

Analysis of Japan's government policy to shut down or mothball 100 "inefficient" coal power units:

Government's proposed policy would extend the life of coal, not phase it out

July 6, 2020

Kiko Network

On July 3, 2020, Hiroshi Kajiyama, Minister of Economy, Trade, and Industry, announced the government's policy to consider the shut-down or mothballing of 100 coal-fired power generation units throughout Japan, representing 90% of the country's "inefficient" coal-fired power generation facilities. This report analyzes the government's policy based on the current situation of coal-fired power plants in Japan.

1. Status of Coal-Fired Power Plants¹

According to information gathered independently by Kiko Network (**Table 1**), there are currently **129 existing coal-fired power generation units (47,155MW) in Japan, with 17 new units in the pipeline (9,924 MW, 3 small-scale and 14 large-scale)** (excluding in-house power generation and units less than 30 MW).²

These include the following:

- The coal-fired power plants considered to be "inefficient" include 78 sub-critical pressure [Sub-C] units (10,612 MW) and 20 supercritical pressure [SC] units (13,322 MW), totaling 98 units (23,934 MW) in all. Additionally, 3 units (524 MW) are currently under construction.
- There are 31 "high-efficiency" coal-fired power units (ultra-supercritical pressure [USC] and integrated coal gasification combined cycle [IGCC]) (23,221 MW) in operation, and preparations are underway to put 14 more planned units (9,400 MW) into operation.

¹ There are no comprehensive published statistics that cover the status of every existing coal-fired power plant in Japan. In particular, there is little information available on in-house coal-fired power generation. Even with the data available, because the utilization rate of each power generation facility is not disclosed, the extent to which old coal-fired power generation equipment is operating is difficult to determine other than information from the power suppliers operating the units and the Ministry of Economy, Trade and Industry, the supervisory agency.

² The difference with the government's "140 units" is unclear. It is possible that some units have not been identified, or that small-scale units of less than 30 MW not included here are included by the government.

Table 1. Status of coal-fired power plants (units 30 MW or greater, excluding in-house power generation)

as of June 2020

	Coal-fired Power Plants	No. of Units	Installed Capacity (MW)	Notes
Existing	Total existing units (excluding in-house units)	129	47,155	
	“Inefficient” units	98	23,934	Shut down or mothball (excluding Hokkaido and Okinawa)
	Subcritical pressure (Sub-C)	78	10,612	
	Supercritical pressure (SC)	20	13,322	
“High-efficiency” units	31	23,221	Eligible to continue operating	
	Ultra-supercritical pressure (USC)			
	Integrated coal gasification combined cycle (IGCC)			
New	Total new units (under planning or construction)	17	9,924	
	“Inefficient” units	3	524	Shut down or mothball (excluding Hokkaido and Okinawa)
	Subcritical pressure (Sub-C)			
	“High-efficiency” units	14	9,400	Planned expansion
	Ultra-supercritical pressure (USC)			
	Integrated coal gasification combined cycle (IGCC)			

Source: Kiko Network

2. What the government’s policy for the shut-down or mothballing of 100 units means

(1) Number of units and installed capacity

The 140 units the government uses as a parameter to calculate its 90% figure are based on FY2018 values. Coal-fired power plants that began operation in FY2019, and the plants currently under construction or planned to operate in the future, were not included in their numbers. Statements about “shut-down or mothballing of 100 units” give the impression the government plans a large-scale reduction of coal-fired power generation. However, this is because a high number of the old facilities are small-scale units. When including the units left out of the government’s calculations, along with the continued operation of “inefficient” units in Hokkaido and Okinawa as well as “high-efficiency” units, calculations based on installed capacity show that, with the construction and operation of new large-scale power plants, there will be still about 35 GW (35,684MW) of coal-fired power generation capacity in Japan after 2030 (**Figure 1**). This represents a reduction of only about 20% compared to FY2018.

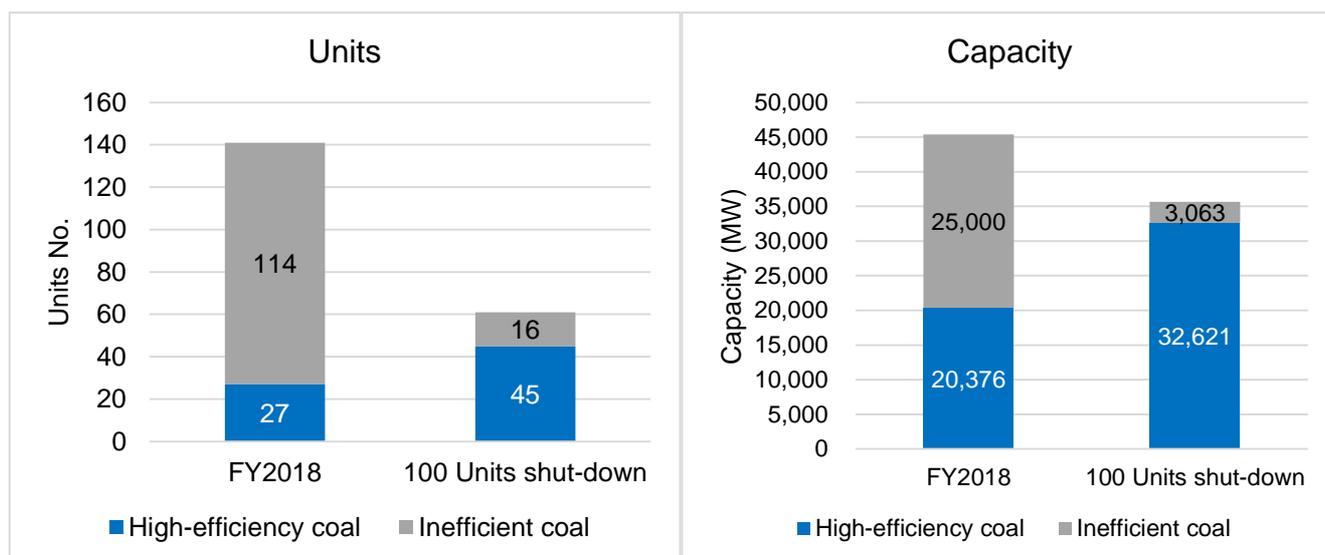


Figure 1. Result of 100 units shut-down or mothballed

Source: Kiko Network

Note: FY2018 numbers for 114 “inefficient” coal units come from the government’s reported count, and the numbers for the 27 “high efficiency” units are based on our data. For the “inefficient” category, generating units in Hokkaido and Okinawa as well as three new units are assumed to be the only ones operating after 100 units are shut down or mothballed. For the “high-efficiency” category, four units that started operating after FY2018 and 14 units planned or under construction are added. For capacity in FY2018, due to a lack of publicly available information on installed capacity of “inefficient” units, we use 25,000 MW to approximate the capacity of the 100 units referenced.

(2) Ratio of “inefficient” coal-fired power generation of all facilities for each power company

The ratio of “inefficient” coal-fired power plants (Sub-C or SC) of power utilities is the highest in Okinawa (100%) and Hokkaido (68.9%) (Table 2).

Table 2. Capacity and ratio of “inefficient” coal-fired power plants of power utilities

	No. of Units	Installed Capacity (MW)	“Inefficient” Capacity (MW)	“Inefficient” Capacity (%)	Notes
Hokkaido	8	2,250	1,550	68.9%	2 units mothballed
Tohoku	5	3,800	600	15.8%	Including Noshiro No. 3
JERA	9	7,300	1,400	19.2%	3 units under construction (Taketoyo, Yokosuka x2 units)
Hokuriku	6	2,900	1,000	34.5%	
Kansai	2	1,800	0	0%	
Chugoku	6	2,581	1,581	61.3%	1 unit under construction (Misumi)
Shikoku	3	1,106	406	36.7%	1 unit under construction (Saijo)
Kyushu	5	3,460	1,400	40.5%	Includes Matsuura No. 2, starting operation in 2020
Okinawa	4	752	752	100%	
J-POWER	14	8,512	3,512	41.3%	

Source: Kiko Network

(3) Impact on CO₂ emissions and coal consumption

If 100 “inefficient” coal-fired power units are shut down or mothballed, the reduction in CO₂ emissions will depend on their capacity utilization rates and what energy source is substituted in their place (Table 3). With a utilization rate of 70% or 80%, total greenhouse gas emission reductions from FY 2018 would be 5-9% or 6-10%, respectively. Meanwhile, domestic coal consumption would see a reduction of approximately 35-40% compared to FY2018.

Table 3. Reduction in CO₂ emissions and coal consumption due to proposed shut-down or mothballing of 100 “inefficient” coal-fired power plant units

Utilization Rate	With Energy Efficiency and Conversion to Renewable Energy		With Conversion to Natural Gas		Reduction in Coal Consumption (PJ, %)
	CO ₂ reduction (Mt-CO ₂)	GHG reduction ratio from FY2018	CO ₂ reduction (Mt-CO ₂)	GHG reduction ratio from FY2018	
70%	107	8.6%	64	5.2%	1200 (35%)
80%	122	9.8%	73	5.9%	1371 (40%)

Source: Kiko Network

Note: The percentage reduction in coal consumption is relative to domestic steam coal consumption in Japan in FY2018.

In addition, if three new “inefficient” coal power units that are currently under construction start up and operate add 3 Mt-CO₂.

However, allowing the 14 planned large-scale coal power units to operate will add 44-49 million tons of CO₂ emissions, equivalent to about 40% of the emission reductions that would have been achieved by shutting down or mothballing the “inefficient” units (**Table 4**).

Table 4. CO₂ emissions and coal consumption of 14 planned “high-efficiency” coal-fired power plant units

	Utilization Rate	No. of Units	Capacity Factor (MW)	CO ₂ Emissions (Mt-CO ₂) and Ratio of Total GHG in FY2018 (%)	Power Generation (TWh, %)	Coal Consumption (PJ, %)
14 New “High-efficiency” Units	70%	14	9400	44 (3.5%)	57.6 (5.4%)	491 (14%)
	80%			49 (4.0%)	64.7 (6.1%)	551 (16%)

Note: Coal consumption volume is relative to Japan’s domestic steam coal consumption in FY2018.

Source: Kiko Network

(4) Impact on Japan’s energy mix

In the government’s current Strategic Energy Plan adopted by the Cabinet in July 2018, the ratio of coal in the power supply mix in 2030 is 26% (**Table 5**). If 100 “inefficient” coal power units are shut-down or mothballed, special cases in Hokkaido and Okinawa are allowed to operate, and existing and new “high-efficiency” coal-fired power plants continue to be used, the ratio of coal in the 2030 energy mix will range from 24% to 27%. Although this represents a decrease from 32% in FY2018, this means that the energy mix in 2030 will remain at virtually the same level as the government's present 2030 energy mix outlook. Based on this, it is obvious that Japan would not deviate from its current mix outlook, and that the government has in effect not taken any further measures.

Table 5. Impact on energy mix in the case of shut-down or mothballing of 100 “inefficient” coal power generation units

Power Generation Estimates	Power Generated (TWh)	Utilization Rate	Coal Ratio of Total Energy Mix (%)
Government’s 2030 Scenario	1,065.0	70%	23.7%
		80%	26.5%
2018 Actual Case	1,051.2	70%	24.0%
		80%	26.8%

Note: The case includes operation of power generation of units in Hokkaido and Okinawa, three new units for “inefficient” coal-fired power, all units of “high-efficiency” coal power generation, and 3% of in-house coal power.

(5) Impact on 2050 targets

The government has an 80% greenhouse gas emission reduction target for 2050, with no base year set. From the viewpoint of the Paris Agreement’s goal of limiting the global temperature increase to 1.5°C, this target must be raised.

If Japan reduces its emissions by 80% from 1990 levels, emissions in 2050 will be 255 million tons CO₂ (t-CO₂). If emissions from “high-efficiency” coal-fired thermal power plants (USC/IGCC) are locked in and continue until 2050, 123 million t-CO₂ will be emitted just by the plants that are already operating, with an additional 172 million t-CO₂ emitted if construction of new units is allowed. Coal-fired power generation alone would account for two-thirds of the emissions under the 80% reduction target.³

Under this plan, permitting the continued operation of “high-efficiency” coal-fired power plants, as well as the construction of new units, would be an utter failure in terms of phasing out coal-fired power generation by 2030, an action required for developed countries to be consistent with the Paris Agreement.

3. Government policy’s problems and remedies

This policy of shutting down or mothballing the equivalent of 20 GW in “inefficient” coal-fired power generation could be seen as the Japanese government’s first concrete actions to restrict the use of Japan’s excessive number of old, inefficient coal-fired power generation facilities. However, this concept was already stated in Japan’s Strategic Energy Plan. These measures should have already been underway, and are long overdue. Moreover, we see it as a serious problem that the government is not only trying to keep many existing so-called “high-efficiency” coal-fired power plants operating but also to construct new units.⁴ “High-efficiency” is only a few percent lower in terms of CO₂ emissions, as pointed out in this report, and considered all together, the implementation of the proposed government policy would allow more than 35 GW of the current installed coal generating capacity to continue operating even after 2030.

In fact, in the past few years we have witnessed a rush in the construction and start of new coal-fired power plants. FY2019 saw the start of two new large-scale coal-powered units (Matsuura Unit 2, Noshiro Unit 3), and since the beginning of FY2020 (April), two more units have started commercial operation (Takehara New Unit 1, Kashima

³ Assumed utilization rate of 80%, and retirement after 40 years of operation

⁴ The difference between “inefficient” versus “high-efficiency” is that CO₂ emissions per kWh for “high efficiency” are only lower by about 10% at most. Conventional coal thermal power emits 876 g CO₂/kWh, whereas “high-efficiency” coal thermal power emits 733-836 g CO₂/kWh (transmission end) (Source: Ministry of the Environment).

Unit 2). From now until 2026, even more new units are expected to start operating every year. The government's new policy demonstrates no effort to reexamine new construction, which the government is aggressively promoting as critical baseload supply on the premise of stable supply and economic efficiency. All of this clearly amounts to a strategy to prolong the life of coal power generation and is entirely inconsistent with the Paris Agreement.

If all coal-fired power plants currently planned or under construction are actually built and begin operation, they would obviously continue operating for decades, locking in a significant amount of CO₂ emissions far into the future. As the global community moves toward decarbonization, new coal power projects have a very high risk of ending up as stranded assets. The government should not only be starting to restrict old coal power facilities, it should at the same time start reexamining and cancelling plans for new projects.

Based on the preceding analysis, here is our summary of the key problems with the government policy and our suggested remedies:

- The government will continue allowing about 35 GW of coal power generation to remain active even after 2030 if 10% of Japan's "inefficient" coal-fired power plants and 26 existing "high-efficiency" coal power units (as of FY2018) continue operating beyond 2030, as well as continued operation of new coal-fired power plants that started operating in FY2019 and new units currently under construction (which are not included in the government's current tally of 140 units).
- The CO₂ emission reductions from the reported policy would range from an estimated 64 million to 122 million tons of CO₂ (about 5-10% of Japan's total greenhouse gas emissions). The ratio of coal in the 2030 energy mix would range from 24% to 27%, which would be lower than the current 32% but still be around the same as the government's current projection of 26% for 2030. In other words, the proposed policies are about the same as the 26% in Japan's current Strategic Energy Plan and a far cry from the complete coal phase-out required of developed countries by 2030 to be consistent with the goals of the Paris Agreement. Also, as the proposed policy includes "mothballing" operations rather than retiring coal-powered generating units, their costs could potentially be covered by the electricity "capacity market," which blurs the path to retire them by 2030.
- In addressing the climate crisis, the policy direction presented is a completely inadequate response by a government that is a signatory to the Paris Agreement. We call upon the Japanese government to take the following actions:
 - Commit to a target of completely phasing out coal power by 2030.
 - Step up to regulate new coal-fired power generation projects, which are a significant risk of becoming stranded assets in the future.
 - Prepare a plan for a staged but rapid phase-out of coal power between now and 2030.
 - Retire coal power plants — don't simply mothball operations.
 - Significantly accelerate the introduction of renewables as alternative energy sources by adopting more proactive policies, avoiding the creation of barriers such as tariffs on renewable power producers, and providing priority dispatch for renewables to the power grid.

Contact: Kiko Network

【Kyoto Office】 E-mail: kyoto@kikonet.org

【Tokyo Office】 E-mail: tokyo@kikonet.org