Overview of the draft of 7th Strategic Energy Plan

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Presentation outline

- What is Strategic Energy Plan?
- Changes in surrounding environment since the current 6th plan was formulated
- Highlights in each energy sector
- Energy and electricity demand outlook for 2040
- Issues for further policy developments
- Summary

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What is Strategic Energy Plan?

- Strategic Energy Plan (SEP) is formulated by the Japanese government for besically every three years based on the Basic Act on Energy Policy to outline the fundamental direction of Japan's energy policy.

- The first plan was provided in 2003. The existing plan is the 6th plan and was formulated in 2021. The Japanese government published the draft of the 7th plan in December 2024.

- The period for public comments for the draft plan has ended. The draft plan is expected to be approved by the Cabinet by the end of the current fiscal year.

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Major changes in surrounding environment

- Growing importance of **economic security**
  - Geopolitical risks in Russia/Ukraine and Middle East; stalled investments in fossil fuel sectors
- Expected **increase in power demand** in Japan
  - Newly emerging demand for AI, data center, semiconductor manufacturing, etc.
- Maintaining climate goal while seeking for **realistic approaches**
  - Widening gap between the expected GHG reduction and reality
- Integration of energy policy and **industrial policy**
  - Policies to link energy transition with strengthening national industrial competitiveness

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S+3E as the plan's fundamental principle

- **S+3E = Safety, Energy Security, Economic Efficiency, Environment**
  - The most important concept that has been consistently adopted since the first SEP.
  - "Ensuring safety as a top priority, while pursuing an optimal balance of energy security, economic efficiency, and environmental compatibility."

- The draft plan, while adopting the above principle, places **more weight on energy security, economic security, and economic and industrial policies**.
  - The frequency of the word "security" has doubled compared to the 6th plan.
  - Strong commitment to restraining the rise in costs associated with decarbonization.
  - The emphasis of the importance of decarbonized power sources for industrial competitiveness
  - Integrated implementation with the Japan's green transformation (GX)

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Energy efficiency improvement and demand-side policy

- Policy direction
  - Energy conservation remains important also for **resilience in energy supply structure to potential crises**.
  - **Economic rationality** needs to be considered in choosing options in the demand side.

- Energy Conservation
  - Development and utilization of cutting-edge technologies; efficiency improvements in data centers (DC); advanced equipment in factories; high-performance windows and heaters for building.
  - Review of the existing programs (top-runner; benchmarking)
- Reduction in fossil fuel use
  - Promoting energy use rationalization by both regulatory and incentivization measures
  - For passenger vehicles, 100% new sales will be electric vehicle by 2035; For small commercial vehicles, 100% of the vehicles will be electric vehicles or use decarbonized fuels by 2040.
  - Installation of 300,000 EV charging points by 2030.

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Expansion of decarbonized power supply sources

- Policy direction
  - A strong commitment to securing **sufficient decarbonized power sources** to achieve economic growth and strengthen industrial competitiveness.
  - Beyond a binary debate over renewable vs nuclear, the use of **both energies** will be maximized.
  - Enhancement of the **predictability of returns on investments**.

- Securing generation capacity
  - Phasing-out of inefficient coal power plants, newbuild/replacement of LNG-power plants, securing necessary fuel, review of capacity markets, consideration of reserve power systems.
  - Modernization of grid; attraction of large demand to near decarbonized power sources.
- Business Environment Development
  - To secure investments in expanding decarbonized power, favorable business environment needs to be established to secure necessary funds by maximizing the use of private capital.
  - Reviewing rules of wholesale market transactions

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Renewable energy

- Policy direction
  - **Maximizing the introduction** of renewable power generation while ensuring coexistence with local communities and minimizing the burden on citizens.
  - **Minimization of the overall integration costs** for society

- The draft plan explains issues for further adoption of renewable energy and provides the countermeasures to address them.

Issue	Countermeasures
Local communities	Strict business discipline; collaboration with local governments
Cost minimization	Utilization of auction such as FIT and FIP
Adapting intermittency	Inter-region grid development; utilization of storage batteries
Accelerated innovation and supply chain development	The introduction of perovskite solar cells; floating offshore wind power in EEZ; commercialization of next-generation geothermal technologies; and small and medium-sized hydropower
Disposal of used solar cells	Development of systems for proper disposal and recycling

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Nuclear power

- Policy direction
  - With safety as the top priority, the plan aims to **sustainably utilize nuclear power at the necessary scale**.
  - Promoting nuclear fuel cycle, decommissioning, and disposal of spent fuels

- Maximizing the use of existing reactors
  - With safety as the top priority, the **restart of reactors will be accelerated** through close collaboration between the government and industry.
- Development and Installation of next-generation innovative reactors
  - Next-gen reactor will be installed as a **replacement** of decommissioned reactor.
  - Contribution to local economy and understanding from local communities are a premise of such installation
  - Installation will be pursued while taking into account progress on the backend issues.
- Developing environment for continuous utilization and strengthening the supply chain and human resources

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Hydrogen and Biofuels

- Policy direction
  - Ensuring Japanese firms to **succeed not only in technology development but also in business**.

- Hydrogen and its derivatives (including ammonia, e-methane, e-fuels)
  - Contract for Difference (CfD) support for early-stage use cases.
  - Support for infrastructure development, rationalization of safety regulations.
  - Long-term decarbonized power source auction for the use in power generation
  - Integrated policies on regulation and support to advance cost reduction and expand utilization.
- Biofuels
  - Low-carbon gasoline with up to 10% bioethanol blending will be supplied by 2030 and low carbon gasoline with 20% bioethanol blending aims to be supplied by 2040.
  - Introduction of bio-derived fuels for SAF (sustainable aviation fuel) and automotive diesel.

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Energy demand outlook for 2040

- **Back casting approach** was adopted in making the energy and power demand outlook.
- Final energy consumption is expected to **decrease by around 15%** from 2022 to 2040.
- CO_2 emissions will **decline by around 70%** compared to 2013.
- Energy self-sufficiency will **improve to 30% to 40%**.

Final Energy consumption

	2022 Actual	2040 Oulook
Industry	140	140-150
Commercial	50	40-50
Residential	50	40-50
Transport	70	30-40
Total	**310**	**260-270**

- All units are million oil equivalent kL
- Outlook figures are approximate numbers.

Primary energy supply self sufficiency rate, CO_2 emissions

	2022 Actual	2040 Outlook
Renewable	70	110-130
Nuclear	10	50
Hydrogen	–	20
Gas	100	80-90
Oil and Coal	290	130-170
Total	**470**	**420-440**
Self suff. %	**12.6%**	**30-40%**
Energy CO_2	**960 mil t-CO_2**	**360-370 mil tCO_2**

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Electricity demand and generation outlook for 2040

- Electricity demand is expected to turn to an increase.
- Renewable will surpass thermal power, becoming the largest power supply source.
- The breakdown of thermal power is not specified.
- Generation of nuclear power will quadruple from 2022 to 2040.

Power demand

TWh	2022 Actual	2040 Outlook
Industry	320	380-410
Commercial	310	290-300
Residential	260	230-260
Transport	20	40-100
Total	**900**	**900-1,100**

Power generation

	2022 Actual	2040 Outlook
Renewable	21.8%	40-50%
Solar	*9.2%*	*23~29%*
Wind	*0.9%*	*4~8%*
Hydro	*7.7%*	*8~10%*
Geothermal	*0.3%*	*1~2%*
Biomass	*3.7%*	*5~6%*
Nuclear	5.6%	20%
Thermal	72.6%	30-40%
Total	**1,000 TWh**	**1,100-1,200 TWh**

- Outlook figures are approximate numbers.

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Risk case scenario (Technology progress scenario)

- Besides the base case, **a risk scenario** is presented, assuming a situation where the development of various decarbonization technologies will not progress as expected.
  - The forecasted LNG demand in the risk case is 74 million tonnes.

		Base case in 2040	Risk case in 2040
Primary energy supply		**420-440**	**430**
	Renewable	110-130	90
	Nuclear	50	50
	Hydrogen	20	10
	Natural gas	80-90	110
	Oil	90-120	120
	Coal	40-50	60
Final energy consumption		**260-270**	**270**
CO2 emissions from energy		**360-370 million tCO_2**	**540 million tCO_2**

- All units are million oil equivalent kL; Outlook figures are approximate numbers.

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Major areas for further policy development

- Improvement of the **predictability of investment in decarbonized power sources**
- Discussions on **kW (generation capacity)** in addition to kWh (generation)
- Exploring the **optimal mix of integration measures** to accommodate intermittency caused by the rising share of renewable energy.
- Development of **innovative energy conservation** technologies.
- **Mid-to-long-term policy measures to ensure hydrogen and CCUS to be adopted** in sustained manner beyond incentivizing policies
- How to define and enhance of the **industrial competitiveness**

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Summary

- The current draft of SEP adopts a balanced approach based on the traditional "S+3E" principle. Compared to the previous plan, the draft places **more weight in energy security and economic efficiency**, reflecting the changes in surrounding environment.

- The draft adopts a **back-casting approach** in making demand outlook for 2040 and presenting **multiple scenarios**. The contents and implications of **the risk case scenario** are also important.

- In the power generation sector, the plan anticipates **an increase in electricity demand.** The plan aims to maximize the introduction of **renewable energy as the largest power source** while **sustainably utilizing nuclear power at the necessary scale**.

- The SEP outlines the directions for Japan's energy policies, and the development of specific policies in each sector will be future actions.

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Supplemental slides

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Chapter structure of SEP

I. Introduction
II. Progress since the accident at TEPCO's Fukushima Daiichi Nuclear Power Plant
III. Changes in circumstances since the 6th SEP
IV. Principle of energy Policy (S+3E)
V. Policy direction toward 2040
VI. Innovations for achieving carbon neutrality
VII. Communication with the Public

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Thermal power generation and its decarbonization

- Policy direction
  - While **maintaining the necessary generation capacity (kW)** for stable supply across all thermal power sources, **the output (kWh) thermal power plants will be reduced**.
  - **Institutional measures to maintain low-operating kW and a reserve power system** for emergencies

- How to utilize thermal power generation?
  - Phasing out of inefficient coal-fired power plants toward 2030.
  - Maintain and replace LNG power plants with the premise of future decarbonization through long-term decarbonized power generation auction
  - Secure long-term LNG contracts for quantities sufficient to ensure stable power supply.
  - Decarbonization of thermal power through the use of hydrogen, ammonia, and CCUS.

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Fossil fuel resources

- Policy direction
  - Efforts will be made in areas such as resource diplomacy, domestic and international resource development, diversification of supply sources, crisis management, and strengthening and maintaining the existing supply chains of petroleum products.
- Natural Gas
  - The self-development ratio of oil and gas to over 50% by 2030 and over 60% by 2040.
  - Development of indicators to assess the stability of LNG procurement and link them to policy
  - Measures to ensure stable LNG supply such as Strategic Buffer LNG, development of storage capacity, and promotion of operational flexibilities
  - Maintain the target of 100 million tons of LNG handling volume by Japanese firms annually.
  - Consider procurement methods such as relaxing destination clauses, flexible use of tank facilities in Asia, and joint procurement.
- Oil
  - Maintenance of the current level of oil stockpiles.
  - Development of service stations as “comprehensive energy hubs.”

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CCUS, CDR, and Critical minerals

- CO_2 Capture, Utilization, and Storage (CCUS) / Carbon Dioxide Removal (CDR)
  - Development of business support scheme; technologies development to reduce costs, and work on storage site development.
  - Enhancement of the competitiveness of Japanese firms.
  - Technological development for CCU/carbon recycling, technology development utilizing the research base in Osaki-Kamijima and fostering the inter-industry collaboration on CO_2 supply and demand.
  - Establish markets, and accelerate technological development, institutional arrangements for transferring removal values between countries of CDR.

- Critical Minerals
  - To ensure stable supply, efforts will be made to secure stockpiles, diversify supply sources, and develop domestic marine mineral resources.
  - A target is set to achieve an 80% self-sufficiency rate for base metals by 2030.

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Innovation to realize carbon neutrality

- Policy direction
  - Connecting innovation to business by sharing a clear international strategy among industry, academia, and government
  - By utilizing GI Fund and GX Transition Bonds, discontinuous innovation will be supported.
  - Development of overseas markets and advance international standards
- Specifically, innovation in the following 13 fields will be promoted:

Renewable (Perovskite battery; floating wind power)	**Storage battery** (Nextgen battery, reuse, recycle)
Nuclear (Next gen reactors, SMR)	**Resource circulation** (Use of recycled materials)
Power network （DR Ready products, batteries）	**Bio-manufacturing** (Product from unused biomass)
Nextgen energy (Electrolysis, e-fuel, H_2 combustion)	**Food/agriculture** (Electrification of facilities)
CCUS (CO_2 sequestration、carbon-recycling)	**Infrastructure** (Electrification, hydrogen, AI, IoT)
Industry (H_2 direct reduction for steel making, electric arc furnace, feedstock decarbonization)	**Community** (Self-consumption type houses/buildings, demand response)
Semiconductor (Photovoltaic fusion technology, AI-driven optimization.)	

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Numerical targets for renewable power generation

Item	Targets
Roof-top solar power	Installation of rooftop solar power generation systems in approximately 50% of applicable buildings and structures by 2030, and in 100% of applicable buildings and structures by 2040.
Perovskite solar battery	Cost reduction to 20 yen/kWh by 2025, 14 yen/kWh by 2030, and 10–14 yen/kWh or lower by 2040. The goal is to build gigawatt-scale capacity before 2030, with an introduction target of approximately 20GW by 2040.
Offshore wind power	10GW installation in 2030; 20GW to 45GW installation including floating offshore wind power in 2040.

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Numerical targets in hydrogen and its relelated fuels

Item	Targets
Supply cost of Hydrogen (on CIF basis)	30Yen/Nm^3 in 2030 20Yen/Nm^3 in 2050
Demand size of Hydrogen	3 million t-H_2/year in 2030 12 million t-H_2/year in 2040 20 million t-H_2/year in 2050
Supply cost of Ammonia	In the range of 10Yen/Nm^3-H_2eq in 2030
Demand size of Ammonia	3 million t-NH_3/year in 2030 (equivalent to 500,000 t-H_2/year) 30 million t-NH_3/year in 2050 (equivalent to 5 million t-H_2/year)
Decarbonization of city gas	E-methane or biogas equivalent to 1% of the supply volume will be injected into pipelines, and together with other measures, achieve a 5% carbon-neutralization of gas in 2030.

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