



VPP demonstration project of Tohoku EPCO with Next Kraftwerke

24th, October 2019



Overview of Tohoku Electric Power

Established in 1951, Tohoku EPCO is one of 10 major electric power utilities in Japan

■ Overview of company

- Capital : 251.4 billion yen
- Main service area : Tohoku and Niigata (79,531km²) **1st in Japan**
- Electricity sales : 68,876GWh (Lighting and power)
- Employees : 12,189

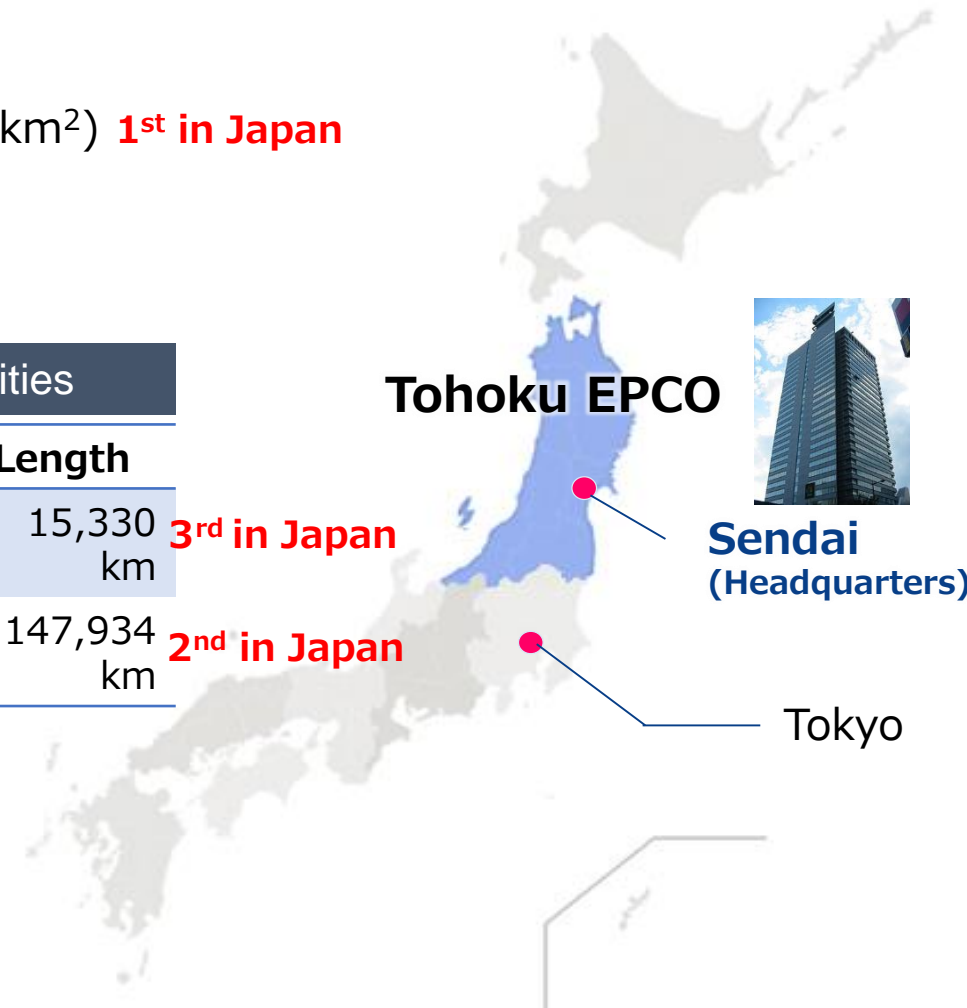
Power Station Sites

Type	No.	Capacity
Thermal	12	11,430 MW
Nuclear	2	2,750 MW
Hydroelectric	209	2,446 MW
Geothermal	4	189 MW
Solar	4	5 MW
Total	231	16,820 MW

Network facilities

Type	Length
Transmission Lines	15,330 km 3rd in Japan
Distribution Lines	147,934 km 2nd in Japan

1st in Japan



※ Figures as of March, 2019

Potential of renewable energy in Tohoku and Niigata region

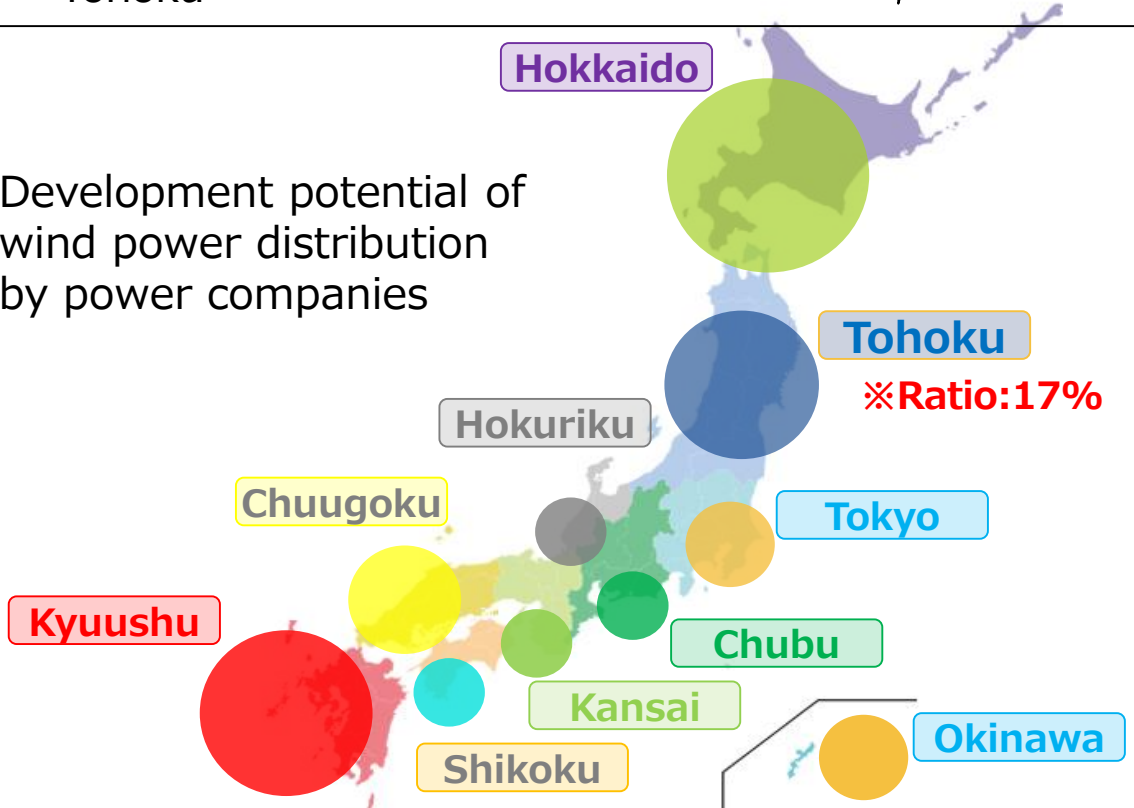
Tohoku has high development potential for solar and wind power due to climate and geographical conditions.

- Development potential of solar is widely distributed around the Pacific side
- Wind power development potential is unevenly distributed in Hokkaido and Tohoku

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- Requests of connection to our grid are concentrated in the Pacific area
- Requests of connection to our grid are concentrated in the Northern area

Development potential of wind power distribution by power companies

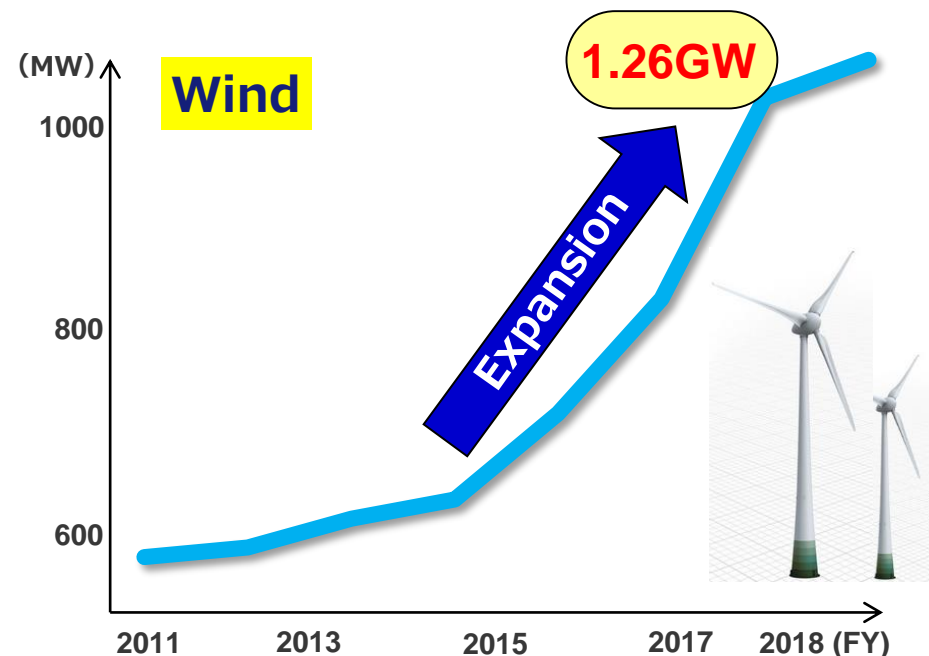
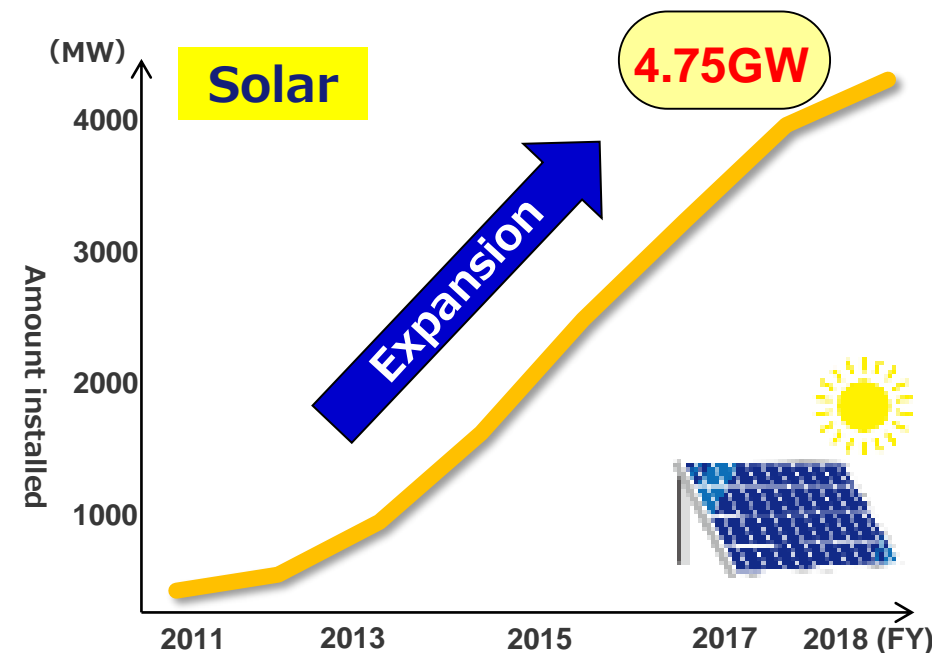


- In the application process of power supply projects in the northern Tohoku area, majority of priority connection is wind
- Our area has the highest wind potential in Honshu(Main island of Japan), and it is expected that requests of connection of renewable energy will continue to expand

Transition of renewable energy connection in Tohoku and Niigata regions

- Since the start of FIT in July 2012, renewable energy connection in our area has expanded rapidly
- Total amount of connection and application to our grid is 9.65GW for solar and 3.27GW for wind. Connection with a capacity equivalent to maximum summer power in 2018 (approximately 14GW) is expected.
- As the amount of renewable energy connection increases, balancing is required accordingly

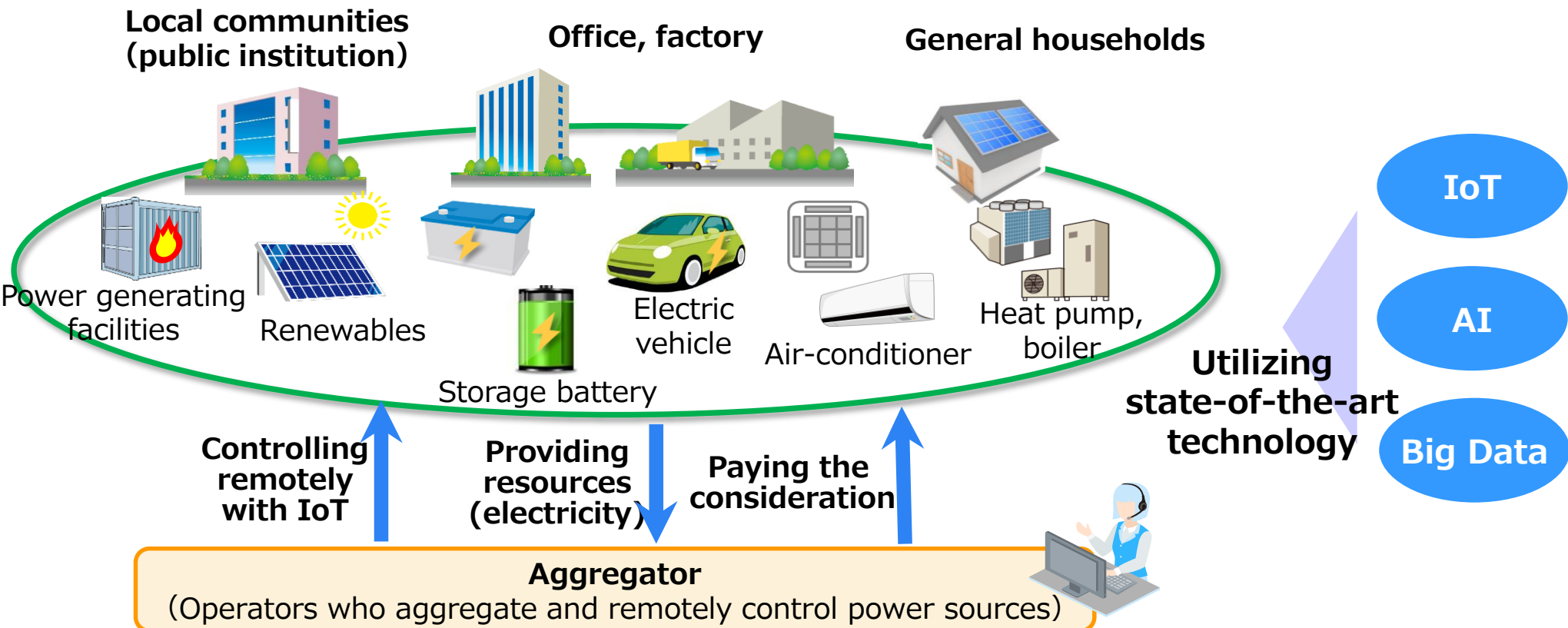
Transition of renewable energy connection



※ Figures are actual as of Mar. 2019

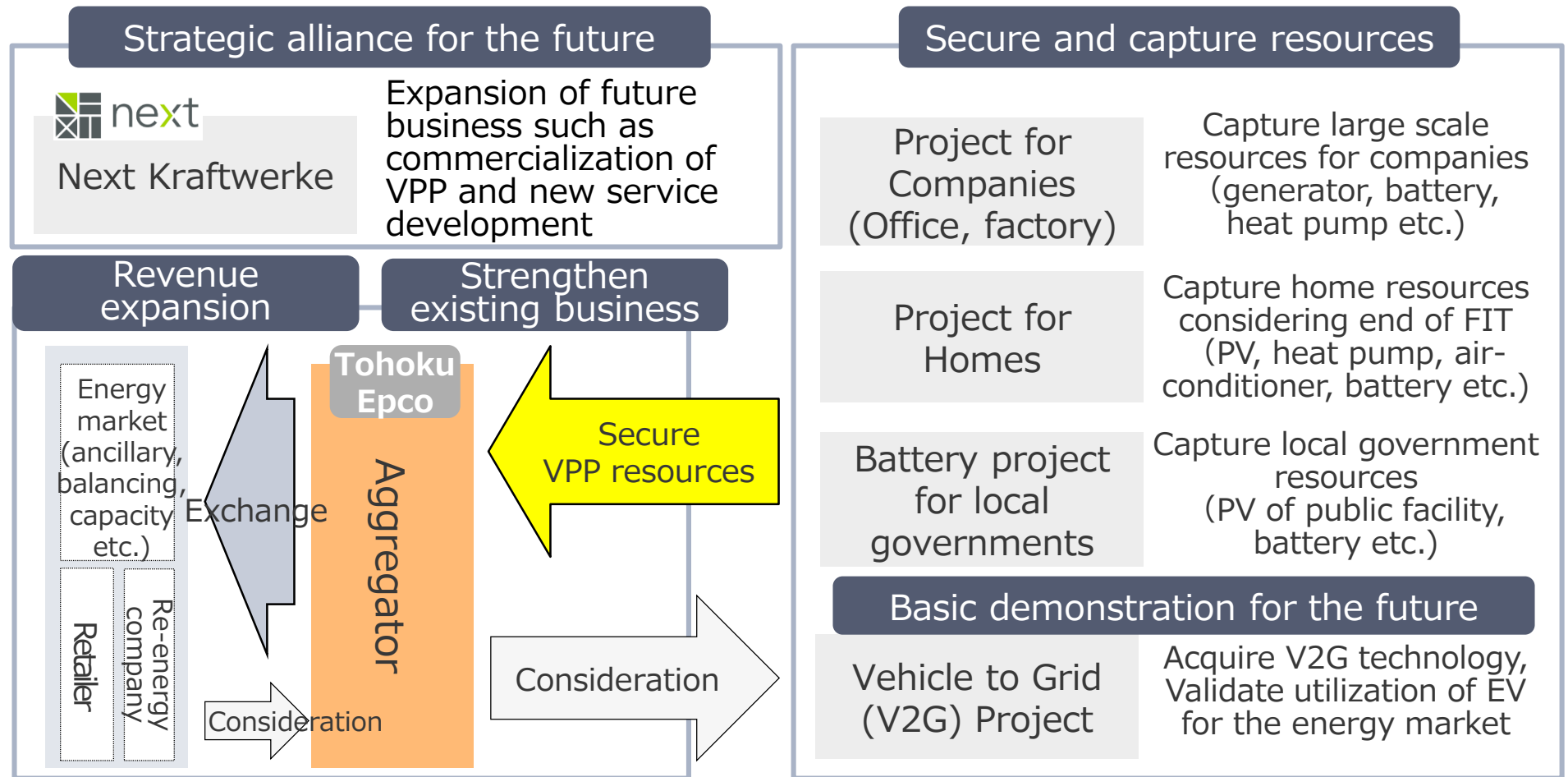
What is Virtual Power Plant ?

VPP uses a new information technology such as IoT to remotely control and aggregate energy resources distributed in the region such as power generation facilities, storage batteries, and electric vehicles owned by customers such as local governments, companies, and general households, to make them function as if it were a single power plant



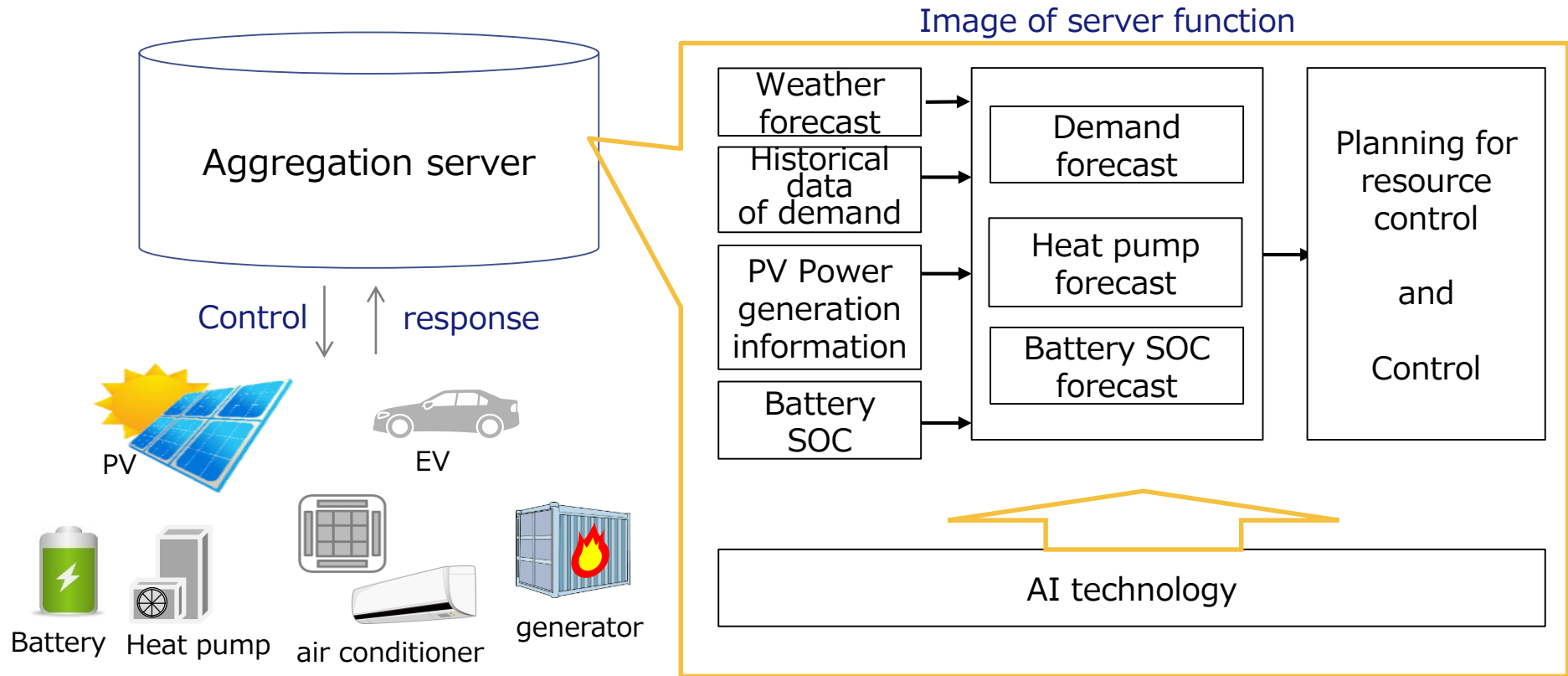
Overview of Tohoku's VPP Project

- In order to commercialize VPP, we are promoting multiple demonstration projects to verify the possibility of using VPP in resources with different attributes
- In addition, a strategic cooperation agreement was signed with Next Kraftwerke in Germany, the world's largest VPP operator, in order to expand future business areas



Technical structure of VPP server/functions

- We are now verifying the availability of energy resources such as industrial or household storage batteries, PV, generators, heat pump and EV (storage battery) etc.
- AI technology is required for advanced and optimal control of these devices



Strategic Partnership with Next Kraftwerke in a Virtual Power Plant (VPP) Demonstration Project



next



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東北電力

May, 23, 2019

Tohoku Electric Power Co., Inc.

Purpose of concluding basic agreement with Next Kraftwerke

- Next Kraftwerke is one of the largest VPP operators in the world developing its large-scale VPP from Germany to most of central Europe. The company possesses extensive expertise and experience in the field of VPP, including technology for accurately controlling various energy resources.
- Tohoku EPCO aims to **accelerate the commercialization of VPP and development of new services in the future** by leveraging Next Kraftwerke's knowledge and technology.
- Next Kraftwerke aims to **develop service solutions for the Japanese electricity system/market.**



NEMOCS



- VPP system that collectively manages multiple energy resources, and measures and predicts power levels in each device
- Automatically control energy resources via Next Box

NEXT BOX



- A transmission and control device that controls VPP resources installed in customer equipment such as generators and batteries.

Conclusion
of basic
agreement



Demonstration schedule based on basic agreement

- Step 1 (from around August 2019): To **verify the basic functions** of VPP system through remotely monitoring and controlling energy storage devices in Tohoku EPCO's Research and Development Center, utilizing "NEMOCS" and "NEXT BOX".
- Step 2 (from around February 2020): To verify and evaluate the system functions to remotely monitor and control multiple devices by **gradually expanding the number of energy resources**.
- Step 3 (from around August 2020): To **verify the feasibility of commercializing VPP and developing new services** leveraging Next Kraftwerke's systems. At the same time, we will **seek for the possibility of a further strategic alliances**, including power trading and ancillary services.

May 23, 2019

March 31, 2021

Verification period will last for approximately 2 years

Step1

Step2

Step3

Schedule

From around August 2019

From around February 2020

From around August 2020

Details

Verify basic functions

- Utilize systems including "NEMOCS" to control energy storage devices (2 to 3 devices) in Tohoku EPCO's Research and Development Center
- Establish technical methods to control resources

Expand energy resources

- Expand applicable energy and verify/evaluate functions to control multiple energy resources

Consider business opportunities

- Verify response in Japan's ancillary/balancing market
- Consider potential business opportunities to increase revenue

より、そう、ちから。



Tohoku Electric Power Co., Inc.