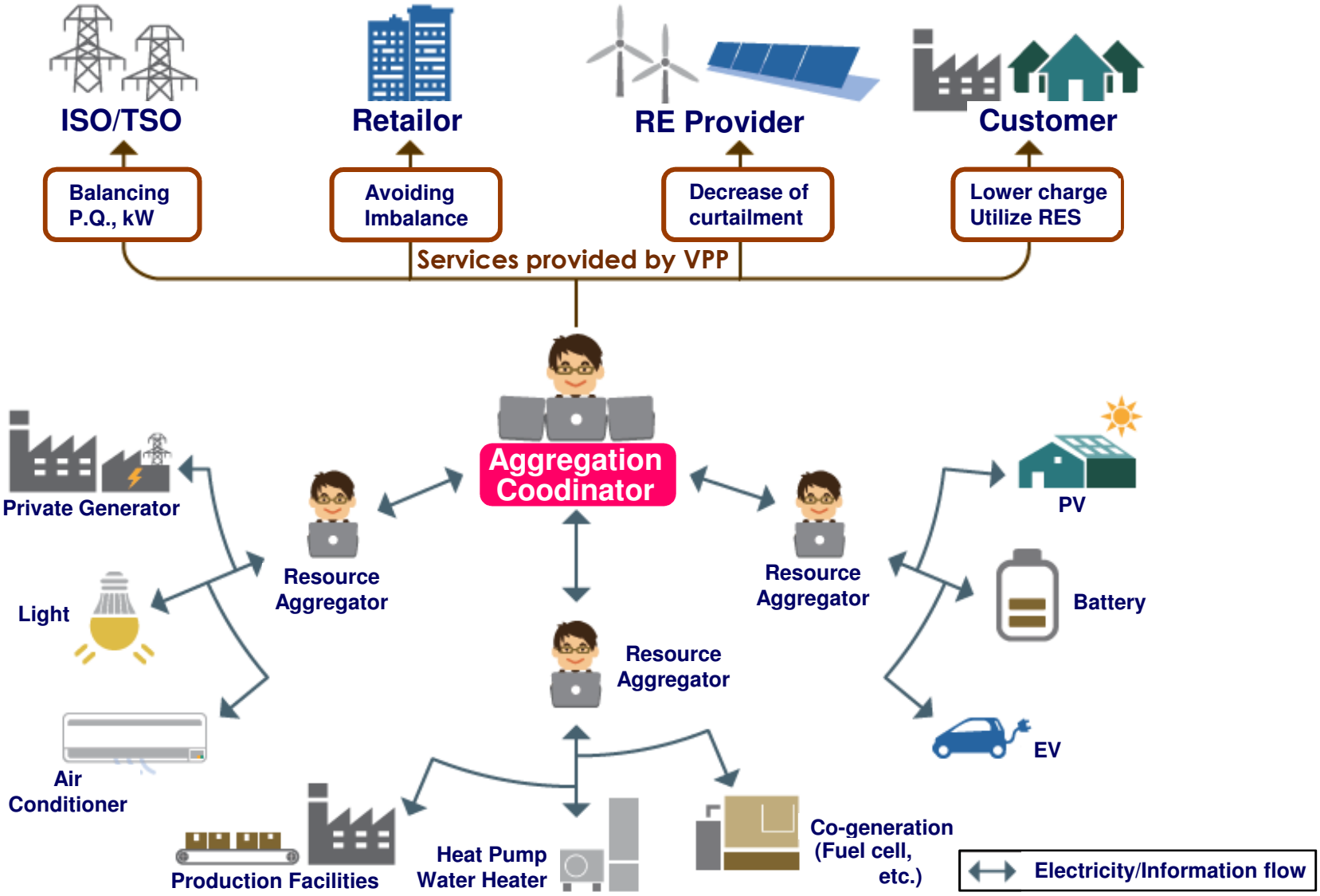


History of DR/VPP in Japan

DR/VPP Demonstration

TEPCO-BSP (2012 - 2013)	METI-Incentive DR (2014 - 2015)	METI-VPP (2016- on going)
5 Aggregators	21 Aggregators 36,700 Resources	6AC + 35 RA 31.5MW of resources
Customers Factory, Stores, Office, Hotels	Customers, 2100 Factory, Stores, Office, Hotels	Customers Factory, Stores, Office, Hotels
Device Private Generator, Factory Machinery HVAC, Light,	Device Private Generator, Factory Machinery HVAC, Light, Battery, Thermal storage	Device Private Generator, Factory Machinery HVAC, Light, Battery, Pump Thermal storage, EV, Refrigerator Co-generation, FC

Latest Demonstration of DR (VPP)

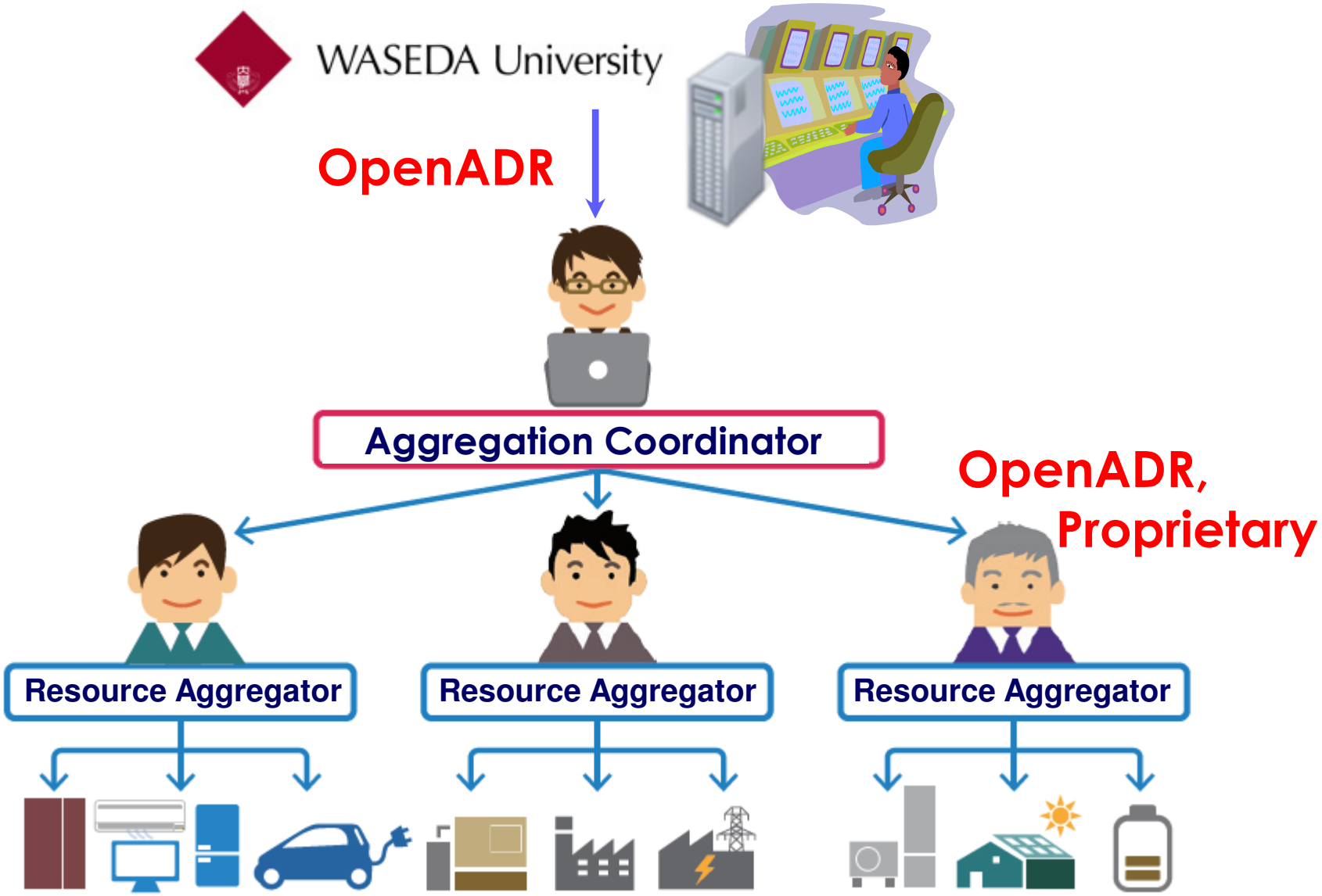


Who is playing an aggregator? – From 2017 demonstration

- **6 AC groups + 35 RA + 31.5MW Resources**

Aggregation Coodinator	Resource Aggregator	Resources
Azbil TEPCO EP, et al.	Azbil	BES, Thermal Storage, Generator, HVAC, etc.
SB Energy, et. al	Looop + 9 RAs	BES, PV, HPWH
Eneres, et al.	KDDI + 2 RAs	BES, Generator, HVAC, EVPS, etc.
Kansai EPCO, et al.	KYOCERA + Panasonic + SHARP + 10 RAs	BES, HPWH, HVAC, EVPS, Refrigerator, water pump
Global Eng., TEPCO HD, TEPCO PG, et al.	TEPCO EP + Osaki + SEKISUI Chem. + 5 RAs	BES, Generator, Light, HVAC, EVPS, etc.
Lawson + Keio Univ.	Lawson	Refrigerator, HVAC, Light, BES, PV, Heat Storage, etc

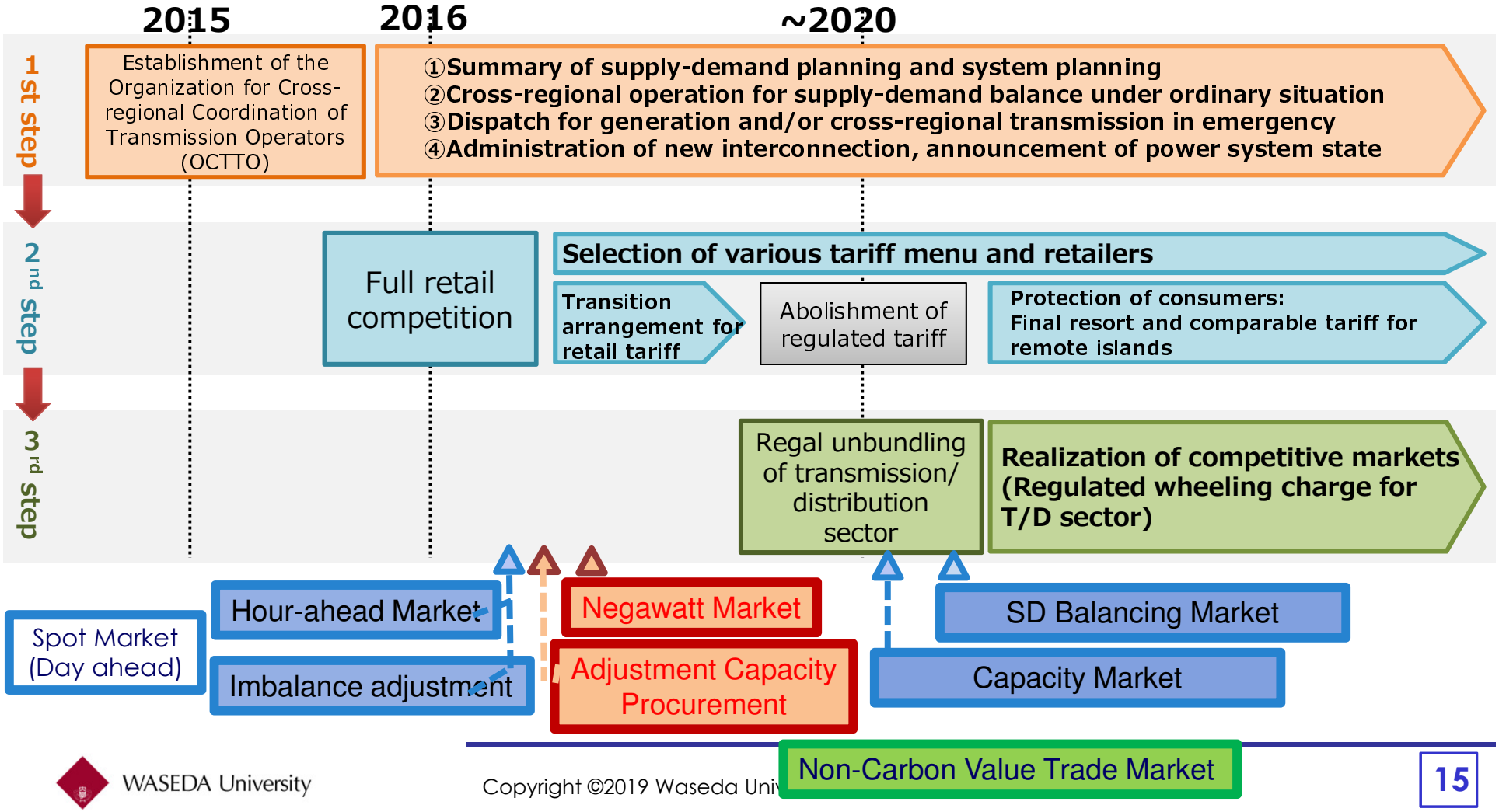
Architecture of FY2017 Demonstration



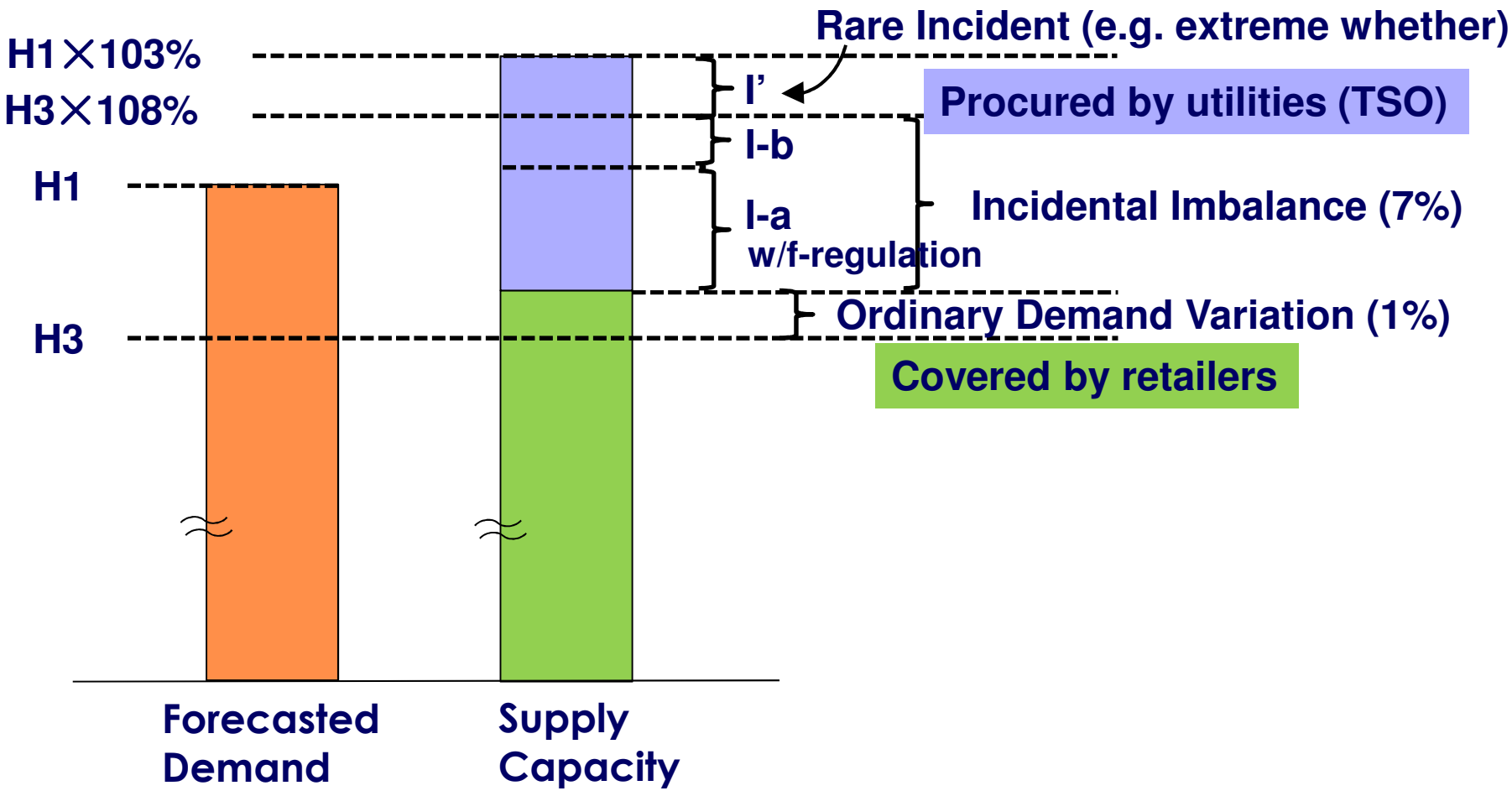
Electric Power System Reform and Markets

Road Map of EPSR

Purpose ① Ensuring Stable power supply
② Supress electricity tariff
③ Expansion of customer choice and business opportunity



Category and required capacity for adjustment



Adjustment Capacity Procurement

- **Generator I' : 958MW of DR (35 MUSD) by 4 utilities for 2017 almost same for 2018**
- **Communication system (VTN/VEN) based on OpenADR2.0b Requirement by TSOs**

	Generator I-a	Gnerator I-b	Generator I'
On Line Control	Mandate	Mandate	Not necessarily
Frequency Regulation FN	Mandate	None	None
Response Time	<5 min.	<15 min.	< 3 hours
Duration	7 – 11 hours	7 – 16 hours	2 – 4 hours
Minimum Capacity	5 – 15 MW	5 – 29 MW	> 1 MW
DR (negawatt)	Not allowed	allowed	allowed

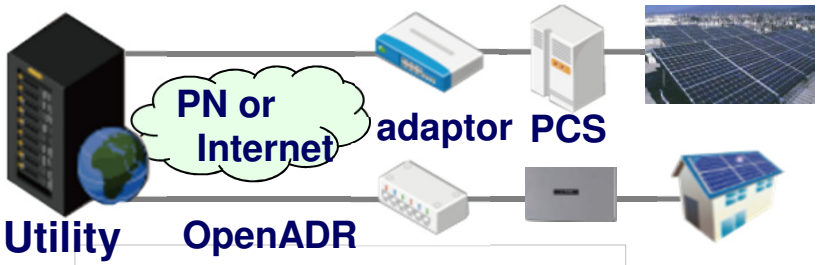
Revision of FIT by METI/ANRE (December, 2014)

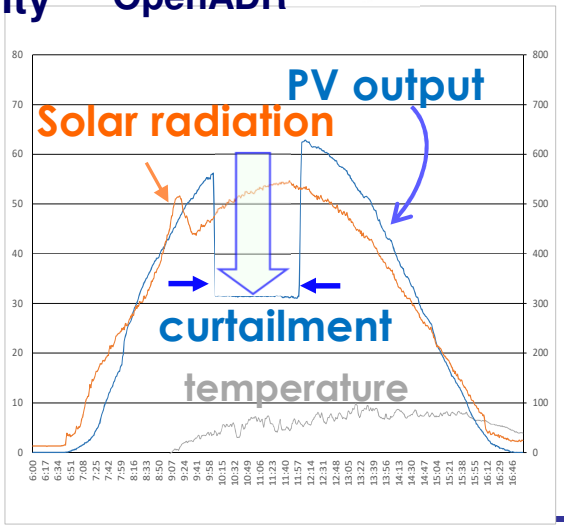
New Output Control Scheme

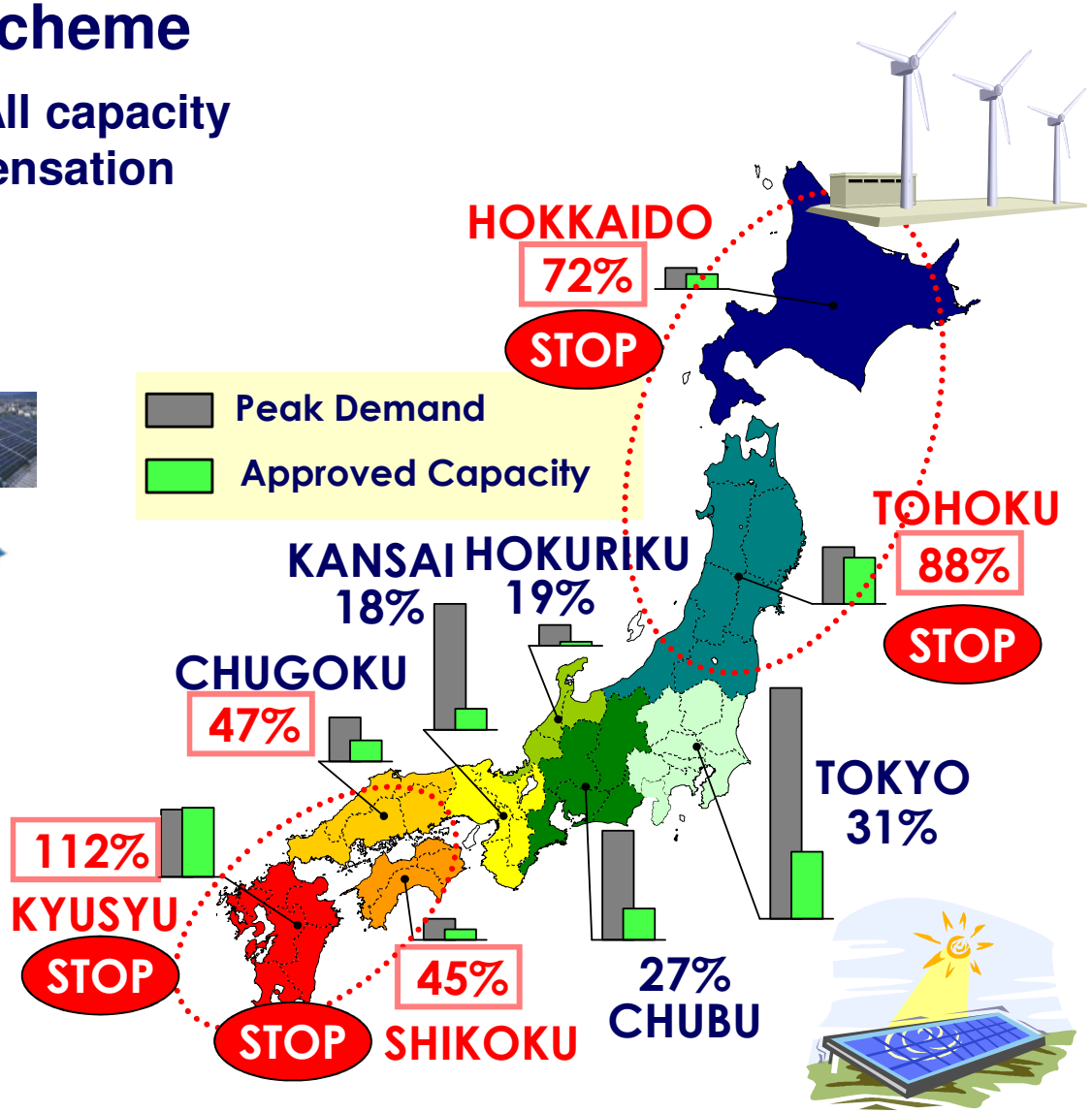
- Remote control function, All capacity
- <360hr/year, without compensation

Demonstration PJ

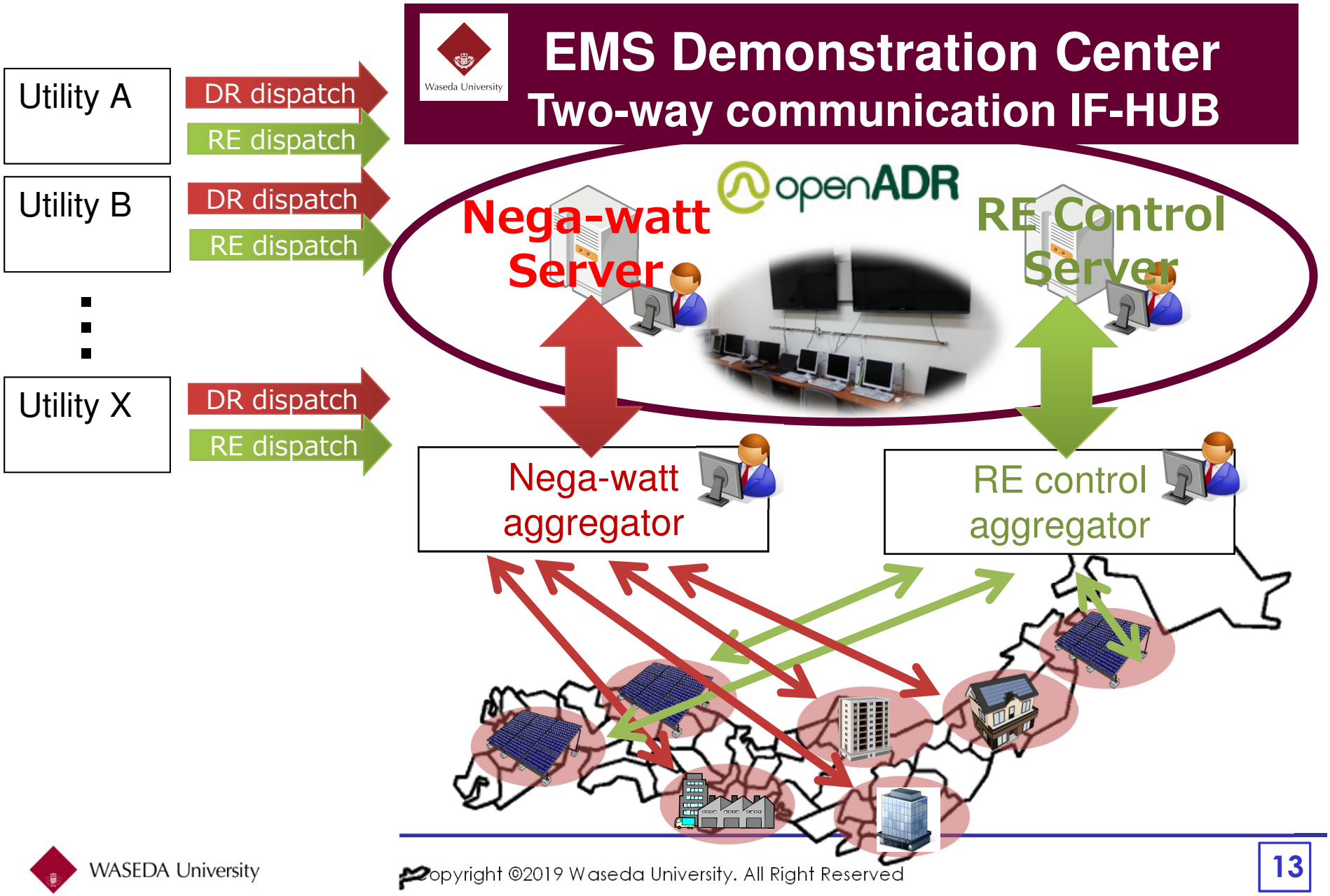
(Dec. 2015-Jan. 2016)







Role of DR & RE dispatch center



OpenADR Implementation Guide Documents

Demand Response Interface Specification, Ver. 2.0

ディマンドリスポンス・インタフェース

仕様書

第 2.0 版

2019 年 4 月 1 日

エネルギー・リソース・アグリゲーション・ビジネス検討会

OpenADR Device Implementation Note Ver. 1.1

OpenADR

機器別実装ノート

第 1.1 版

2019 年 4 月 1 日

Both available @ https://www.enecho.meti.go.jp/category/saving_and_new/advanced_systems/vpp_dr/download.html

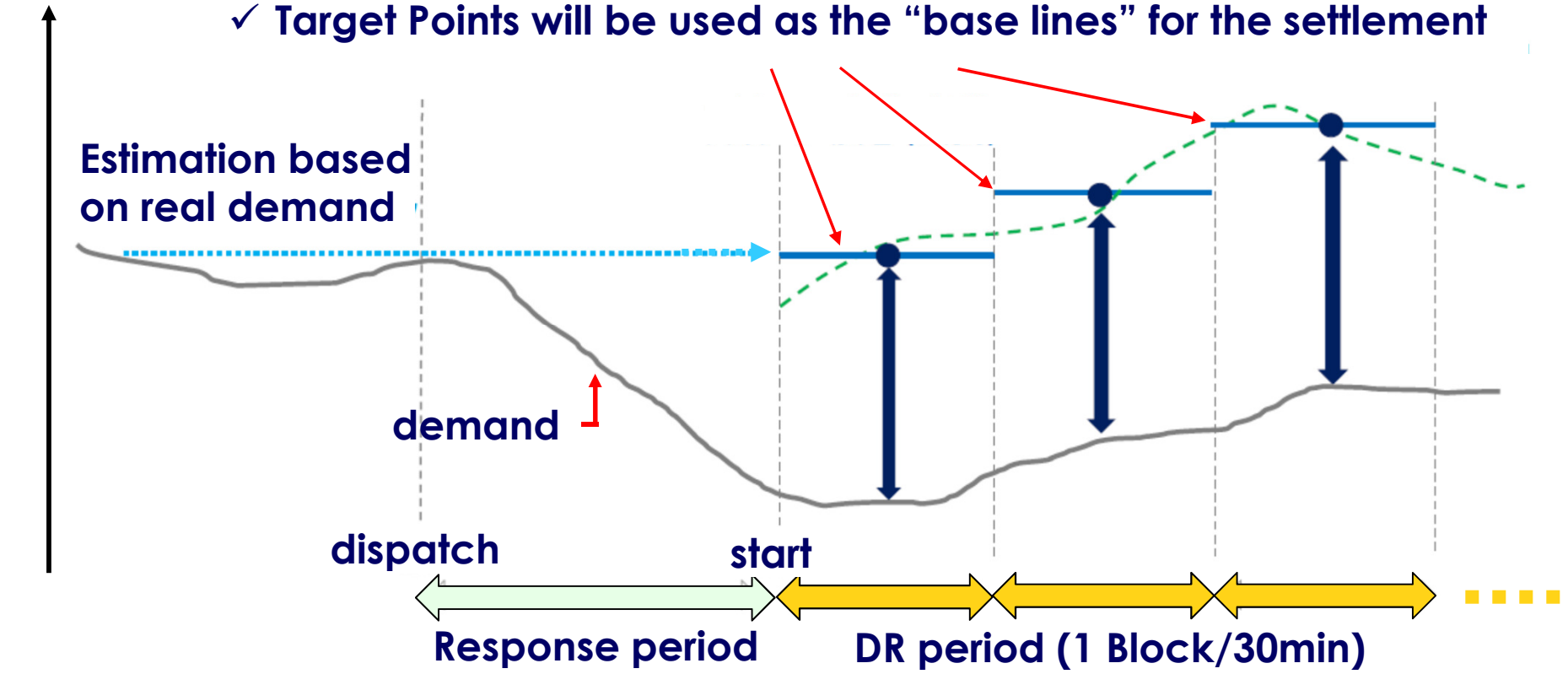
Categories and requirements in Japanese Balancing Market

	Primary (GF)	Secondary-1 (LFC)	Secondary-2 (EDC-H)	Tertially (EDC-L)	Tertially (Slow Res.)
Name*	FCR	S-FRR	FRR	RR	RR-FIT
Order/Control	—	Order/Control	Order/Control	Order/Control	Order
Comm. Line	—	Private NW, etc.	Private NW, etc.	Private NW, etc.	Dispatch system
Monitor	on line	on line	on line	on line	on line
Response	< 10 sec	< 5 min	< 5 min	< 15 min	< 45 min
Duration	> 5 min	> 30 min	> 30 min	3 hr	3 hr
Max. bidding	As much as possible	As much as possible	As much as possible	As much as possible	As much as possible
Min. bidding	5MW	5MW	5MW	5MW	1MW
Order period	autonomous	0.5~10sec	1~a few min	1~a few min	30 min
Monitor period	1~a few sec	1~5 sec	1~5 sec	1~5 sec	TBD
Bidding unit	1kW	1kW	1kW	1kW	1kW
Category	up / down	up / down	up / down	up / down	up / down

Target Point

Target Point :

- ✓ Estimated demand in every thirty minutes during the DR-period based on the real demand before dispatch.
- ✓ Values of the Target Points during the DR period as well as those during the response period should be determined and reported to TSO by the ACs
- ✓ Target Points will be used as the “base lines” for the settlement



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