The Road to Carbon Neutrality and the Issues of the 6th Strategic Energy Plan

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The confusion caused by the new reduction targets

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Prime Minister Suga Yoshihide announced a policy of realizing carbon neutrality and reducing Japanese greenhouse gas emissions to a "net zero" by 2050 in his policy speech immediately after his inauguration on October 26, 2020. He also presented the target of reducing greenhouse gas emissions by 46% by FY2030 compared with FY2013 at the Leaders Summit on Climate, hosted by US President Joseph R. Biden, Jr. on April 22, 2021.

This new target of a 46% reduction is a considerable upward adjustment of the previous target. At COP21 (The 21st Conference of the Parties to the United Nations Framework Convention on Climate Change), which adopted the Paris Agreement in 2015, the Japanese government made the international commitment to "reduce greenhouse gas emissions by 26% by FY2030 compared with FY2013." This was also something they repeatedly stated right up until the Leaders Summit on Climate.

This 26% reduction target was formulated ahead of COP21 in 2015 and conformed with the current prediction for the composition of power sources and the primary energy usage composition as ratified in the 5th Strategic Energy Plan of 2018. As such, the setting of this 46% reduction target that is such a considerable upward adjustment meant that the prediction for the composition of power sources and the primary energy usage composition has to be revised as well, but that has run into trouble.

The immediate cause of this trouble is that it overturned the procedure as it has been, namely (1) to first predict the composition of power sources and the primary energy usage composition and then (2) to make an international announcement of our greenhouse gas reduction target based on that. This time, the political factor of pressure from the Biden administration played a big part in the decision to adopt the 46% reduction target. As a consequence, the prediction for the composition of power sources and the primary energy usage composition has to be "adjusted" so that it is consistent with the new target. This is why the policy authorities became so confused.

The 6th Strategic Energy Plan as a way to get consistency

It was not until July 21 2021 that the responsible agency, the Ministry of Economy, Trade and Industry (METI), was able to propose a rough draft of predicted composition of power sources in FY2030 that was adjusted to harmonize with the 46% reduction target (see Table 1), doing so in the Strategic Policy Committee of the Advisory Committee for Natural Resources and Energy (hereinafter, "the Strategic Policy Committee") that was responsible for formulating the next (6th) Strategic Energy Plan. After that, the Strategic Policy Committee approved that draft with a majority at a meeting on August 4, 2021.

However, this draft came to have a number of problems, partly because it was forced to be consistent with the new target. At the August 4 meeting, there was no "unanimous" vote as with regular council cases and a majority vote was used because I, a member of the committee, objected. The reason for my objection was the following three issues I saw with the draft.

Table 1: The prediction for the composition of power sources in FY2030 and why they are problematic

Power sources		Current (the 5th Strategic Energy Plan)	Proposed revision (the 6th Strategic Energy Plan)	Problems
Zero-emission power sources	Renewable energy	22-24%	36-38%	Difficult to achieve
	Nuclear power	20-22%	20-22%	Difficult to achieve
	Hydrogen / ammonia	———	1%	
	(subtotal)	(44%)	(59%)	(Difficult to achieve)
Thermal power generation	LNG	27%	20%	Obstacles for stable supply and global warming measures
	Coal	26%	19%	Obstacles for stable supply and reducing costs
	Oil	3%	2%	
	(subtotal)	(56%)	(41%)	(use of public funds due to overachievement)
Total		100%	100%	———

A ratio of renewable energy and nuclear power generation that is difficult to realize

The first is the doubts that exist about the feasibility of the ratio of renewable energy power generation that has been set so high.

In fact, the Strategic Policy Committee had charted out a direction of increasing the current ratio of renewable energy power generation at 22–24% to around 30% in the FY2030 composition of power sources, based on solid evidence, at the meeting on April 13, 2021. Yet, when the new reduction target was defined as 46% nine days later, an FY2030 ratio of renewable energy power generation at 30% was deemed insufficient, so it had to be increased to 36–38% in order to be consistent with the new target. In other words, they had no choice but to increase the ratio of renewable energy power generation by another 6–8% without any clear grounds. As such, it is only natural that serious doubts would arise about the feasibility of this "adjusted" prediction for the composition of power sources.

In order to boost the ratio of renewable energy power generation so much, the ratios of other power/energy sources have to be reduced quite a bit. If we look at nuclear power as one of the other power sources, the level of "nuclear power ratio 20–22% in FY2030" in the current prediction was also kept in the draft for the 6th Strategic Energy Plan. At the meeting of the Strategic Policy Committee on July 13, 2021, METI indicated that it would be possible to achieve "nuclear power ratio 20–22% in FY2030" if a facility utilization rate of 80% is attained in twenty-seven reactors, which includes not only the ten currently in operation, but also the seven that have yet to start but for which permission from the Nuclear Regulation Authority (NRA) has been obtained as well as ten others that the NRA is currently deliberating on. However, if we take a realistic viewpoint, the number of nuclear reactors up and running in 2030 is likely not to exceed twenty even if we are generous and the facility utilization rate will probably struggle to make it over 70%. To begin with, it is possible to raise the criticism that including all the reactors currently under deliberation by the NRA is something that infringes on their independence.

In reality, there is no expectation of realizing "nuclear power ratio 20–22% in FY2030" at all. That is, the normal thing to do would have been to reduce the nuclear power ratio, but since the government has various political intentions, such as making arrangements for the municipalities in which nuclear power facilities are located, the nuclear power ratio in the prediction for the composition of power sources in FY2030 included in the 6th Strategic Energy Plan also was not decreased but kept at the current level. The fact that this unrealistic nuclear power ratio was kept for political reasons is the second problem with this prediction of the composition of power sources that is part of the 6th Strategic Energy Plan draft.

Concerns about excessive coal reductions

Because the nuclear power ratio was kept, the ratios reduced in the prediction for the composition of power sources were for thermal power generation. The third problem with the prediction of the composition of power sources in the 6th Strategic Energy Plan draft is that the thermal power generation ratio has been excessively reduced to the extent that it raises serious concerns in terms of energy policy.

With regard to coal, which is one of the energy sources related to thermal power generation, there were already plans to reduce the ratio somewhat. This is because METI worked out a policy in July 2020 of fading out inefficient coal-fired power generation.

Table 2 shows different types of coal power. This table shows that Japanese coal power generation can be roughly divided into inefficient coal-fired power generation and high-efficiency coal-fired power generation according to differences in generation efficiency.

According to METI's explanations as of July 2020, if inefficient coal-fired power generation is abolished and we shift to high-efficiency coal-fired power generation in accordance with government policy, the coal-fired power ratio in the FY2030 composition of power sources will be about 20%. However, as a result of seeking consistency between the 46% reduction target for greenhouse gas emissions and the prediction of the composition of power sources in the 6th Strategic Energy Plan draft, the coal-fired power ratio for FY2030 was changed to 19%, thus falling

below 20%. Moreover, the coal-fired power ratio in the prediction for FY2030 primary energy usage composition was also reduced by 6% from 25% in the current plan to 19%. The range of ratio reduction for coal exceeded the appropriate range. If coal-fired power is shrunk excessively, it will create obstacles for stable energy supply and reducing energy costs.

Table 2: Types of coal-fired power and their power generation efficiency

Efficiency	Method of generation	Overview	Generation efficiency	Vapor pressure/temperature
Inefficient	Subcritical pressure (SUB-C)	Steam turbine power generation, old type.	38% or lower	221 bar or lower
	Supercritical pressure (SC)	Steam turbine power generation, mainstream in developing countries.	About 38-40%	More than 221 bar
High-efficient	Ultra-supercritical pressure (USC)	Steam turbine power generation, mainstream in Japanese new facilities. Increased efficiency through high-temperature and high-pressure vapor.	About 41-43%	More than 221 bar, 593°C or higher
	Integrated coal Gasification Combined Cycle (IGCC)	Technology that generates power by gasifying and burning coal. Gas turbine power generation + Steam turbine power generation.	About 46-50%	Gas temperature 1300°C or higher
	Integrated coal Gasification Fuel Cell combined cycle (IGFC)	Triple integrated power generation that combines fuel cells with IGCC.	About 55%	Gas temperature 1300°C or higher

Note: 1 bar≒1 atm.
Source: Agency for Natural Resources and Energy, METI "What to do about inefficient coal-fired power generation? Fade-out initiatives," November 6, 2020. https://www.enecho.meti.go.jp/about/special/johoteikyo/hikouritu_sekitankaryoku.html (Japanese only)

Following the shutting down of all nuclear power plants and due to the accident at the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plant in 2011 and their subsequent long-term suspension of operations, eight of nine major power companies have been forced to raise power charges. Of these, Kyushu Electric Power and Kansai Electric Power subsequently restarted their reactors and lowered power charges. By contrast, Chugoku Electric Power, which has a high proportion of coal power, has not raised its charges from the Fukushima accident until today. Despite their Shimane Nuclear Power Station having been shut down long-term and not having been restarted, they are able to keep the charges down. This is a straightforward indication that coal power is an economically excellent power source. This is the reason why excessively reducing the coal power ratio will "create obstacles for stable energy supply and reducing energy costs."

Reducing natural gas has a negative effect on procurement

Another point to consider is that reducing the ratio of thermal power generation affected not only coal but also natural gas. The current 5th Strategic Energy Plan apparently advocates a "shift to natural gas," but it actually predicts that natural gas demand will shrink by more than 20% by FY2030 compared to 2018 when the plan was formulated, thus putting a damper on this "shift to natural gas."

When formulating the 6th Strategic Energy Plan, the ratio of liquefied natural gas (LNG) in the predicted FY2030 composition of power sources was further reduced to achieve consistency with

the 46% reduction target for greenhouse gas emissions. More specifically, it was a reduction to 20%, which is 7% lower compared to the 5th Strategic Energy Plan. Meanwhile, unlike the case of coal, the natural gas ratio in the FY2030 prediction for primary energy usage composition was kept at 18%. The argument is that the use of natural gas is shrinking in power generation, while it is expanding in non-power areas. This argument may be considered correct if we consider how differences in CO_2 emissions per unit of heat can lead to a greenhouse gas emissions reduction effect through the fuel shift from oil and coal to natural gas in the period leading up to 2030.

However, there is one fact that we must not overlook here. It is that although the ratio was kept the same because of a considerable downward adjustment of the overall prediction for the amount of primary energy supply in the 6th Strategic Energy Plan, the predicted annual natural gas demand for FY2030 has gone down to less than 55 million tons, which is 8 million tons less than in the 5th Strategic Energy Plan.

This will inevitably have a negative impact on LNG procurement. Amid intensifying competition over LNG in the world, rival countries will likely point to the contents of Japan's 6th Strategic Energy Plan to gas-producing countries to gain a competitive advantage over Japan in LNG procurement. That is, there is a major risk that the 6th Strategic Energy Plan makes the future of natural gas in Japan even bleaker. This might perhaps be considered the biggest problem with the 6th Strategic Energy Plan.

If there is a negative effect on LNG procurement, this will not simply create obstacles for stable energy supply. It will also have a bad effect on the important reduction of greenhouse gas emissions. This is because, as I already mentioned, "differences in CO_2 emissions per unit of heat can lead to a greenhouse gas emissions reduction effect through the fuel shift from oil and coal to natural gas in the period leading up to 2030."

The issue is not the "46% reduction target" but past misgovernment

With these points in mind, it is easy to get the impression that the 46% reduction target for greenhouse gas emissions is the cause of all these problems. However, such a viewpoint is entirely misdirected. The 46% reduction target itself is consistent with the "1.5 degree Celsius scenario" (1.5DS) that belongs to the Paris Agreement and is something that should be lauded.

To be clear, the issue is not the 46% reduction target but the current prediction of the composition of power sources whose nuclear power ratio is too high and renewable energy power ratio too low. I think the severity of the problems we are now facing would have been considerably decreased if they had included accurate values like "nuclear power 15%, renewable energy power 30%" in the prediction for the FY2030 composition of power sources when the current prediction for the composition of power sources was formulated in 2015 or at least when the 5th Strategic Energy Plan ratified it in 2018.

We still have time until 2050

Japan had previously fallen behind the rest of the world in terms of responses to climate change issues, but we have caught up target-wise by pledging our intention to become "carbon-neutral by

2050" and "reduce greenhouse gas emissions by 46% by FY2030 (compared with FY2013)." However, when it comes to policy measures, the past misgovernment of the 5th Strategic Energy Plan and so forth will likely keep us from catching up with the rest of the world by 2030. Just like we reached the reduction target of the Kyoto Protocol adopted in 1997 by covering the missing bits with emissions trading, there is a high probability that public funds will be used to reach the 46% reduction target.

Nevertheless, we should not just despair. Even if we cannot make it by 2030, we still have plenty of time until 2050. Even if it is impossible for Japan to keep using coal like we are now, we may pin great hope to methods for replacing coal-fired thermal power generation with ammonia thermal power generation as well as the method called Carbon dioxide Capture, Utilization and Storage (CCUS), which collects CO_2 before it enters the atmosphere at thermal power generation plants and either reuses or stores it. If we mobilize such policies, then it is very possible that we can become "carbon-neutral by 2050." Now is the time for us as Japanese to fulfill our responsibility as global citizens.

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