WORLD ENERGY STORAGE DAY
22nd SEPTEMBER

NEDO

Japan's Initiatives for Energy Storage and xEV

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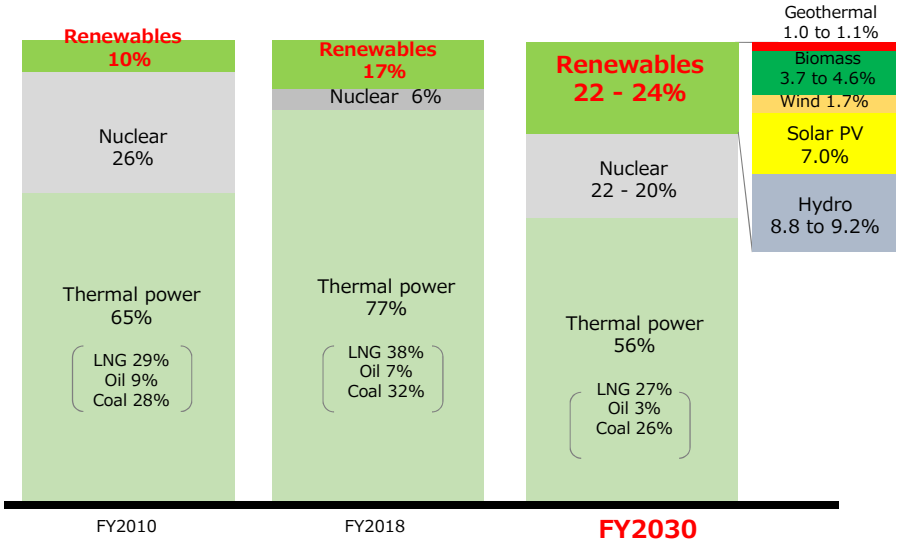
Table of Contents

Current status and future direction of Japan's energy policy

- The basic direction of energy policy of Japan
  Best mix of "3E + S" (Energy Security, Economic efficiency, Environment and Safety)
- Current energy mix : dominated by fossil fuels.
  → The goal of the **2030 energy mix** : reduce GHGs by 26%.
- Japan has positioned **"Long-term Strategy"** under the Paris Agreement as an economic growth strategy, aiming for achieving a **"virtuous cycle of environment and growth"** through discontinuous innovation leading to 80% GHGs reduction by 2050.
- In this direction, Japan's Government and **NEDO promote R&D** of technologies to make renewable energy (RE) a main power source, and to introduce electricity storage, EVs, hydrogen, microgrids and so on.

Power Source Composition (2010-2018-2030)



Japan's "Long-term Strategy" under the Paris Agreement

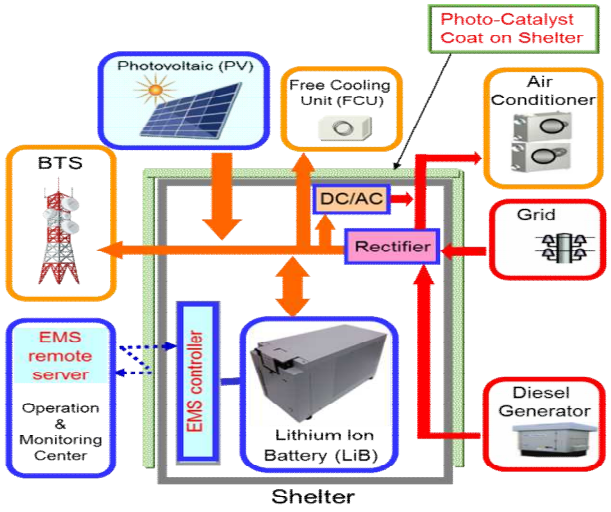
- Sets out **"Decarbonised Society"** as the ultimate goal and aims to realize this goal as early as possible in the second half of this century, as making **bold efforts for 80% GHGs reduction by 2050**.
- Aims for achieving **"virtuous cycle of environment and growth"** through discontinuous business-driven innovation and contributing to the world.
- Specific measures include **(1) Progressive Environmental Innovation**, **(2) Green Finance**, and **(3) International Cooperation**.

Efforts to introduce Batteries for power system

- RE's output varies with time (Duck-curve etc.)
  → In order to introduce a large amount of RE and stabilize power system, it's important to install batteries for power adjusting.
- Needs to verify the technical aspects of optimal control and reduce costs for expanding the use of batteries there in the future.
  (1) **VPP projects in Japan** (As energy resources, VPP uses batteries with a capacity of 50 MW or more, which is equivalent to a small-scale power plant)
  (2)NEDO promotes **international demonstration projects** using batteries in power system.

Green Telecom Tower Project in India

- Control of PV power generation and battery reduces diesel.
- Photocatalyst coating reduces temperature rise in the shelter.



Redox Flow Battery for Power Grid in California, USA

Large-Scale Hybrid Battery System in Germany

Efforts related to xEV(Electrified Vehicle)

xEV：Battery Electric Vehicle(BEV), Plug in Hybrid Electric Vehicle(PHEV), Hybrid Electric Vehicle(HEV), and Fuel Cell Electric Vehicle(FCEV)

- While the spread of xEV contributes to solving global warming, air pollution, energy security, etc., it is also expected to be **an important component of distributed energy systems** including RE (**VtG**).
- The concept of **"Well to Wheel"** which evaluates GHGs including emissions from the generating process of electricity to the running process of vehicles is important.
- Japan's long-term goal : **reduce emissions of GHGs per km per vehicle by 80% by 2050**
  (All of passenger cars are supposed to be xEV).
- To this end, the Government will promote the following measures.

(1) Support for xEV purchase and charging facility installation
(2) Creating a market for battery reuse and recycling
(e.g. Establishment of evaluation method for residual performance of LiB)
(3) VPP Project [rewritten]
(4) Development of next-generation batteries [→ Next Page]

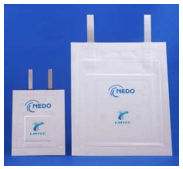
Utilization of xEV in time of disaster

- In Sep. 2019, a big typhoon attacked Japan, causing **a prolonged power outage in a wide area** by destroying utility poles and grids.
- At that time, **xEVs were utilized** so that the victims could use mobile phone chargers, lights, fans, refrigerators, etc. in shelters where they had to stay.
- Based on these experiences, the government formulated the "**Manual for promoting the use of electric vehicles in times of disaster**" in July 2020.

Source：Nissan Corp.

Technological development of next-generation automotive batteries

- As for the next-generation automotive battery, NEDO has promoted the development of technology to achieve **high energy density**, **high durability** and **low cost**.

	All-Solid-State Lithium ion Battery	Innovative batteries			
		Fluoride Battery	Zinc Air Battery	Sulfide Battery	Conversion Battery
Image					
Target year	Around 2025 (Target battery pack for practical use)	Around 2030 (Target battery pack for practical use)			
Energy/volume density（Wh/L)	600Wh/L	570Wh/L			
Output/weight density（W/kg)	2,000W/kg	1,500W/kg			
Energy/weight density（Wh/kg)	300Wh/kg	500Wh/kg			
Cycle life	1,500 times	1,500 times			
Charging time	10 minutes (quick charge)	30 minutes (quick charge)			
Other advantages	High safety, flame resistance, etc.	Low cost, high safety, flame resistance, etc.			
Other disadvantages	Li, Co and Ni are needed as LiB.	Rare metals are NOT needed. Use resources easy to procure.		Li is needed as LiB.	

Efforts related to Hydrogen energy

- Hydrogen energy, which is also important as adjusting power, has become clearly positioned in Japan's policy.
  - **"Basic Hydrogen Strategy"** (Dec. 2017)
    - World's first national strategy
    - 2050 vision : position H_2 as a new energy option (following RE)
    - Target : make H_2 affordable。
      ($3/kg by 2030 ⇒ $2/kg by 2050)
  - "Strategic Roadmap for Hydrogen and Fuel Cells" (revised in Mar. 2019) establishes approaches to achieving target

- International forum
  - **Hydrogen Energy Ministerial Meeting** (Oct. 2018. "Tokyo Declaration")
  - **G20 Ministerial Meeting** on Energy Transitions & Global Environment for Sustainable Growth (Jun. 2019)

- NEDO carries out R&Ds and demonstrations at each stage of H_2 production, storage, transportation, supply, and utilization.

Key Technologies to be Developed

Production
- Electrolysis System
- Gasification + CCS

→

Transportation
- Energy Carrier (LH_2, MCH, NH_3, etc.)

→

Use
- Fuel Cells (Mobility, Generation)
- H_2-fired Generation

Efforts related to Hydrogen energy (continued)

Establishing an Inexpensive and Stable Supply System

(1) **Liquefied hydrogen**

・Production of liquefied H_2 from brown coal in Australia and shipping to Japan
(**World's first liquefied H_2 carrier** launched in Dec. 2019)

(2) **Organic hydride**

・After extracted from natural gas in Brunei, H_2 is chemically bonded to toluene to form **methylcyclohexane (MCH)**, which is transported and stored at **ordinary temperature and pressure**. (Conventional tankers and oil tanks can be used)

Demonstration of "Power to Gas"

Item	Specification
Function	1) Hydrogen Production 2) Grid balancing
Input power of electrolysis	(Max.) 10MW (Rated) 6MW (Range) 1.5MW - 10 MW

・**The Fukushima Hydrogen Energy Research Field (FH2R)** opened in March 2020.
・Electrolysis is carried out at a **10 MW H2 production** facility (the world's largest), using PV.
・Adjusts the amount of H_2 in order to **balance between supply and demand** of the electric power system .

Explore more @ www.indiaesa.info

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