

# Thoughts on Natural Gas in Japan's Energy Strategy

Taiju Morimoto, Energy Data and Modelling Center

## 1. Positioning of natural gas in the 6th SEP

Discussions towards the formulation of the 7th Strategic Energy Plan (SEP) have begun. In this paper, I would like to focus on natural gas, which is expected to play a role in the transition to carbon neutrality, taking up what to expect from natural gas in the 7th SEP, based on the positioning of natural gas in the 6th SEP and the current situation.

Chart 1 shows natural gas supply and demand in Japan in FY2022 and projections under the 6th SEP, the IEEJ Outlook 2024 of the Institute of Energy Economics, Japan (IEEJ), and the World Energy Outlook (WEO) 2023 of the International Energy Agency (IEA).<sup>1</sup> The IEEJ and IEA scenarios presented in this paper suggest that natural gas demand will exist even in 2050, including that in the power generation sector, although projections vary. For 2030 in the transition to 2050, the 6th SEP projection is characteristically different from other projections.

Specifically, the primary natural gas supply projection for 2030 in the 6th SEP is relatively high, somewhere between those in the IEEJ Reference Scenario (REF) and Advanced Technologies Scenario (ATS), while the 6th SEP natural gas power generation projection is as low as the projection in the IEA's Announced Pledges Scenario (APS). The 6th SEP was formulated when the 2050 carbon neutrality goal gained global momentum. In particular, renewable energy such as solar photovoltaics and wind was spotlighted for the power generation sector, leading to a power generation mix in which shares for natural gas and other fossil fuels decline toward the accelerated expansion of renewable energy shares (Chart 2). As a result, the position of natural gas in Japan's energy mix for 2030 in the 6th SEP receded relatively.

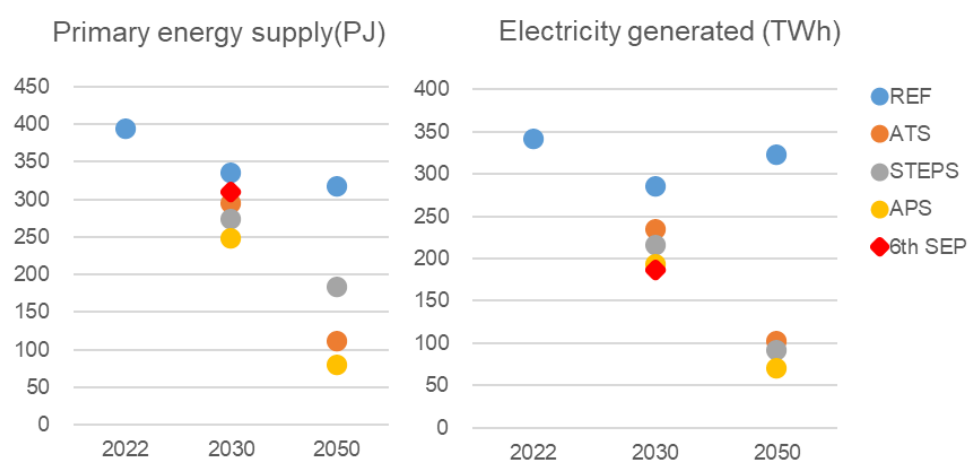


Chart 1: Comparison of primary natural gas supply<sup>2</sup> and electricity generated from natural gas in Japan  
 (Sources: Prepared from the Comprehensive Energy Statistics, IEEJ Outlook 2024, IEA World Energy Outlook 2023, 6th SEP)

<sup>1</sup> Citing four scenarios: the Reference Scenario (REF) and Advanced Technologies Scenario (ATS) of the IEEJ Outlook 2024, and the Stated Policies Scenario (STEPS) and the Announced Pledges Scenario (APS) of the IEA WEO 2023

<sup>2</sup> As for primary natural gas supply, figures in the IEEJ Outlook 2024 and IEA WEO 2023 were simply converted into high calorific values for comparison in line with the Comprehensive Energy Statistics and Sixth SEP.

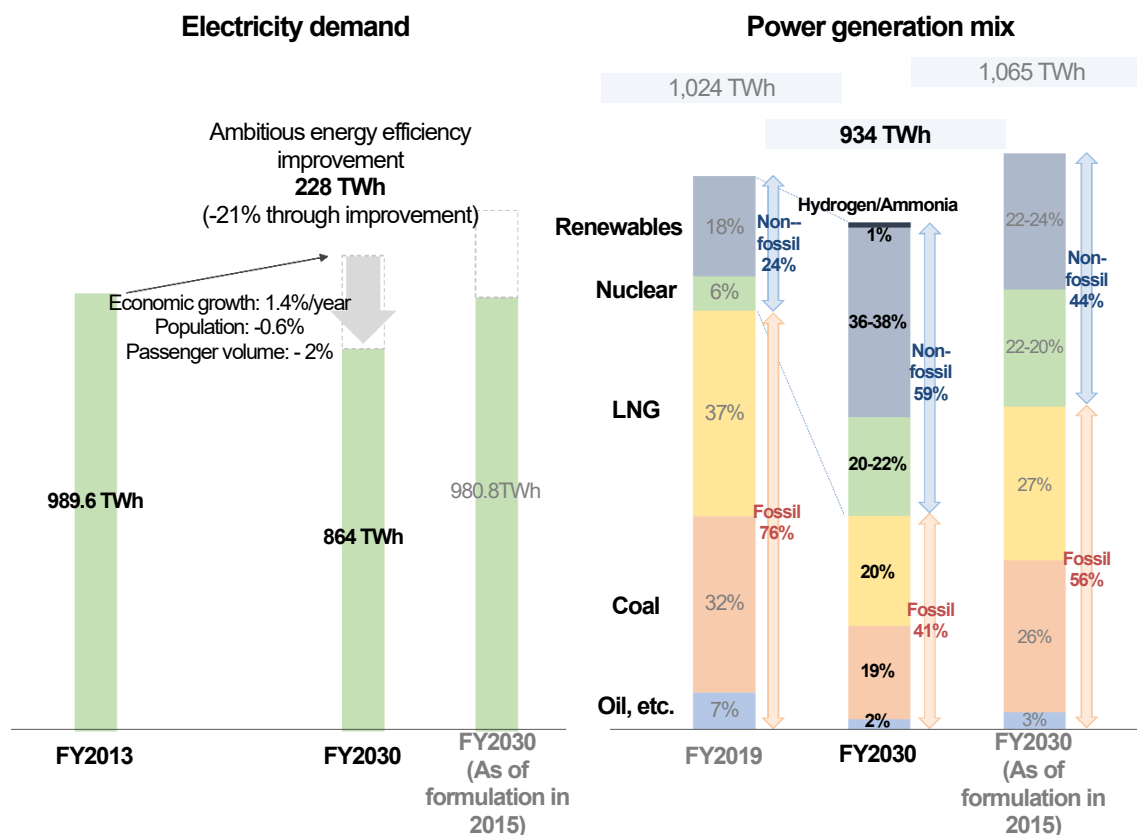


Chart 2 Electricity demand and power generation mix under 6th SEP  
(Source: “Outlook for Energy Supply and Demand in FY2030”)

## 2. Current natural gas demand trend

Chart 3 shows changes in natural gas demand since FY2010. This indicates that natural gas demand since FY2010 has been affected by changes in power generation natural gas demand. Power generation natural gas demand grew significantly to cover nuclear power generation losses caused by the shutdown of nuclear power plants in the wake of the 2011 Great East Japan Earthquake. However, it peaked at 3,328 PJ in FY2014 and has been on a downward trend since then. In FY2022, it decreased to 2,304 PJ, below the FY2010 level before the Great East Japan Earthquake. This downtrend is apparently attributable to the restart of nuclear power plants and the expansion of solar and other renewable energy, as well as a decline in electricity demand (Chart 4).

Chart 4 for a comparison between power generation mix shares for natural gas and coal shows that the natural gas share posted a decrease of 9.2 percentage points from the peak of 43.0% in FY2014 to 33.8% in FY2022, while the coal share registered a slower decline of 3.4 points from the peak of 34.2% in FY2015 to 30.8% in FY2022. This may be because relatively inexpensive coal-fired power generation has increased as natural gas prices have continued to soar due to the acceleration of global decarbonization efforts and Russia's invasion of Ukraine after the announcement of the 6th SEP. According to an advisory panel report,<sup>3</sup> installed power

<sup>3</sup> 74th Meeting of the Basic Policy Subcommittee on Electricity and Gas, “Future Thermal Power Generation Policy”  
[https://www.meti.go.jp/shingikai/enecho/denryoku\\_gas/denryoku\\_gas/pdf/074\\_10\\_00.pdf](https://www.meti.go.jp/shingikai/enecho/denryoku_gas/denryoku_gas/pdf/074_10_00.pdf)

generation capacity decreased by about 3 million kW from FY2016 to FY2023 for natural gas, while increasing by about 9 million kW for coal. Although the utilization of natural gas, known as the lowest-carbon fossil fuel, has been required for the transition to carbon neutrality, natural gas has become a power source that is easy to reduce due to relative cost hikes.

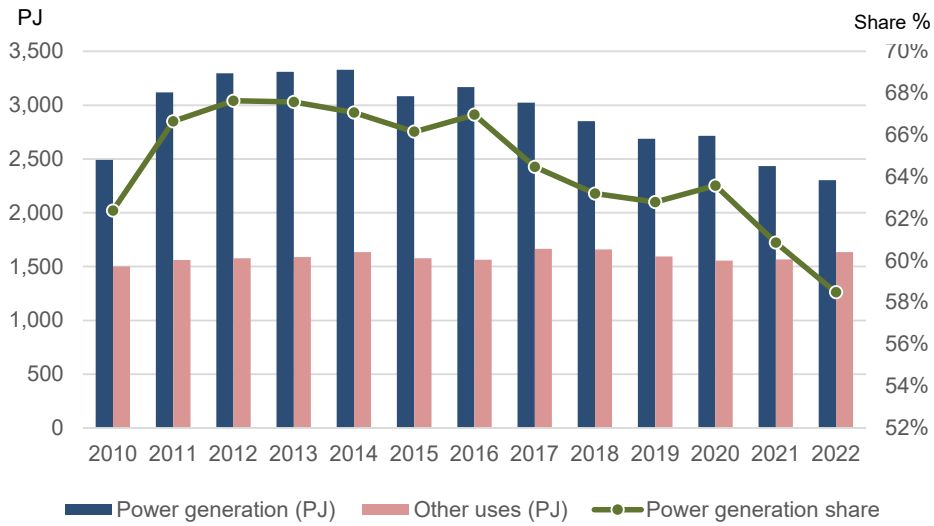


Chart 3: Domestic demand for natural gas and its share of power generation  
 (Source: Prepared from the Comprehensive Energy Statistics)

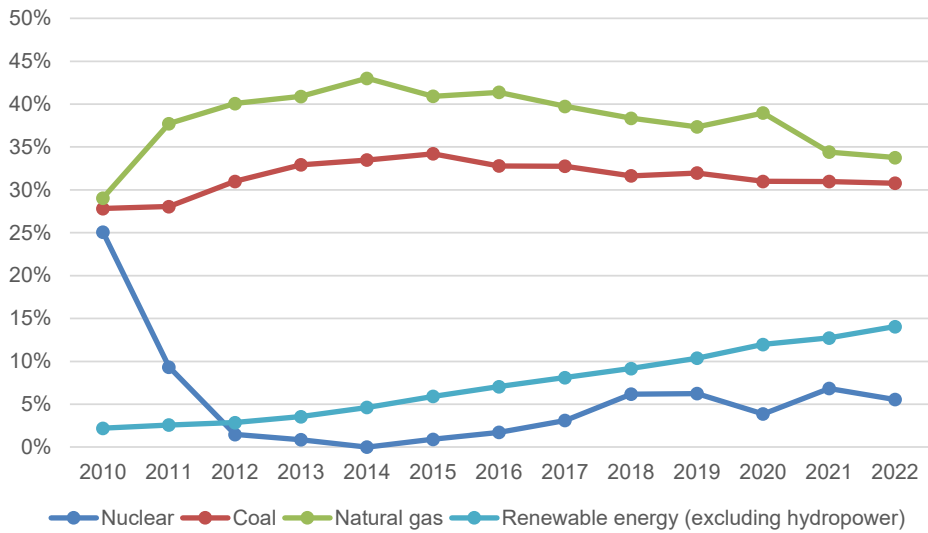


Chart 4: Power generation mix (excerpt)  
 (Source: Prepared from the Comprehensive Energy Statistics)

### 3. OCCTO assumption of natural gas-fired power generation

The Organization for Cross-regional Coordination of Transmission Operators, Japan (OCCTO), has released the Aggregation of Electricity Supply Plans for FY2024,<sup>4</sup> indicating installed power generation capacity and transmission-end electricity supply for each power source through FY2033. According to Chart 5 for excerpts from the aggregation for natural gas and coal, it is assumed that installed capacity for natural gas-fired power plants will increase toward FY2033, while their transmission-end electricity supply decreases. On the other hand, transmission-end electricity supply from coal-fired power plants is assumed to exceed supply from natural gas-fired power plants from FY2024 to FY2033, although installed capacity for coal-fired plants will decrease. Transmission-end electricity supply is estimated under the assumption that operational priority will be given to lower-cost power sources. As a result, the capacity factor for natural gas-fired power plants is estimated to plunge from 42.9% in FY2023 to 34.0% in FY2033. While it is predicted that it will become even more difficult to recover costs for natural gas-fired power plants, the recent supply-demand trend shown in Section 2 indicates that it is doubtful whether capital investment in natural gas power generation capacity will be carried out as planned.

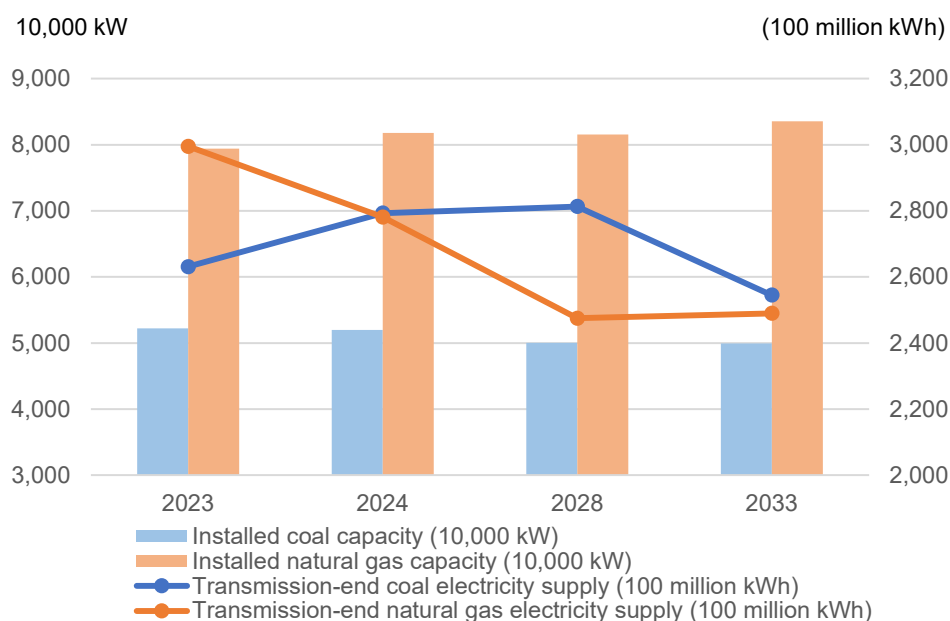


Figure 5: Assumed installed power generation capacity and transmission-end electricity supply for natural gas-fired and coal-fired power plants

(Source: Prepared from the OCCTO, “Aggregation of Electricity Supply Plans for FY2024”)

<sup>4</sup> OCCTO, “Aggregation of Electricity Supply Plans for FY2024”  
[https://www.occto.or.jp/kyoukei/torimatome/files/240329\\_kyokei\\_torimatome.pdf](https://www.occto.or.jp/kyoukei/torimatome/files/240329_kyokei_torimatome.pdf)

#### 4. Current challenges and expectations for the 7th SEP

There have been various comments on the description of natural gas in the 6th SEP since its formulation. In particular, experts pointed out that the significant decline in the natural gas share of the power generation mix in FY2030 from the current level could have a negative impact on natural gas procurement after the formulation of the 6th SEP.<sup>5</sup> In fact, Russia's invasion of Ukraine in early 2022 and the subsequent global surge in natural gas spot and short-term contract prices have once again highlighted the importance of low-cost and stable long-term contracts for natural gas.

As noted in Section 2, the natural gas share of the power generation mix has declined significantly in the past. As described in Section 3, it is assumed that the capacity factor of natural gas-fired power plants is assumed to decrease from the current level by around FY2030 in line with a decline in natural gas-fired power generation, if based on the merit order. Demand for natural gas for power generation seems to continue to decline. It may seem strange that natural gas, which emits less carbon dioxide than coal, maybe the first to become subject to the reduction of consumption at a time when Japan pursues carbon neutrality. After all, costs seem to be a major challenge. Although policy measures have recently been put in place to recover costs through long-term decarbonized power auctions,<sup>6</sup> facilities subject to the auctions are required to have hydrogen and other decarbonization technologies in the future. Therefore, it is important to develop technologies for the decarbonization of natural gas-fired power plants to secure their utilization.

My impression has so far been that there is a lack of reality-based discussion on how to treat natural gas and other fossil fuels during the transition to carbon neutrality and how to seamlessly transition to carbon neutrality based on reality. Therefore, the following points are considered important for the 7th SEP.

The first point is to specify the use of natural gas during the transition period. It is important to secure and maximize the economically rational and stable use of natural gas as the most low-carbon fossil fuel in order to achieve carbon neutrality. To this end, a well-balanced procurement portfolio is necessary. In particular, medium- to long-term contracts at low prices are of great significance for securing a stable supply of natural gas in Japan. To natural gas-producing countries, Japan should demonstrate its stance on utilizing natural gas during the transition period and continuing government support for business operators' natural gas procurement.

The second is to promote international efforts to decarbonize existing natural gas-fired power plants. Such efforts currently include a transition from co-firing natural gas with hydrogen to future hydrogen-only combustion. It is necessary to emphasize progress in such efforts after the 6th SEP, the current state of relevant international cooperation, and future prospects. In particular, it is important to clearly state that Japan will work with current natural gas exporters such as North America, the Middle East, and Australia to develop and introduce technologies for cleaner and decarbonized natural gas.

The third point is how to present the future outlook based on the two points above. When carbon neutrality is achieved, natural gas may be completely replaced by zero-carbon energy. Given that the current and future stable supply is the top energy policy priority, however, it will be difficult to smoothly achieve the replacement. It is important for the 7th SEP to pave a seamless way for a stable energy supply from the transition period to carbon neutrality achievement. The 7th SEP will discuss energy supply and demand, and a power generation mix for FY2040. A major challenge for the 7th SEP may be how to present a roadmap towards carbon neutrality in

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<sup>5</sup> Takeo Kikkawa, "Inevitable Revision of the Strategic Energy Plan"  
<http://www.world-economic-review.jp/impact/article2777.html>

<sup>6</sup> OCCTO, "What is a Long-Term Decarbonized Power Auction?"  
[https://www.occto.or.jp/capacity-market/decarbonation\\_know](https://www.occto.or.jp/capacity-market/decarbonation_know)

addition to measures for reducing fossil fuel consumption, based on changes and discussions after the 6th SEP formulation. The next SEP should provide a scenario to indicate how natural gas and other fossil fuels would be used and decarbonized. It may be effective to provide multiple scenarios.

The 7th SEP will be prepared on the premise of changes in the global situation after the formulation of the 6th SEP and future uncertainties. I look forward to future discussions on how to chart a path towards carbon neutrality by 2050 on the premise of a stable supply of natural gas and other energy sources that are indispensable to society.

Contact: [report@tky.ieej.or.jp](mailto:report@tky.ieej.or.jp)