

Issues in Electricity System and Expectation for Japan-India Cooperation

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New Energy and Industrial Technology Development Organization

- About NEDO
- Global Trend of Smart Grid
- NEDO's Experience in India
- Solutions for Grid Stabilization

What is NEDO?

Established in 1980

Personnel : Approx. 900 (As of 2016)

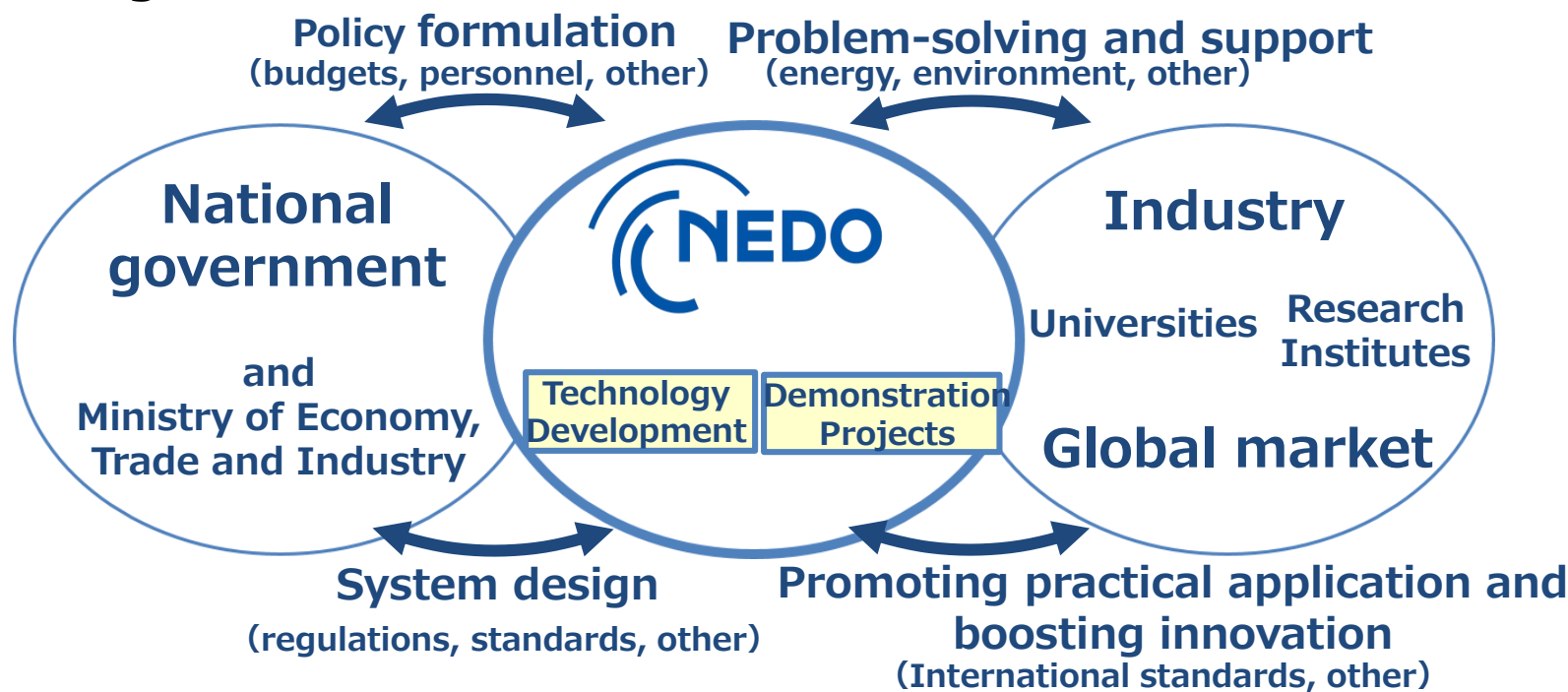
Budget : Approx. 1.1 billion € (FY 2016)

Mission of NEDO

Address energy and global environmental problems

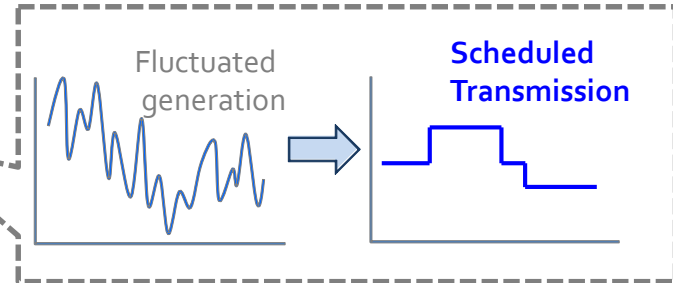
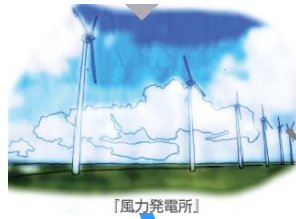
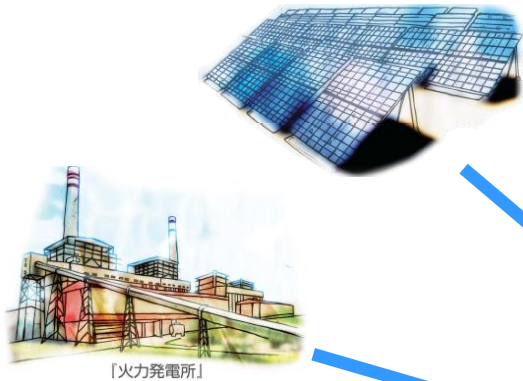
Enhance Japan's Industrial Competitiveness

Positioning of NEDO



Needs for Generation & Transmission Management

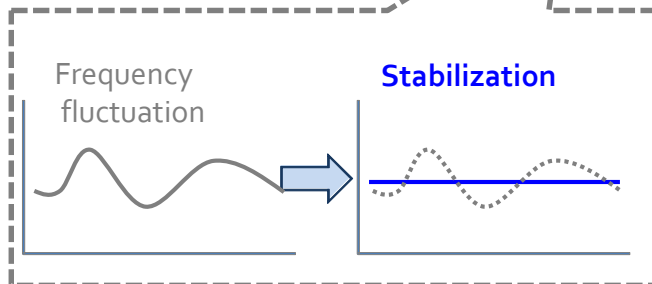
Generation



central load
dispatching
instruction office

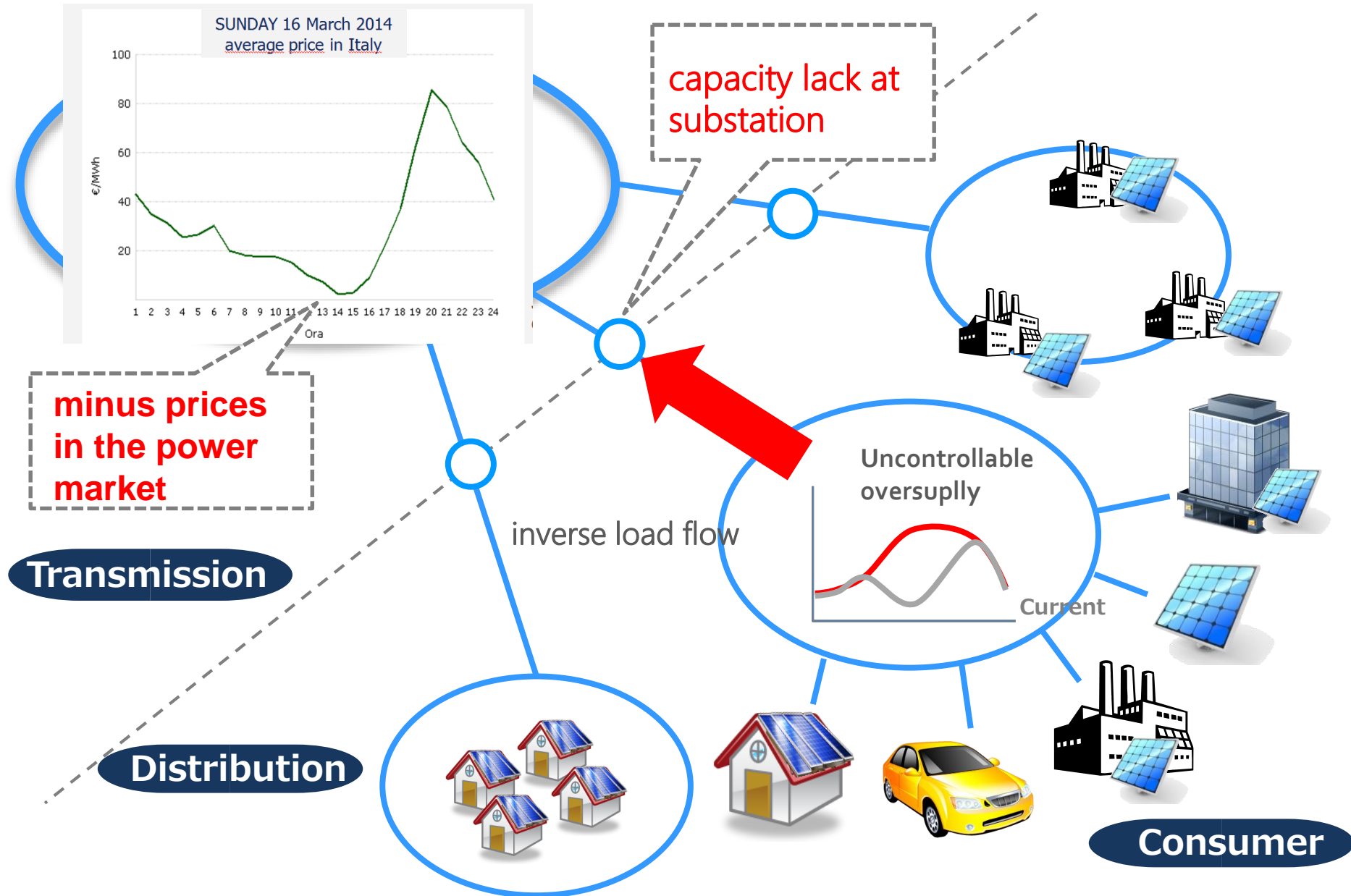


Transmission



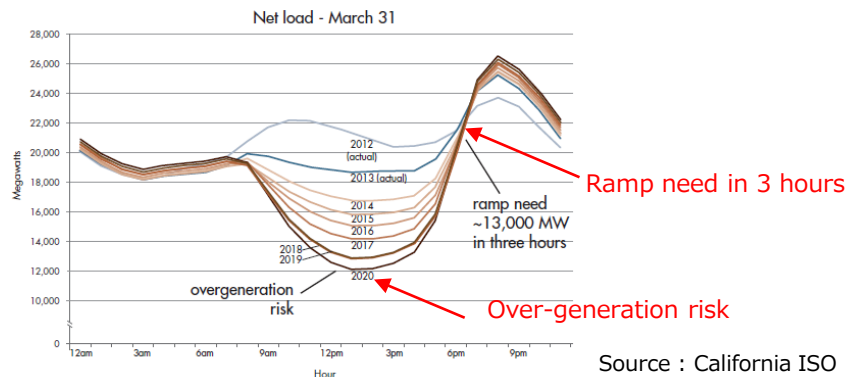
Distribution

Needs for Demand Side Management



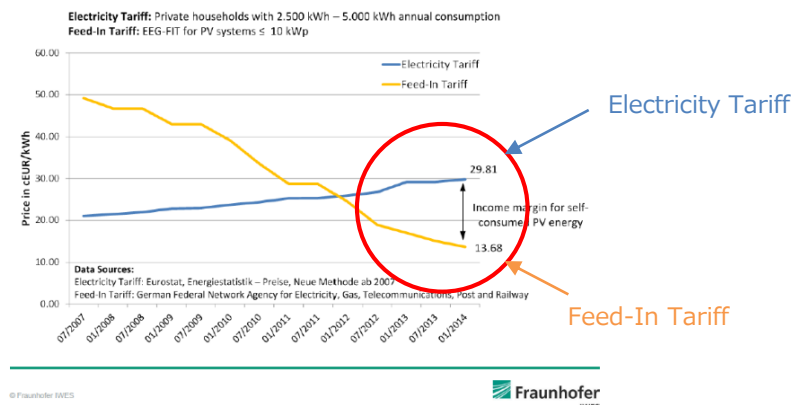
Duck Curve (ex. California)

- The risk of over-generation in the afternoon and an increased need for ramping as solar drops off in the late afternoon.



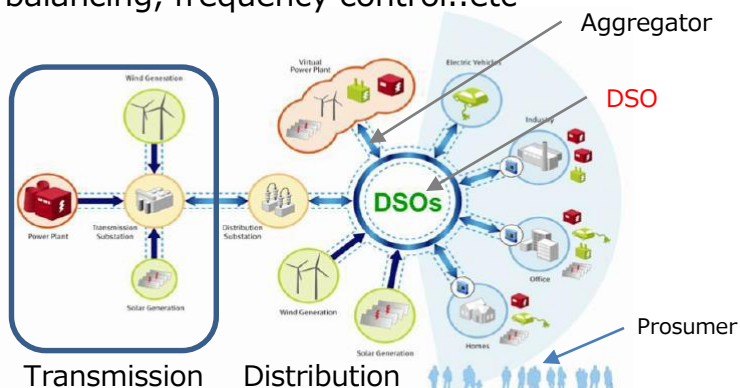
Self Consumption (ex. Germany)

- Self-generated solar electricity to be self-consumed.



Distribution System Operator (DSO)

- Increasing amounts of RE sources at the distribution level will change the roles and responsibility of DOS for balancing, frequency control..etc

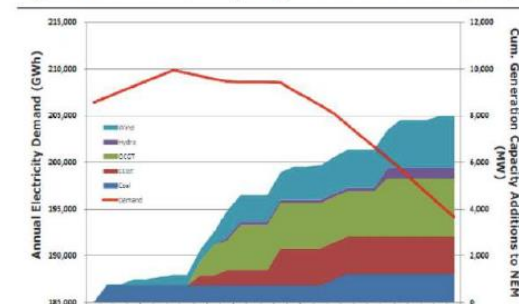


Source : ENTSO-E R&D Roadmap

Failing traditional business model

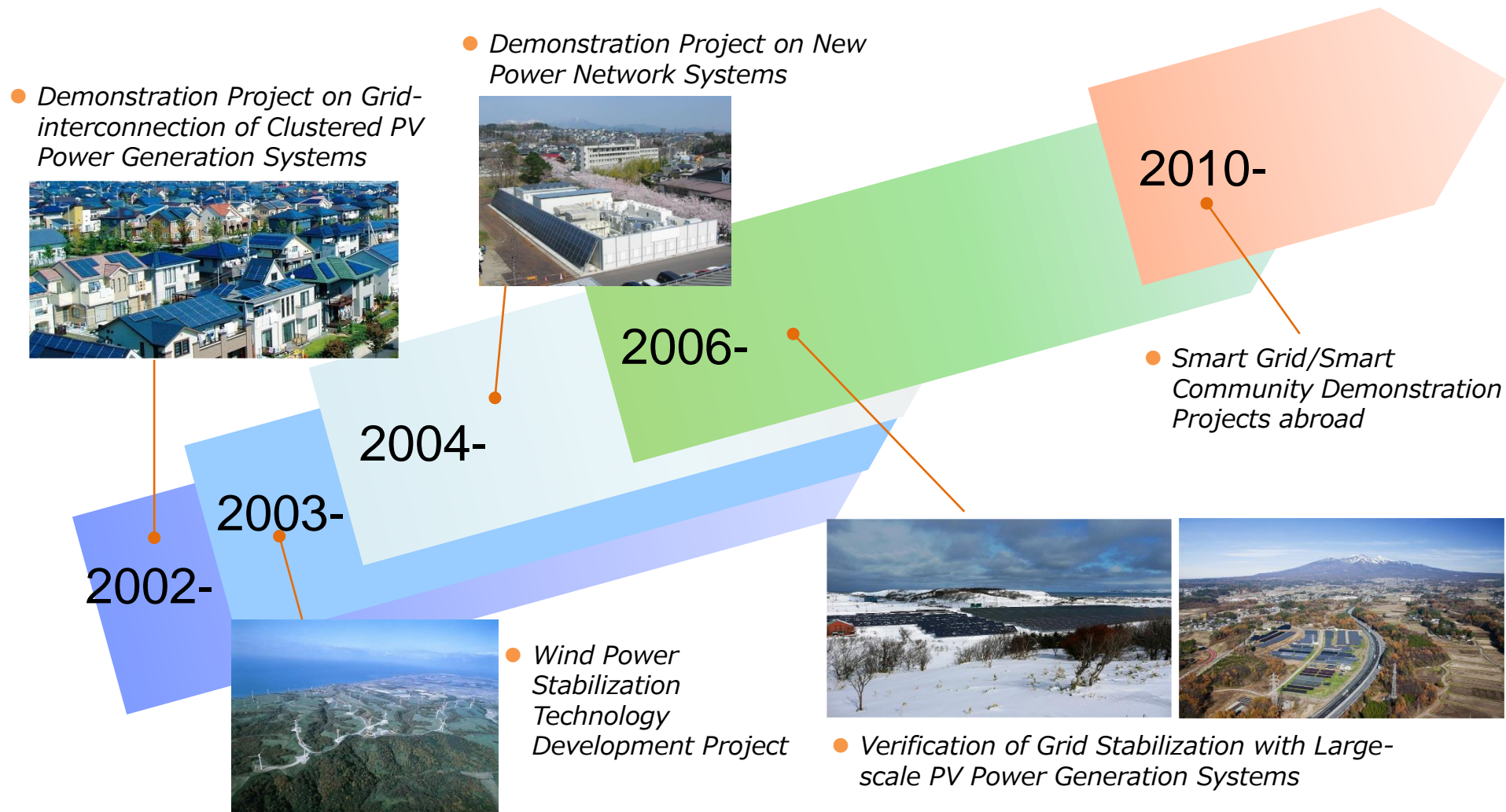
- Falling demand and shrinking electricity market due to the increase of solar PV.

Figure 33: Generation capacity added vs demand (NEM)



Source: AEMO's Electricity Market Management System (EMMS), EnergyAustralia

Smart Grid/Smart Community projects of NEDO

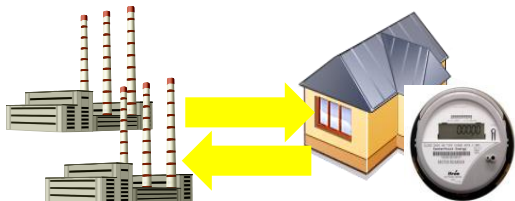


Smart Community Projects in Japan

(Fy2011-2014 by METI)

Housing complex

- 700 households and HEMS
- Consulting business about saving energy.



Keihanna Science City

Wide-area metropolis

- 4000 households and HEMS
- 10 large-scale building and BEMS.
- Multiple storage batteries.

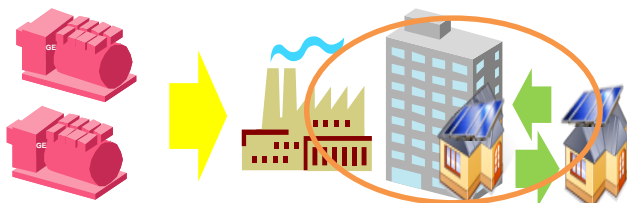


Yokohama City

Kitakyushu City

Designated supply area

- Power is supplied by Nippon Steel & Sumitomo Metal Corporation.
- Dynamic pricing system for 180 households.



Toyota City

Separate housing

- local production for local consumption
- 67 households equipped with solar panels, household fuel cells, storage batteries.
- Advanced transportation system(EV, PHV)



NEDO's Activities in India



Ongoing Projects

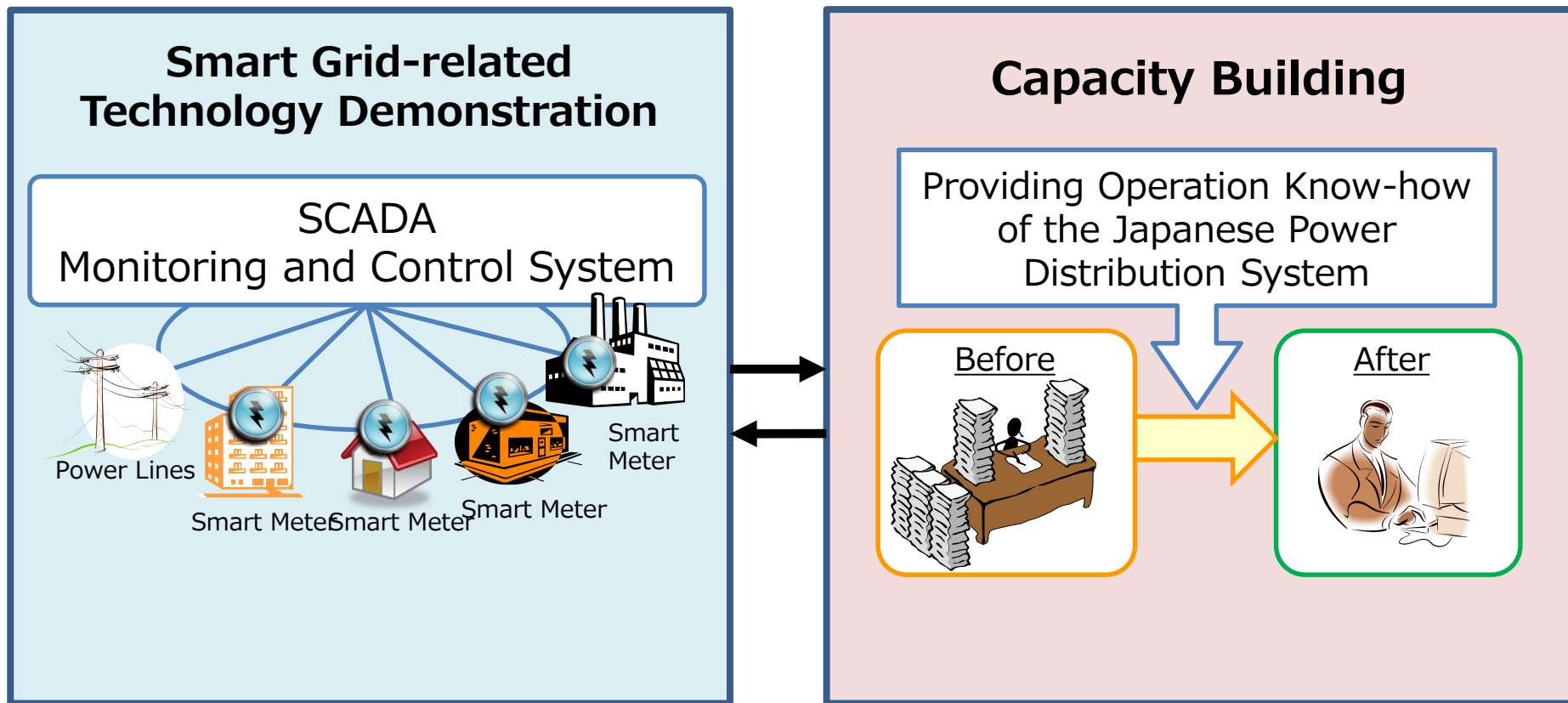
- ① Micro-Grid System with PV Power Generation (-2019)
- ② Green Telecom Tower Project (-2016)
- ③ Smart Grid Pilot Project (-2018)
- ④ High-performance industrial furnace (-2018)
- ⑤ EMS for Multiple Energy Sources at Steel Plant (-2019)
- ⑥ ICT Based Green Hospital (-2019)

Completed Projects

- ⑦ FS for USC Coal-Fired Power Plant in Delhi (-2016)
- ⑧ FS for USC Coal-Fired Power Plant in AP (-2016)
- ⑨ Parallel Micro Hydro Power Generation System (-2015)
- ⑩ Sinter Cooler Waste Heat Recovery (-2014)
- ⑪ Highly Efficient Coal Preparation Technology (-2014)
- ⑫ Increasing the Efficient Use of Energy Using a Coke Dry Quenching System (-2011)
- ⑬ Converting a Diesel Generator to Dual-fuel Operation (-2011)
- ⑭ Regional Energy Efficiency Centre (-2011)
- ⑮ Utilization of Sensible Heat from Blast Furnace Hot Stove Waste Gas (-2004)
- ⑯ Waste Heat Recovery System of Cement Plant (-2004)

Smart Grid Demonstration Project in Haryana

- Combining “**Technology Demonstration**” and “**Capacity Building**” to make power distribution smarter in Haryana, India.



Capacity Building for DISCOM

- By providing operational know-how, smart grid-related technologies will contribute to *reduce distribution losses, failure rate of distribution transformers, improve the frequency of power failures.*



Startup Ceremony at the Training Center (Nov 3rd, 2016)

Smart Grid Project at Panipat, India

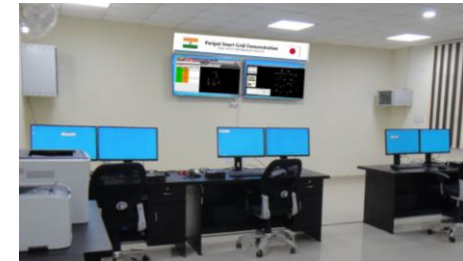


Haryana Power Training Institute (HPTI), Panchukla



- Demonstration Room
- Training Room
- Switchgear
- Substation Panel
- Smart Meter

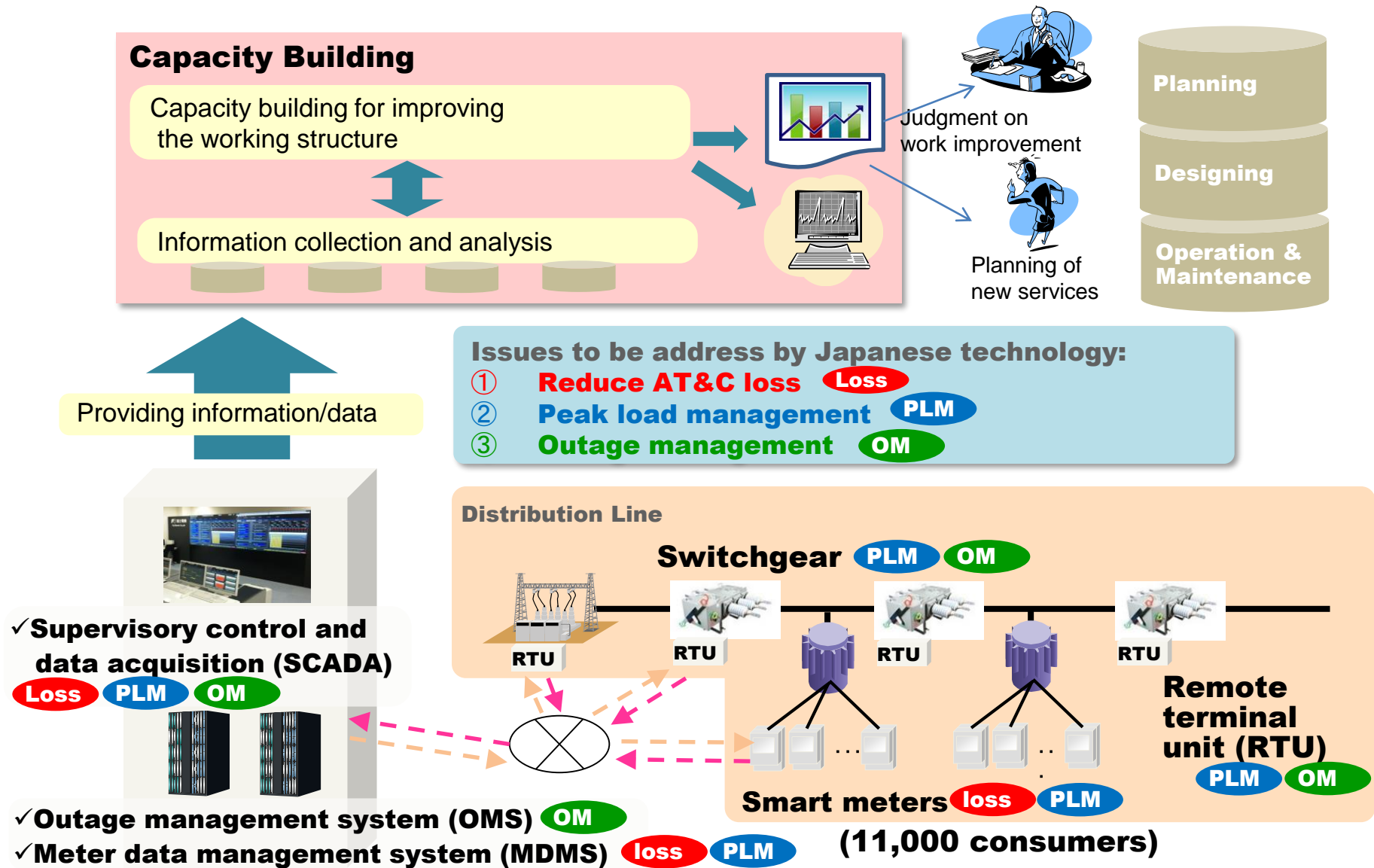
Operation Center and Demonstration Field, Panipat



Operation & Monitoring by

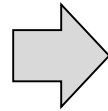
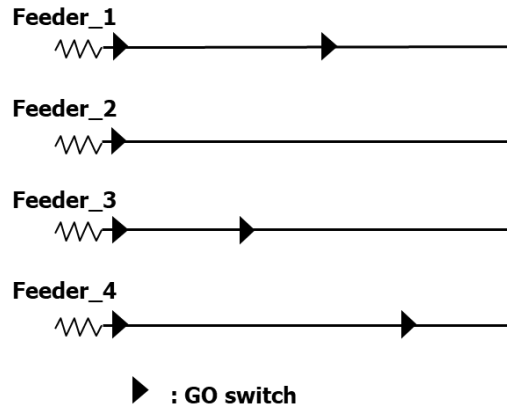
- SCADA
- MDMS
- OMS

Smart Grid Pilot Project in Panipat – Cont.

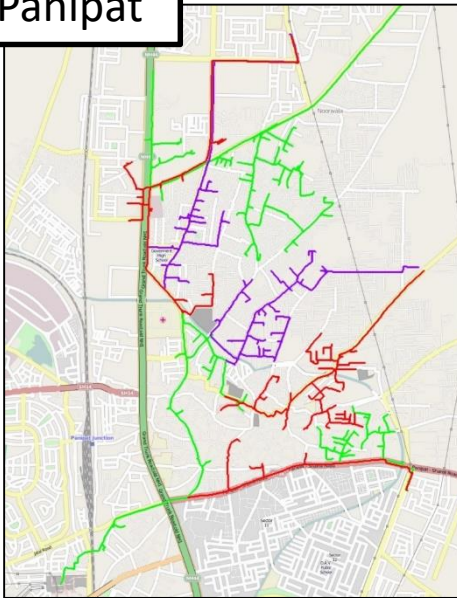


Smart Grid Project at Panipat, India

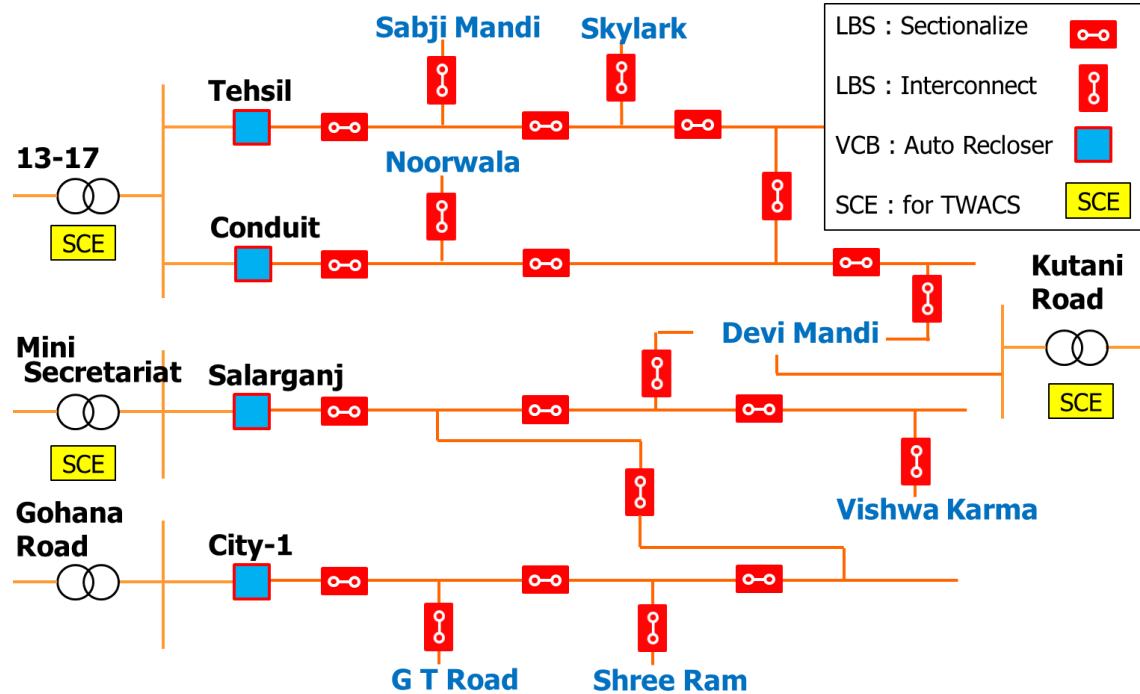
Current Feeder Network



Panipat



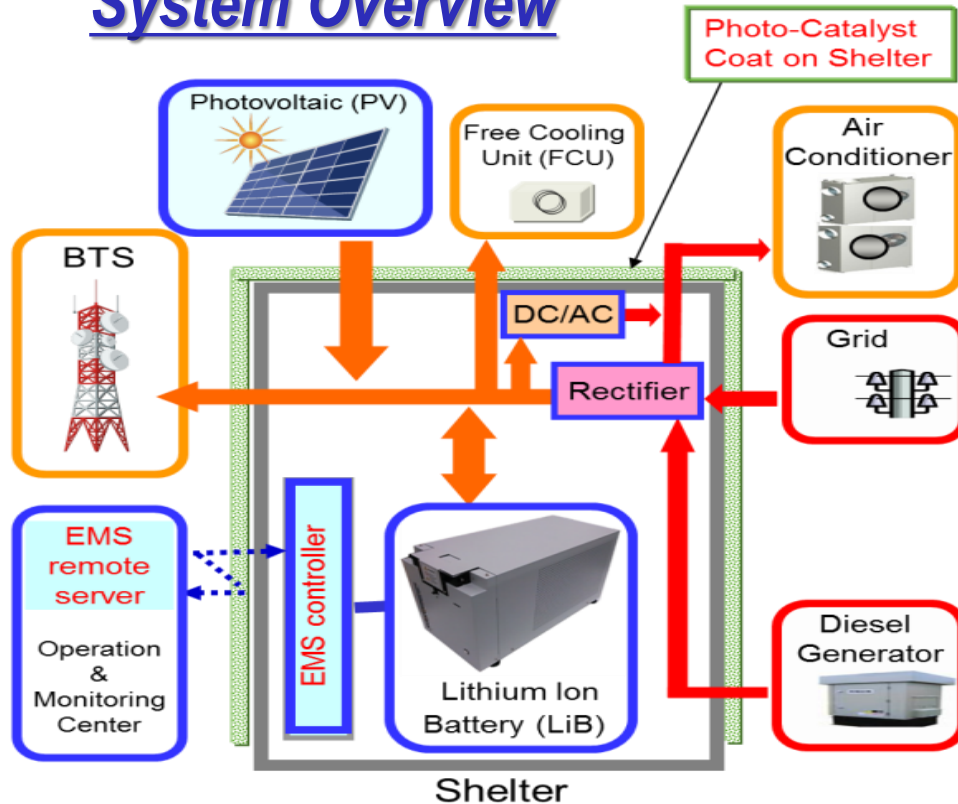
Multi divided and multi connected distribution network



Green Telecom Tower Project

- The **purpose** of this project is to reduce diesel fuel consumption of backup diesel generators at telecom tower sites by installing PV cells and lithium-ion batteries controlled by the energy management system (EMS).

System Overview



Telecom Tower



EMS



PV panels

Demonstration Sites



Key Information

- Period: 2013-2017
- Cost: US\$ 6 M
- MOU Signatory: DEA, MNRE, DOT, VIOM, GTL
- Tech Provider: NEC
- Energy Saving: 50%



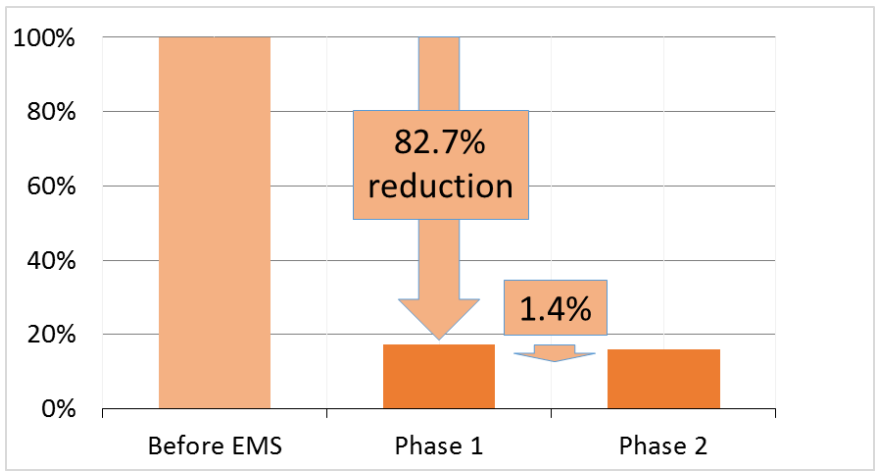
Signing Ceremony of MOU in Delhi

Summary Result of EMS (Phase 2)

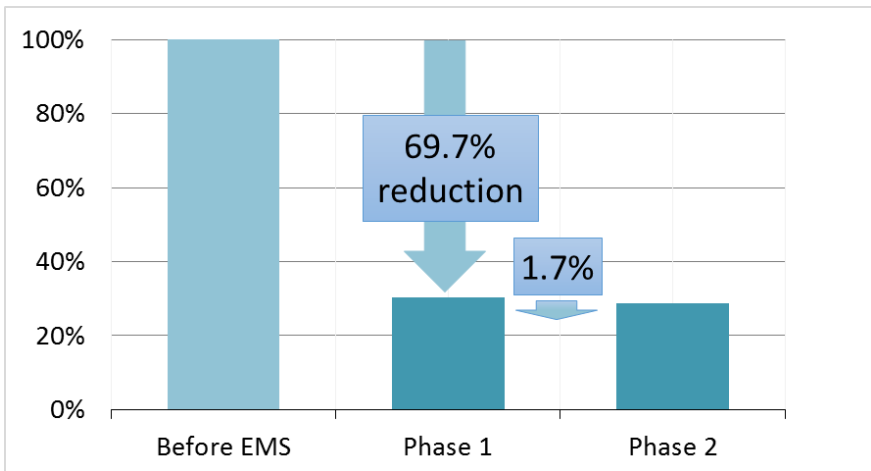
Phase 2: After Optimization of NEC EMS



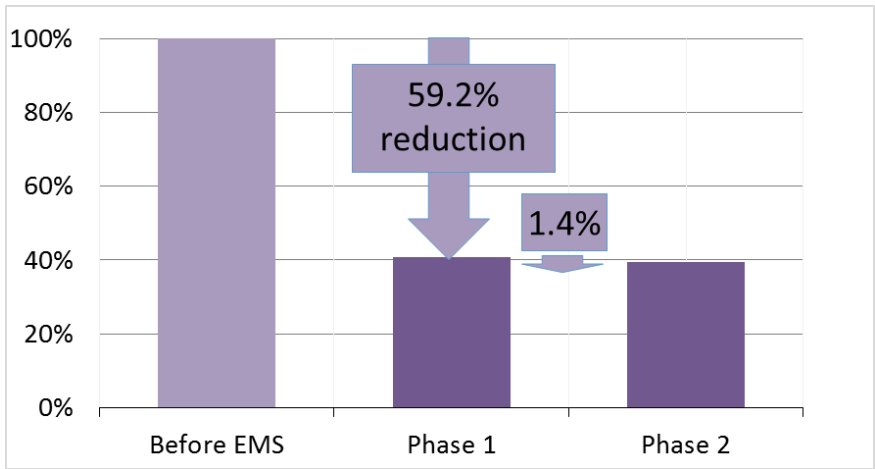
■ DG Fuel Consumption



■ Energy Cost

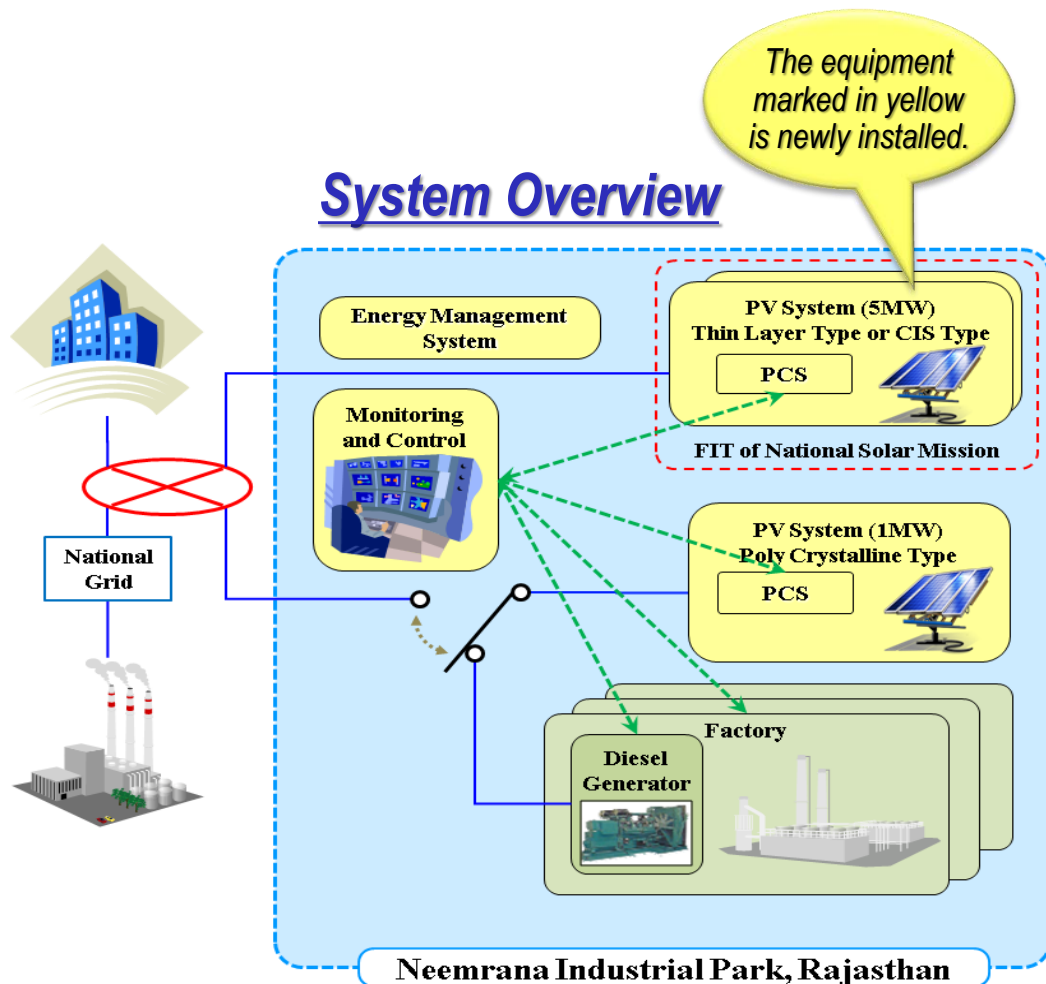


■ CO₂ Emission



Micro-Grid System with PV Power Generation

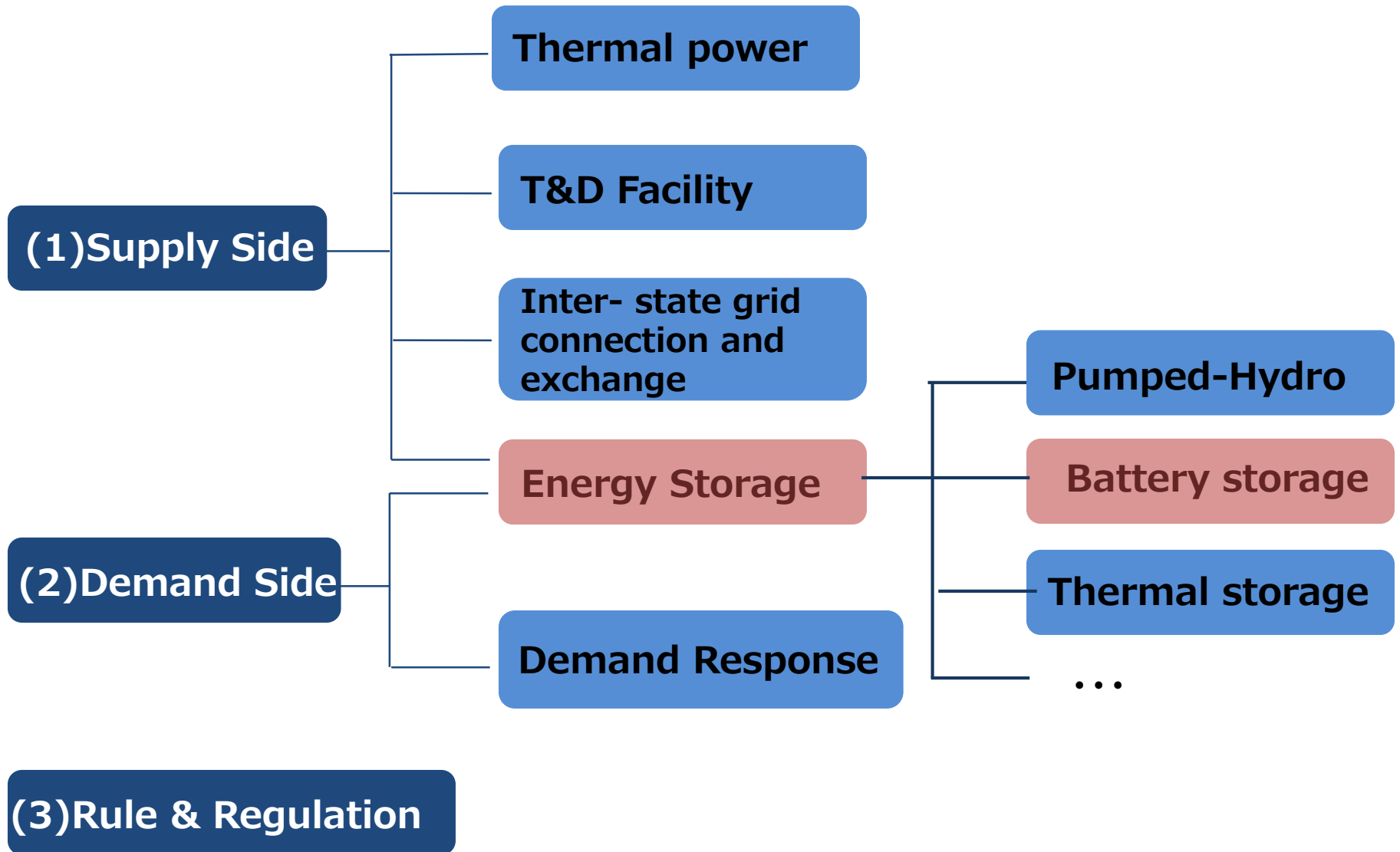
- The **purpose** of this project is to demonstrate a **micro-grid system** by using Japan's **Energy Management System** in Neemrana Industrial Park. The EMS monitors supply-demand of electricity for factories, controlling power supplies effectively from the grid, diesel generators and PV cells.



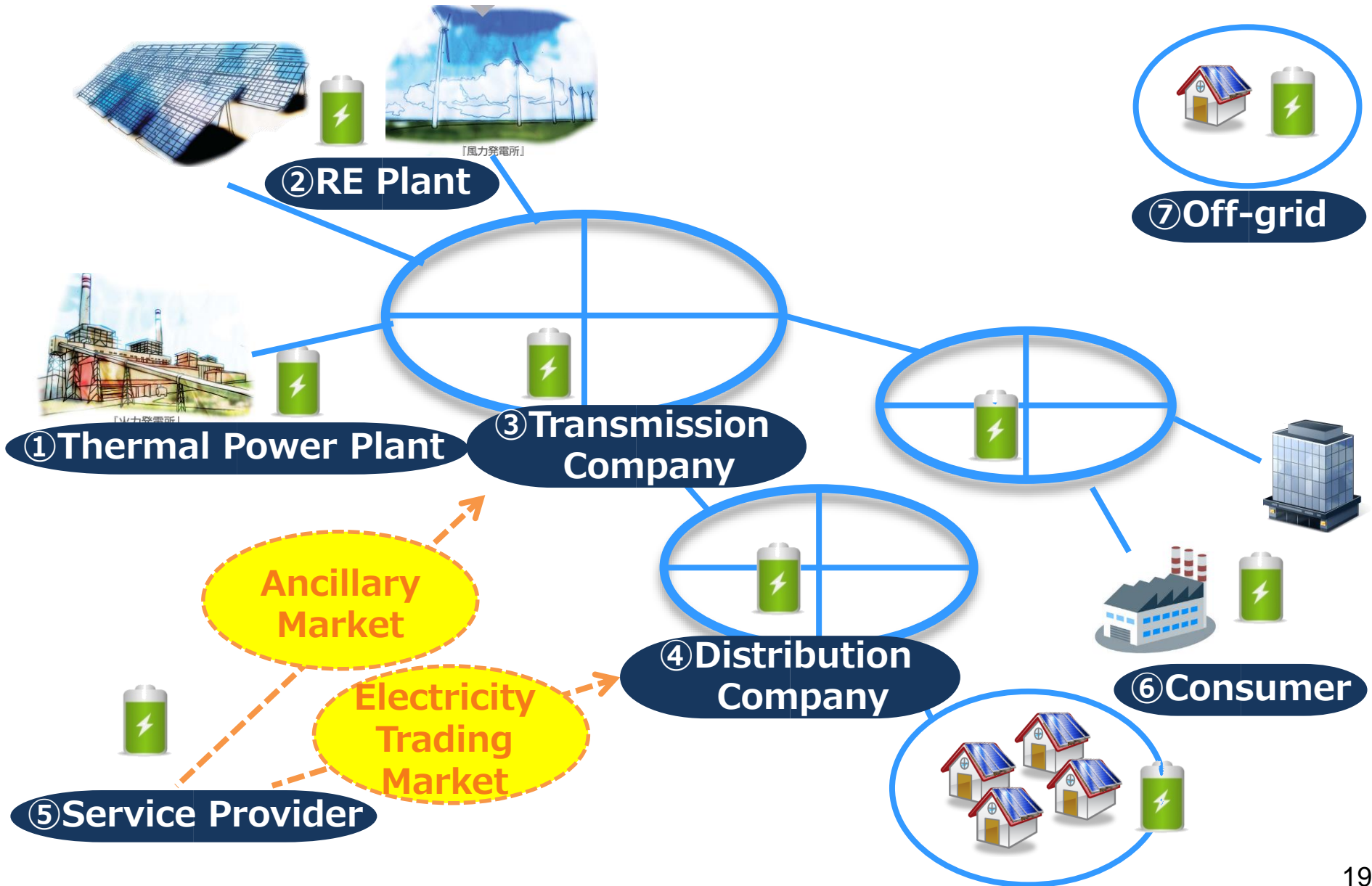
5MW PV System in Neemrana Industrial Park

Key Information

- Period: 2012-2019
- Cost: US\$ 27 M
- MOU Signatories: DEA, MNRE, DMICDC
- Tech Provider: Hitachi
- Capacity: 6MW



Battery Storage Applications



Our experience on Storage Battery

- Japan has an experience various Large Capacity Storage Batteries.

**NAS Battery
(34MW, 238MWh)**



Aomori

**Redox Flow Battery
(15MW, 60MWh)**



Hokkaido

**Lithium-Ion Battery
(40MW, 20MWh)**

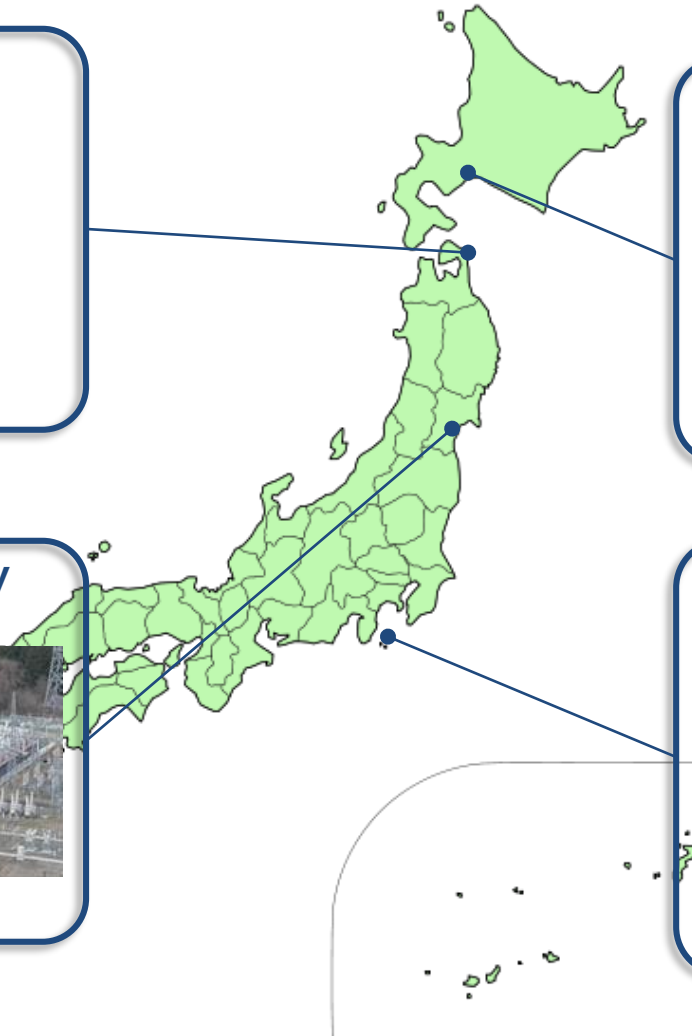


Miyagi

**Lithium-Ion Capacitors
Lead Acid Battery
(15MW, 8MWh, 15kWh)**

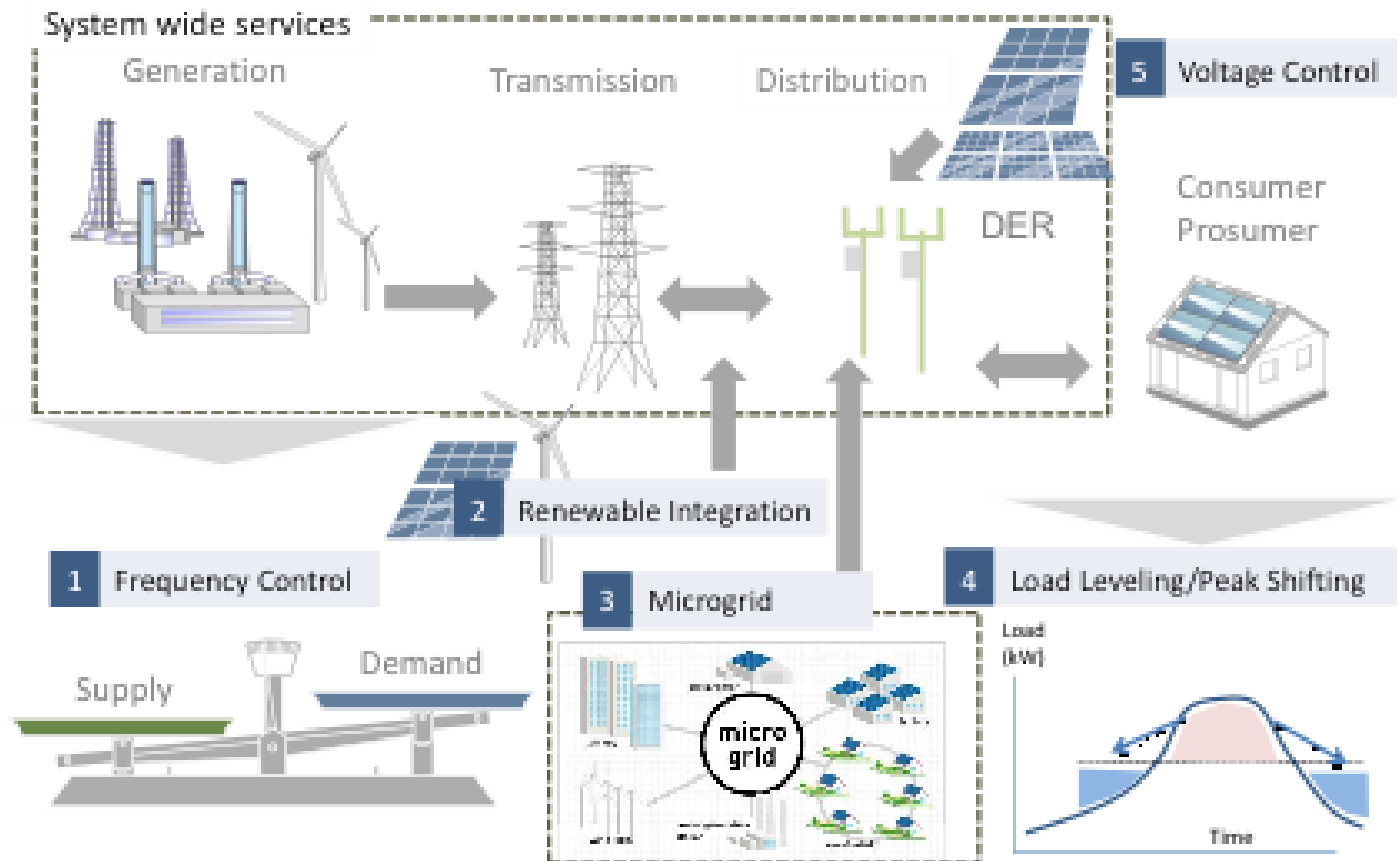


Izu Oshima



Key to deploy Storage Battery

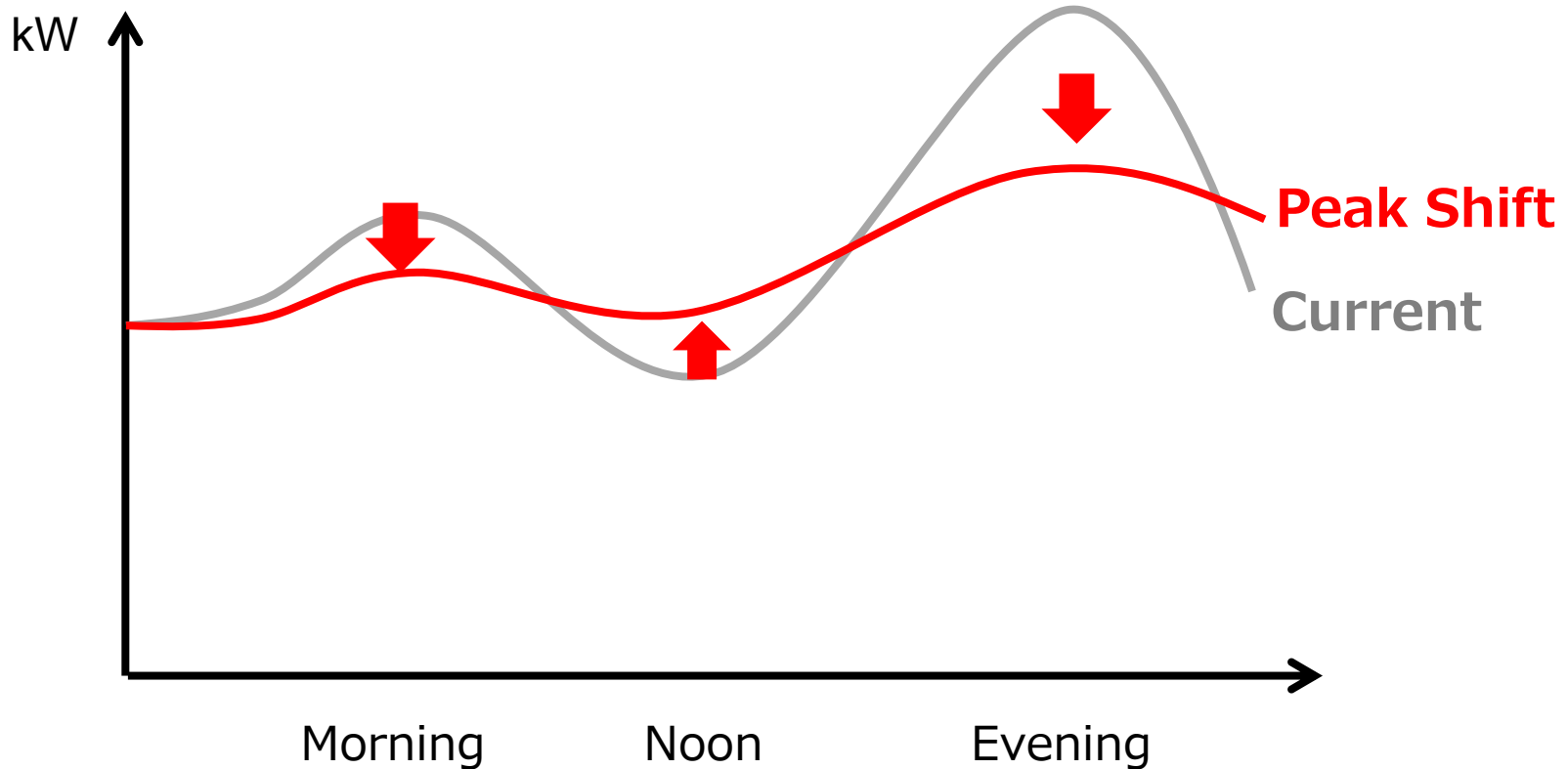
- *Monetize* the value of the storage battery function.
- For monetization, *institutional framework* and *market design* is essential.



The Power Grid and the applications for battery storage

Shift the electricity demand

Electricity Demand



Thank you for your attention

<http://www.nedo.go.jp/english/index.html>