Ministry of Economy, Trade and Industry
Agency of Natural Resources and Energy

THE EFFORTS ON RENEWABLES INTRODUCTION IN JAPAN

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Excerpt from the 4th Strategic Energy Plan of Japan

Ministry of Economy, Trade and Industry
Agency of Natural Resources and Energy

Ⅱ. Principles of Energy Policy and Viewpoints for Reform

2. Evaluation of each energy source

(1) Renewables (solar, wind, geothermal, hydroelectricity, biomass)

- Promising, multi-characteristic, important, low carbon and domestic energy sources
- Accelerating their introduction as far as possible for three years, and then keep expanding renewables

Ⅲ. Policies on Energy Supply/Demand Structures

3. Accelerating Introduction of Renewable Energy: Toward Grid Parity in the Mid/Long Term

- Accelerating introduction as far as possible for three years from 2013, followed by continuous active promotion
- Establishing "Ministerial Meeting on Renewables" for policy coordination
- Pursuing a higher level of introducing renewables than the levels* which were indicated based on the former Strategic Energy Plans, and GOJ takes them into account in a next energy mix
- Operating FIT stably and appropriately, promoting regulatory reforms, R&D etc.

** "the Foresights of Long-Term Energy Supply and Demand(Recalculated)" (Aug. 2008, METI)*
- The ratio of renewables in total watt-hour in 2020: 13.5% (141.4 billion kWh)
"the Shape of Energy Supply and Demand in 2030" (Jun. 2010, the document for Advisory Committee on Energy and Natural Resources)
- The ratio of renewables in total watt-hour in 2030: approximately 20% (214 billion kWh)
(53GW for PV, 10GW for WP in 2030)

Excerpt from the 4th Strategic Energy Plan of Japan Cont.

Ⅲ. Policies on Energy Supply/Demand Structures

3. Accelerating Introduction of Renewable Energy: Toward Grid Parity in the Mid/Long Term

(1) Strengthening the measures for expansion of wind and geothermal power

<Onshore Wind Power>

- Shortening periods for environmental assessment, establishing regional/inter-regional grid for renewables, installing large storage cells, rationalizing regulations, and so on

<Offshore Wind Power>

- Promoting pilot projects for floating wind turbines technology in Fukushima and Nagasaki prefecture, and making the technology commercialized by 2018

<Geothermal>

- Reducing investment risk, shortening a period for environmental assessment, and promoting understanding of local people

Excerpt from the 4th Strategic Energy Plan of Japan Cont.

Ⅲ. Policies on Energy Supply/Demand Structures

3. Accelerating Introduction of Renewable Energy: Toward Grid Parity in the Mid/Long Term

(2) Promoting distributed energy systems with renewables

<Woody Biomass>

- Promoting the power generation and thermal usage of woody biomass, through forest /timber policies and the "Act for Promotion of Power Generation of Renewable Energy Electricity to take Harmony with Sound Development of Agriculture and Forest"

<Medium/Small size Hydro Power>

- Simplification of procedure on water rights by the amendment of the "River Act"

<Solar Power>

- Continuing supports for introduction for self-consumption in regions

<Thermal Energy from Renewables>

- Promoting introduction of thermal-supply facilities and pilot projects for multi-heat use

(3) FIT

- Examination of the system from various views; facilitating the maximum use of renewables as well as reducing cost burden, referring situations of other countries which have faced challenges of cost burden and strengthening grid systems

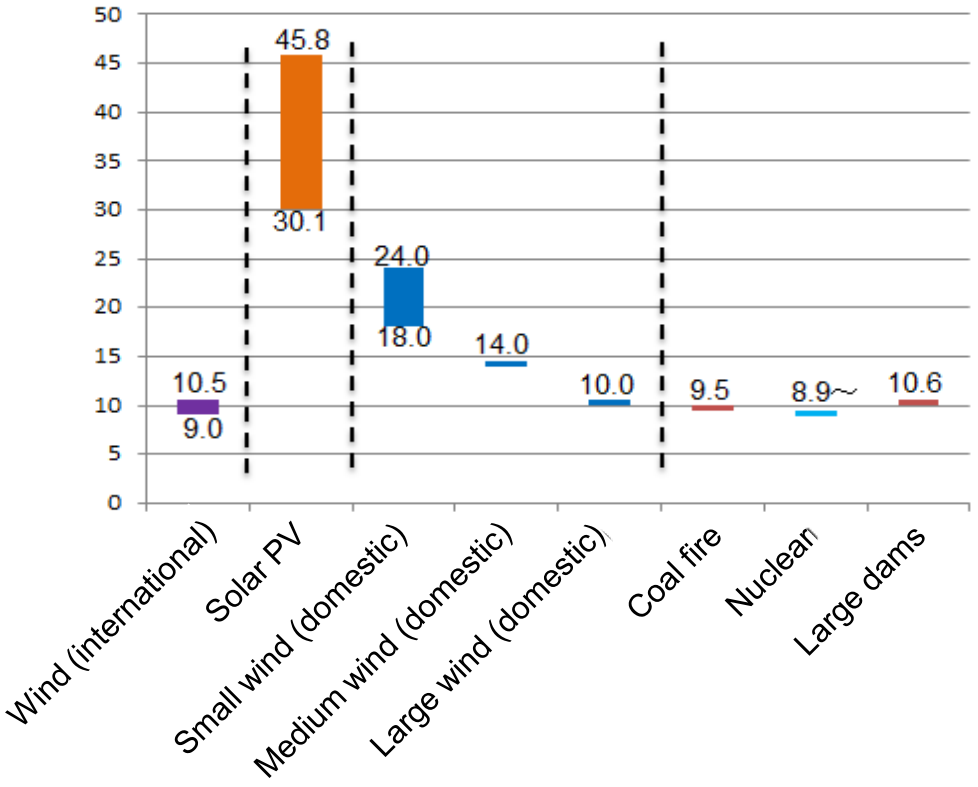
(4) Fukushima as a new hub of renewable energies' industries

- Constructing an AIST's new research center for renewables

Opportunities and challenges of “onshore” wind

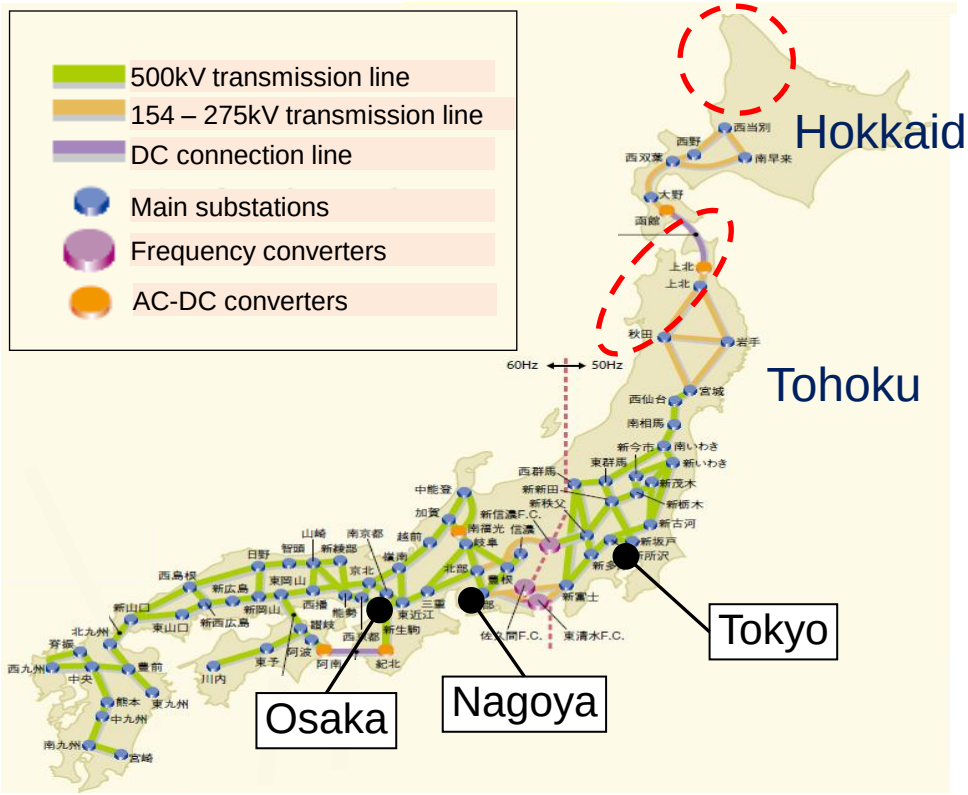
- If developed as a large wind farm, its unit cost is well competitive with coal, nuclear and hydro.
- But windy, vast areas which are suitable for large development are concentrated in particular regions – Hokkaido (41%) and Tohoku (21%), where the grid is considerably weak due to small population.

【JPY/kWh】



Comparison of power generation cost

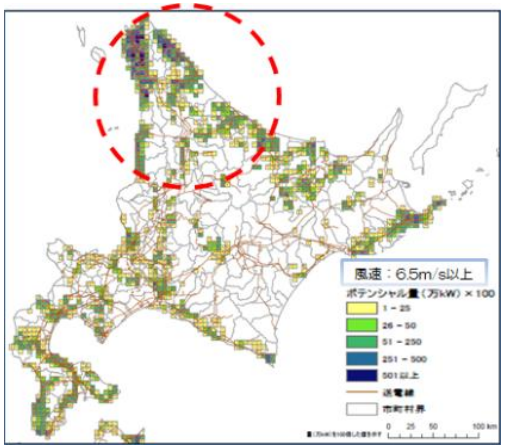
Source: “Cost Verification Committee” “World Energy Outlook 2009(IEA)”
“NEDO’s White Paper of renewable energy technology”

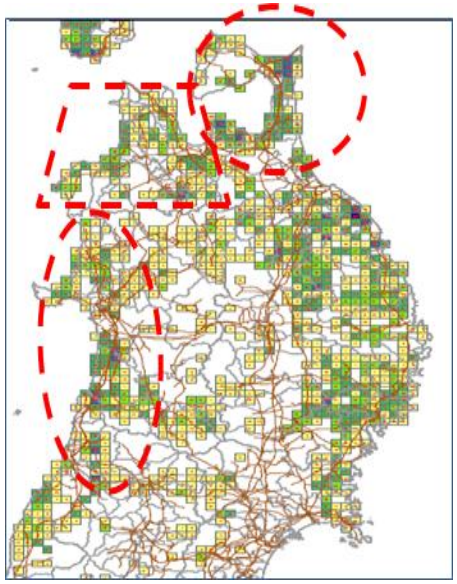


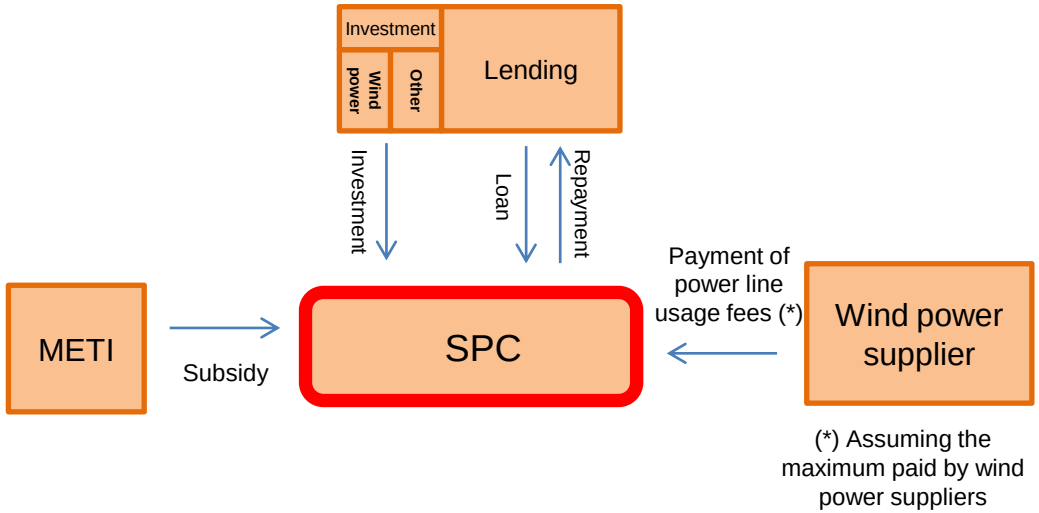
Map of transmission lines
[as of 2010]

Buildup of the super-long transmission line for the wind power

- In order to promote private capital's building transmission lines that convey the wind electricity from wind abundant area, and to verify necessary technologies, METI subsidizes SPC's building such a transmission lines in fore-mentioned Hokkaido and Tohoku area.
- SPC is required to be sponsored by wind power generation businesses, who agree to pay fee to the SPC for transmitting services.







Hokkaido and part of Tohoku have been designated as specified areas for wind power promotion, where power line strengthening and technology verification efforts are to be implemented. Projects commenced in Hokkaido in FY2013, while in the Tohoku region, they are scheduled to begin in FY2014.

Collection of the expenses will not be based on electricity retail fees, rather, the power line usage fees will be collected from wind power suppliers, and assigned to the repayment (the introduction of the "toll road" concept to power lines).

Buildup of the super-long transmission line for the wind power

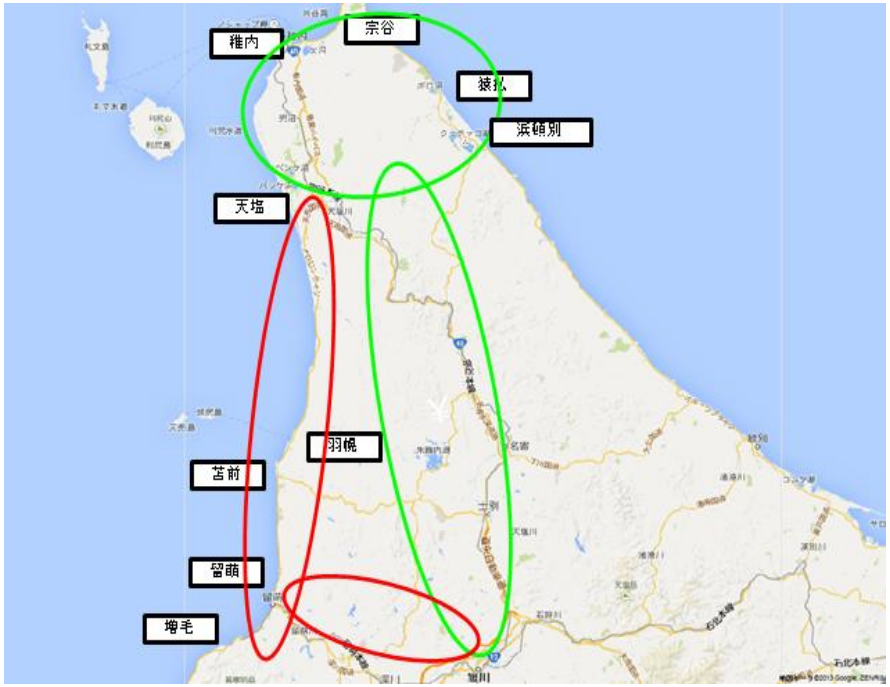
- For Hokkaido area, two SPCs were selected, in which traders, renewable energy generators and other relevant parties make their investment. At the present stage, detailed investigation of the developmental feasibility has commenced, while selection of routes and other specific details will be examined in the near future.
- The potential of introducing wind power generation within this region has been estimated at a maximum of around 2 million kW.

(1) J-Grid Co., Ltd.

- SPC formed through investment by Mitsui & Co., Ltd., Marubeni Corporation and SB Energy Corp.
- A route along the Japanese coast is envisioned, from Mashike to south of Teshio River.
- The potential of introducing wind power generation is 300 to 600 thousand kW.

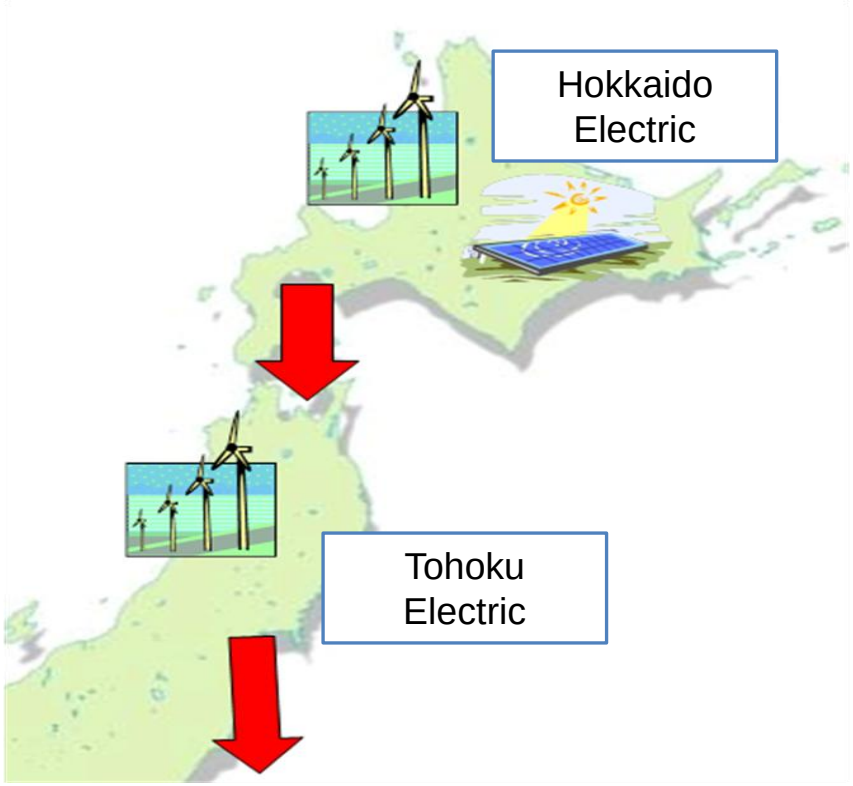
(2) North Hokkaido Wind Power Transmission Co., Ltd.

- SPC formed through investment by Eurus Energy Holdings Corporation.
- A route is envisioned from the Wakkanai and Soya area and Teshio to the Sarufutsu and Hamatonbetsu area (central Hokkaido to Okhotsk route).
- The potential of introducing wind power generation is a maximum of 1.4 million kW.



Strengthening interconnections between regions

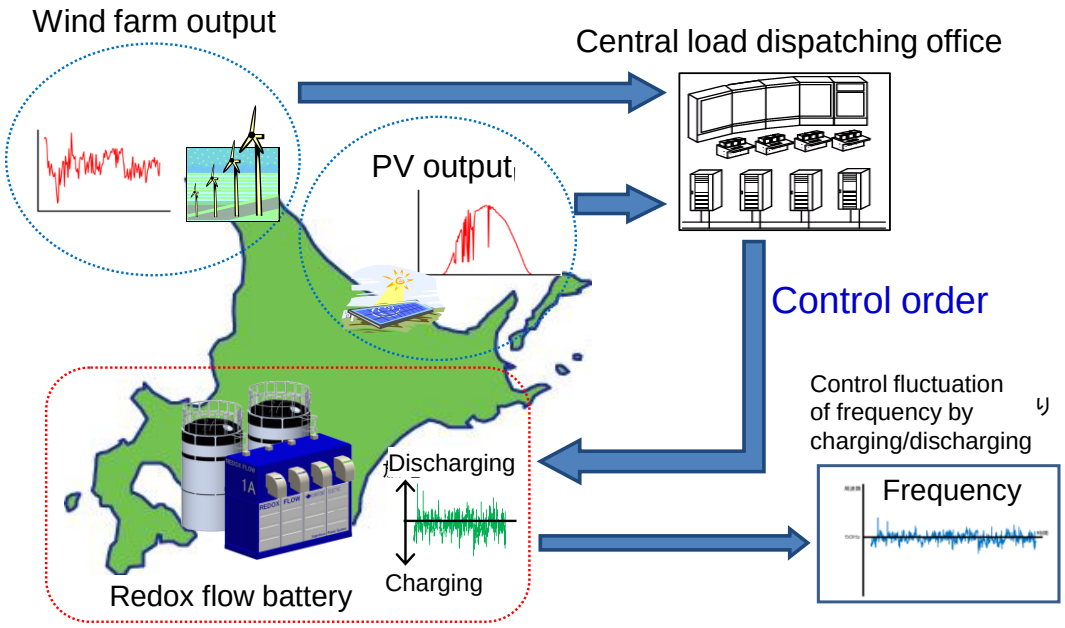
- If additional interregional transmission lines can be constructed in the Hokkaido and Tohoku area, then it will contribute to adopting more and more wind in these areas.
- When planning the adoption of 5.9 million kW of the wind (the total capacity applied for the demonstration study of interconnecting between Hokkaido and Tohoku which was announced in FY2011), it is estimated that around 900 billion yen of investment will be needed for strengthening of the interconnectors.



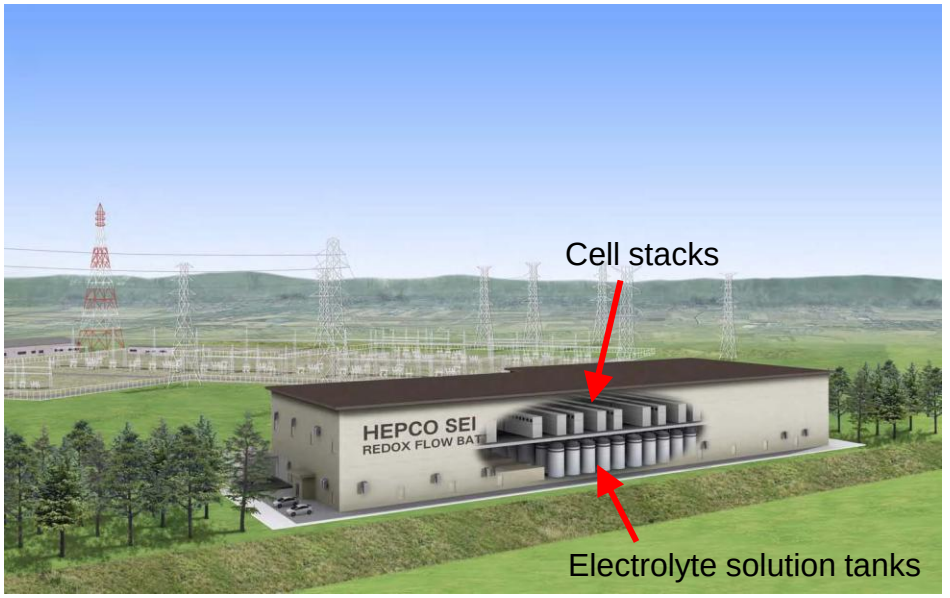
Source: Master Plan for Strengthening Lines Interconnecting Regions Research Council, interim report (April FY2012)

Massive battery system for the power grid

- Hokkaido and Tohoku introduce enormous battery systems nearby their central load dispatching office for the purpose of frequency control and supply-demand adjustment.
- With this effort, they would be able to accept more RE within the grids.



Demonstration Plan of Hokkaido Elec. Power and Sumitomo



Appearance View of Large Battery Facility

Operator	Battery Type	Capacity [kWh]	Location
Hokkaido Electric Power Sumitomo Electric	Redox flow battery	60,000 kWh	Minami-Hayakita Substation
Tohoku Electric Power	Li-ion Battery	20,000 kWh	Nishi-Sendai Substation

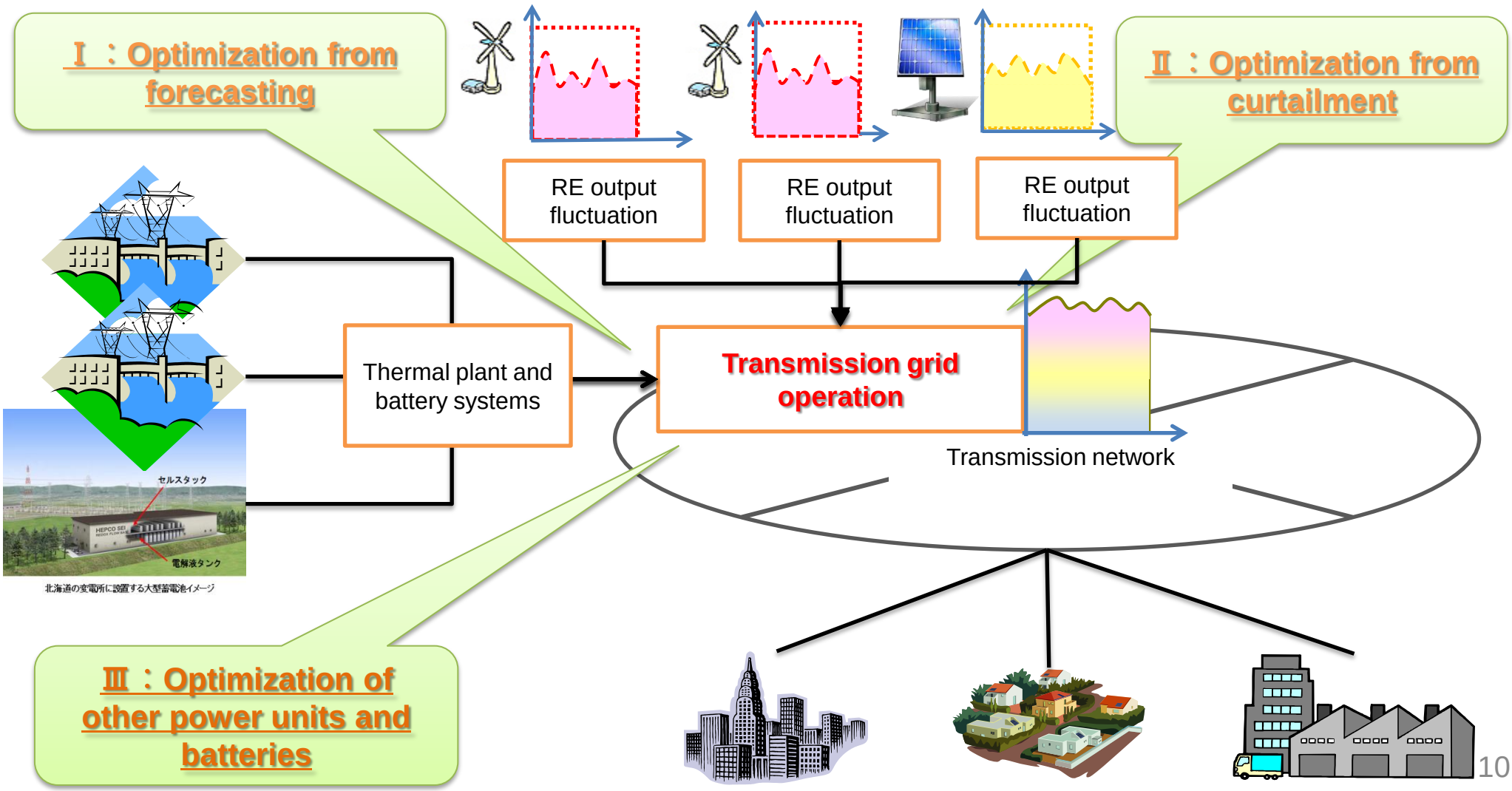
Development: Low cost battery for power grid

- Reduce the cost of batteries with a capability of large scale energy storage by aiming at the cost (23,000 yen/kWh) for pumped storage hydropower in 2020
- Cost-down committed by battery makers to ensure deployment in future power market.

	Sumitomo Electric Industries, Ltd. (rep.)	NGK Insulators, Ltd.
Battery Type	**Redox-flow battery** 	**NAS(sodium-sulfur) battery** 
Structure	Charge and discharge by transforming the number of valence electrons for vanadium in electrolyte	Discharge and charge by moving Na^+ within solid electrolyte(fine-ceramics)
Feature	◆ Easy of up-scaling by adding flow-tank ◆ Potential for more cost-down	◆ No resource constraints on composing materials ◆ Potential for more cost-down

Developing technology for forecasting wind power fluctuation

■ By taking full advantage of forecasting technology of wind power fluctuation, efficient combination with thermal power plants and battery systems, and minimum curtailment of wind farms all at once, an advanced grid operation simulator system will be developed.



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