

IEEJ Energy Journal

Vol.21, No.2 2026

Energy Outlook of Japan for FY2026

- summary-

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- 2) Outlook for International Oil Market in 2026
- 3) Gas Market Outlook for 2026
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- 5) Climate Change Policy Challenges in 2026
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From draft regulation to outright sanction

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The Institute of Energy Economics, Japan

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Economic and energy outlook of Japan for FY2026

Seeking a new equilibrium amid unstable circumstances

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Reference Scenario ❖ Summary

Macro economy | The Japanese economy will continue its modest expansion in fiscal year 2026, growing by 0.9%. Slowing inflation will ease households' thrift mindset, supporting consumption. While capital investment continues to increase, factors such as uncertainty about the future, slowing exports and rising interest rates could function as restraints.

Real gross domestic product (GDP) will show resilience, growing at a rate of 0.9% for the second consecutive year. As households gradually adapt to inflation, the slowdown in price rises will underpin consumption. Businesses are encouraged to invest in productivity improvements and addressing labour shortages. Nevertheless, private demand will still decelerate somewhat. The only component accelerating from FY2025 is private residential investment, which is currently experiencing a significant decline due to the impact of amendments to the Act on the Improvement of Energy Consumption Performance of Buildings (Building Energy Conservation Act). Concerns surrounding private non-residential capital investment include US tariff policies, labour shortages, rising material and equipment prices and interest rates, and relations with China. Regarding external demand, the slowdown in import growth will provide a tailwind for GDP. However, export growth will be at its lowest level since the onset of the COVID-19 pandemic, falling short of import growth. Consequently, external demand will make a negative contribution for the third consecutive year.

The indices of industrial production (IIP) will rise by 1.1%, marking its second consecutive annual increase for the first time in nine years, driven by increased production in sectors such as electrical machinery amid the boom in digital transformation (DX) and artificial intelligence (AI). However, the impact of reduced exports to the US continues to affect automobile production. Furthermore, production of energy-intensive materials will be generally sluggish. Exports will be squeezed by China's overproduction, with crude steel production falling below 80 Mt for the first time since FY1968 and ethylene production dipping below 5 Mt once again.

Consumer prices will rise by around 3% for four consecutive years until FY2025. However, in FY2026, despite upward pressures such as the pass-through of wage increases, the rate of increase will slow to 1.9%—below 2% for the first time in five years—due to factors including falling international energy prices and a correction in the weak yen.

Energy consumption | The decrease attributable to the cooler summer will exceed the increase from production growth centred on low-energy-consumption processing and assembly industries, resulting in an overall decrease of 0.7%. Whilst CO₂ reduction continues, concerns about falling behind the 2030 target are growing further.

A significantly cooler summer than the previous year, coupled with reduced energy consumption due to factors such as decreased production of raw materials, will outweigh the increase attributable to falling energy prices and the gradual expansion of economic and production activities. Primary energy supply will fall below 400 million tonnes of oil equivalent (Mtoe) for the first time in 40 years. Despite the overall decline in consumption, non-fossil fuels will increase due to expanded solar photovoltaics and the restart of nuclear

◆ Created based on the published research in the 452nd Forum on Research Works with the information available as of December 2025.

power plants. Consequently, fossil fuels—oil, coal and natural gas—all will fall below the previous year’s levels for the fifth consecutive year. Liquefied natural gas (LNG) imports will decline to 58.6 Mt, the first time they have been in the 50 Mt range since FY2005. Improving energy efficiency (GDP intensity) is a key global challenge. Despite the tailwind of a cooler summer compared to the previous year, the rate of improvement will slow to 1.5%, the lowest since FY2020.

Table 1 | Summary for the Reference Scenario

	Historical			Projection		Changes			
	FY2022	FY2023	FY2024	FY2025	FY2026	FY2024	FY2025	FY2026	
Energy	Primary energy supply (Mtoe) ¹	422.4	410.1	405.4	402.0	399.2	-1.1%	-0.8%	-0.7%
	Oil ² (GL)	172.9	164.6	157.7	157.0	155.7	-4.2%	-0.4%	-0.9%
	Natural gas ² (Mt of LNG-eq.)	70.4	67.9	66.9	65.1	59.9	-1.5%	-2.8%	-8.0%
	Coal ² (Mt)	177.1	166.1	165.4	162.9	162.1	-0.4%	-1.5%	-0.5%
	Nuclear (TWh)	53.5	80.3	89.3	93.3	106.2	11.3%	4.4%	13.9%
	Renewable power ³ (TWh)	223.1	232.4	239.4	252.0	262.0	3.1%	5.2%	4.0%
	FIT, etc. power sources (TWh)	185.9	197.2	209.4	221.2	233.6	6.2%	5.6%	5.6%
	Self-sufficiency ratio	12.6%	15.3%	16.4%	17.6%	19.2%	1.1p	1.2p	1.6p
	Electricity sales (TWh)	822.2	809.4	822.8	821.8	805.9	1.7%	-0.1%	-1.9%
	City gas sales ⁴ (Bcm)	38.61	36.66	36.88	36.95	37.41	0.6%	0.2%	1.3%
	Fuel oil sales (GL)	150.8	144.6	138.1	138.0	137.3	-4.5%	0.0%	-0.5%
	Energy-related CO ₂ emissions (Mt)	961	921	908	886	868	-1.4%	-2.4%	-2.1%
(vs. FY2013)	-22.2%	-25.4%	-26.5%	-28.3%	-29.8%	-1.1pt	-1.7pt	-1.5pt	
Import prices	Crude oil, CIF (\$/bbl)	103	86	82	69	57	-4.3%	-15.7%	-18.0%
	LNG CIF (\$/MBtu)	18.0	12.5	11.9	10.6	8.8	-5.3%	-10.5%	-16.7%
	Steam coal, CIF (\$/t)	360	195	151	122	127	-22.6%	-18.9%	3.3%
	Coking coal, CIF (\$/t)	339	247	203	160	170	-17.9%	-21.0%	5.8%
Economy	Real GDP (¥2020 trillion)	584.3	584.0	586.9	592.4	597.7	0.5%	0.9%	0.9%
	Indices of industrial production (CY2020=100)	104.9	102.9	101.4	102.2	103.4	-1.4%	0.8%	1.1%
	Trade balances (¥ trillion)	-22.1	-6.2	-5.4	-1.3	-0.4	-13.2%	-74.8%	-67.4%
	Fossil fuel imports (¥ trillion)	35.3	26.0	25.1	20.8	17.3	-3.6%	-16.9%	-17.0%
	Exchange rates (¥/\$)	135.0	143.8	152.6	149.6	147.0	6.1%	-2.0%	-1.7%
	Consumer price index (CY2020=100)	103.2	106.2	109.5	112.6	114.7	3.1%	2.9%	1.9%
Temperature	Cooling degree-days (degree Celsius-days)	506	614	648	694	422	5.6%	7.0%	-39.1%
	Heating degree-days (degree Celsius-days)	850	843	916	947	969	8.6%	3.3%	2.4%

Notes: 1. Mtoe stands for Mt of oil equivalent (= 10¹³ kcal). 2. Oil is converted at 9 139 kcal/L until FY2022 and at 9 105 kcal/L from FY2023.

LNG is converted at 13 068 kcal/kg until FY2022 and at 13 065 kcal/kg from FY2023. Steam coal is converted at 6 231 kcal/kg until FY2022 and at 6 181 kcal/kg from FY2023. Coking coal is converted at 6 866 kcal/kg until FY2022 and at 6 893 kcal/kg from FY2023.

3. Includes large-scale hydro. 4. Converted at 10 421 kcal/m³ until FY2022 and at 10 366 kcal/m³ from FY2023.

Energy-related carbon dioxide (CO₂) emissions will fall below the previous year’s level for the fifth consecutive year, reaching 868 Mt. However, the 2.1% reduction rate is only about two-thirds of the 2.9% average for the FY2013–FY2023 period. Compared to FY2013, emissions will decrease by 29.8%, heightening concerns about delayed progress towards the FY2030 target (a 45% reduction). The self-sufficiency rate will improve at an accelerated pace, rising by 1.6 percentage points (pt) to 19.2%, just 1pt below the FY2010 level (20.2%) recorded before the impact of the Great East Japan Earthquake.

Renewable power generation | FIT and other power generation capacity will expand to 117 GW by the end of FY2026.

The installed capacity of power sources eligible for the Feed-in Tariff (FIT) scheme and similar programmes (including those that have completed the FIT period and those under power purchase agreements [PPAs]) will

reach 116.8 GW. Electricity generated from FIT-eligible sources will reach 233.6 TWh, accounting for 23% of total electricity generated (of which solar photovoltaics: 105.3 TWh, 11%). However, the trend of slowing expansion, which has become pronounced in recent years, continues.

Energy sales | Electricity and fuel oil sales will level off or decline. Meanwhile, city gas sales will increase for the fourth consecutive year, with the rate of increase also expanding.

Electricity sales volume will decline by 1.9% (a 3.6% decrease for lighting services and a 1.1% decrease for power services) due to factors such as reduced space cooling demand from a cooler summer and decreased production in the power-intensive steel and other industries, marking significant drops. This will result in the lowest volume since the full retail liberalisation in FY2016, at 805.9 TWh. In the electricity generated and received mix, whilst non-fossil fuel sources will exceed 40%, LNG will relinquish its long-held position as the largest source to coal, which will see a relatively smaller decrease.

Fuel oil sales volume in FY2025 will remain largely flat, partly due to the low base effect in FY2024, before returning to a downward trend in FY2026. That said, the 0.5% decline rate is relatively modest compared to the period prior to FY2024. For gasoline, the increase impact of the abolition of the provisional gasoline tax rate will outweigh the decrease impact of improved vehicle fuel efficiency and the spread of hybrid vehicles. Although temporary and only a slight increase, this marks the first consecutive two-year increase since FY2010. Diesel oil will increase for the second consecutive year, driven by increased freight movement due to production recovery, alongside the impact of the provisional tax rate abolition, similar to gasoline. Jet fuel oil will remain largely flat, as the recovery in domestic air travel demand post-COVID-19 pandemic has run its course. Conversely, naphtha will decrease due to reduced ethylene production resulting from plant consolidation and increased scheduled maintenance. Kerosene and heavy fuel oil will decline due to fuel switching and other factors.

Unlike declining electricity and fuel oil sales, city gas sales volume will increase by 1.3%, marking the third consecutive year of growth. While this appears robust at first glance, it remains below the level recorded in FY2020, when economic and social activities were severely constrained by the COVID-19 pandemic. A cooler summer will stimulate water heating demand, with 1.1% of contributions to total sale increase by sales for households, most significant one. Sales for industries will see their first increase in five years, as growth in sales for general industries, boosted by expanding production activities, will outweigh a decline in those for power generation. Conversely, sales for commercial will fall by 1.4%, dipping below the previous year's level for the first time in six years, reflecting reduced space cooling demand.

Topics ❖ Summary

The economic and energy impacts of wage increases

The scheduled monthly wages (based on the 'Monthly Labour Survey', for enterprises with five or more employees) increased by 2.1% in FY2024, marking the highest rise in 30 years since FY1994. This trend has continued into FY2025, albeit at a slightly slower pace. With consumer prices rising for over four years since September 2021, the extent of wage improvements has the potential to significantly impact people's lives.

Referencing the Japanese Trade Union Confederation's (RENGO) policy of demanding wage increases of 5% or more in the 2026 spring wage negotiations, we have established a '5% Wage Increase Case' for analysis. Nominal wages (compensation of employees per capita) in FY2026 would exceed the Reference Scenario by 1.1%. The upward swing in disposable income stimulates private final consumption. Conversely, wage increases exceeding the 'fundamental level' driven by productivity gains also generate downward pressures. These include accelerated price rises due to increased labour costs, reduced private non-residential capital investment from squeezed investment funds, and consequent supply capacity declines leading to further price increases. Real GDP remains flat as these positive and negative contributions largely offset each other. Energy sales volumes will see upward swing for city gas, power services of electricity and diesel oil, driven by increased industrial and transport consumption due to production expansion. Gasoline and jet fuel oil will also see

upward swing as household income growth stimulates travel and mobility demand. Consequently, electricity sales will increase by 0.01%, city gas by 0.05% and fuel oil by 0.02%. In the '10% Wage Increase Case', which mechanically doubles the wage increase rate from the 2026 spring wage negotiations, nominal wages would rise by 5.3% compared to the Reference Scenario. This would cause real GDP to decline, while energy sales volumes would see a further upward swing.

Table 2 | Impact of wage increases

	Reference	FY2026		Changes from Reference		
		5% Wage Increase	10% Wage Increase	5% Wage Increase	10% Wage Increase	
Economy	Compensation of employees per capita (¥ thousand)	5,482	5,542	5,770	+1.1%	+5.3%
	Real GDP (¥2020 trillion)	597.7	597.7	597.3	-0.0%	-0.1%
	Private consumption	311.9	312.0	312.5	+0.0%	+0.2%
	Private non-residential investment	107.8	107.6	106.5	-0.2%	-1.1%
	Indices of industrial production (CY2020=100)	103.4	103.4	103.6	+0.1%	+0.2%
	Consumer price index (CY2020=100)	114.7	115.2	117.7	+0.4%	+2.6%
Energy	Primary energy supply (Mtoe)	399.2	399.3	399.3	+0.01%	+0.02%
	Electricity sales (TWh)	805.9	806.0	806.1	+0.01%	+0.03%
	City gas sales (Bcm)	37.41	37.43	37.47	+0.05%	+0.17%
	Fuel oil sales (GL)	137.3	137.3	137.5	+0.02%	+0.12%
Environment	Energy-related CO ₂ emissions (Mt)	868	868	868	+0.01%	+0.01%

However, such consumption-stimulating effects cannot be counted on with any great certainty. The younger generation, who are the primary beneficiaries of the targeted wage increases, show little effect of increased consumption from their regular income growth. Conversely, elder generations such as the baby boomers' children, who have experienced significant declines in real wages, are causing a substantial drop in consumption due to both their large population size and high propensity to consume. It is crucial to implement balanced and appropriate wage increases that are commensurate with productivity gains and other fundamentals, are sustainable, and do not disproportionately favour specific groups.

Impact on the 3Es according to the degree of nuclear utilisation

Assessing the impact on the '3Es'—economy, stable supply and environment—based on differing levels of nuclear power generation utilisation. In the 'Low Case' where no nuclear power plants will restart by the end of FY2026, compared to the Reference Scenario, fossil fuel imports would increase by ¥112 billion, self-sufficiency would decrease by 0.9pt, and CO₂ emissions would rise by 5 Mt. Conversely, in a hypothetical '18-unit Case' where the 18 nuclear power plants that passed the installation permit standards review operate at an 80% capacity factor, the contribution to the 3Es from increased nuclear power generation becomes clearly evident. Appropriate utilisation of nuclear power generation yields positive effects.

Table 3 | Impact according to the degree of utilisation of nuclear power generation

		FY2026			Changes from Reference	
		Low	Reference	18-unit	Low	18-unit
Nuclear	Restarted nuclear plants, as of the end of FY	14	16	18	-2	+2
	Electricity generated (TWh)	92.4	106.2	126.0	-13.8	+19.8
	Share in total electricity generated	9.1%	10.4%	12.4%	-1.4pt	+1.9pt
3Es	Fossil fuel imports (¥ billion)	17,413	17,301	17,137	+112	-164
	Self-sufficiency rate	18.3%	19.2%	20.5%	-0.9pt	+1.3pt
	Energy-related CO ₂ emissions (Mt)	873	868	861	+5	-7

The outlook for electricity demand, long anticipated to decline, is shifting. With the yen at its weakest level in 40 years, the yen-denominated import price of fossil fuels remains high. Consequently, voices expressing hope for nuclear power generation—capable of supplying low-carbon, stable and affordable electricity—are increasingly being heard. To meet these expectations and achieve its 'maximum utilisation', it is essential not only to ensure safety in power generation but also to secure public understanding by guaranteeing safety throughout the entire process, including the back-end operations of spent nuclear fuel reprocessing and disposal.

Overview of the economy

Real gross domestic product (GDP) for the 3Q2025 fell by 0.4% quarter-on-quarter, marking the first contraction in six quarters. Private non-residential capital investment increased by 1.0%, setting a new record high for the second consecutive quarter. However, private final consumption expenditure, which accounts for over half of GDP, remained weak, rising by just 0.1% and essentially flat. This was compounded by a significant 9.4% decline in private residential investment, largely due to the impact of amendment to the Building Energy Efficiency Act. Exports also decreased, heavily affected by US tariff policies. Ultimately, both domestic and external demand shifted from positive to negative contributions compared to the previous quarter. The sharp decline in private residential investment, whose impact is expected to last several quarters to about a year, significantly contributed to the GDP contraction (contributions: -0.3%). Consequently, the view that this downturn is temporary appears to be widely held. However, domestic supply constraints, including labour shortages, rising prices, and US tariff policies remain risks. Furthermore, trade friction with China, particularly among Western nations, and deteriorating Japan–China relations could also dampen the economy through supply disruptions and a sharp decline in Chinese tourists visiting Japan.

International trade from January to October 2025 saw exports to the United States decline, but this was offset by increased exports to Asia excluding China. Combined with a reduction in fossil fuel imports, the trade deficit decreased by 46% year-on-year to ¥3.1 trillion. The current account balance rose by 14% to ¥27.7 trillion, driven by the trade surplus improvement and an expansion in the surplus from overseas direct investment income. The annual current account surplus is projected to reach a record high for the second consecutive year.

The rate of inflation has been declining since peaking at 4.0% in January, yet it has remained above 2% for 43 consecutive months. Contributions from food remain significant, whilst

contributions from communications have also increased since June. Wages are rising but failing to keep pace with price increases, resulting in real wages declining for nine consecutive months.

The Nikkei Stock Average briefly dipped below ¥32 000 in April following the announcement of Trump's tariff rates. However, the subsequent rise was steep, with the index breaking through the ¥50 000 mark for the first time in October. The earnings of listed companies, which are anticipated by share prices, had at one point raised concerns about a downturn, but have generally remained robust, partly due to the weak yen.

The dollar–yen exchange rate, which had started the year around ¥158/\$ following the previous year's trend, had appreciated to ¥140/\$ by April. The subsequent trend of yen depreciation accelerated from October following the inauguration of the expansionary fiscal policy-oriented Takaichi administration. Consequently, the rate has now returned to its year-start level. The euro–yen rate broke through ¥180/€ to record the weakest yen level since the euro's introduction. Long-term interest rates became particularly volatile from November onwards, driven by a combination of factors: reduced bidding interest for ultra-long and long-term government bonds, market speculation regarding additional bond issuance under the large-scale supplementary budget and regarding monetary policy. In December, the rates surged sharply, briefly threatening to breach the 2.0% mark for the first time in 19 years.

Beyond interest rates, concerns are mounting that labour shortages could become a factor constraining economic activity. Indeed, reports indicate bankruptcies attributed to labour shortages are occurring at a record pace. Although the income tax threshold has been raised to ¥1.6 million, no significant effect on increasing the labour supply has materialised.

Brent crude oil prices commenced January at an average of \$79 per barrel but subsequently entered a downward trend due to factors including oversupply and stagnant demand, reaching a low of \$64/bbl in May. Subsequently, they rose briefly to the \$70/bbl range due to the impact of the

Israel–Iran conflict but have since been hovering around \$60/bbl as concerns over supply–demand imbalances have resurfaced. The perceived high

cost of oil domestically is largely attributable to the historically weak yen.

Table 4 | Domestic events in 2025

January 2025

The Bank of Japan raised interest rates further.

February

The Seventh Strategic Energy Plan was approved by the Cabinet.

March

Decommissioning work began on Hamaoka Nuclear Power Station Unit 2.

Release of government-held rice reserves commenced

April

Expo 2025 Osaka, Kansai, Japan opened (until October).

Rice prices surged again.

Second removal of fuel debris from Fukushima Daiichi Nuclear Power Station Unit 2

May

Summer electricity and city gas bill support measures decided

June

The number of births in the previous year fell below 700 000, setting a new record low.

July

Liberal Democratic Party (LDP) and Komeito suffered defeat in House of Councillors election, losing majority.

Japan and United States agreed on 15% 'reciprocal tariffs'.

Kansai Electric Power announced resumption of investigations for new nuclear reactor construction at Mihama Power Station.

August

Record-high minimum wage increases proposed
Mitsubishi Corporation, Chubu Electric Power and others withdrew from offshore wind projects off Chiba and Akita prefectures.

Record-breaking heatwave

September

Prime Minister Ishiba announced his resignation.

October

Komeito withdrew from coalition with LDP. Japan Innovation Party joined LDP coalition.

Takaichi Cabinet formed

Number of foreign visitors to Japan exceeded 30 million annually at fastest pace on record.

Nikkei Stock Average broke through ¥50 000 mark for the first time.

November

Winter electricity and city gas bill support measures decided

Act abolishing provisional rates for gasoline tax and diesel oil transaction tax enacted.

Local mayors of Kashiwazaki–Kariwa and Tomari nuclear power stations each announced acceptance of restart.

December

Osaka Gas, Toho Gas and others joined e-methane business in the United States.

Key assumptions in the Reference Scenario

Global economy

The global economic growth rate (based on purchasing power parity) in 2025 is projected to be +3.2%. Growth will be sustained in Asian emerging economies such as India and the Association of Southeast Asian Nations (ASEAN), but North America will slow due to trade friction and China due to its property crisis. In 2026, advanced economies are assumed to maintain growth at a similar level to the previous year. However, growth is assumed to slow to +3.1%, partly due to a slowdown in China affected by its property crisis and a slowdown in India where exports are assumed to weaken due to additional tariffs imposed by the United States.

Import CIF prices for fossil fuels

Japan's crude oil import price is assumed to average \$69/bbl in FY2025 (\$74/bbl in the first half, \$65/bbl in the second half) and \$57/bbl in FY2026. LNG prices, reflecting oil price movements with a lag, are assumed to be \$10.6/MBtu in FY2025 and \$8.8/MBtu in FY2026. Steam coal is assumed to be \$122/t in FY2025 and \$127/t in FY2026, whilst coking coal is assumed to be \$160/t in FY2025 and \$170/t in FY2026 (refer to Morikawa "Outlook for International Oil Market in 2026", Yanagisawa "Outlook for International Gas Market in 2026", and Takahashi "Outlook for International Coal Market in 2026").

Foreign exchange rate

The dollar–yen exchange rate is assumed to average ¥149.6/\$ for FY2025 and ¥147.0/\$ for FY2026.

Energy consumption subsidies, taxes

Fuel oil subsidies commenced on 27 January 2022 to mitigate sharp price fluctuations, transitioning to a fixed-rate reduction measure on 22 May 2025. For gasoline, subsidies were increased to ¥25.1/L by 11 December, with both the provisional tax rate and subsidies scheduled for abolition by the end of 2025. For diesel oil, the subsidy was increased to ¥17.1/L by 27 November, with the provisional tax rate and subsidy being abolished on 1 April 2026. For kerosene, heavy fuel oil and aviation fuel, the subsidy will also be abolished on 1 April 2026.

Subsidies for electricity and city gas were decided for January–March 2026 under the 'Comprehensive Economic Measures' approved by the Cabinet on 21 November 2025. For electricity, subsidies of ¥4.5/kWh for low-voltage and ¥2.3/kWh for high-voltage usage in January and February, and ¥1.5/kWh for low-voltage and ¥0.8/kWh for high-voltage usage in March will be provided. For city gas, subsidies of ¥18/m³ will be provided for usage in January and February, and ¥6.0/m³ for usage in March. No subsidies will be provided for either electricity or city gas from April onwards.

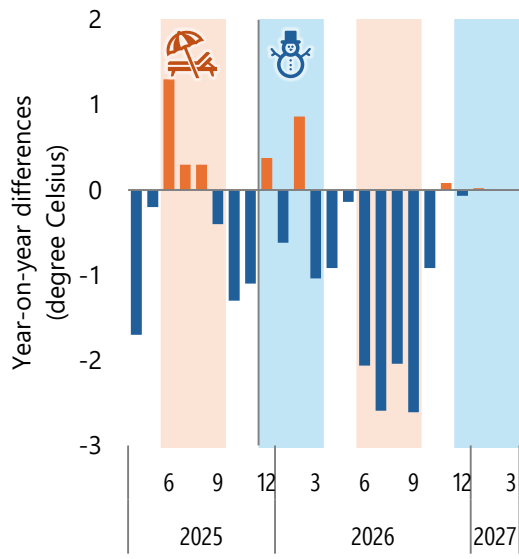
Nuclear power generation

To date, 14 plants have resumed operations. No new plants are scheduled to restart in FY2025. Operating for an average of 10.6 months, electricity generated will reach 93.3 TWh (a 4.4% increase compared to the previous year). Based on progress with regulatory compliance reviews and other factors, two new plants will restart operations in FY2026. Operating for an average of 10.1 months, electricity generated will increase to 106.2 TWh (+13.9%).

Atmospheric temperature

The summer of 2025 saw record-breaking high temperatures, surpassing the previous year's equally intense heatwave (+0.4°C). The winter of FY2025 (November 2025–February 2026) is assumed to be near average based on the Japan Meteorological Agency's three-month forecast, with subsequent periods assumed to be mechanically near average. That is, compared to the previous year: the winter of FY2025 will be slightly colder (−0.1°C), the summer of FY2026 will be considerably cooler (−2.3°C), and the winter of FY2026 will be similar to the previous year (±0.0°C).

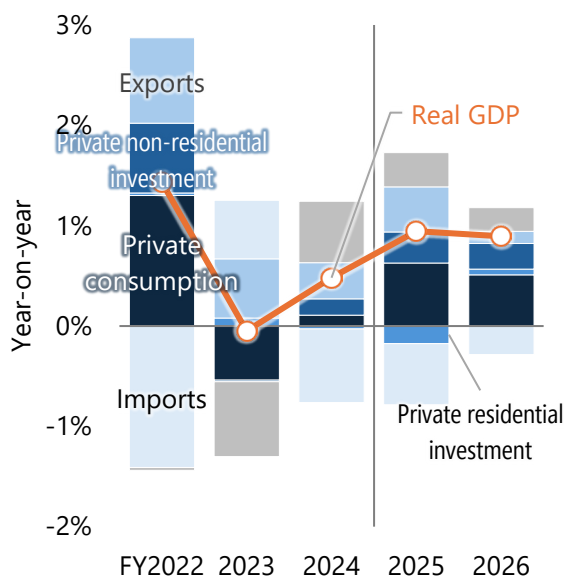
Figure 1 | Temperature assumptions



Macro economy

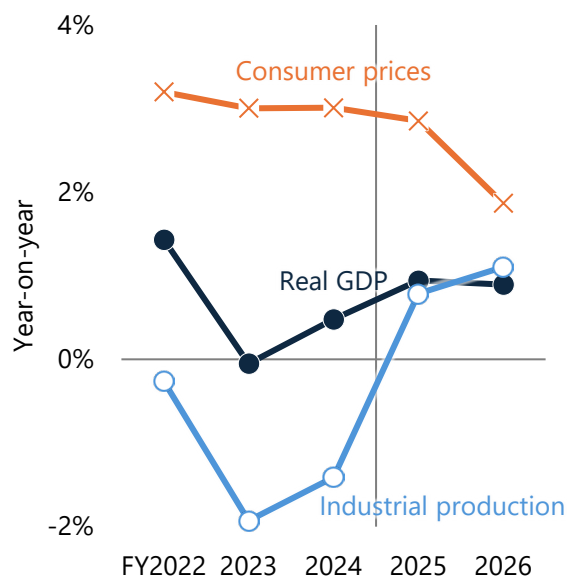
The Japanese economy in FY2026 will continue its modest expansion at 0.9% growth, though the shadow of US tariff policies will persist. Slowing inflation will ease household thriftiness, supporting consumption. However, factors such as uncertainty about the future, slowing exports and rising interest rates could act as restraints.

Figure 2 | Real GDP and contributions



Real GDP will recover in FY2025, driven mainly by domestic demand, and grow by around 1% (+0.9%) for the first time in three years. Private demand will contribute +1.0% to growth. Private final consumption will be boosted by wage increases and slowing inflation (+1.2%). Private residential investment is declining sharply (-4.1%) due to the impact of the April 2025 amendment to the Building Energy Efficiency Act. Private non-residential investment will increase (+1.7%) for productivity improvement, labour shortage countermeasures and green transformation (GX). Public demand will see a slight increase in government final consumption due to factors such as increased defence spending, but public investment in disaster recovery, disaster prevention and national resilience will be curbed due to rising construction costs, resulting in a contribution of 0.0%. External demand will contribute -0.1% due to the impact of factors such as a decline in automobile exports caused by US tariff policies

Figure 3 | Consumer prices, real wages and industrial production



and an increase in imports of pharmaceuticals and other goods.

In FY2026, growth will expand primarily driven by domestic demand, similar to the previous year. However, the lingering impact of US tariff policies will result in a growth rate of +0.9%. Private demand will contribute +0.9% to growth. Private final consumption will continue to recover (+1.0%), as households gradually adapt to inflation and the rate of price increases continues to moderate. Private residential investment will see the impact of the decline caused by the 2025 amendment to the Building Energy Efficiency Act gradually ease but will not recover to the FY2024 level (+1.5%). Private non-residential investment will see its growth rate slow (+1.4%) due to concerns over future uncertainty, despite continued investment in productivity improvements and measures to address labour shortages. Public demand will contribute +0.1% to growth, driven by increased social security expenditure stemming from measures to address an ageing population

and declining birth rates. Regarding external demand, exports will show sluggish growth, partly due to lingering effects from reduced automobile exports. Conversely, imports will grow at a rate

exceeding GDP growth, partly due to domestic supply constraints. Overall, the net contribution will be -0.2%, marking the third consecutive year of negative contribution.

Table 5 | Macro economy

	Historical			Projection		Year-on-year		
	FY2022	FY2023	FY2024	FY2025	FY2026	FY2024	FY2025	FY2026
Real GDP (¥2020 trillion)	584.3	584.0	586.9	592.4	597.7	0.5%	0.9%	0.9%
Private demand	436.2	431.0	433.0	438.9	443.5	(0.8%)	(1.0%)	(0.9%)
Private consumption	307.7	304.7	305.3	308.9	311.9	0.2%	1.2%	1.0%
Private residential investment	22.8	23.2	23.1	22.1	22.4	-0.7%	-4.1%	1.5%
Private non-residential investment	103.8	103.7	104.6	106.3	107.8	0.9%	1.7%	1.4%
Public demand	147.4	146.3	149.1	149.3	150.6	(0.3%)	(0.0%)	(0.1%)
Government consumption	119.7	118.8	121.5	121.8	122.8	2.3%	0.3%	0.8%
Public investment	27.7	27.7	27.7	27.5	27.8	0.1%	-0.7%	1.0%
Net exports of goods and services	1.6	6.7	5.3	4.8	4.1	(-0.5%)	(-0.1%)	(-0.2%)
Exports	99.2	102.0	103.7	105.8	106.4	1.7%	2.0%	0.6%
Imports	97.6	95.3	98.4	101.0	102.3	3.3%	2.7%	1.3%
Nominal GDP (¥ trillion)	591.7	619.4	642.4	671.4	693.3	3.7%	4.5%	3.3%
Balance of trade (¥ trillion)	-22.1	-6.2	-5.4	-1.3	-0.4	-13.2%	-74.8%	-67.4%
Exports	99.2	102.9	108.9	110.4	112.2	5.9%	1.4%	1.6%
Imports	121.3	109.1	114.3	111.8	112.7	4.8%	-2.2%	0.8%
Imports of fossil fuels	35.3	26.0	25.1	20.8	17.3	-3.6%	-16.9%	-17.0%
Oil	17.8	14.8	14.6	12.3	10.0	-1.7%	-15.8%	-18.6%
LNG	8.9	6.1	6.2	5.2	3.9	2.1%	-15.2%	-25.0%
Current account (¥ trillion)	9.1	26.2	29.5	36.7	34.4	12.8%	24.2%	-6.4%
Domestic corporate goods price index (2020=100)	117.2	120.1	124.1	127.3	128.6	3.4%	2.6%	1.0%
Consumer price index (2020=100)	103.2	106.3	109.5	112.6	114.7	3.0%	2.9%	1.9%
Unemployment rate (%)	2.6	2.6	2.5	2.5	2.5	[-0.1p]	[-0.0p]	[-0.0p]

Notes: GDP and breakdown totals may not match due to changes in inventory and residuals.

Figures in () indicate contributions. Figures in [] indicate year-on-year changes.

Production activities

Industrial production in FY2026 will expand, driven by progress in tariff countermeasures and increased output of production machinery and electrical machinery. The raw materials will see reduced production due to structural and trend factors, as well as the impact of China's overproduction.

Figure 4 | Indices of industrial production

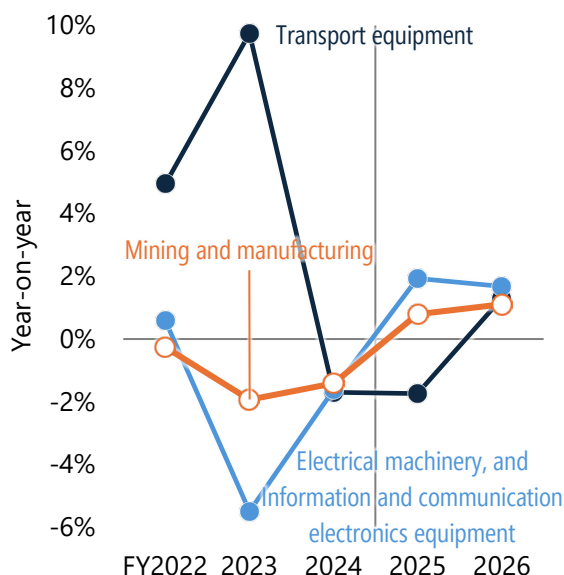
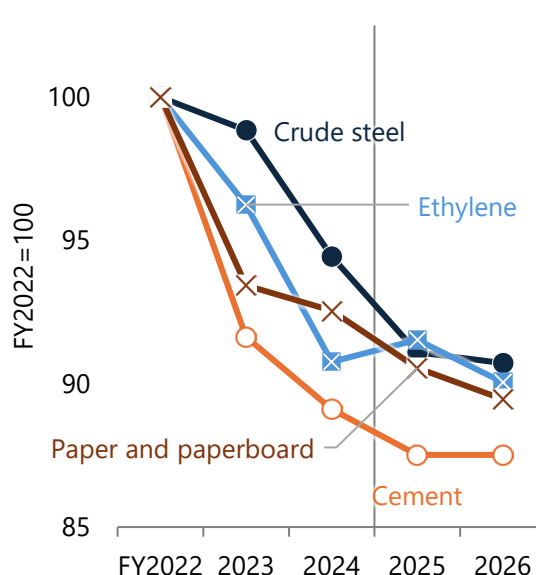


Figure 5 | Production of raw materials



Mining and manufacturing industry

The indices of industrial production in FY2025 will be restrained in sectors vulnerable to US tariff policies. Conversely, production will increase for information and communications equipment and data centre server-related equipment driven by digital transformation (DX) and artificial intelligence (AI), alongside next-generation power network equipment (such as transformers and control devices for transmission and distribution) for GX, leading to an overall rise (+0.8%). In FY2026, demand for production machinery and electrical machinery will remain strong. Furthermore, as countermeasures against tariff impacts progress, downward pressure will ease, leading to an increase (+1.1%). However, the impact of reduced exports to the United States will persist in automobile production.

Crude steel

Domestic demand for steel products in FY2025 will see growth in the electrical machinery and shipbuilding sectors, but demand for construction will remain sluggish due to the impact of

maximum working hour regulations, labour shortages and soaring material prices. Furthermore, exports will decline, partly due to the impact of China's excess production entering the Asian market. Consequently, crude steel production will decrease for the fourth consecutive year (-3.5%). In FY2026, domestic steel demand will increase for the first time in five years, primarily driven by the automotive and electrical machinery sectors. Exports, while still affected by China's overproduction, will see a narrowing decline due to expanding demand in regions such as ASEAN. Consequently, the decline in crude steel production will moderate (-0.4%).

Ethylene

Production of ethylene, one of the key petrochemical base products, will increase by 0.8% in FY2025 due to fewer scheduled maintenance shutdowns at ethylene plants compared to the previous year. Domestic demand for derivative products will increase, driven by robust demand for food containers, despite sluggish demand for automotive parts. Exports will rise, despite the

impact of Chinese excess products flooding Asian markets, due to fewer scheduled plant maintenance periods than the previous year. Production in FY2026 will decrease by 1.6% as ethylene plant restructuring reduces production capacity. Domestic demand is expected to remain largely flat. This is due to structural factors such as reduced plastic usage in downstream products and sluggish construction demand, offset by a recovery in consumer purchasing power as inflation eases and sustained demand for automotive parts. Exports are projected to return to a declining trend, impacted by China's overproduction amid slowing domestic demand in the country.

Cement

Domestic demand in FY2025 will decline due to labour shortages at construction sites, revised project timelines stemming from rising building material prices and labour costs, construction delays caused by work-style reforms and mandatory heatstroke countermeasures, and the concrete industry's move towards a two-day weekend system. Exports to Asia will decrease due to increased production in Viet Nam, a cement powerhouse producing over twice Japan's output, but growth to other regions will support overall exports. Production will decrease by 1.8% as the decline in domestic demand outweighs other factors. In FY2026, domestic demand will remain largely flat under similar conditions to FY2025, supported by demand for the renewal of ageing infrastructure. Exports will increase, despite the continued impact of Viet Nam's overproduction, due to steady demand from other regions. Consequently, production will remain flat.

Paper and paperboard

In the domestic demand for paper and paperboard in FY2025, paper will decline due to

structural factors related to digitalisation, compounded by the suspension or discontinuation of evening newspapers and magazines. Paperboard will decrease due to the impact of reduced purchasing caused by slowing inbound demand and high prices. Exports will remain flat for paper due to weak demand in the Asian region, whilst paperboard will decrease due to the impact of expanded production capacity in China. Production will decline for the fourth consecutive year (-2.2%). Regarding domestic demand in FY2026, paper will see a continued decline, with the reduction in demand driven by digitalisation outweighing the temporary boost from events such as the Fédération Internationale de Football Association (FIFA) World Cup. Paperboard will decrease due to progress in shifting from corrugated cardboard to alternatives like paper bags as part of packaging reduction efforts. Against this backdrop, production of paper and paperboard will continue to decline, albeit at a slower rate (-1.2%).

Automobiles

Automotive production in FY2025 will see the impact of certification issues from the previous year resolved. However, it faces new supply constraints due to delays in procuring components such as semiconductors. Production will decrease by 0.3% due to factors including extended delivery times, order suspensions associated with product transitions, US tariff policies and sluggishness in the European market affecting exports. Domestic shipments in FY2026 will increase as component supply constraints ease. Exports, while continuing to face downward pressure from US tariff policies, will largely stabilise as the impact of these policies runs its course. Consequently, production will increase by 0.4%.

Table 6 | Production activities

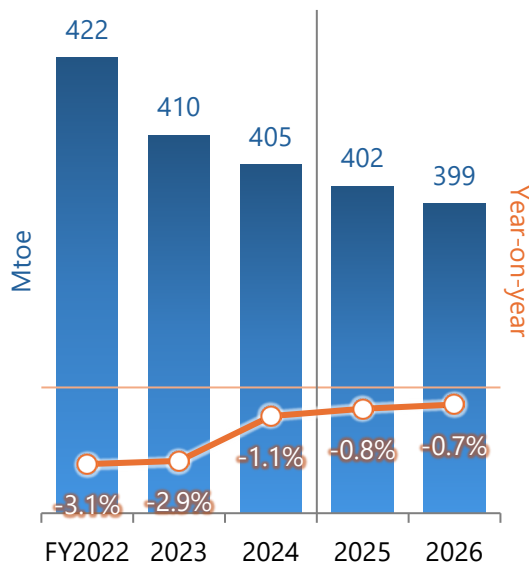
	Historical			Projection		Year-on-year			
	FY2022	FY2023	FY2024	FY2025	FY2026	FY2024	FY2025	FY2026	
Production	Crude steel (Mt)	87.8	86.8	83.0	80.0	79.7	-4.5%	-3.5%	-0.4%
	Ethylene (Mt)	5.48	5.28	4.98	5.02	4.94	-5.7%	0.8%	-1.6%
	Cement (Mt)	51.5	47.2	45.9	45.1	45.1	-2.8%	-1.8%	0.0%
	Paper and paperboard (Mt)	23.3	21.8	21.6	21.1	20.8	-0.9%	-2.2%	-1.2%
	Automobiles (million)	8.10	8.68	8.47	8.45	8.48	-2.4%	-0.3%	0.4%
Indices of production	Mining and manufacturing (2020=100)	104.9	102.9	101.4	102.2	103.4	-1.4%	0.8%	1.1%
	Food and tobacco	98.7	98.1	98.1	96.2	96.7	0.1%	-2.0%	0.5%
	Chemicals	102.5	99.2	99.0	107.6	108.5	-0.1%	8.6%	0.9%
	Non-ferrous metals	105.4	101.6	102.0	100.1	100.9	0.3%	-1.8%	0.8%
	Metal products and machinery	108.6	107.4	105.6	106.4	108.1	-1.6%	0.8%	1.6%
Indices of tertiary industry activity (2019-2020=100)	99.9	101.5	102.9	104.8	106.0	1.5%	1.8%	1.2%	

Notes: Chemicals include synthetic fibres. Metal products and machinery includes metal products, general machinery, electrical machinery, information and communication machinery, electronic components and devices, transport equipment and precision machinery.

Energy consumption and carbon dioxide emissions

Energy consumption will decline for the fifth consecutive year, falling to levels last seen four decades ago. Whilst expanded production activities will contribute to the increase, the impact of a cooler summer will be significant. LNG imports will decrease by over 30% from their peak, partly due to fuel substitution. Although CO₂ emissions are gradually decreasing, concerns are growing regarding progress towards the 2030 targets.

Figure 6 | Energy consumption

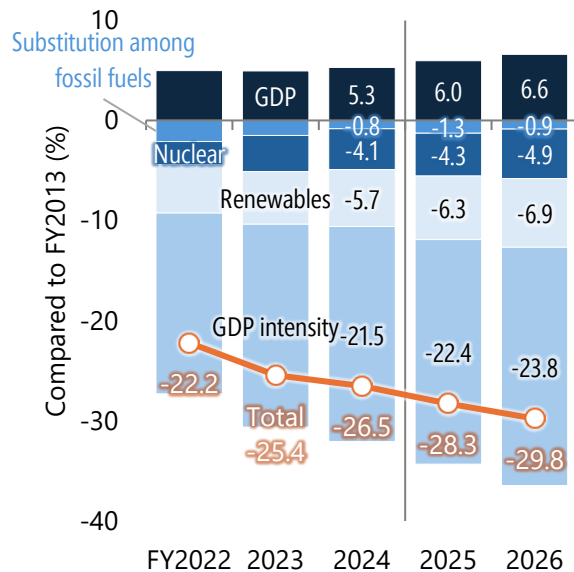


Energy consumption

Energy consumption (primary energy supply) will decrease by 0.8% in FY2025, influenced by sluggish production in energy-intensive industries, particularly iron and steel industry. In FY2026, it will decline for the fifth consecutive year (-0.7%), driven by reduced space cooling demand due to a cooler summer compared to the previous year and lower demand stemming from decreased production of crude steel and other products.

Energy intensity per unit of real GDP will improve for the fifth consecutive year (FY2025: -1.8%, FY2026: -1.5%). Alongside energy conservation across sectors, the reduction in production of energy-intensive materials, coupled with growth driven by energy-light industries—electrical machinery manufacturing in FY2025 and transport machinery manufacturing additionally in FY2026—will contribute to improvement through industrial lightening. While GDP energy intensity will continue to improve, the rate of

Figure 7 | CO₂ emissions and contributions



improvement will slow. The high improvement rate of 4.3% recorded in FY2022 was exceptional, driven by the sharp rise in energy prices due to the direct and indirect impacts of the Ukraine crisis, energy conservation involving restraint, and sluggish manufacturing production activity.

New energies

New energy sources such as solar photovoltaics (PVs), wind and biomass continue to increase (FY2025: +5.7%, FY2026: +5.8%). Excluding nuclear, where restarting power plants is progressing, this represents growth unseen in other energy sources, accounting for 9.6% of primary energy consumption in FY2026. The largest non-residential solar PVs are also undergoing changes, such as the increasing adoption of power purchase agreements (PPAs) not covered by the Feed-in Tariff (FIT) or Feed-in Premium (FIP) schemes. However, the explosive expansion seen in the early days of the FIT has subsided. Factors include not only the decline in FIT purchase prices and the reduction in suitable installation

sites, but also friction with local communities where installations occur.

Nuclear

Nuclear will see two new restarts of power plants in FY2026, with energy supply increasing for the fourth consecutive year (FY2025: +5.1%, FY2026: +13.7%). This marks the first time since the Great East Japan Earthquake that its share of primary energy consumption will exceed 5%.

Oil

Oil consumption will decrease by 0.4% in FY2025 due to improvements in energy efficiency, progress in fuel switching, and reduced utilisation factors of oil-fired power generation. However, this decline will be partially mitigated by increased space heating demand resulting from a slightly colder winter compared to the previous year. In FY2026, alongside the decline due to reduced ethylene production, the ongoing fuel switching and progress in energy conservation will have a significant impact, leading to a continued decrease (-0.9%), primarily in heavy fuel oil.

Coal

Coal consumption will decrease by 1.6% in FY2025, driven by reduced industrial demand due to lower production of crude steel and cement, alongside reduced demand for power generation by biomass co-firing at existing coal-fired power plants. In FY2026, the decline in both power generation and industrial uses will moderate somewhat, with the rate of decrease being the smallest over the five-year period (-0.7%).

Natural gas

Natural gas consumption will decline, primarily for power generation, due to the continued expansion of new energies centred on solar PVs and the restart of nuclear power plants (FY2025: -2.8%, FY2026: -8.0%). Consequently, LNG imports will decrease for the second consecutive year (FY2025: -2.9%, FY2026: -8.4%). In FY2026, imports will reach 58.6 Mt, representing a decline of over 30% from the peak recorded in FY2014. The value of LNG imports will fall below ¥5 trillion, aided by lower dollar-denominated prices and a moderation in yen depreciation. Together with oil, this will significantly contribute to an improvement in the trade balance.

Energy self-sufficiency rate

The self-sufficiency rate will rise for the fourth consecutive year, driven by increases in new energies and nuclear (FY2025: +1.2pt, FY2026: +1.6pt). In FY2026, it will reach 19.2%, approaching within 1pt of the FY2010 figure (20.2%) recorded before the impact of the Great East Japan Earthquake.

CO₂ emissions

Energy-related CO₂ emissions will decrease for five consecutive years (FY2025: -2.4%, FY2026: -2.1%), reaching 868 Mt in FY2026. However, compared to FY2013 levels, this represents a 29.8% reduction, growing concerns about delays in progress towards the FY2030 reduction target (45% reduction compared to FY2013 levels).

Table 7 | Primary energy supply

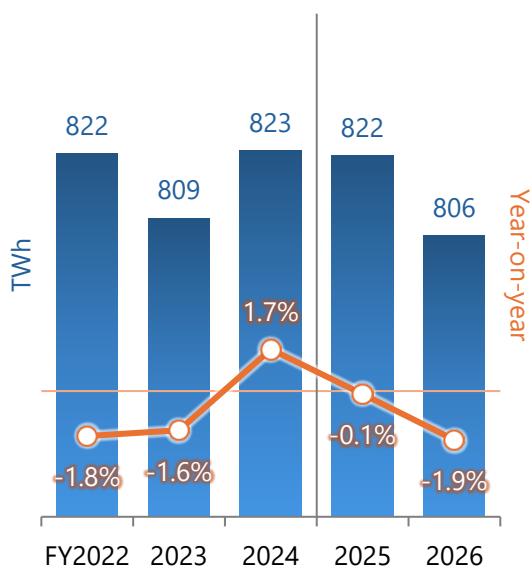
	Historical			Projection		Year-on-year		
	FY2022	FY2023	FY2024	FY2025	FY2026	FY2024	FY2025	FY2026
Primary energy supply (Mtoe)	422.4	410.1	405.4	402.0	399.2	-1.1%	-0.8%	-0.7%
Coal	114.0	106.9	105.7	104.1	103.4	-1.1%	-1.6%	-0.7%
Oil	158.0	149.9	143.6	143.0	141.7	-4.2%	-0.4%	-0.9%
Natural gas	92.0	88.8	87.5	85.1	78.2	-1.5%	-2.8%	-8.0%
LNG imports (Mt)	70.5	64.9	65.9	64.0	58.6	1.5%	-2.9%	-8.4%
Hydro	16.0	15.6	15.4	15.2	14.9	-1.3%	-1.0%	-1.8%
Nuclear	11.5	17.1	19.0	20.0	22.7	11.2%	5.1%	13.7%
New energies, etc.	30.9	31.9	34.2	36.1	38.2	7.3%	5.7%	5.8%
Self-sufficiency rate	12.6%	15.3%	16.4%	17.6%	19.2%	1.1pt	1.2pt	1.6pt
GDP intensity (FY2013=100)	83.0	80.3	78.9	77.5	76.3	-1.7%	-1.8%	-1.5%
Energy-related CO ₂ emissions (Mt)	961	921	908	886	868	-1.4%	-2.4%	-2.1%
(vs. FY2013)	-22.2%	-25.4%	-26.5%	-28.3%	-29.8%	-1.1pt	-1.7pt	-1.5pt

Notes: Renewables include solar photovoltaics, wind, biomass, solar heat and geothermal. Self-sufficiency rate is based on IEA standards.

Electricity sales and mix of electricity generated/received (electric utilities)

Electricity sales volume will decrease, driven by reduced production in energy-intensive industries. Ratio of non-fossil fuel electricity generated and received will reach 40%, supported by the restart of nuclear power plants and the continued growth of renewable energy.

Figure 8 | Electricity sales volume

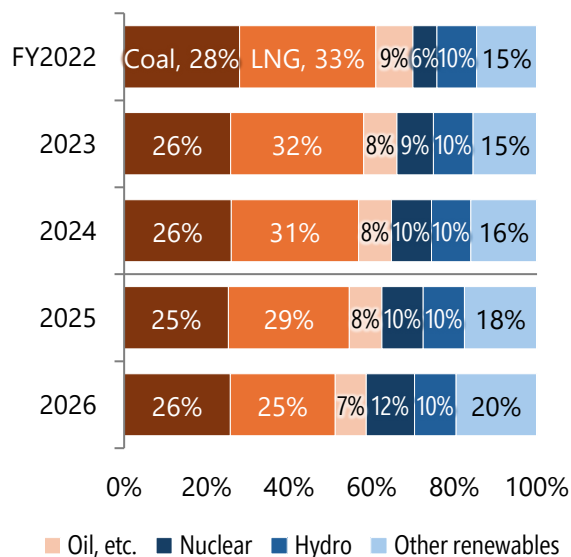


Electricity sales

Total electricity sales volume for FY2025 will decrease marginally by 0.1% due to reduced power services. Power services will decline slightly by 0.2%, despite increased production in the chemical and electrical machinery industries, owing to sluggish production of crude steel and automobiles. Meanwhile, lighting services will see a slight increase (+0.1%) due to a summer hotter than FY2024 and a somewhat colder winter. Consequently, lighting services will again account for over half of electricity sales in FY2025, following FY2024. This rise in lighting services' share implies that Japan's electricity consumption, and consequently its energy consumption for power generation, will become more susceptible to factors like temperature than to economic trends.

Total electricity sales for FY2026 will decline for the second consecutive year (-1.9%). Power services will decrease for the second year running (-1.1%), impacted by sluggish production in raw material industries such as the chemical sector. Meanwhile, lighting services will fall

Figure 9 | Mix of electricity generated/received



significantly (-3.6%) due to the combined effects of a notably cooler summer and ongoing energy-saving progress. The cold spell in early spring will not contribute enough to offset the decline. Furthermore, assuming temperatures remain at the previous year's level, total electricity sales would decrease by 0.1% (with both lighting services and power services -0.1%).

Mix of electricity generated and received

The mix of electricity generated and received will see an increase in renewables (excluding hydro), primarily solar PVs and biomass-fired, rising by 1.6pt in FY2025 and 2.0pt in FY2026. Nuclear will see only a 0.4pt increase in FY2025 due to no restarted power plants but will rise by 1.7pt to just under 12% in FY2026 following the restart of two power plants, exceeding hydro's share by over 1pt. Non-fossil fuel will rise by 3.8pt to 41.3% in FY2026, reaching the 40% milestone. However, continued expansion will be necessary to achieve the approximately 59% non-fossil ratio targeted for FY2030, which underpins the Nationally

Determined Contribution (NDC) set by the government.

In FY2026, although coal-fired electricity generated and received will decrease due to the decommissioning of existing plants, its share will rise by 0.4pt as a result of the overall decline in total electricity generated and received. For oil and other sources, considering seasonal and regional supply capacities, the scope for further reductions in

oil (heavy fuel oil and crude oil)-fired electricity generated and received has largely reached its limits. Whilst the sharp decline in its share seen previously will subside, it is unlikely to increase further (-0.4pt) unless other power sources experience disruptions. LNG, meanwhile, will fall below 30% in FY2025 due to the increase in non-fossil fuel power sources. Its share will continue to decline thereafter, falling by 3.8pt to 25.4% in FY2026.

Table 8 | Electricity sales volume, and mix of electricity generated and received

	Historical			Projection		Year-on-year		
	FY2022	FY2023	FY2024	FY2025	FY2026	FY2024	FY2025	FY2026
Electricity sales (TWh)	822.2	809.4	822.8	821.8	805.9	1.7%	-0.1%	-1.9%
Lighting services	270.2	266.8	276.0	276.3	266.3	3.4%	0.1%	-3.6%
Power services	552.0	542.6	546.9	545.5	539.5	0.8%	-0.2%	-1.1%
Electricity generated/purchased (TWh)	918.3	911.5	922.0	921.5	905.5	1.2%	0.0%	-1.7%
Hydro	9.6%	9.6%	9.6%	10.0%	10.1%	-0.1pt	0.4pt	0.1pt
Thermal	70.0%	66.2%	64.7%	62.4%	58.6%	-1.4pt	-2.3pt	-3.8pt
Coal	27.9%	25.8%	25.9%	25.3%	25.7%	0.1pt	-0.7pt	0.4pt
LNG	33.0%	32.2%	30.8%	29.3%	25.4%	-1.4pt	-1.6pt	-3.8pt
Oil, etc.	9.1%	8.1%	8.0%	7.9%	7.5%	-0.1pt	-0.1pt	-0.4pt
Nuclear	5.8%	8.8%	9.7%	10.0%	11.7%	0.9pt	0.4pt	1.7pt
Renewables (non-hydro), etc.	14.6%	15.4%	16.0%	17.5%	19.5%	0.5pt	1.6pt	2.0pt

Notes: Electricity sales are for electric utility use and do not include own use and specified supply.

Electricity generated/purchased is the actual estimate. Hydro includes pumped storage, and oil, etc. includes city gas, coal products and others.

City gas sales (gas utilities)

City gas sales volumes will increase for the third consecutive year, driven by a cooler summer boosting those for residential and expanded production activities increasing those for general industries. However, they remain below the FY2020 level.

Figure 10 | City gas sales volume

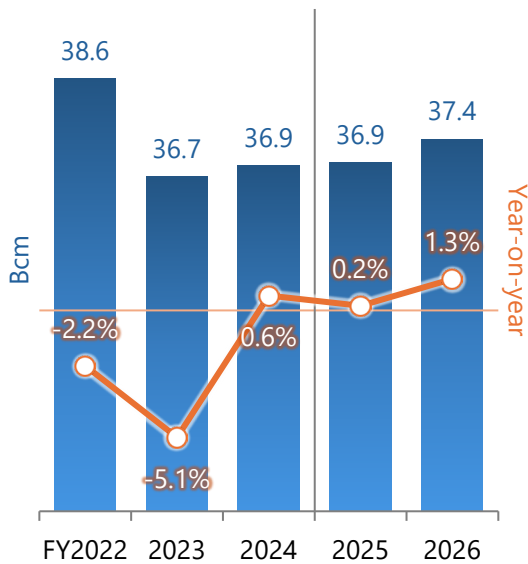
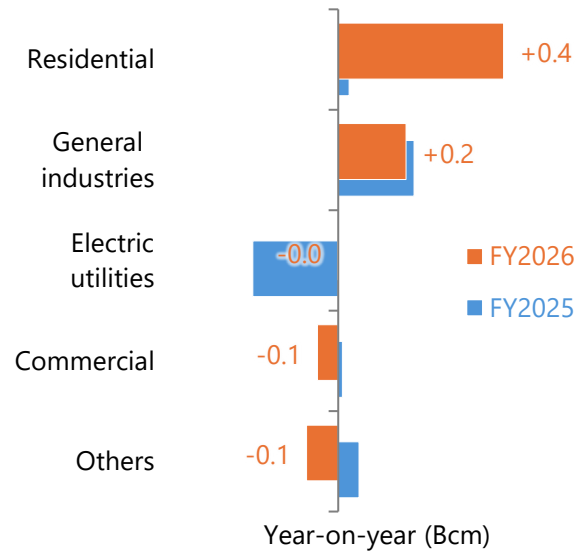


Figure 11 | City gas sales volume (year-on-year changes)



Total city gas sales volume¹ will increase marginally by 0.2% in FY2025. This growth stems from increases in those for non-electric utilities—namely residential, commercial, general industries and others—despite a decline in those for electric utilities. In FY2026, commercial and others will decrease, partly due to reduced space cooling demand from a cooler summer. However, residential will increase due to higher water heating demand, whilst industry will increase linked to industrial production recovery and expansion, driving overall growth. Total sales volume will increase for the third consecutive year, with the growth rate exceeding 1% (+1.3%). However, the impact of the significant decline caused by reduced sales for general industries in FY2023 remains substantial, and the level is still lower than that of FY2020, when economic and social activities were severely constrained by the COVID-19 pandemic.

Sales for residential will increase marginally by 0.3% in FY2025, driven by slightly colder winter temperatures compared to the previous year, which will boost water and space heating demand. In FY2026, the sales will increase significantly (+4.8%). This is because the rise in water heating demand due to a much cooler summer compared to the record-breaking heatwave of FY2025 (which exceeded that of FY2024) will outweigh the impact of electrification and energy-conservation progress. Should temperatures follow the previous year's pattern and result in a heatwave summer, the growth rate would shrink to 0.3%.

Sales for industry will decline slightly by 0.1% in FY2025. Although those for general industries will increase due to growth in non-raw material industries, this will be significantly offset by a substantial decrease in those for electric utilities. In FY2026, the sales will increase for the first time

¹ Gas utilities excluding former community gas utilities; converted at 1 m³ = 10 421 kcal until FY2022 and at 1 m³ = 10 366 kcal from FY2023.

in five years (+0.8%), driven by continued growth in those for general industries alongside expanding production in non-raw material industries.

Sales for commercial will increase marginally by 0.3% in FY2025, driven by increased activity in lifestyle-related services and entertainment sectors, coupled with slightly colder winter temperatures compared to the previous year boosting water and space heating demand. In FY2026, the sales will decrease by 1.4% due to factors including a significantly cooler summer leading to a

substantial drop in space cooling demand. Should temperatures remain similar to the previous year, resulting in a scorching summer, the rate of decrease would narrow to 0.1%.

Sales for others will increase due to the impact of the intense heatwave since demand for space cooling in hospitals and similar facilities (+1.7%) in FY2025. In FY2026, the sales will decrease by 2.5% as the summer is significantly cooler compared to the previous year.

Table 9 | City gas sales volume

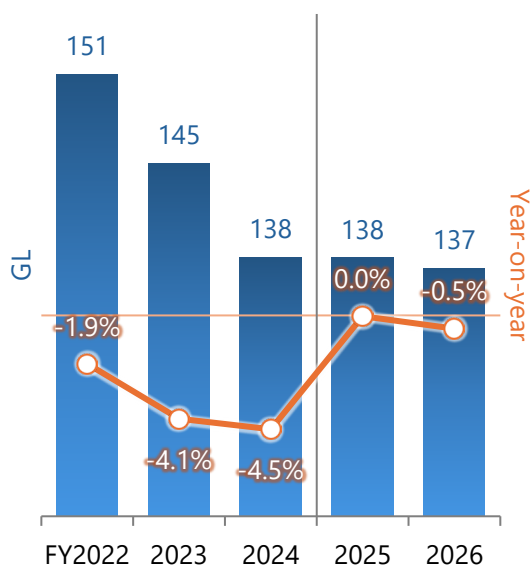
	Historical			Projection		Year-on-year		
	FY2022	FY2023	FY2024	FY2025	FY2026	FY2024	FY2025	FY2026
City gas sales (Bcm)	38.61	36.66	36.88	36.95	37.41	0.6%	0.2%	1.3%
Residential	8.96	8.58	8.73	8.75	9.18	1.7%	0.3%	4.8%
Commercial	3.67	3.72	3.80	3.81	3.76	2.3%	0.3%	-1.4%
Industry	22.95	21.37	21.14	21.11	21.29	-1.1%	-0.1%	0.8%
General industries	17.58	16.63	16.80	16.99	17.17	1.0%	1.2%	1.0%
Electric utilities	5.37	4.74	4.34	4.12	4.12	-8.5%	-5.0%	0.0%
Others	3.03	2.99	3.21	3.26	3.18	7.3%	1.7%	-2.5%

Note: Converted at $1 \text{ m}^3 = 10\,421 \text{ kcal}$ until FY2022 and at $1 \text{ m}^3 = 10\,366 \text{ kcal}$ from FY2023.

Fuel oil and LPG sales, and crude oil throughput

The decline in fuel oil sales volumes will be driven by reduced demand for heavy fuel oils and kerosene due to fuel switching, and reduced demand for naphtha as a petrochemical feedstock. The sales will shift from remaining flat in FY2025 to declining thereafter.

Figure 12 | Fuel oil sales volume

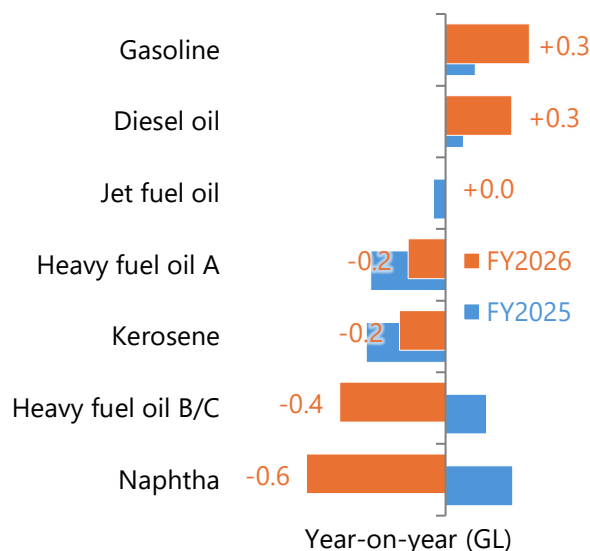


Fuel oil sales volume

Fuel oil sales volumes will remain flat in FY2025, as increases in naphtha and gasoline offset declines in heavy fuel oil A, kerosene and jet fuel oil. In FY2026, sales will decrease by 0.5% primarily for heavy fuel oils, naphtha for petrochemical feedstock and kerosene, driven by progress in energy conservation and fuel switching. Gasoline and diesel oil will see a modest increase, but this will not be sufficient to offset the decline in other fuel oils.

Gasoline decreased by 1.9% in FY2024 due to improved fuel efficiency, the spread of hybrid vehicles, and reduced mileage caused by soaring fuel prices. In FY2025, although the effects of improved fuel efficiency and the spread of hybrid vehicles will continue, the sales will increase by 0.3% due to a rise in transport volume. In FY2026, gasoline will increase for the second consecutive year (+0.8%). This growth is driven by factors including increased freight transport volumes due to production recovery and lower gasoline prices

Figure 13 | Fuel oil sales volume (year-on-year changes)



resulting from the abolition of the provisional gasoline tax rate.

Naphtha will increase by 0.8% in FY2025 due to higher ethylene production driven by growing domestic demand. In FY2026, however, it will decline by 1.6% as planned shutdowns of ethylene plants reduce production capacity.

Jet fuel oil has fully recovered from the post-COVID-19 pandemic decline in domestic air travel and will remain largely flat in FY2026.

Kerosene will decrease by 2.9% in FY2025, as the effects of fuel switching will outweigh the impact of a slightly colder winter and higher space heating demand. In FY2026, it will decline for the sixth consecutive year (-1.7%), influenced by ongoing fuel switching and other factors.

Diesel oil will increase marginally by 0.2% in FY2025, driven by growth in the industry sector. In FY2026, it will rise by 0.9% due to increased truck mileage accompanying higher logistics volumes.

Heavy fuel oil A will decline by 3.1% in FY2025 due to reduced demand in agriculture, forestry and fisheries, coupled with progress in fuel switching within the industry sector. In FY2026, it will decrease for the fourth consecutive year (-1.6%), as reduced demand in agriculture, forestry and fisheries and ongoing fuel switching in the industry sector persist.

Heavy fuel oil B/C sales for electric utilities will decline by over 10% in FY2025, though this represents a moderation from the nearly 40% drop recorded in FY2023. Increased industrial demand will offset the reduction in electric utilities, leading to an overall increase by 3.6%. In FY2026, however, progress in energy conservation and fuel switching will cause the sales to reverse course, resulting in a substantial 9.0% decrease.

LPG sales volume

Liquefied petroleum gas (LPG) sales will decline by 1.4% in FY2025, excluding for city gas, due to trend-driven fuel switching and energy

conservation. In FY2026, although increased production activity and a significantly cooler summer than the previous year will contribute to increase, the sales will decrease for the fourth consecutive year (-1.4%). This decline is attributed to fuel switching, energy conservation and reduced demand for chemical feedstocks.

Crude oil throughput

Crude oil throughput will increase by 0.9% in FY2025. This growth is driven by flattening domestic demand for fuel oils, coupled with favourable export market conditions. The strong export market conditions stem from United States sanctions against certain countries related to Russian and Iranian crude oil and its imports, and the shutdown of major overseas refineries due to unexpected power outages. In FY2026, throughput will decline due to reduced domestic demand for fuel oils such as naphtha. However, the decrease will be 1.1%, not as steep as the sharp declines seen in FY2023 and FY2024.

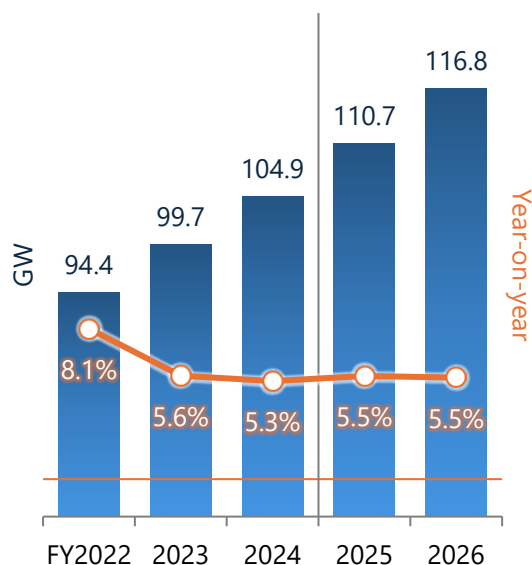
Table 10 | Fuel oil and LPG sales volume, and crude oil throughput

	Historical			Projection		Year-on-year		
	FY2022	FY2023	FY2024	FY2025	FY2026	FY2024	FY2025	FY2026
Fuel oil sales (GL)	150.8	144.6	138.1	138.0	137.3	-4.5%	0.0%	-0.5%
Gasoline	44.8	44.5	43.6	43.8	44.1	-1.9%	0.3%	0.8%
Naphtha	38.2	36.2	34.1	34.3	33.8	-5.8%	0.8%	-1.6%
Jet fuel oil	4.0	4.4	4.2	4.2	4.2	-3.3%	-1.2%	0.0%
Kerosene	12.2	11.8	11.1	10.8	10.6	-6.3%	-2.9%	-1.7%
Diesel oil	31.7	31.2	30.7	30.8	31.1	-1.6%	0.2%	0.9%
Heavy fuel oil A	10.4	9.8	9.7	9.4	9.3	-1.3%	-3.1%	-1.6%
Heavy fuel oil B/C	9.5	6.7	4.6	4.8	4.3	-31.0%	3.6%	-9.0%
For electric utilities	5.1	3.1	2.3	1.9	1.7	-26.6%	-14.9%	-14.0%
For others	4.4	3.6	2.3	2.8	2.7	-34.9%	21.8%	-5.6%
LPG (Mt)	13.9	13.3	12.7	12.5	12.3	-4.6%	-1.4%	-1.4%
Crude oil throughput (GL)	156.2	145.1	135.1	136.3	134.7	-6.9%	0.9%	-1.1%

Renewables power generation (FIT+PPA power sources)

The cumulative installed capacity of renewable power generation facilities will expand to 117 GW by the end of FY2026.

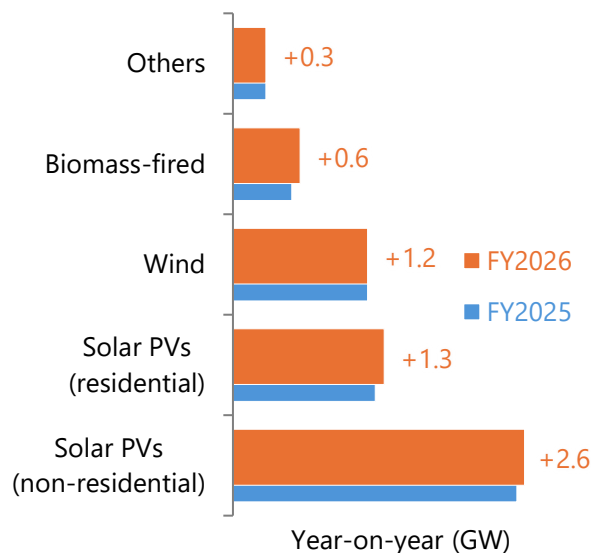
Figure 14 | Installed renewable power generation capacity



Notes: In operation. As of the end of fiscal year.

The cumulative installed capacity of FIT²-eligible power sources (including post-FIT and PPA projects) will reach 117 GW by the end of FY2026 (Figure 14). Non-residential solar PVs, which has constituted the bulk of renewable energy, continues to see a slowdown in the increase of FIT and FIP certified projects. To compensate, projects not reliant on FIT or FIP, such as PPAs, are gradually expanding. However, this expansion is insufficient to significantly reverse the slowing trend. Combined with residential solar PVs, total solar PV capacity will reach 85.5 GW. Onshore wind capacity will increase to around 8 GW as projects that were certified under FIT/FIP but delayed due to environmental assessments and local coordination gradually commence operation. Offshore wind capacity will not see a significant increase in installed capacity by FY2026, as the majority of projects awarded under the Renewable Energy Marine Area Utilisation Act³ will not commence

Figure 15 | Installed renewable power generation capacity (year-on-year changes)



Notes: In operation. As of the end of fiscal year.

full-scale operation until 2027 or later. Furthermore, of the total 5.1 GW of awarded offshore wind projects, 1.7 GW have seen the winning bidders withdraw from the projects. This will negatively impact future capacity growth, though the effects of these withdrawals will also become apparent only from 2027 onwards.

The combined generation from FIT/FIP schemes and non-FIT/FIP schemes such as PPAs will reach 233.6 TWh in FY2026 (comprising solar PVs: 105.3 TWh, biomass-fired: 59.1 TWh, small-scale hydro: 46.7 TWh, wind: 18.4 TWh, geothermal: 4.1 TWh), accounting for 23% of total electricity generated. Including large-scale hydro power plants of 30 MW or more, the share of renewable energy in total electricity generated will rise to 26%.

Furthermore, the certified capacity of FIT facilities as of the end of March 2025 stands at 113 GW.

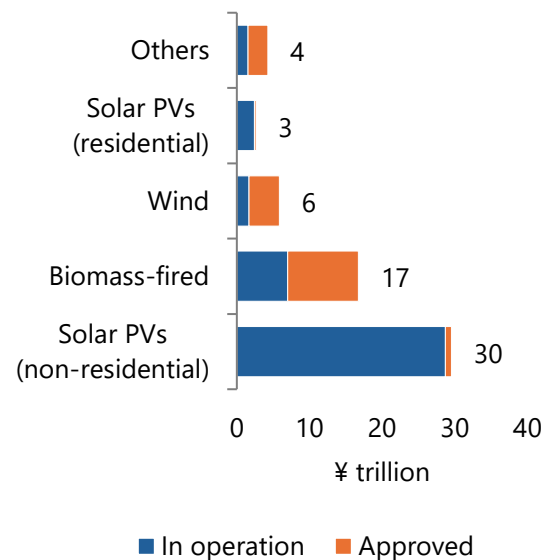
² Large-scale hydro power plants with a capacity of 30 MW or more are not covered by the scheme.

³ Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy Power Generation Facilities

Should all this certified capacity become operational, the cumulative consumer burden, including operational facilities and transition facilities⁴, would amount to approximately ¥59 trillion (Figure 16)⁵. This equates to an electricity price increase of ¥2.1/kWh—representing a 9% rise for residential and 13% for industry users compared to the rate at the start of the FIT scheme (2012).

The Seventh Strategic Energy Plan positions renewable energy as a primary power source, targeting a share of 40%–50% of total electricity generated by FY2040. Achieving this goal requires accelerating the current pace of deployment. Whilst prioritising environmental harmony and consensus-building with local communities, steady advancement is needed for rooftop solar PVs on homes, offices, factories, etc., and for offshore wind, which possesses enormous potential. Furthermore, alongside the increase in renewable energy, steady development of the power grid is also required.

Figure 16 | Cumulative purchase amount under the FIT scheme (for capacities certified or in operation as of the end of March 2025)



Notes: The purchase period is 10 years for residential solar PVs, 15 years for geothermal and 20 years for other power sources. Includes equipment for which the FIT purchase period has ended.

⁴ Facilities installed before the FIT programme started and enrolled in it after it started.

⁵ The remaining purchase period of transitional facilities is also taken into account. Avoidable costs are estimated based on various data. The avoided cost in 2022 soared to ¥22.5/kWh due to high fuel prices, but in 2025 (by mid-October) it had settled down to ¥11.5/kWh and is assumed to remain at this level. However, this value is higher than the previously assumed value of ¥7.7/kWh, which means that the cost paid by consumers is significantly reduced. Assumed plant capacity factors are 24.8% for wind, 13.7% for solar PVs, 70% for geothermal, 45% for hydro and 70% for biomass-fired.

Topic 1 | The economic and energy impacts of wage increases

It is important to implement wage increases that are commensurate with actual capabilities, such as productivity, and that are sustainable.

Historic pay rises to counter persistent inflation

With consumer prices having risen continuously for over four years since September 2021, public expectations for wage increases exceeding inflation are high. The extent of wage improvements can significantly impact people's lives.

The scheduled monthly wages (based on the 'Monthly Labour Survey', for enterprises with five or more employees) rose by 2.1% in FY2024, marking the highest increase in 30 years since FY1994. This trend has continued into FY2025, albeit at a slightly slower pace.

According to the Japanese Trade Union Confederation (RENGO), the average wage increase demanded during the FY2025 spring wage negotiations stood at 6.09%, the highest rate in 32 years since FY1993. The actual wage increase rate also reached 5.25%, marking the second consecutive year of a 5% increase following FY2024. RENGO has indicated its policy of demanding wage increases of 5% or more for FY2026, including amounts equivalent to regular pay rises.

Whilst private final consumption increases due to wage rises, private non-residential investment decreases.

In FY2026, the impact of US tariff policies and heightened uncertainty will act as headwinds against wage increases. Under the Reference Scenario, compensation of employees per capita⁶ (nominal wages) will rise by only 2.6%, falling short of the growth seen in the previous two years. However, real wages⁷ will increase by

0.7% due to slowing inflation, maintaining the momentum seen since FY2024. From the perspective of improving people's livelihoods, sustained wage increases that outpace inflation are required.

However, a higher wage increase rate is not necessarily better. The spiralling inflation and wage increase during the first oil crisis, which led to 'runaway inflation', serve as a bitter lesson. To analyse the current situation, we have established a '5% Wage Increase Case' for the FY2026 spring wage negotiations, assuming a wage increase of around the same level as the previous year (5%).

In the 5% Wage Increase Case, nominal wages in FY2026 would rise by 1.1% compared to the Reference Scenario (a 3.7% increase compared to FY2025) (Figure 17). The increase in disposable income would cause private final consumption to rise by ¥100 billion (Figure 18). Conversely, accelerated price increases due to the passing on of increased labour costs and pressure on investment funds would cause private non-residential investment to decrease by ¥200 billion. Despite this, GDP would remain broadly flat. This is partly because changes in private inventories (build-up) offsets the downward contribution from factors like private non-residential investment. The scale of changes in private inventories contribution is close to that of private final consumption. However, this build-up of inventory is likely either a trade-off for future production cuts or 'unintended'.

⁶ Compensation of employees per capita shows a smaller contribution from regular pay rises if the age composition of employees is relatively even. Consequently, the rate of increase tends to be lower than the wage increase rate shown by the RENGO.

⁷ Deflated by consumer price index (all items)

Figure 17 | Impacts of wage increases on economy [FY2026]

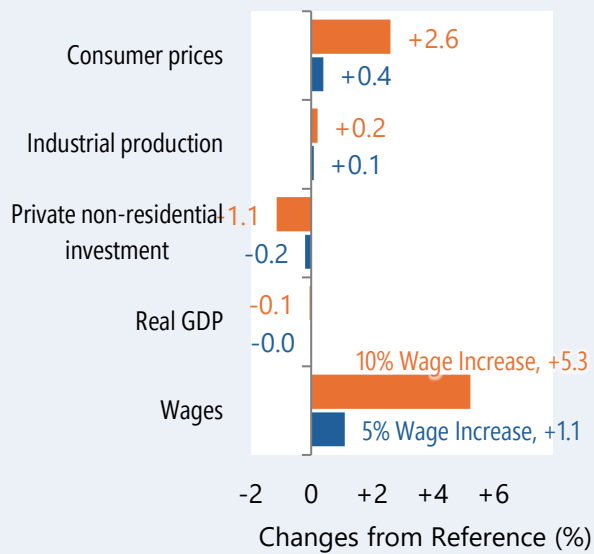
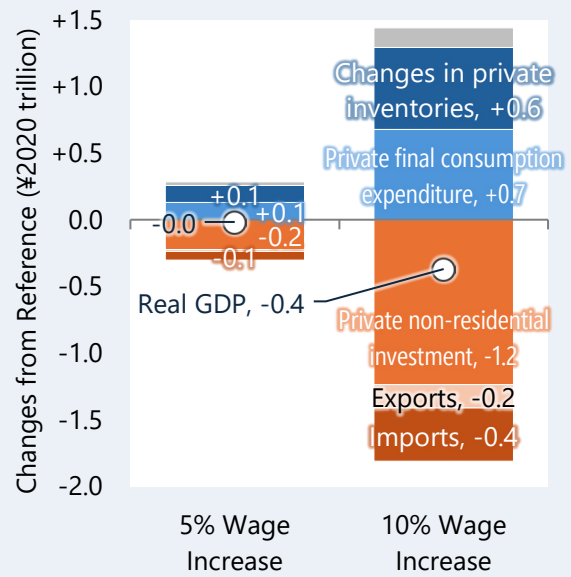


Figure 18 | Impacts of wage increases on real GDP and contributions [FY2026]

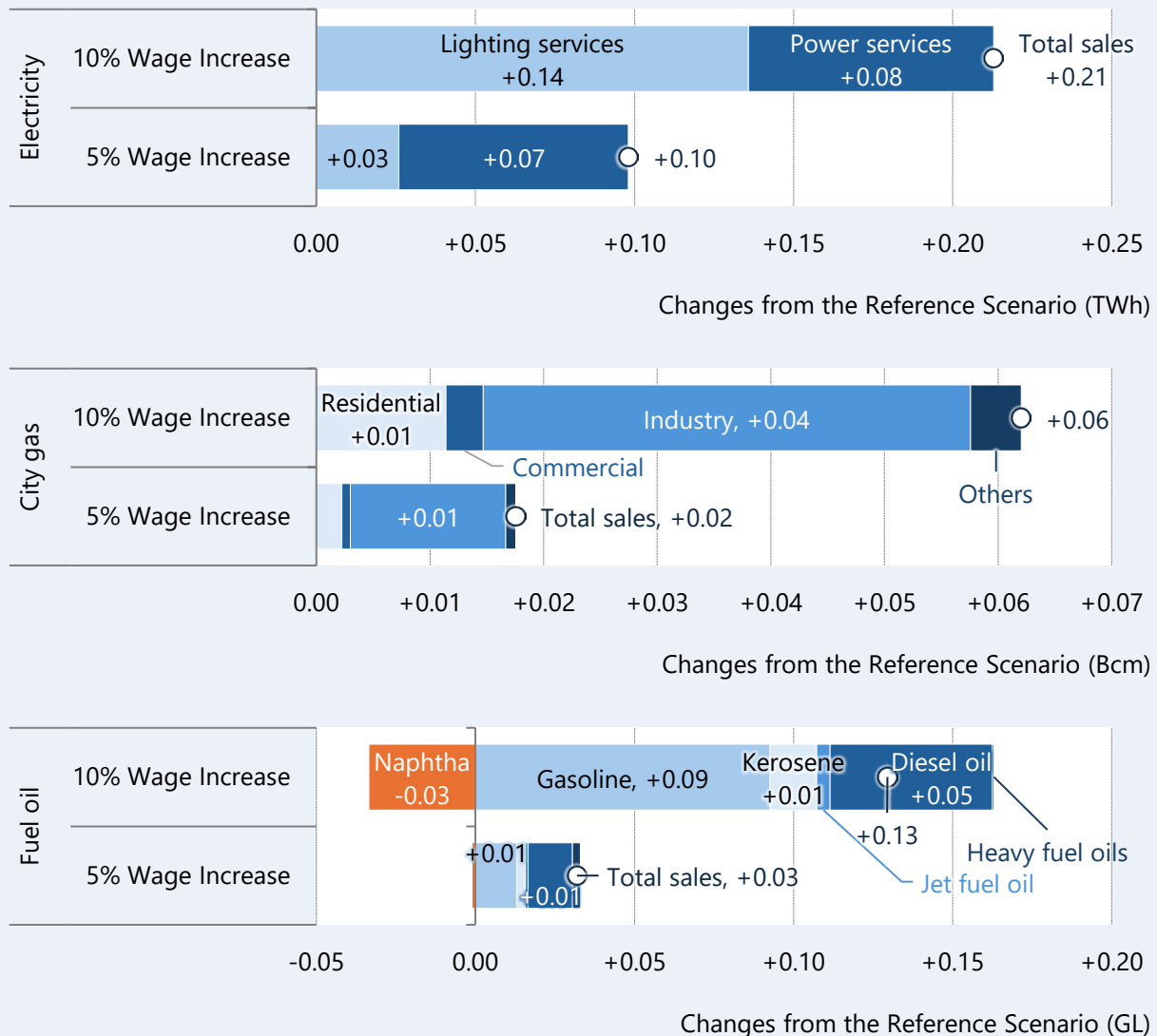


Wage increases would boost energy sales volumes.

In energy sales volume, increased household income would stimulate demand for travel and transport, leading to boost sales by 0.03% for gasoline and by 0.02% for jet fuel oil (Figure 19). In industry, energy consumption would be induced by increased production of goods where demand is rising, such as consumer goods. City gas would

increase by 0.05% and electricity by 0.01%. Furthermore, diesel oil would rise by 0.04% due to increased movement of people and goods. Conversely, demand for capital goods and related production goods would decline, reducing the energy consumption required for their production. Primary energy supply of coal would decrease by 0.02% due to reduced production of crude steel and cement.

Figure 19 | Impacts of wage increases on energy sales volume and contributions [FY2026]



Too much is as bad as too little.

Furthermore, a numerical experiment was conducted establishing a ‘10% Wage Increase Case’ which substantially raised the wage increase rate for the FY2026 spring wage negotiations to 10%—double that of the 5% Wage Increase Case⁸.

In FY2026, nominal wages would increase by 5.3% compared to the Reference Scenario, yet real GDP would decrease by 0.1%. Excessive wage increases would squeeze corporate investment funds to finance them, significantly reducing capital expenditure. Accelerating inflation, triggered by soaring labour costs, would erode international competitiveness. Reduced exports and

increased imports would then exert downward pressure on real GDP through external demand. Excessively high wage increases risk hindering economic expansion rather than fostering a ‘growth-oriented economy driven by wage increases’. In the medium term, reduced investment—the very source of expanding supply capacity and productivity gains—could stifle the potential for future wage increases.

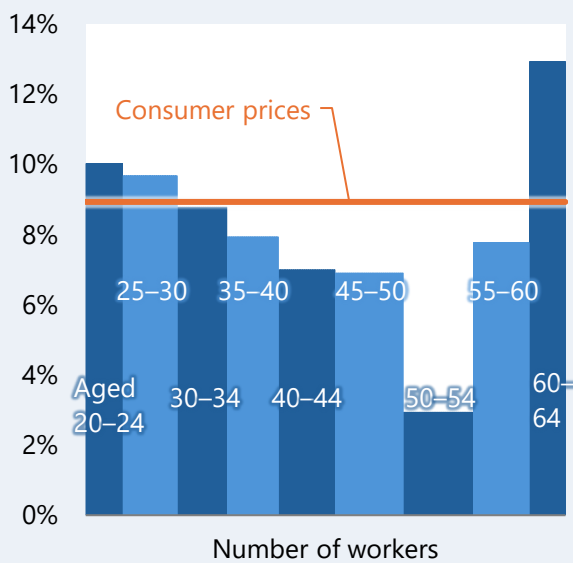
In energy sales volume, all of city gas, electricity and fuel oil would be boosted beyond the 5% Wage Increase Case. Meanwhile, primary energy supply of coal would decrease by 0.2%.

⁸ The highest pay rise rate since the formation of RENGO was 5.95% in FY1990.

Uneven wage increases are unlikely to directly contribute to a virtuous economic cycle.

However, the stimulus effect of wage increases on private final consumption is, in reality, not so reliably predictable. The aforementioned analysis is based on the assumption that wage increases benefit everyone equally. In reality, current wage increases are skewed towards younger generations, as symbolised by the substantial rise in starting salaries (Figure 20)—which, given the labour shortages felt by companies and the age

Figure 20 | Increase rates of scheduled monthly wages and consumer prices [2019–2024]

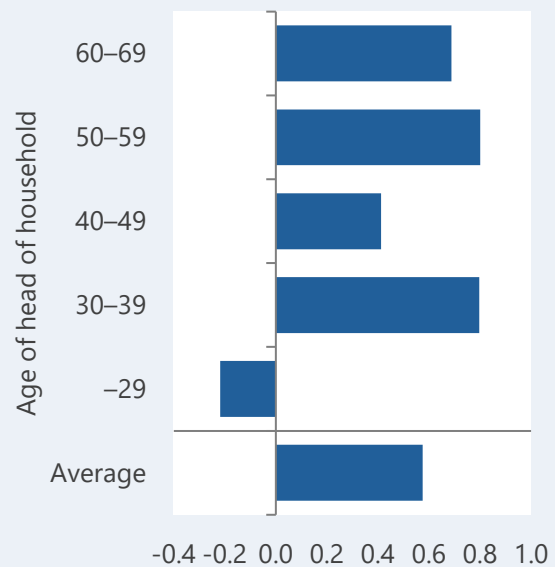


Sources: Ministry of Health, Labour and Welfare ‘Basic Survey on Wage Structure’, Ministry of Internal Affairs and Communications ‘Consumer Price Index’

It is only natural for individuals to desire substantial pay rises. However, wage increases reliant solely on revising the labour share lack sustainability. Moreover, their effects are not always as anticipated. Balanced and appropriate wage increases—commensurate with actual performance such as productivity gains, sustainable over time, and not excessively skewed towards specific groups—are what both society and individuals ought to aspire to, in the short and medium term alike.

composition of the workforce, is in a sense a natural consequence. However, this younger generation exhibits a limited propensity to increase consumption in response to wage rises (Figure 21). Conversely, elder generations, such as the baby boomers’ children (aged 50–54), who have experienced substantial declines in real wages, possess both a large population volume and a high propensity to consume. Consequently, they are driving a significant decline in consumption.

Figure 21 | Gross elasticity of household consumption expenditure with respect to regular income



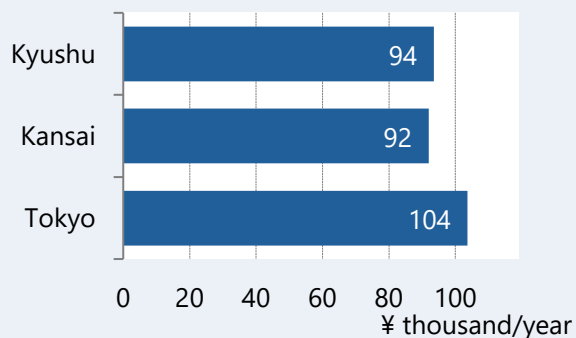
Notes: Real, equivalent basis. Workers households
Source: Estimated from Ministry of Internal Affairs and Communications ‘Family Income and Expenditure Survey’

Topic 2 | Impact on the 3Es according to the degree of nuclear utilisation

Nuclear contributes to the '3Es'.

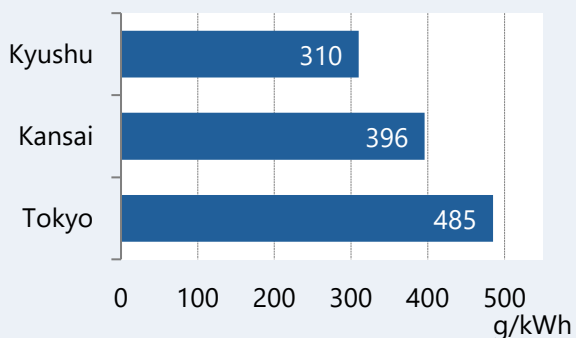
The Strategic Energy Plan approved by the Cabinet in February 2025 shifted the stance on nuclear power generation from 'reducing dependence as much as possible' to 'maximising its utilisation'. In reality, only 27 power plants have applied for compliance reviews under the new regulatory standards, of which 18 have passed the review of changes in reactor installation, and only 14 have resumed operations. Currently, restart progress is more advanced in western Japan, which is cited as one factor behind the east-west disparity in electricity supply.

Figure 22 | Electricity bills of model households



Notes: Metre rate lighting services, 260 kWh/month, 30 amperes. Based on rates in December 2025. Source: Calculated from each company's tariffs.

Figure 23 | Base CO₂ emission factor (unadjusted) for electricity [FY2024]

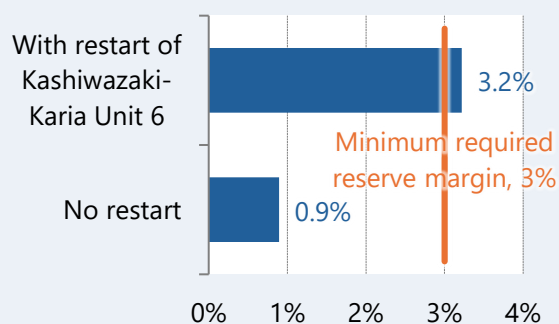


Source: The electric utilities' websites

Amidst this situation, in November the Governor of Niigata Prefecture announced approval for the restart of Unit 6 at the Kashiwazaki-Kariwa Nuclear Power Station, bringing the prospect of a

second restart in eastern Japan and the first for Tokyo Electric Power Company into view. Furthermore, in December the Governor of Hokkaido announced consent for the restart of Unit 3 at the Tomari Power Station. Other developments include plans for a new reactor at Kansai Electric Power Company's Mihama Power Station.

Figure 24 | Minimum reserve margin for electricity supply in the Tokyo Area [August 2026]



Note: Minimum reserve margin for peak demand during severe weather conditions (H1)

Source: Calculated from Agency for Natural Resources and Energy data

Here, we assess the impact on the '3Es'—energy security, economic efficiency and environmental compatibility—resulting from differences in nuclear utilisation.

Case configuration

The Reference Scenario assumes that two additional nuclear power plants will resume operations during FY2026. For the purposes of analysis, the following four separate cases were established:

- 1/ Low Case—No new restarting plants by the end of FY2026 due to lack of local consent.
- 2/ High Case—One reactor restarts earlier than the Reference Scenario.
- 3/ 18-unit Case—Hypothetical. Eighteen reactors that passed the review of changes in reactor installation operate at 80% capacity factor.
- 4/ 28-unit Case—Hypothetical. Twenty-seven reactors that applied for the new regulatory

standards compliance review, plus one next-generation nuclear power plant, operate at 80% capacity factor.

Economic efficiency

The increased utilisation of nuclear power generation will reduce fossil fuel import expenditure and lower the unit cost of electricity. Containing fuel import payments inflated by the weak yen and cost-push inflation will increase real income and, consequently, real GDP.

Energy security

The heightened risk of energy supply disruptions following Russia's invasion of Ukraine and the deterioration of the Middle East situation remains a major concern. As the utilisation of domestically produced nuclear progresses, LNG imports will simultaneously decrease, leading to an increase in energy self-sufficiency rates. Given

that uranium fuel is used over several years, stockpiling effects can also be anticipated.

Environmental compatibility

CO₂ emissions will decrease even when accounting for the increase attributable to the economic boost resulting from the utilisation of nuclear power generation. In the 28-unit Case, emissions would be reduced by 32.5% compared to FY2013.

Ensuring a smooth restart while avoiding hasty action

Some plants remain under ongoing review, whilst others have met the new regulatory standards but have not yet actually resumed operations. Facilitating the smooth restart of plants through appropriate reviews tailored to each plant's circumstances and cooperation from host municipalities will contribute to strengthening the 3Es.

Table 11 | Impact based on the volume of nuclear power generation [FY2026]

	Low	Reference	High	18-unit	28-unit	Changes from Reference				
						Low	High	18-unit	28-unit	
Nuclear	Restarted nuclear plants	14	16	16	18	28	-2	-	+2	+12
	Power generation (TWh)	92.4	106.2	109.1	126.0	204.5	-13.8	+2.9	+19.8	+98.3
	Share in total electricity generated	9.1%	10.4%	10.7%	12.4%	20.1%	-1.4pt	+0.3pt	+1.9pt	+9.7pt
Economy	Real GDP (¥2020 trillion)	597.6	597.7	597.7	597.8	598.3	-0.09	+0.02	+0.13	+0.64
	Trade balances (¥ trillion)	-0.53	-0.44	-0.43	-0.32	0.18	-0.09	+0.01	+0.12	+0.62
	Total fossil fuel imports (¥ trillion)	17.41	17.30	17.28	17.14	16.49	+0.11	-0.02	-0.16	-0.81
	LNG	4.03	3.93	3.90	3.77	3.15	+0.11	-0.02	-0.16	-0.77
	Electricity unit cost ¹ (¥/kWh)	8.46	8.36	8.34	8.23	7.68	+0.10	-0.02	-0.14	-0.69
Energy	Primary energy supply	398.5	399.2	399.4	400.3	404.4	-0.7	+0.2	+1.1	+5.1
	Nuclear (Mtoe)	19.8	22.7	23.3	26.9	43.5	-2.9	+0.6	+4.2	+20.8
	Natural gas (Mt of LNG eq.)	80.3	78.2	77.8	75.2	63.2	+2.1	-0.4	-3.0	-15.0
	LNG imports (Mt)	60.2	58.6	58.2	56.3	47.1	+1.6	-0.3	-2.3	-11.5
	Self-sufficiency rate	18.3%	19.2%	19.4%	20.5%	25.4%	-0.9p	+0.2pt	+1.3pt	+6.3pt
Environment	CO ₂ emissions (Mt)	873	868	867	861	834	+5	-1	-7	-34
	Changes from FY2013	-29.4%	-29.8%	-29.8%	-30.3%	-32.5%	+0.4pt	-0.1pt	-0.5pt	-2.7pt

Note: 1. Fuel and FIT purchasing costs divided by total electricity generated.

Witnessing the rapid advancement and widespread adoption of AI, perspectives on electricity demand—once thought to decline indefinitely—are shifting. The yen's exchange rate, at its weakest level in 40 years, is pushing up the cost of imported goods, and fossil fuels are no exception. Against this backdrop, voices expressing hope

for nuclear power generation—capable of supplying low-carbon, stable and affordable electricity—are increasingly being heard. To meet these expectations and 'maximise the use' of nuclear, it is essential not only to ensure safety in power generation but also throughout the entire back-end process, and to gain public understanding.

452nd Forum on Research Works on 19 Dec. 2025

Outlook for International Oil Market in 2026

- Over supply and geopolitical risks -

<Summary> ♦

Tetsuo Morikawa *

International oil market in 2026

1. Global oil demand is expected to continue growing at a moderate pace in 2026. However, global oil supply is also projected to keep expanding, driven mainly by production increases from non-OPEC+ producers. As a result, the overall market balance is expected to remain in surplus.
2. Under this supply–demand environment, downward pressure on crude oil prices is likely. Brent crude price in 2026 is expected to center around \$55/bbl. However, oil prices could fluctuate significantly depending on factors such as global economic conditions, OPEC+ production policies, and geopolitical risks.

Oil demand

3. Global oil demand increased by 1.1 mb/d (1.0% y/y) to 105.1 mb/d in the third quarter of 2025. Demand growth in Asia has been modest, and the overall pace of global demand growth has slowed. Demand in 2026 is forecast to rise by 0.96 mb/d (0.9% y/y) to 104.9 mb/d.
4. China’s oil demand increased by 0.28 mb/d (1.7% y/y) to 17.09 mb/d in the third quarter of 2025. Due to US sanctions, imports of crude oil from “Malaysia” - which is believed to consist largely of Iranian crude - have declined, and imports from Russia are also expected to decrease. While US-China tensions have temporarily eased following the leaders’ summit in November, a renewed escalation could further slow economic growth and weigh on oil demand.

Oil supply

5. Global oil supply increased by 4.7 mb/d (4.6% y/y) to 108.1 mb/d in the third quarter of 2025. In addition to OPEC+ production increases, output in the Americas has been strong, resulting in a significant rise in production. Even after factoring in a decline in Russian exports, global

♦ Created based on the published research in the 452nd Forum on Research Works with the information available as of December 2025.

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production in 2026 is forecast to increase by 1.0 mb/d (1.0% y/y) to 107.2 mb/d.

6. OPEC+ shifted to a production increase in April 2025. While production was raised at a faster-than-planned pace through September, the group decided in October to halt production increases for the first quarter of 2026, a decision reaffirmed at the November 30 meeting. If OPEC+ is unable to resume production increases from the second quarter of 2026, countries with strong incentives to raise output - such as the UAE and Iraq - may push back, potentially undermining compliance with production agreements.
7. US crude oil production increased by 0.41 mb/d (4.0% y/y) to 13.78 mb/d in the third quarter of 2025. Although production growth has been maintained, current WTI prices are below the average production cost of US oil. As a result, further production increases are likely to be difficult, and US crude output in 2026 is forecast to remain flat at 13.5 mb/d, unchanged from 2025.

Geopolitical risks

8. Geopolitical risks for the oil market intensified in 2025. In April, escalating the US-China trade tensions led to a sharp decline in oil prices, while in June, attacks on Iran by Israel and the US temporarily pushed prices higher. In October, the US, the UK, and the EU tightened sanctions on Russia, and in December, the possibility emerged that the US could launch a military attack against Venezuela. Sanctions or attacks on oil-producing countries are upside risks for prices, while a renewed escalation of the US-China tensions would be a downside risk.
9. In particular, uncertainty surrounding Russia's oil exports remains high. Due to tighter sanctions, Russia's oil exports declined by 0.42 mb/d m/m to 6.86 mb/d in November 2025. Russian exports in 2026 are assumed to decline by 0.5-1.0 mb/d from the November 2025 level. Conversely, exports could recover if a ceasefire agreement in Ukraine is reached.

Oil market balance and price outlook

10. Even after accounting for the assumed decline in Russian exports, production growth is expected to exceed demand growth, resulting in an average supply surplus of 2.3 mb/d over the full year 2026.
11. Against the backdrop of persistent surplus pressure, Brent crude prices in 2026 are expected to center around \$55/bbl.
12. Key uncertainties include geopolitical risks involving Russia and other oil-producing countries, China's oil demand in light of potential renewed US-China tensions, and OPEC+ production policy from the second quarter of 2026 onward.

13. If Russian exports decline more sharply than assumed and supply disruptions occur in Iran or Venezuela, the central price level could rise by around \$10/bbl. Conversely, a Ukraine ceasefire, renewed US-China tensions, or additional OPEC+ production increases could push prices down by around \$10/bbl.

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Gas Market Outlook for 2026

-LNG supply starts a major expansion, but uncertainty remains

both on demand and supply -

<Summary> ♦

Takafumi Yanagisawa *

Key points of this report

1. With major production capacity expansions in the United States and Qatar beginning in 2026, global LNG production capacity will grow faster than demand, putting downward pressure on prices.
2. However, there is uncertainty surrounding existing and under-construction projects (sanctions against Russia, the security situation, rising equipment and material costs, etc.), and when operating rates are considered, LNG supply volume may decline.
3. Furthermore, as prices fall due to expanded supply, LNG demand may increase, particularly in Asia. Depending on the level of introduction of AI, data centers, and renewable energy, LNG demand may also increase further.
4. As a result, LNG supply and demand will be balanced, and an "oversupply" such as unsold LNG is unlikely to become a reality.
5. Japan's LNG import price is forecast to be \$11.2 per million Btu in 2025 and \$9.2 in 2026. Meanwhile, spot LNG prices in Asia, determined by LNG supply and demand, are forecast to be around \$12.5 in 2025 and \$10.5 in 2026.
6. Under these circumstances, temporary tightness due to seasonal demand fluctuations and supply disruptions remains a possibility. Continuing investment and financing to LNG projects for medium- to long-term is important.
7. In anticipation of the decline in LNG prices due to increased supply, which is expected to become apparent from 2026 onward, it will be important for buyers to strategically pursue long-term contracts in addition to utilizing spot procurement.
8. Leveraging a series of deregulations under the Trump 2.0 administration, progress is being

♦ Created based on the published research in the 452nd Forum on Research Works with the information available as of December 2025.

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made in final investment decisions (FIDs) for LNG projects in the United States. This is partly due to the support of term contracts, including those involving Japanese companies. Meanwhile, rising EPC costs (inflation and rising equipment and material costs due to tariffs) have led to FID postponements. The administration's pursuit of lowering energy prices could have a negative impact on business viability, so uncertainty remains for future developments.

9. Qatar's expansion project is scheduled to begin production in the second half of 2026, aiming to increase production capacity from the current 78 million tons per year to 142 million tons by 2030. Western majors, as well as Chinese and Taiwanese companies, have already invested and signed large-scale long-term contracts. However, a considerable amount of unsold LNG remains, which may flow into the spot market. Qatar is confident in its price competitiveness and is likely to maintain the "destination clause".
10. The strengthened sanctions by the United States and Europe against Russian gas and LNG could affect Japan's imports of LNG from Sakhalin 2. A joint public-private response is essential to ensuring Japan's energy security.
11. Australia's retroactive regulatory changes to protect domestic gas supplies and to strengthen decarbonization measures have made the country's LNG business environment uncertain. Meanwhile, there are signs that the Australian government's stance may be changing, and it is noticeable whether concrete policy changes will happen.
12. The U.S. government's involvement in methane emissions measures has been declining, while companies still recognize the importance.

Reference Information

<LNG price and supply/demand outlook>

13. Overall, supply and demand in the global natural gas and LNG markets will remain weak in 2025, and this trend will continue in 2026.
14. The global LNG market size is expected to expand significantly from 440 million tons in 2025 to 470 million tons in 2026 and 490 million tons in 2027.

<Factors affecting the LNG market balance>

15. The smooth start-up of new and expanded LNG production projects, primarily in the United States and Qatar, will be key to ensuring a stable global supply of LNG.
16. LNG imports in 2025 are expected to increase significantly in Europe, which has adopted a policy of phasing out Russian gas and LNG, while China and Southeast Asia will see significant declines. The impact of future developments in Europe on the market will be noticeable. China's gas market contracted for the first time in 2022, but increased again from

2023, reached a record high in 2024, and remained flat year-on-year for the January-September period of 2025. Breaking this down, domestic gas production and pipeline imports increased by 7% and 8%, respectively, while LNG imports decreased by 17%.

<Points to keep in mind for the future LNG market>

17. LNG projects are progressing in various parts of the world, not only in the United States and Qatar. There are particularly high hopes for the West Coast of North America, starting with Canada. Meanwhile, as the world as a whole sees an increase in frontier and highly challenging projects, greater attention will be required for the risks associated with development.
18. The risk of delays and increased costs after construction decisions is also emerging. While the United States is driving medium-term expansion, there have been cases where FID has been postponed due to rising EPC costs. The future of new projects in Russia is uncertain due to sanctions following the Russian invasion of Ukraine, and there is uncertainty about the continuation of production at existing projects. There are also uncertainties, such as the risk of labor disputes in Australia.
19. As the bottleneck surrounding the canals becomes prolonged, it will be necessary to develop a strategy for LNG transportation.

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Outlook for the International Coal Market in 2026

- Steady Demand, Evolving Trade Dynamics -

2026 as a Turning Point for the Coal Market

<Summary> ◆

Yoshiaki Takahashi *

Global Coal Demand and Market Environment

1. Global coal demand in 2025 is estimated at approximately 8.8 billion tonnes, holding steady compared to the previous year, continuing to demonstrate resilience. By type, thermal coal accounts for about 90% of total demand, consumed for power generation. By country, China accounts for 56% and India for 15% of global demand, making these two countries the core drivers of the world coal market.
2. In contrast, international coal trade amounts to around 1.5 billion tonnes per year, representing only about 17% of global demand, reflecting a fundamentally “local production for local consumption” structure. Indonesia is the world’s largest coal exporter, with a 36% share, while Australia remains Japan’s largest source of coal imports.
3. Global coal demand in 2026 is likely to remain broadly in line with the previous year. However, increased domestic coal production in China and India is likely to lead to a decline in their import volumes. As a result, thermal coal trade appears to have reached a plateau, suggesting that the market is entering a phase of structural contraction.
4. Average Australian thermal coal FOB prices declined from USD 140/tonne in 2024 to USD 110/tonne in 2025 and are projected to remain broadly stable in 2026, following a sharp correction in 2025. Australian premium metallurgical coal FOB prices followed a similar trend, declining from USD 249/tonne in 2024 to USD 185/tonne in 2025, and are projected to remain broadly flat in 2026. While reduced imports by China and India warrant attention in the overall thermal coal market, Australian thermal coal is less exposed to these two markets, limiting the impact and supporting a continuation of price stability. For metallurgical coal, increased demand from India and ASEAN countries will provide some support; however, this is not expected to be sufficient to trigger a price rebound.

◆ Created based on the published research in the 452nd Forum on Research Works with the information available as of December 2025.

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Developments in Major Importing Countries

5. In China, domestic coal production has been expanded to meet growing power demand, and imports of thermal coal have recently shown a declining trend. Domestic production is likely to continue expanding through 2026; however, tighter supply–demand conditions could emerge depending on production developments. China’s supply-demand balance will therefore continue to exert a considerable influence on the international coal market. For metallurgical coal, declining crude steel production has led to inventory accumulation, resulting in a downward trend in import volumes.
6. In India, domestic coal production has also expanded, and combined with a recovery in hydropower generation, thermal coal imports slowed in 2025. At the same time, continued economic growth and expansion of steel production have sustained strong demand for metallurgical coal imports. This structure is expected to persist in 2026, with thermal coal imports gradually declining while metallurgical coal import demand remains robust.
7. In ASEAN, coal consumption has traditionally been centered on thermal coal; however, increased crude steel production in countries such as Vietnam and Indonesia has driven growth in metallurgical coal imports. Available capacity and project pipelines suggest that this trend will continue.

Developments in Major Exporting Countries

8. In Australia, coal production in 2025 remained broadly stable, aside from some weather-related transportation constraints. However, the continuation of environmentally focused policies has reduced predictability for operations and development. Decisions on whether to continue operations may be influenced by policy and market conditions at the time of mining lease renewals. Furthermore, differences in views between the federal government and the Queensland state government regarding the timing of coal-fired power plant exits have become more apparent, highlighting the challenge of balancing energy security and environmental commitments. In New South Wales, there have also been renewed discussions about further extending coal-fired power plant closures that were previously postponed.
9. This unstable policy environment affects the medium- to long-term operation of the coal industry and heightens concerns over future export supply capacity. While stable production levels are expected to be maintained in 2026, the scope for expanding supply remains limited amid continued policy and investment uncertainty.
10. In Indonesia, declining exports to China and India are expected to reduce coal exports in 2025 by around one hundred million tonnes year-on-year, to approximately 740 million tonnes. The government is considering measures that prioritize domestic demand, such as expanding domestic market obligations and introducing export taxes. In addition, the current president’s

policy of accelerating the transition to renewable energy has increased uncertainty regarding the predictability and consistency of coal policy. Close attention to Indonesia's coal policy developments will therefore be required in 2026.

Diversity of Coal Policies

11. In ASEAN, coal-fired power generation is being re-evaluated as a stable power source. This reassessment reflects the need to secure sufficient supply to meet rapidly growing electricity demand and is being considered in parallel with renewable energy deployment, incorporating clean coal technologies and energy efficiency improvements.
12. Under the Trump administration, inaugurated in January 2025 in the United States, the "Energy Dominance" policy has been promoted, leading to measures such as postponing coal-fired power plant closures and easing emissions and mining regulations. While the short-term impact on the international coal market is expected to be limited, these policy shifts could influence policy decisions in emerging economies and energy-import-dependent countries over the medium to long term.

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Climate Change Policy Challenges in 2026

- Weakening Policy Commitments and the Approaching GX-ETS -

<Summary> ♦

Tohru Shimizu *

Outlook for 2026

1. A shift toward more pragmatic climate policies is becoming increasingly evident. In particular, in advanced economies, policies are expected to place greater emphasis on energy security and industrial competitiveness.
2. At the 31st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP30), the UNFCCC Secretariat published the results of its analysis of Nationally Determined Contributions (NDCs) from 113 countries. According to this analysis, global greenhouse gas (GHG) emissions in 2035 are projected to be only 12% lower than 2019 levels. This falls far short of the 60% reduction by 2035 required to be consistent with achieving the 1.5°C target under the Paris Agreement.
3. The status of climate policy implementation among major economies—including the United States, Europe, and China—is uneven. While climate policy momentum has slowed in the United States and Europe, carbon pricing initiatives continue to expand in China and other countries.

Country Developments

United States

4. In January 2025, the United States formally announced its withdrawal from the Paris Agreement, with withdrawal scheduled for January 2026. The federal government did not dispatch an official delegation to COP30.
5. The U.S. Environmental Protection Agency (EPA) announced a proposal to revoke the 2009 endangerment finding, which determined that greenhouse gases pose a threat to public health and welfare. As a result, major environmental regulations—including carbon emission standards for power plants and proposals to repeal the Greenhouse Gas Reporting Program (GHGRP)—have been rolled back.

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6. Following the enactment of the One Big Beautiful Bill Act under the Trump administration, the large-scale tax credits introduced under the previous administration's Inflation Reduction Act are being phased down or terminated. In contrast, support for carbon capture and storage/utilization (CCS/CCU) has been retained, including increased tax credits for enhanced oil recovery (EOR) and related activities.
7. These revisions to environmental regulations have been criticized by power generators, financial institutions, and oil and gas companies, which argue that they increase uncertainty in investment decision-making.
8. The U.S. midterm elections in 2026 may prove decisive in determining the durability of climate policies under the Trump administration.

Europe

9. The political process to adopt a 2040 emissions-reduction target as part of the European Climate Law is ongoing. In July 2025, the European Commission proposed a 90% reduction relative to 1990 levels by 2040, but divisions among Member States could not be resolved in time for COP30. In December, a provisional agreement was reached between the European Parliament and EU Member States.
10. Triggered by the Draghi Report (September 2024), Europe has positioned the rebuilding of industrial competitiveness as a key policy priority. The Clean Industrial Deal announced in February 2025 presented a framework aimed at simultaneously pursuing decarbonization and industrial competitiveness. In addition, measures to simplify environmental regulations, such as the Carbon Border Adjustment Mechanism (CBAM) and the Corporate Sustainability Reporting Directive (CSRD), have been successively adopted.

China

11. Prior to COP30, China submitted an updated NDC that includes a new absolute emissions target of a 7–10% reduction from peak-year emissions, signaling a shift away from its previous focus on CO₂ intensity targets.
12. Under the 14th Five-Year Plan, China set targets of a 13.5% reduction in energy intensity and an 18% reduction in CO₂ intensity. While these targets are widely viewed as difficult to achieve, strengthened policy measures could bring emissions close to the targeted levels.
13. Under the 15th Five-Year Plan, beginning in 2026, supplementary absolute emissions targets are expected to be introduced at the provincial and municipal levels. For major sectors covered by the ETS—including power generation, steel, cement, and aluminum—benchmark-based allocation will continue.

East and Southeast Asia

14. The introduction of emissions trading systems (ETSs) and carbon taxes is accelerating. Korea launched its ETS in 2015, China in 2021, and Indonesia introduced an ETS and tax for coal-fired power generation in 2023. Viet Nam plans to launch a pilot ETS in 2025, with full-scale implementation in 2029, while Thailand and Malaysia are also advancing discussions on ETS adoption.
15. In addition, under AZEC, discussions are progressing on the enhancement of emissions accounting and the development of “high-quality carbon markets” aligned with Article 6 of the Paris Agreement, and institutional foundations across the ASEAN region are expected to be strengthened.

Domestic Developments (Japan)

16. Based on the Seventh Strategic Energy Plan, Japan submitted a new NDC to the United Nations, setting emissions-reduction targets of 60% below 2013 levels by 2035 and 73% below 2013 levels by 2040.
17. Amendments to the GX Promotion Act will bring the GX Emissions Trading System (GX-ETS) into full-scale operation as a mandatory scheme in April 2026. Within the ETS Subcommittee, an interim summary of detailed design elements—including allocation methodologies—has been prepared.
18. A total of 21 benchmarks covering manufacturing, power generation, and transport have been established. From April 2027 onward, actual procedures—including emissions reporting and applications for free allocation—will begin. From 2026, close attention will be paid to how GX-ETS price-stabilization measures (price ceilings and floors) function in practice, and to their impact on corporate behavior and emissions-reduction investment.
19. Amid a retreat in climate change policies internationally, Japan is advancing an emissions trading system (ETS) as a statutory framework. For firms, this represents a turning point at which domestic emissions-reduction actions become unavoidable.

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Challenges for Japan's Electricity Policy in 2026

- Securing Medium- to Long-Term Power Supply
in the Face of Increasing Electricity Demand -

<Summary> ♦

Kenichi Onishi *

Outlook for Electricity Demand and Securing Supply Capacity in Japan

1. According to the electricity demand outlook published in January 2025 by the Organization for Cross-regional Coordination of Transmission Operators, Japan (OCCTO), nationwide electricity demand (end-use basis) is projected to grow at an average annual rate of 0.6% between FY2024 and FY2034. From FY2026 onward, demand is expected to continue increasing through FY2034, driven by economic growth as well as ongoing construction and expansion of data centers and semiconductor manufacturing facilities. From a regional perspective, electricity demand growth is particularly pronounced in Hokkaido and the Tokyo metropolitan area.
2. OCCTO estimates that new and expanded data centers and semiconductor plants will increase peak electricity demand by up to 7.15 GW between FY2024 and FY2034. In the Tokyo metropolitan area, grid reinforcement may be required when connecting data centers to the power system, raising concerns that grid connection lead times could become longer. Going forward, in addition to promoting earlier grid connections, it will be important to encourage the geographical dispersion of data centers to regions outside the Tokyo and Osaka metropolitan areas, particularly for applications that do not require ultra-low latency.
3. For winter FY2025, Japan is expected to secure a minimum reserve margin of at least 3% in all regions against severe winter demand assumptions.
4. Looking ahead, long-term suspensions and retirements—particularly of inefficient coal-fired power plants—are expected to continue. At the same time, new construction and replacement of power plants, such as LNG-fired power plants, will proceed through the Long-Term Decarbonized Power Source Auction, although commercial operation is expected to begin after 2029. As Japan enters a transitional phase of power supply restructuring, supply–demand conditions remain uncertain, especially during peak summer and winter periods through the

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early 2030s.

5. According to the FY2026 supply–demand outlook published in October 2025, overlapping long-term outages and suspensions of power plants could reduce the reserve margin in the Tokyo area to as low as 0.9% in August 2026. In response, a policy direction was indicated to conduct a 1.2GW capacity tender (kW auction) in the Tokyo area. In November 2025, the Governor of Niigata Prefecture approved the restart of Kashiwazaki-Kariwa Nuclear Power Plant Unit 6. Its restart is expected to increase the reserve margin by approximately 2.4 percentage points, potentially raising it to around 3.3% even without conducting a kW auction.
6. Japan has already introduced a capacity market designed to secure supply capacity four years ahead. In January 2025, a capacity auction targeting FY2028 supply was conducted, and capacity prices have been rising overall. The primary driver of higher capacity prices is considered to be an increase in bid price levels. Depending on developments in the Long-Term Decarbonized Power Source Auction and the pace of power plant suspensions and retirements, capacity prices could rise further if electricity demand continues to grow while supply capacity remains constrained.

Electricity Demand Outlook and Supply Capacity in the United States

7. In the PJM region in the eastern United States, demand forecasts have been revised upward on an annual basis. While the projected average annual growth rate of electricity consumption over the next decade was 0.7% in the 2020 outlook, it increased to 4.8% in the 2025 outlook.
8. In PJM, capacity prices for the 2026/27 delivery year rose to the price cap of USD 329.17 per MW per day (approximately JPY 18,000 per kW per year). The main factors behind the surge in capacity prices include: (1) a reduction in supply-side bidding volumes, (2) an increase in projected electricity demand, and (3) an increase in the required reserve margin to 19.1%.

Challenges for the Long-Term Decarbonized Power Source Auction and Consideration of Public Finance

9. In Japan, the Long-Term Decarbonized Power Source Auction was introduced in January 2024 as a supplement to the conventional capacity market. Winning bidders receive fixed-cost revenue for 20 years in principle, while approximately 90% of profits from other electricity markets are clawed back ex post. In both the first and second auctions, a large number of battery storage projects were awarded. The first auction included Shimane Nuclear Power Plant Unit 3, while the second auction focused on safety investments in existing nuclear power plants, with a total awarded capacity of 3.153 million kW. Although LNG-fired power plants attracted strong participation in the first auction, the number of bids declined in the second auction.

10. Under this scheme, the scope of eligible power sources and related requirements has been expanded and revised. Newly eligible categories include new construction and replacement of ammonia-fired power plants, conversion of existing thermal power plants to hydrogen or ammonia dedicated firing, retrofitting with carbon capture and storage (CCS), and long-duration energy storage facilities. In addition, the minimum continuous operation duration for batteries and similar resources was extended to six hours or more. Furthermore, for certain power sources, provisions were added to allow construction costs to be reflected in bid prices—up to 1.5 times the initial cost—once additional investment amounts are confirmed.
11. From the fourth auction onward, potential discussion points include:
 - (1) eliminating the risk of unrecovered fixed costs for nuclear power and other capital-intensive power sources;
 - (2) introducing mechanisms to allow cost recovery during the construction period of nuclear power plants and similar facilities;
 - (3) enabling the participation of offshore wind projects under the FIP scheme in the Long-Term Decarbonized Power Source Auction;
 - (4) realizing optimal operation of battery storage systems; and
 - (5) region-specific deployment of batteries that takes into account the geographic concentration of variable renewable energy.
12. Achieving decarbonization of the power sector while ensuring a stable electricity supply requires large-scale investment in power generation facilities as well as transmission and distribution infrastructure. However, securing financing within a short time frame is not always easy. In Texas, the United States, a state-funded mechanism has been established to support power generators through low-interest loans provided by a government-backed fund. Japan is also moving toward greater utilization of government creditworthiness, but it will be necessary to organize and develop financing mechanisms—including Fiscal Investment and Loan Program (FILP)-type schemes—to effectively support large-scale investment.

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Renewable energy in 2026

: Continuous concentration on solar PV and China

<Summary> ♦

Yasushi Ninomiya^{*}, Hiroyuki Okawa^{**}

Renewable energy will be the largest energy resource in electricity generation in the world in 2026.

1. The share of renewable energy, including hydropower, in global electricity generation is expected to expand to around 36% by 2026. Renewable energy is likely to surpass coal, which was previously the largest source, to become the top source for the first time over the past few decades. The share of variable renewable energy, hereafter VRE, which combines solar and wind, is also expected to expand to nearly 20%, making efforts to ensure the flexibility of the power grid to integrate high-share VRE increasingly realistic as a medium- to long-term challenge.

Global renewable generation capacity is projected to increase by 690 GW in 2026.

2. The increase in renewable energy generation is driven by the rapid growth of renewable generation capacity. While the annual increases continued to break records year by year, reaching 680 GW in 2024 and 750 GW in 2025, the rise in 2026 is expected to be at the same level as 2024, at 690 GW. The annual growth rate will slow to 12% in 2026, compared to 16% in 2024 and 15% in 2025, but it will still remain at a historically high level.
3. China, the largest market in the world, undertook a major change in its renewable support policy in mid-2025, shifting from the traditional fixed-price purchase system to a CfD, Contract for Difference, system based on bidding and market sales. This policy change aims to integrate renewable energy into the market. A surge in activity under the old system occurred in the first half of 2025, and this rebound is expected to lead to a slowdown in the growth of global renewable generation capacity in 2026. Although China has entered an adjustment phase due to the policy change, it is expected to continue to grow at least at the same level as in 2026 under the new system from 2026 onward.

♦ Created based on the published research in the 452nd Forum on Research Works with the information available as of December 2025.

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Solar PV is expected to account for 80% of the global renewable capacity growth in 2026.

4. Solar PV is likely to account for nearly 80% of the increase in global renewable capacity by 2026, continuing the concentration on solar PV that has become prominent since 2020. The dramatic drop in the price of Chinese-made solar modules has led to a decrease in the cost of solar PV generation, even amid inflation, plus the relatively easy acquisition of permits and rapid installation have contributed to its global spread. While such an increase is particularly pronounced in China, the growth of solar PV in other countries will also progress, heavily relying on Chinese products. On the other hand, wind power, which has a relatively high proportion of production outside of China, would see its growth slow down, particularly due to rising costs for offshore wind power, creating a clear contrast with solar PV.
5. The dominance of VRE in the growth in global renewable capacity, which has become significant since 2023, will continue into 2026, 96% in the year, further accelerating the share of VRE in the global power system.

China accounts for 60% of renewable deployment, while the US is slowing down, and India is rapidly becoming the third-largest renewable market after Europe.

6. China's share of the global annual increase in renewable capacity is expected to be almost 60 % in 2026, keeping its dominant position globally. While the policy changes in 2025 will lead to an adjustment period, China will still outperform other markets in 2026. In contrast, in the US, where significant policy changes have also occurred in 2025, a slowdown is expected to begin in 2026, with the most significant impacts anticipated in 2027 onwards. India is accelerating its solar PV deployment and is likely to surpass the US to be the world's third-largest renewable market after Europe.
7. Whereas advanced economies are projected to keep a market size of about 40% of China's in 2026, their growth rate would slow to around 8% p.a. Conversely, developing countries excluding China are growing at 12% p.a., and their markets would rapidly expand to around 80% of the size of the advanced economies in 2026.

Japan's renewable capacity is expected to rise by approximately 6 GW p.a. in 2026.

8. In Japan, renewable capacity, excluding large-scale hydro exceeding 30 MW, will reach 117 GW by the end of FY2026, producing 231 TWh of electricity in the year. When including large-scale hydro in this figure, the share of renewables in total electricity generation in FY2026 is expected to be 26%.
9. The growth of renewable capacity in Japan in FY2026 is expected to be approximately 6 GW p.a., the same level as the previous year. The annual growth rate would slow from a peak of 34% in FY2014 to 6% in FY2026. Achieving the national target of 40-50% renewable share

in total power generation by FY2040, set out in the 7th Strategic Energy Plan, will require a further expansion of renewable capacity from the current growth level.

Challenges associated with the further expansion of renewables in 2026.

10. Challenges commonly found in the world associated with further expansion of renewables in 2026 include the concentration of supply chain in specific country; business instability for solar module manufacturers due to excessive competition with and price drop; rising cost of offshore wind development with global inflation; increased grid congestion and curtailment as a result of inadequate power grid infrastructure; grid flexibility to accommodate high-share VRE; public acceptance with local communities and delays in permits to renewable development.
11. In Japan, challenges in 2026 include a decline in public acceptance due to concerns about sustainability, such as environmental impact; a decrease in suitable sites for renewable development; an increase in curtailment due to grid constraints; moving away from Feed-in Tariff scheme and becoming self-sufficient renewable business models and withdrawal of operators and development delays from offshore wind development.

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Key Policy Challenges for Hydrogen and Its Derivatives and CCS in 2026

- Efforts and Issues Toward Full-Scale Societal Deployment -

<Summary> ♦

Tatsuya Hagita *

Current Status and Challenges of Global Hydrogen and Its Derivatives Production

Project Development

1. Based on a bottom-up assessment of announced production projects, the outlook for hydrogen and its derivatives production had shown a steady increase up to 2024, reaching approximately 49 million tonnes of hydrogen per year as of 2024. However, a series of project cancellations and delays has since led to a downward revision, with the current estimate declining to around 37 million tonnes of hydrogen per year.
2. At the same time, particularly in Europe, policy support and institutional frameworks have continued to advance, and global production volumes of hydrogen and its derivatives, as well as the amount of committed investment, are increasing overall. At present, investment decisions are primarily driven by the replacement of existing hydrogen and ammonia demand, such as for fertilizer production and oil refining.
3. While the expansion of hydrogen and its derivatives use—including in hard-to-abate sectors—is expected to remain essential for decarbonization, a gap persists between the current situation, characterized by high costs and a lack of offtakers, and the future vision in which demand expands and costs decline. Bridging this gap will require appropriate policy support and market design that can serve as a transitional mechanism.

Developments in Domestic Hydrogen and Its Derivatives Policy in 2025 and Key Focus

Areas for 2026

4. Under the Price-Gap Support Scheme, designed to bridge the cost differential with existing competing fuels, two domestic projects were initially selected. One project, led by Toyota Tsusho and Aichi Steel, involves the use of hydrogen as fuel for steel reheating furnaces, with

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an annual supply of 1,600 tonnes of hydrogen. The other project, led by Resonac and Nippon Shokubai, produces ammonia from hydrogen derived from waste plastics and waste textiles, and manufactures and sells ammonia-derived products for textile feedstocks (20,815 tonnes of ammonia per year, equivalent to 3,234 tonnes of hydrogen per year). The review process for this support scheme remains ongoing, and developments in 2026—including the selection of large-scale projects involving imported hydrogen and its derivatives—will be closely watched. (Note: Two additional overseas projects were newly selected in mid-December 2025.)

5. In the third round of the Long-Term Decarbonization Power Source Auction, support for hydrogen and ammonia power generation was expanded. Variable costs, including fuel costs, were allowed to be included in bid prices, and the upper price cap was raised to a level that enables project deployment. Projects involving 100% hydrogen firing and 100% ammonia firing were also made eligible.
6. Looking ahead to 2026, key points of attention include the concretization of efforts toward creating an enabling environment for strategic investment and advancing market design that supports the expansion of hydrogen and its derivatives use. In this context, progress and outcomes of selection under Hub Development Support for shared hydrogen infrastructure aimed at building large-scale supply chains will be important. In addition, initiatives to design markets and incentives in which the use of hydrogen and its derivatives generates clear economic value will be critical. Policy support and institutional design to enable the commercialization of hydrogen-based fuels—such as synthetic fuels (e-fuels) and ammonia for maritime use—remain key challenges.

Recent Trends and Outlook for CCS Projects Worldwide

7. Global CO₂ storage volumes have been increasing steadily, reaching approximately 50 million tonnes per year at present. The cumulative storage capacity of projects in operation or under construction has already exceeded 100 million tonnes per year, and this upward trend is expected to continue.
8. Concrete progress has been observed in CCS projects, particularly in Europe. In Norway, the Northern Lights project has announced that CO₂ injection began in August 2025.
9. In the United States, the Environmental Protection Agency (EPA) proposed the abolition of the GHG reporting requirement in September. As EPA GHG reporting is linked to the 45Q tax credit for CCUS under the Inflation Reduction Act (IRA), there are concerns that CO₂ accounting could become less transparent. The future direction of this proposal warrants close attention.

Developments in Japan's CCS Policies in 2025 and Key Issues for 2026

10. As part of Japan's CCS policies, a support scheme for domestic pipeline-based CCS projects has been presented that is based on a Contract-for-Difference (CfD) mechanism. The scheme is designed to cover the difference between a strike price—representing CCS costs, including CAPEX and OPEX—and a reference price, defined as the costs that would be incurred in the absence of CCS, with GX-ETS prices serving as a reference. In addition, in the third Long-term Decarbonized Power Source Auction, thermal power generation with CCS was added as an eligible bidding category.
11. Regarding the progress of CCS in Japan, two designated areas for exploratory drilling have been specified: parts of the offshore areas of Tomakomai, Hokkaido, and offshore Kujukuri, Chiba Prefecture. For advanced CCS support projects involving ship-based transport, support may include component-by-component support across the value chain. In parallel, further institutional design is advancing with respect to issues required for the implementation of CCS, including monitoring and leakage prevention, future closure measures, and detailed cost-related arrangements.
12. Key issues to watch in 2026 include, in addition to the progress of the above initiatives, developments in cross-border CCS, such as bilateral discussions aligned with the London Protocol and progress toward establishing international frameworks for CO₂ accounting. Further attention is also warranted with regard to efforts aimed at overall cost reduction through infrastructure standardization and optimization of the entire capture–transport–storage value chain.

452nd Forum on Research Works on 19 Dec. 2025

Nuclear Energy Policy Challenges for 2026

- Ongoing Discussions to Reduce Business Uncertainty -

<Summary> ♦

Kenji Kimura *

Recent situation surrounding nuclear energy

1. In recent years, discussions worldwide have increasingly highlighted the role of nuclear power from the perspectives of climate change mitigation and energy security. More recently, the need to respond to growing electricity demand from the expansion of data centers has further prompted a reassessment of nuclear power's role.
2. Several analyses on the impact of increased deployment of variable renewable energy have found that nuclear energy can remain competitive within overall power-system costs.

Notable global trends

3. In the U.S., executive orders were issued in May 2025 to promote the use of nuclear power. These orders direct measures such as promoting technology development, strengthening the industrial base, and accelerating regulatory processes. Notably, one of the orders established decision deadlines for regulators: 18 months for new construction applications and 1 year for applications related to the continued operation of existing reactors.
4. Additionally, in the U.S., several IT companies that operate data centers have begun investing in nuclear power or entering into power purchase agreements (PPAs). Policy-driven promotion combined with the emergence of new user segments is creating favorable momentum for nuclear deployment.
5. In the U.K., the government made a final investment decision in July 2025 to construct Sizewell C. Under this plan, support is provided through a regulated asset base (RAB) model that guarantees an adequate revenue level and enables cost recovery from the construction phase. The government is also making significant direct investments to address project uncertainties and financing challenges.
6. In Sweden, a new nuclear support bill was enacted in May 2025. The support consists mainly

♦ Created based on the published research in the 452nd Forum on Research Works with the information available as of December 2025.

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of: (i) low-interest government loans for the construction phase; (ii) Contract for Difference (CfD)-style top-up payments after operations begin; and (iii) revenue guarantees for a certain period post-startup. It will be important to monitor developers' responses to these mechanisms.

7. While institutional efforts to promote nuclear energy are progressing in Europe and the U.S., nuclear construction in China and reactor exports from Russia to emerging economies continue steadily. The strong presence of these two countries in the global nuclear market is expected to persist in the near term.

Outlook and notable trends in Japan

8. In February 2025, the 7th Basic Energy Plan was approved by Cabinet decision, presenting an outlook in which nuclear power will account for roughly 20% of electricity generation in FY2040. This level is achievable if the currently remaining reactors are restarted and operated stably and if projects labeled as "under construction" proceed as planned. However, maintaining a similar share through 2050 will likely require reactor replacement. In November 2025, Kansai Electric Power Company announced the resumption of geological surveys in the Mihama area in preparation for such replacement projects.
9. Discussions have also progressed on improving the investment environment for nuclear projects. For the third auction round for long-term decarbonized power generators scheduled for FY2025, it was decided that retrospective support would be provided for cost increases up to 1.5 times the bid price (with inflation and interest-rate fluctuation components treated separately). A policy was also presented to allow public financing for a certain share of large-scale, long-term projects. Future developments in both public- and private-sector efforts will be of interest.
10. Between November and December 2025, the governors of Niigata Prefecture and Hokkaido each expressed acceptance of restarting Kashiwazaki-Kariwa Unit 6 and Tomari Unit 3, respectively. Along with Tokai No. 2, for which safety-related construction is scheduled for completion in December 2026, attention will turn to whether additional restarts proceed steadily.
11. Regarding Kashiwazaki-Kariwa Unit 6, even if it is restarted, the deadline for completing its Specialized Safety Facility for remotely handling severe accidents is September 2029, after which the unit should be shut down again. Onagawa Unit 2 will also reach its deadline in December 2026. In October 2025, the operators proposed to the Nuclear Regulation Authority a three-year extension of the deadline (currently set as five years after approval of the main facilities' construction plan). Since this is a key issue for many existing reactors, the progress of these discussions warrants close attention.
12. Regional development in nuclear-hosting communities is another important issue. Sustainable

local development requires not only the grant programs but also broader economic growth; in particular, attracting manufacturing bases or data centers aligns with GX (green transformation) industrial policies of Japan. Whether concrete incentives can be offered to attract private companies will be a key point to watch.

13. The Rokkasho reprocessing plant in Aomori Prefecture is scheduled for completion in FY2026. If completed as planned, it will be an important step toward easing the tightening spent-fuel storage capacity at each power station. At the same time, ensuring steady progress in MOX fuel operation will become an increasingly significant challenge.

452nd Forum on Research Works on 19 Dec. 2025

Energy Efficiency Policy Challenges for 2026

- Overseas Policies Swayed by Considerations of
Industrial Competitiveness and Political Agendas -

<Summary> ♦

Seonghee Kim *

Trends in Global Improvements in Primary Energy Intensity

1. Global primary energy consumption per unit of GDP improved by around 1% year-on-year in 2024, and is projected to improve by 1.8% in 2025.
2. In 2025, improvement rates are expected to be particularly high in China (3.5%) and India (4.0%). In contrast, following several years of strong performance after the 2022 energy crisis, improvement rates in the United States and the European Union are projected to fall below 1%.
3. Since 2022, global primary energy consumption per unit of GDP has improved at an average annual rate of 1.5%. The current pace of improvement remains well below the target presented at COP28, which calls for annual improvement of more than 4% by 2030.

Slowing Energy Efficiency Investment and Expanding Electrification/Renewable Energy Investment

4. In 2025, global demand-side energy investment is projected to increase by 6.1% year-on-year. Energy efficiency investment is expected to increase by only around 1%, indicating a clear slowdown. Electrification and renewable energy investment are projected to surge by 13.1%.
5. Electrification is expected to deliver energy-saving benefits through the use of more efficient equipment. In addition, expanding renewable power generation reduces primary energy consumption compared with thermal power, thereby improving primary energy intensity. For these reasons, trends in electrification and renewable energy investment are also important for energy efficiency.
6. Looking at energy efficiency, electrification, and renewable energy investment by sector, investment in the industrial sector increased by 25% year-on-year. This was driven by China's

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strengthened energy efficiency targets for 2024/2025 and sector-specific measures for priority industries, a rush of demand in the United States ahead of the early termination of the IRA, and Europe's support for industrial revitalization.

7. In the transport sector, investment—centered on EVs—is expected to reach a record high of about USD 330 billion in 2025. Electrification is playing a leading role.
8. In the buildings sector, amid weakening construction demand, energy efficiency investment is shifting from new development to retrofits. In Europe, surging electricity prices relative to gas prices and the scaling back of subsidy measures are slowing investment. As a result, in 2025, investment in the buildings sector increased by 3% year-on-year, as electrification and related investment offset the decline in investment in energy efficiency retrofits and other measures.

Policies Swayed by Industrial Competitiveness Concerns and Political Considerations

9. Germany introduced a “65% renewable energy requirement” for newly installed heating systems starting on January 1, 2024. However, under the Merz administration that took office on May 6, 2025, there is now the possibility that the “65% renewable energy requirement” will be abolished.
10. In 2021, the United Kingdom set out a policy in principle to ban fossil-fuel boilers in newly installed heating systems from 2035 onward. In September 2023, former Prime Minister Sunak announced measures to delay a range of net-zero policies, including those related to boilers. The Starmer administration, which took office in July 2024, has expressed its intention to strengthen related policies and decided to bring forward the ban on gasoline and diesel vehicles—previously postponed to 2035 under the prior administration—to 2030.
11. The EU aims to fully phase out fossil-fuel boilers by 2040, but individual countries are responding flexibly in line with their circumstances.
12. To address challenges facing Europe's manufacturing sector—such as high costs, intensifying international competition, and regulatory complexity—the European Commission announced in February 2025 a roadmap that integrates industrial competitiveness and decarbonization: the “Clean Industrial Deal (CID).”
13. In the United States, under the Trump administration, a series of “deregulatory” policy directions related to energy efficiency have been announced, including early termination of energy efficiency and clean-energy tax credits, the announced repeal of efficiency standards for equipment, and the discontinuation of the Energy Star program (as reported in the media).
14. In China, as it became difficult to achieve the energy efficiency target under the 14th Plan period, policy measures were successively strengthened in 2024/2025. As a result, the

situation changed, and achieving the 14th Plan energy efficiency target—once seen as difficult—has come into view.

Data Centers and AI: Energy Efficiency Improvements and Strengthened Environmental Requirements

15. Regarding improvements in data center efficiency, requirements beyond power usage effectiveness (PUE)—such as the use of waste heat and water-use efficiency—are increasingly being sought. For AI, the EU requires reporting of energy consumption for general-purpose AI models (AI Act, 2024), and efforts led by standards bodies and industry associations to develop standards and introduce labeling/rating schemes are becoming more active.

Key Points to Watch in 2026 Energy Efficiency Policy

16. In Japan, the 7th Strategic Energy Plan sets the direction of “accelerating the shift to non-fossil energy and expanding electrification” and “thorough energy conservation.” Energy efficiency policy is steadily progressing—for example, the obligation for all new buildings to comply with energy efficiency standards will begin in April. In 2026, additional measures on data center energy efficiency and the development and implementation of new standards for gas water heaters are scheduled.

17. In the EU, specific measures and follow-up actions under the CID need to be closely watched. For the United States, it will be necessary to monitor how energy efficiency related deregulation under the Trump administration develops, including reactions from state governments and industry. In China, close attention should be paid to new energy efficiency related targets and policies in the 15th Five-Year Plan (2026–2030).

From draft regulation to outright sanction

- Russian LNG moving out from the European Union

Hiroshi Hashimoto *

1. Introduction

The Council of the European Union made announcements on 20 and 23 October, respectively, on measures to phase out and ban Russian LNG import into the EU. The first one (2.1 below) was on a draft regulation, and the second one (2.2 below) was on a 19th sanction package. What is the difference of the two regarding the timing and legal binding aspects?

2. Descriptions of the two announcements

2.1 Council's position on rules to phase out Russian gas imports under REPowerEU¹

2.1.1 The Council of the European Union (ministers) agreed on 20 October 2025 on its negotiating position on the draft regulation to phase out imports of Russian natural gas.

2.1.1.1 The proposed regulation introduces a legally binding, stepwise prohibition on both pipeline gas and liquefied natural gas (LNG) imports from Russia, with a full ban to apply from 1 January 2028.

2.1.1.2 The Council confirmed that imports of Russian gas will be prohibited from 1 January 2026, while maintaining a transition period for existing contracts.

2.1.1.3 Short-term contracts concluded before 17 June 2025 may continue until 17 June 2026, whereas long-term contracts may run until 1 January 2028.

2.1.1.4 Amendments to existing contracts will be permitted only for narrowly defined operational purposes and cannot lead to increased volumes, except for some specific flexibilities for landlocked member states affected by recent changes in supply routes.

2.1.2 Compared to the European Commission's proposal, the EU Council has streamlined customs obligations by establishing lighter documentation requirements and procedures for imports of non-Russian gas.

2.1.3 The proposed regulation requires all member states to submit national diversification plans outlining measures and potential challenges to diversifying their gas supplies.

2.1.4 The Council has agreed to exempt those member states that can demonstrate that they no longer receive any direct or indirect imports of Russian gas.

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¹ <https://www.consilium.europa.eu/en/press/press-releases/2025/10/20/council-agrees-its-position-on-rules-to-phase-out-russian-gas-imports-under-repowerEU/>

2.2 19th package of sanctions against Russia²

2.2.1 The Council of the European Union adopted a 19th package of further individual listings and numerous economic restrictive measures against Russia on 23 October 2025. The package introduces a ban on imports of Russian LNG into the EU, starting January 2027 for long-term contracts, and within six months for short-term contracts.

2.3 The two announcements from the Council of the European Union on 20 and 23 October 2025 differ significantly in legal nature, timing, and procedural context.

3. Legal nature and timeframes

3.1 Council Position on Draft Regulation - 20 October 2025

3.1.1 Legal Nature:

3.1.1.1 This is not yet law, but a negotiating position adopted by the Council on a draft regulation under the REPowerEU framework.

3.1.1.2 It is part of the ordinary legislative procedure, meaning it still needs to be negotiated with the European Parliament before becoming a binding EU law.

3.1.2 Timing & Implementation:

3.1.2.1 The proposed regulation sets a stepwise, legally binding phase-out of Russian gas imports:

3.1.2.1.1 Ban starts in January 2026 (with exceptions for existing contracts).

3.1.2.1.2 Full ban by 1 January 2028.

3.1.2.2 The proposed regulation includes transitional arrangements and national diversification plans.

3.1.3 Purpose:

3.1.3.1 A long-term structural shift in EU energy policy.

3.1.3.2 Focused on energy security and diversification, not just sanctions.

3.2 19th Sanctions Package - 23 October 2025

3.2.1 Legal Nature:

3.2.1.1 This is an adopted and immediately binding measure under the EU's Common Foreign and Security Policy (CFSP).

3.2.1.2 It is a sanctions decision, which does not require approval by the European Parliament.

3.2.2 Timing & Implementation:

3.2.2.1 Ban on Russian LNG imports:

3.2.2.1.1 Short-term contracts: banned within 6 months.

3.2.2.1.2 Long-term contracts: banned from January 2027.

² <https://www.consilium.europa.eu/en/press/press-releases/2025/10/23/19th-package-of-sanctions-against-russia-eu-targets-russian-energy-third-country-banks-and-crypto-providers/>

3.2.2.2 These timelines are shorter than those in the draft regulation.

3.2.3 Purpose:

3.2.3.1 A foreign policy tool aimed at punishing Russia for its actions.

3.2.3.2 Part of a broader package targeting energy and different sectors.

Summary of Differences

Aspect	Draft Regulation (20 October)	Sanctions Package (23 October)
Legal Status	Draft law (not yet binding)	Binding sanctions decision
Procedure	Legislative (Council + Parliament)	CFSP (Council only)
Purpose	Energy policy (REPowerEU)	Foreign policy (punitive)
Start of Ban	January 2026 (full by January 2028)	Within 6 months / January 2027
Scope	Pipeline + LNG	LNG only

4. Suspected concessions

Some exemptions and concessions were suspected to be part of the negotiations leading to the adoption of the EU's 19th sanctions package banning Russian LNG imports.

4.1 No Formal Exemptions in the Final Sanctions Text

4.1.1 The final adopted sanctions package does not include formal exemptions for specific member states or contracts.

4.1.2 The LNG ban applies uniformly:

4.1.2.1 Short-term contracts: must end within six months.

4.1.2.2 Long-term contracts: banned from January 2027.

4.2 Political Concessions During Negotiations

4.2.1 Some member states initially resisted the package due to concerns over energy security and economic impact.

4.2.2 Their objections were suspected to have been resolved through political assurances and side arrangements, not formal legal exemptions

4.3 Force Majeure Clauses for Contracts

- 4.3.1 The sanctions package allows EU member states to invoke force majeure to terminate long-term contracts with Russian suppliers without facing legal penalties or lawsuits.
- 4.3.2 This is particularly relevant for countries which still have LNG contracts with Russia.
- 4.3.3 However, it is uncertain what those companies who have FOB LNG contracts or have equity allocation of LNG volumes at the Russian LNG projects can do.

4.4 No Explicit Country-Level Exemptions

- 4.4.1 Unlike earlier sanctions (e.g., pipeline oil exemptions for some member states), the LNG ban does not carve out country-specific exemptions.
- 4.4.2 The EU is moving toward uniform enforcement to close loopholes and ensure consistency across member states.

4.5 Summary of accommodations

- 4.5.1 While formal exemptions are not part of the 19th sanctions package, political accommodations and contractual flexibility mechanisms (like force majeure) were suspected to have been used to secure consensus.
- 4.5.2 These measures are suspected to aim to balance energy security concerns with the EU's strategic goal of cutting off Russian energy revenues.

Comparison of Exemptions Across EU Sanctions Packages

Sanctions Package	Energy Type	Exemptions Granted	Nature of Exemptions
6th Package (June 2022)	Crude Oil (Pipeline)	Some	Continued imports via Druzhba pipeline
8th–17th Packages	Oil & Gas	Limited	Some transactional exemptions for global energy stability
18th Package (July 2025)	Crude Oil & LNG	Narrowed	Price cap lowered; Nord Stream ban; exemptions for existing contracts on LPG
19th Package (October 2025)	LNG	No formal exemptions	Uniform ban: short-term contracts end in 6 months; long-term by January 2027

4.6 Key Observations of the Shift

- 4.6.1 **2022 - 2023:** Major exemptions for pipeline oil (Druzhba) and limited gas measures.
- 4.6.2 **2024:** First LNG-related restrictions (transshipment ban).
- 4.6.3 **2025:** Shift to zero formal exemptions for LNG

5. Key Differences in the 19th Package

- 5.1 **No country-specific legal exemptions** like those granted in 2022.
 - 5.1.1 Force majeure clauses allow termination of contracts without penalties, but do not exempt countries from the ban.
 - 5.1.2 Some member states are suspected to have received political assurances, not legal exemptions, to address energy price and supply concerns.
- 5.2 **Why is the shift observed?**
 - 5.2.1 Earlier packages prioritized energy stability and allowed gradual decoupling.
 - 5.2.2 The 19th package reflects a harder stance, aiming to close loopholes and standardize enforcement across the EU.
 - 5.2.3 The EU is moving from reactive exemptions to a strategic phase-out, especially for LNG, which may be easier to replace than pipeline gas.
- 5.3 Although the new package will ban import of LNG into the EU, the package does not impose sanctions against the Yamal LNG project. In that sense, those European companies that buy LNG from the Yamal LNG on an FOB basis may not be able to invoke force majeure as the buyers can find outlets of LNG outside of the EU.

6. Key Differences in the 19th Package

Despite the 19th sanctions package banning Russian LNG imports into the EU, several loopholes and risks may remain:

- 6.1 **FOB Contract Flexibility**
 - 6.1.1 Under FOB (Free on Board) terms, title and risk transfer at the Russian loading port (e.g., Sabetta for Yamal LNG).
 - 6.1.2 EU buyers could resell cargoes to non-EU destinations instead of invoking force majeure, as the LNG never enters EU territory.
 - 6.1.3 This is not explicitly prohibited under current EU law, provided the LNG does not enter the EU.

6.2 No Direct Sanctions on Yamal LNG Project

6.2.1 The EU has not sanctioned Yamal LNG production or Novatek.

6.2.2 This means Yamal LNG can continue producing and selling globally, reducing the impact of EU import bans.

6.3 Transshipment Outside EU Jurisdiction

6.3.1 Russia has shifted ship-to-ship (STS) transfers from Zeebrugge to Murmansk (Kildin), bypassing EU ports.

6.3.2 This allows Yamal LNG to maintain flows to Asia without EU interference.

6.4 No Ban on EU Companies Facilitating Non-EU Sales

6.4.1 Current EU rules prohibit import and transshipment in EU ports, but do not ban EU companies from arranging sales to third countries.

6.4.2 This creates a compliance uncertain area for traders and portfolio players.

6.5 Enforcement Challenges

6.5.1 Monitoring FOB cargo destinations may be difficult once LNG leaves Russian waters.

6.5.2 EU relies on self-reporting and due diligence, which can be circumvented through complex ownership structures or intermediaries.

Securitization of Critical Minerals

: Toward Enhancement of Japan-U.S. Cooperation

Shoichi Itoh ^{*}, ^{**}

The escalation of U.S.-China rivalry reminds us of the fact that international struggles among big powers and energy markets are inextricably linked. The linkage between securing critical minerals, including rare earths, and energy is such a typical case.

There are uncertainties regarding whether the post-Trump U.S. administration will keep shifting away from clean energy or return to clean energy to some degree down the road. Even in the former case, however, it is no longer realistic to reject fossil fuels in an “extreme” manner, as the Biden administration aimed to do at least in the short to medium term against the backdrop of the heavy dependency on China for critical minerals which are not only indispensable for enhancement of introducing renewables, requiring wind turbines, solar panels and storage batteries, but also are dual-use.

Today, the perception of China as a threat is gaining momentum across party lines in the United States. If the United States is to once again actively promote international adoption of clean energy, including renewables, it is essential to diversify and strengthen the resilience of critical minerals supply chains, including significantly reducing dependence on China. It would, however, require a considerable amount of time. Otherwise, with the world gradually divided, China will likely expand its international influence by promoting the adoption of clean energy equipment. Traditional energy security has addressed the weaponization of fossil fuels like oil and natural gas. However, as Jason Bordoff (Columbia University Professor) and Megan L. O'Sullivan (Harvard University Professor) argue in their [“The Resurgence of Energy Weapons,” published in Foreign Affairs](#), we must now factor in China's growing capacity to advance the “weaponization of clean energy.”

The U.S. Energy Act of 2020 defines critical minerals as “those that are essential to the economic or national security of the United States.” However, warnings are now sounding that they represent [“America’s Most Dangerous Dependence.”](#) For the 50 critical minerals designated by the U.S. Geological Survey (USGS) under the U.S. Department of the Interior, [as of 2024](#), the United States relies on China for over 80% of its imports for 16 minerals. Furthermore, for six minerals, the United States depends entirely on China for 100% of its imports. China is the largest supplier of [nearly all 12 critical minerals](#) essential to the U.S. defense industry. [“Ensuring National Security and](#)

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** This text expresses the author’s personal opinions and does not in any regard represent the views held by any organizations with which the author is affiliated.

[Economic Resilience through Section 232 Actions on Processed Critical Minerals and Derivatives](#)” (dated April 15, 2025) notes that U.S. reliance on a small number of foreign suppliers for processed critical minerals and derivatives exposes it to vulnerabilities in global supply chains and market distortions, increasing risks to national security and economic prosperity and resilience.

According to the [Fact Sheet](#) released by the White House on November 1, China agreed at the U.S.-China summit in Busan on October 30 to cease export restrictions, announced on October 9, 2025, with regard to critical minerals, including rare earths and graphite, not only to the United States but to the entire world. China's Ministry of Commerce announced on [November 7](#) that it would temporarily suspend export restrictions on certain rare earth elements, and on [November 9](#), on gallium, germanium, antimony, and other materials. However, each suspension carries a one-year time limit, signaling a hardline stance by leaving open the possibility of reinstating export restrictions depending on the outcome of the standoff with the United States.

At the G7 Energy and Environment Ministers' Meeting, held in Toronto on October 30-31, [the leaders condemned](#) “the use and manipulation of the supply of energy, critical minerals, and energy system technologies, as a tool of economic coercion, specifically through the adoption of non-market policies and practices such as market manipulation,” with China effectively in mind. They also explicitly stated the need to reduce and ultimately eliminate dependence on these supply chains.

At the Japan-U.S. summit meeting held in Tokyo on the 28th of the same month, “[Japan-United States Framework For Securing the Supply of Critical Minerals and Rare Earths through Mining and Processing](#),” signed by Prime Minister Sanae Takaichi and President Donald Trump, indicated that in addition to strengthening the bilateral supply chain between Japan and the U.S., the two countries share the intention to cooperate with third parties as necessary.

Japan and the United States have already [agreed](#) to explore the construction of copper smelting and refining facilities in the western United States and the involvement of Japanese suppliers or off-takers. Furthermore, on [November 6](#), Prime Minister Takaichi stated during a House of Councillors representative question session that she intends to seek specific ways to cooperate with the United States regarding the potential for rare earth development around Minamitorishima.

The Alaska LNG project is currently attracting significant attention as one of the flagship cooperative projects between the two countries. However, it would also be worthwhile to explore potential cooperation in developing Alaska's critical mineral resources. [Alaska](#), which the United States particularly values [from geopolitical and military perspectives](#), holds the majority of the [critical mineral resources](#) Japan seeks to secure for a stable supply. On [September 20](#), the U.S. Department of War announced a \$43.4 million award to Alaska Range Resources, LLC under the Defense Production Act. This award supports antimony production (including refining processes)

pursuant to Presidential Executive Order 14241, "[Immediate Measures to Increase American Mineral Production](#)," dated March 20, 2025.

Besides, Japan is encouraged to actively pursue possibilities for Japan-U.S. cooperation involving third countries. This includes promoting policy coordination with nations that share the vision of a "Free and Open Indo-Pacific" emphasized by the Takaichi administration, particularly Australia. On October 20, the leaders of the United States and Australia agreed to establish a "[Framework for Securing of Supply in the Mining and Processing of Critical Minerals and Rare Earth](#)". Japan also agreed with Australia at their [summit meeting](#) on October 26, held in Kuala Lumpur, to advance concrete cooperation in the field of economic security, including critical mineral supply chains.

Central Asia could be another potential candidate region for exploring Japan-U.S. cooperation on critical minerals. The region holds [significant reserves](#) of numerous critical minerals, including 40% of the world's manganese, 30% of chromium, and 20% of lead. However, Chinese companies currently dominate the entire supply chain from upstream to downstream, making it an [impending issue](#) for the regional countries to seek third parties in order to diversify the participants. At the C5+1 (Central Asia's five countries plus the U.S.) summit held in Washington, D.C. on November 6, President Trump emphasized that critical minerals are a [top priority](#). [Secretary of State Rubio](#) has announced plans to visit those countries (Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan) in 2026. Over the past two decades, Japan has been the most proactive Western nation in supporting economic development and capacity building of human resources in the region. Based on experience, pursuing [cooperation with the United States](#) could also be an option, given that the United States has [reaffirmed](#) its commitment to advancing the C5+1 Critical Minerals Dialogue, which began in February 2024.

Challenges in Introducing a Mandatory Quantitative Energy Supply Capacity (kWh) Requirement in Japan

Kenichi Onishi *

Since the full liberalization of the electricity retail market in 2016, Japan's electricity market has been transitioning toward a more efficient market structure based on competitive principles. Trading volumes in the spot market of the Japan Electric Power Exchange (JEPX) have increased year by year, and by 2025, they have expanded to account for approximately 30–40% of total electricity sales. As a result, while market liquidity has improved and the price discovery function has been strengthened, a structural reliance on the spot market has also emerged, particularly among new power producers and suppliers (PPSs) that do not own generation assets. Such operators tend to face significant risks of sudden changes in procurement costs due to fuel price fluctuations and supply–demand imbalances, and their vulnerability from the perspective of the stable supply has become evident.

Under the current scheme, retail companies are only required to secure the necessary electricity volume (kWh) by 1 hour before real-time supply and demand (the so-called “gate closure”). However, there is no institutional mechanism that obliges them to procure the necessary electricity in advance over the medium to long term. While this allows flexible adjustments through short-term markets such as spot and intraday markets, it also embeds structural vulnerability to sudden events such as fuel price spikes and unexpected generation outages.

In fact, from the end of 2020 to January 2021, electricity supply and demand became extremely tight due to cold weather and tight LNG inventories, and spot market prices temporarily reached an extraordinary level of 251 yen/kWh, more than ten times the normal level. Combined with this price spike and the subsequent sustained high price levels, several PPSs with a high dependence on short-term markets faced severe financial deterioration, and some were forced to exit the market. This vividly exposed the limits of a market structure premised on excessive reliance on short-term markets.

Based on these experiences, the government is considering, as part of electricity system reform, the introduction of a new scheme requiring retail companies to secure quantitative energy supply capacity (kWh) over the medium to long term. Unlike the capacity market, which secures installed generation capacity (kW), this system aims to guarantee the actual energy supply volume itself through bilateral contracts. Under the draft scheme currently under consideration, retail companies would be required, in proportion to their projected sales volumes, to secure 50% of their projected sales electricity volume 3 fiscal years before delivery (N-3) (25% for small-scale operators) and 70% 1 fiscal year before delivery (N-1) (50% for small-scale operators). “Small-scale operators” are assumed to be those with an average sales volume of less than 500 million kWh over the past 3 years, and these measures are designed to avoid excessive burdens.

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However, the appropriateness of these benchmarks—“50% three years in advance and 70% one year in advance”—has been questioned even within advisory councils, and the author also believes that there is room to reconsider their rationale and levels. Accordingly, the following discussion seeks to clarify the background to imposing quantitative energy supply capacity (kWh) obligations on retail companies and to reconsider the institutional design after clearly distinguishing between different time horizons and policy objectives.

First, from the perspective of generation companies, it is necessary to procure fuel in a stable manner over the long term in order to continuously maintain and operate thermal power plants. For this reason, it is important for generators to conclude long-term fuel contracts with gas-producing countries and other suppliers. Since such contracts usually require contract terms of 10 years or more, it becomes essential to build a framework that makes it possible to reliably offtake the electricity generated over a long period. For example, one possible approach would be to establish a single-buyer system under which a public body would purchase electricity generated based on such long-term fuel contracts at the time when a generator concludes or renews a long-term fuel procurement contract with gas-producing countries. In this case, the single buyer would sell the electricity in the spot market and other markets, and would be able to recover the additional cost—calculated as the difference between the thermal power purchase price based on the long-term fuel contract and the spot market price—through surcharges and similar mechanisms, as in the “FIT imbalance special measure (Type ③).” This would make it easier for generators to conclude stable long-term fuel procurement contracts and, as a result, would suppress the impact of price spikes that can occur with short-term fuel procurement, thereby helping to mitigate sharp price increases in the spot market.

Second, consideration is required from the perspective of retail companies and electricity consumers. Excessive dependence by retailers on short-term markets such as the spot market significantly destabilizes their management during periods of sharp wholesale price increases. When spot prices surge, the risk of retailer exit becomes a realistic concern. For this reason, it is policy-wise desirable for retailers to hedge price fluctuation risks to some extent. However, long-term contract periods are not necessary for this purpose, and medium-term arrangements of around 1 year are sufficient. Moreover, such medium-term measures need not be limited to physical bilateral contracts, as financial hedging instruments such as electricity futures trading can also achieve the objective of price stability.

Third, it is also necessary to consider the perspective of retailers that provide electricity through real-time pricing, in which tariff levels fluctuate in accordance with supply and demand conditions. Among consumers, there are likely to be a certain number who are willing to actively engage in demand response (DR) in response to changes in price levels. For retailers that offer real-time pricing to such consumers, the need to conclude long-term bilateral contracts is limited. For example, it would be possible to establish a framework under a licensing system that exempts such retailers from the obligation to secure medium- to long-term quantitative energy supply capacity (kWh) and allows them to provide only real-time pricing. However, if such an exemption is granted, it would be desirable to impose certain conditions, such as requiring retailers to provide sufficient explanations to customers regarding the mechanism and risks of real-time pricing, and to present concrete policies to the regulator to avoid business withdrawal and other risks.

As described above, generators require a reliable offtake framework to support long-term fuel procurement, and this can be ensured through a single-buyer system. Retailers, on the other hand, face an increased risk of exit due to dependence on short-term markets, and it is therefore appropriate to require them to enter into medium-term bilateral contracts or to hedge through futures trading. Furthermore, for retailers that offer real-time pricing, the necessity of long-term contracts is low, and it is effective to establish an exemption framework while imposing conditions such as disclosure obligations to customers and the presentation of business continuity measures.

Next, it is also possible to reconsider the relationship between quantitative energy supply capacity (kWh) and installed generation capacity (kW). In Japan, a centralized capacity market was first implemented in FY2020 to secure installed generation capacity (kW) 4 years in advance, adopting a model in which the Organization for Cross-regional Coordination of Transmission Operators (OCCTO) procures the required installed generation capacity (kW) through auctions. Retail companies bear a capacity obligation and pay capacity contributions in order to cover the costs necessary to secure installed generation capacity (kW). During the consideration of introducing the capacity market, there were discussions on whether to adopt a model in which OCCTO centrally procures installed generation capacity (kW) through auctions, or a model that allows the conclusion of bilateral installed generation capacity contracts (kW bilateral contracts) between generators and retailers in addition to OCCTO's auctions. The former model is used in the United Kingdom, while the latter is used by PJM (Pennsylvania–New Jersey–Maryland), a regional transmission organization in the eastern United States. In Japan, the former model, in which OCCTO centrally procures installed generation capacity (kW), was adopted due to concerns that if kW bilateral contracts were allowed, it would be difficult to grasp the number and types of such contracts and would impose a heavy administrative burden to prevent fraud.

However, if retail companies are required to continuously secure a certain portion of their projected sales volume of quantitative energy supply capacity (kWh) 1 year in advance, then when concluding longer-term bilateral contracts—such as those extending beyond 4 years—it would be possible to include provisions on installed generation capacity (kW) in those bilateral contracts. This would enable generators to deliver both quantitative energy supply capacity (kWh) and installed generation capacity (kW) to retailers in an integrated manner. In that case, the capacity (kW) procured by retailers under such bilateral contracts would be deducted from the amount of capacity that OCCTO needs to procure through capacity auctions, and the retailers concerned would be required to pay capacity contributions only for the portion not covered by their bilateral contracts. In fact, in PJM, alongside the Reliability Pricing Model (RPM), under which PJM itself conducts capacity auctions to secure installed generation capacity (kW), there exists the Fixed Resource Requirement (FRR), under which generators and retailers individually conclude bilateral contracts to secure installed generation capacity (kW).

In summary, since the full liberalization of retailing in 2016, competition in the electricity market has intensified and JEPX liquidity has increased, but it is necessary, when considering scheme design, to keep in mind the fact that a structure in which new power suppliers without their own generation assets rely on short-term markets and become financially vulnerable during periods of fuel price increases has been exposed. In particular, during the 2020–2021 price spike, several PPSs collapsed,

making the limitations of dependence on short-term markets clear. Based on this experience, the government is considering a system that requires retailers to secure sales volumes over the medium to long term, but the appropriateness of benchmarks such as “50% three years in advance and 70% one year in advance” remains open to reconsideration. Generators require a reliable offtake framework to support long-term fuel contracts, and a single-buyer system is one possible option. On the other hand, it is appropriate to encourage retailers to use medium-term bilateral contracts and futures hedging to reduce the risks of short-term dependence. In addition, for retailers that offer real-time pricing, the need for long-term contracts is low, and it is desirable to allow exemptions from supply security obligations, subject to conditions such as sufficient disclosure to consumers and the presentation of business continuity measures. Furthermore, by integrating installed generation capacity (kW) into long-term bilateral contracts for quantitative energy supply capacity (kWh), it would become possible for generators to deliver both kWh and kW to retailers in an integrated manner, and a mechanism similar to PJM’s FRR, under which bilaterally contracted capacity is deducted from centrally procured capacity, could be considered in the future.

What is necessary to secure human resources in the wind power industry?

– An appeal of a growing industry that attracts talented engineers

Tomoko Murakami *

It is common sense across sectors that relying solely on training new workers from the ground up, tailored to a specific industry, is not sufficient to meet the growing demand for personnel, particularly in rapidly expanding fields. This paper examines recent developments in the wind power industry and considers the conditions necessary for securing a skilled workforce.

On 4 December 2025, the Global Wind Energy Council (GWEC) released its workforce outlook for the wind industry, “Global Wind Workforce Outlook 2025–2030”¹. Based on global projections that installed wind power capacity will nearly double over the next five years, the report analyzes future labor requirements for both new construction and ongoing maintenance. It focuses specifically on two areas in which on-site technicians are essential—Construction & Instrumentation (C&I) and Operation & Maintenance (O&M)—and estimates regional demand for technicians in each field. Both existing installed capacity and the scale of future deployment vary widely across countries and regions. Moreover, the skill sets required for C&I and O&M differ between “emerging markets,” where new installations are expanding rapidly, and “mature markets,” where installed capacity is substantial, but growth has stabilized. The report identifies the types of skills demanded in the wind power industry and offers implications for strategies to secure and develop the necessary workforce. It highlights five core activities essential to workforce development and retention, and notes that these activities should be undertaken not only by public-sector bodies such as government agencies and municipalities, but also by private stakeholders, including investors and project developers.

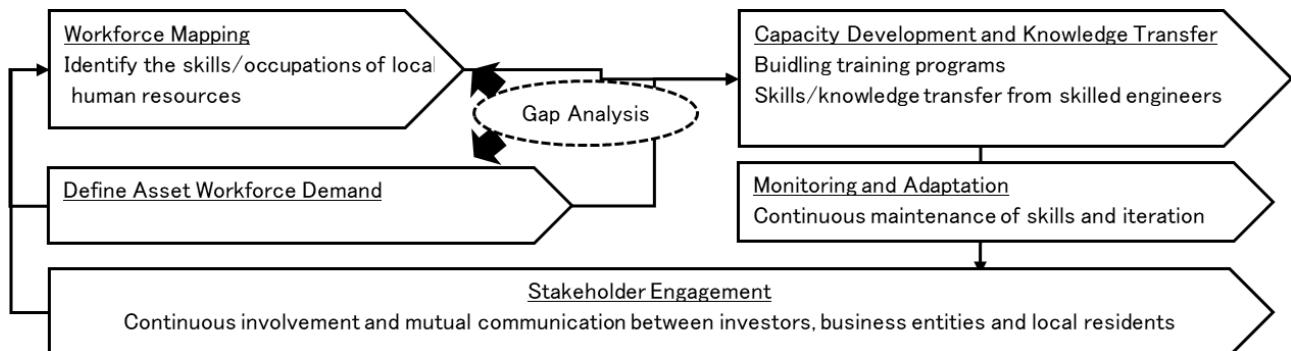
In many countries, including those in Europe and North America, the wind power industry is a relatively latecomer to regions that previously supported other industries such as coal-fired power generation, shipbuilding, and steel manufacturing. Many wind power component manufacturing bases and maintenance hubs are located in such areas. The report emphasizes the need to begin by identifying the skills and occupations that local workers possess, based on the industrial development of the region (Workforce Mapping), and then determining the skills required for C&I and O&M of wind power assets (Define Asset Workforce Demand). By aligning these needs and existing strengths, stakeholders can identify gaps and design training programs specifying what skills must be built, by when, and to what extent. Skill transfer from experienced technical specialists to local workers is then carried out as part of this process (Capacity Development and Knowledge Transfer). Continuous repetition of these activities allows stakeholders to verify whether ongoing skill retention by local workers is taking place (Monitoring and Adaptation). The report describes this approach as a “PDCA cycle for technical transfer” and introduces examples of its application, including efforts to transfer

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¹ GWEC, Global Wind Workforce Outlook 2025 – 2030, 2025-12-4, <https://www.gwec.net/reports/global-wind-workforce-outlook/2025-2030>

skills to the offshore wind power industry in Gippsland, a traditional coal-mining region in Victoria, Australia².

The figure below shows the concept of the “PDCA cycle”.



Source: Figure 7. Local Workforce Readiness Assessment and Development

Let us turn to the example of the nuclear industry. In Japan, the period of greatest expansion in the nuclear sector was the 1980s, when one or two new reactors began operation each year. During this time, both electric utilities and plant manufacturers expanded their workforces and technical expertise accumulated through extensive construction experience. The increase in personnel was supported not only by graduates of nuclear engineering departments but, in fact, largely by engineers from other fields such as mechanical, electrical, chemical, and civil engineering. Although growth in the nuclear industry had already slowed in Europe and the United States by that time—further affected by the Three Mile Island Unit 2 accident in the United States and the Chernobyl Unit 4 accident—the Japanese industry as a whole remained committed to improving safety, reliability, and economic performance.

To put it plainly, growing industries attract capable people even without special policy measures. Until the 1980s, the nuclear industry exemplified a field that attracted talented individuals because it was an appealing area in which to build a career. I do not particularly wish to see how the circumstances are in 2025.

How, then, does the wind power industry look in 2025?

Many countries already regard the wind power sector as part of their national strategic industries and are working to develop it further while securing the next generation of skilled workers. As noted in the GWEC report mentioned earlier, one example from Australia involves a partnership between the wind power developer Ocean Winds—a joint venture between EDF Renewables and ENGIE established in 2019—and Federation University to train personnel for offshore wind projects in the Gippsland region³. Japan, which has been actively supporting offshore wind power development, is

² Energy Australia, Transition Opportunities: Coal to Offshore Wind, August 2024, https://www.energyaustralia.com.au/sites/default/files/2024-08/Transition%20Opportunities_Coal%20to%20Offshore%20Wind%20%28007%29.pdf

³ Ocean Winds, Ocean Winds and Federation University have partnered to drive offshore wind opportunities and build Australia’s clean energy workforce, 2025-9-25, <https://www.oceanwinds.com/news/uncategorized/ocean-winds-and-federation-university-have-partnered-to-drive-offshore-wind-opportunities-and-build-australias-clean-energy-workforce/>

no exception; numerous universities and research institutes are participating in the Offshore Wind Talent Development Promotion Council (ECOWIND), established in 2024, to advance workforce development.

However, as the experience of the nuclear industry suggests, the essential factors that attract talented individuals lie elsewhere. Although the execution of wind power projects has become increasingly challenging across countries and regions in recent years, choosing to avoid these challenges by framing them merely as “risks” is unlikely to appeal to capable personnel. Instead, presenting these challenges as opportunities to bring together diverse expertise and achieve meaningful results—and demonstrating a willingness to confront them—may be the most effective way to attract highly skilled individuals.

Emergence of North American West Coast for LNG

-Advantages, Challenges, and Recent Developments -

Hiroshi Hashimoto *

Introduction

With the start of full-scale LNG exports from the West Coast of Canada in July 2025, the West Coast of North America may emerge as an important source of LNG supply for the Asia-Pacific region.

The LNG Canada project has a capacity to deliver 14 million tonnes of LNG per year from the facilities of its first phase that has started operation. The project shipped out estimated 2 million tonnes of LNG in 28 cargoes to the four markets in Northeast Asia during the six months through December 2025. Steady ramping up to the capacity of the project is expected in 2026 and thereafter.

This paper discusses the reasons LNG exports from the West Coast of North America warrant attention, and examines their advantages and challenges. The paper then presents current status of project development in Canada and Mexico.

1. Advantages and challenges of LNG from the West Coast of North America

1.1 Geographical advantage

1.1.1 To export LNG to the Asia-Pacific market, the distance will be shorter compared to the supply from the Gulf region of the United States. During the second half of 2025, LNG shipments from British Columbia, Canada, reached in the shortest case to Japan in 11 days and the shortest case to Korea in 12 days. It takes 30 days to transport LNG from the Gulf region of the United States to Northeast Asia through the Panama Canal and 40 days via the Southern Tip of South Africa.

1.1.2 LNG shipments from the West Coast of North America do not require passing through the Panama Canal.

1.2 Diversification of supply sources of LNG

1.2.1 Supply from Canada and Mexico enables diversification of supply sources, in addition to Oceania, including Australia, Southeast Asia, the Middle East and the East Coast of North America. With LNG supply from Russia's Sakhalin surrounded by uncertainty, diversification of supply sources is essential.

1.3 Collaboration between Asian countries

1.3.1 Energy-security conscious Asian governments and companies can collaborate with each other in LNG project development on the West Coast of North America. As a matter of fact, companies of Japan, Korea, China and Malaysia participate in the LNG Canada project to contribute to enhanced LNG supply security to the respective countries.

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- 1.4 Effective utilisation of North America's additional natural gas supply potential, notably in Western gas producing states in the United States and its contribution to economic development
- 1.4.1 Supplying gas to LNG export facilities in the Gulf region of the United States enables Texas and Louisiana, hosts of large-scale LNG export facilities, as well as surrounding gas producing states, to expand the economic benefits of gas production by leveraging relatively high international gas prices. Texas and Louisiana together represented 35% of total gas production in the United States as of 2024.
- 1.4.2 Although Wyoming, Utah, Colorado, and New Mexico - surrounding the Rocky Mountain region - accounted for 15% of total gas production in the United States in 2024, they have not benefited from access to international markets. The realization of LNG export facilities in Mexico's northern Pacific Coast is likely to expand access to international markets for natural gas produced in the United States, which will bring economic benefits to gas-producing states and further boost production and development activities.
- 1.4.3 Likewise, gas resources in Western Canada will also benefit from access to international markets.
- 1.5 Challenges to promote LNG projects
- 1.5.1 It is important to ensure demand in the midst of market cycle fluctuations. In 2025, although a steady increase is expected in LNG volumes in the global LNG market, Asian LNG imports are expected to decline. Imports of LNG during the first eleven months of 2025 are estimated to be down 5% year-on-year in Asia, compared to an estimated 4% year-on-year increase globally. Securing stable and reliable buyers through the promotion of dialogue with LNG consuming markets is the key to promoting LNG project development.
- 1.5.2 It is important to secure permits and authorizations, secure regional agreements, and avoid environmental risks for infrastructure development, including feed gas transportation pipelines in addition to LNG facilities. It will be important to ensure labour, engineering and construction productivity, and ensure timely completion and avoid delays in construction after investment decisions.

2. Current status of LNG projects on Canada's West Coast

- 2.1 LNG Canada: Following the first LNG cargo in July, operations at the export facility have steadily ramped up. Work is underway on Phase 2 development.
- 2.2 Cedar LNG: After an investment decision in June 2024, construction activities are underway and LNG offtake commitments have been secured in 2025. Commercial operations are targeted by the end of 2028.
- 2.3 Woodfibre LNG: In 2025, construction activities have progressed to half of the total, and the project is scheduled to start operation in 2027.
- 2.4 Ksi Lisims LNG: Following progress in environmental procedures, governmental support, and marketing activities during 2025, the project approaching the start of construction.

3. Current status of LNG projects on Mexico's West Coast

- 3.1 ECA LNG (Energía Costa Azul): The project is expected to start commercial operation in early 2026. The project has LNG sale deals with TotalEnergies and Mitsui and Co. for 20 years, respectively. The same developer considers ECA LNG Phase 2, as well as Vista Pacifico LNG at a separate location.
- 3.2 Saguario Energía: As the project prepares for an investment decision underpinned with multiple reliable offtake commitments, it has requested an extension of the export commencement deadline from the U.S. Department of Energy.
- 3.3 Amigo LNG: As the project pursues an investment decision in the first quarter of 2026, it has also requested an extension of the export commencement deadline from the U.S. Department of Energy.

Appendix

1 LNG Canada's export - number of LNG cargoes by importing country

	Japan	Korea	China	Chinese Taipei	Total
2025/07	1	1			2
2025/08		1	1		2
2025/09		4	1	1	6
2025/10	2	1	1	2	6
2025/11	4	1	1	1	7
2025/12	1	2	2		5

2 Canadian LNG - landed price by importing country (USD / million Btu)

	Japan	Korea	China	Chinese Taipei
2025/07	9.31	11.22		
2025/08		10.64	13.12	
2025/09		10.95	11.91	9.97
2025/10	9.59	12.49	11.38	11.68
2025/11	n/a	9.12	10.86	10.92

(Source) Calculation based on official customs statistics

(Note) Numbers in the green columns indicate those prices which were lower than the overall average LNG prices in the relevant month.

In the spring, cherry blossoms, in the summer, the cuckoo, in the autumn, the moon, and in the winter, the snow, clear, cold?

YANAGISAWA Akira

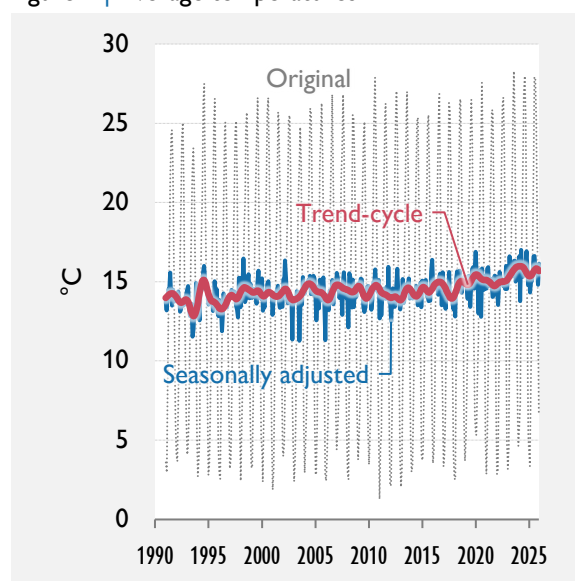
The Energy Data and Modelling Center, The Institute of Energy Economics, Japan

Recent years have seen frequent occurrences of high temperatures, including three consecutive summers of intense heat up to 2025 (Figure 1). Simultaneously, there are voices suggesting that days where one can truly feel spring or autumn are becoming fewer, with the year seemingly reduced to just two seasons: winter and summer. In the Tokyo suburbs last autumn, temperatures defied the saying ‘The heat and cold last only until the equinox’ and plummeted sharply in late October. Autumn felt as though it had passed in the blink of an eye.

The trend in change producing this sensation can be grasped more clearly from the seasonal factors and trend obtained by seasonally adjusting the average temperatures (Figure 2). Over the past decade or so, warm periods have shown a warming trend in every month. The rise in July temperatures is particularly marked, alongside August, bringing forward the start of summer. September faces an even greater temperature increase, with the lingering heat delaying the arrival of autumn. Conversely, the cold period may defy many people’s expectations. While ‘global warming’ is a widely recognised term, the

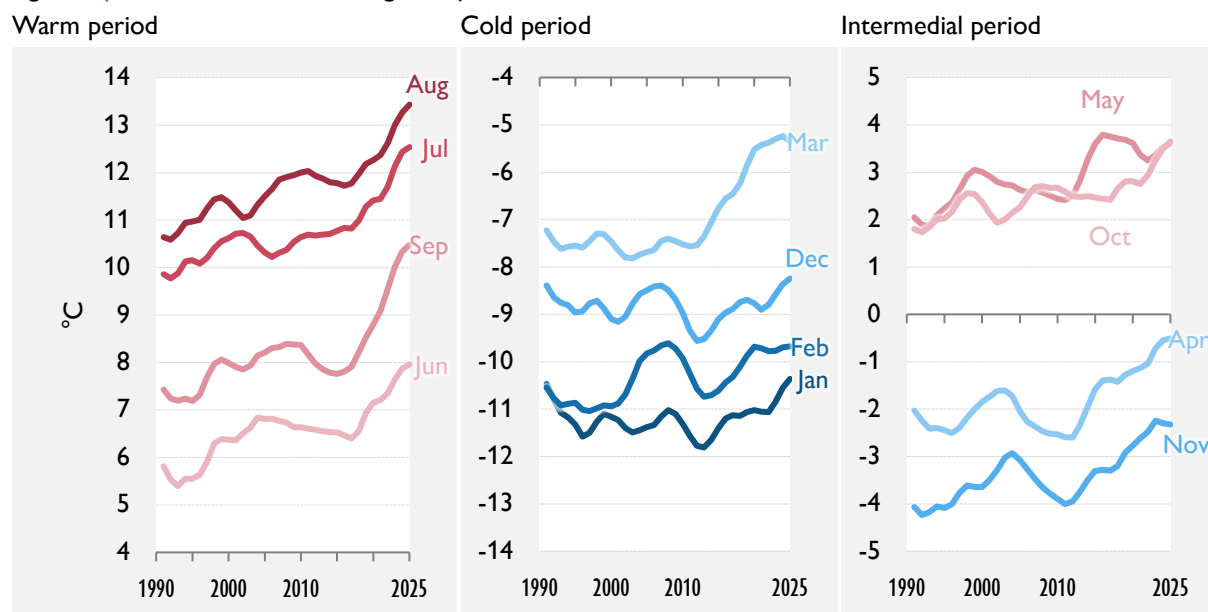
changes observed are not as pronounced as during the warm period. Only March has seen a rapid increase in temperatures. In Tokyo, cherry blossom blooming advanced to mid-March by the early 2020s. Winter arrives at roughly the same time but now departs more swiftly.

Figure 1 | Average temperatures



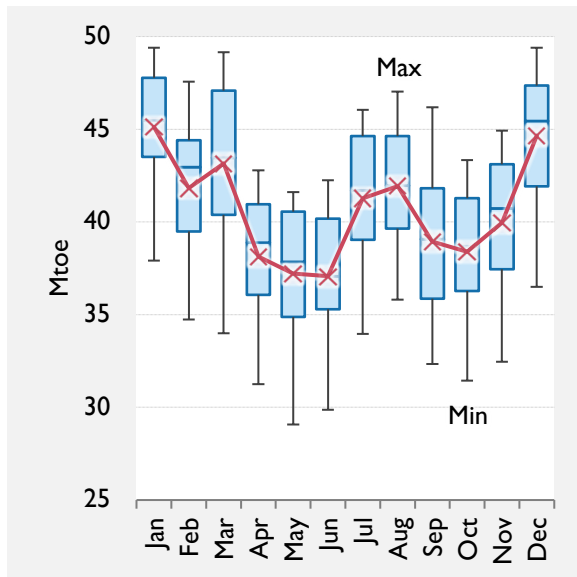
Note: Simple average of 42 locations nationwide
Source: Calculated from Japan Meteorological Agency data

Figure 2 | Seasonal factors of average temperatures



The impact of these changes extends beyond the emotional realm of losing one’s familiar sense of seasons. The resulting poor harvests of fruit and vegetables could fuel rising prices. Sectors such as clothing, where demand patterns are heavily influenced by the seasons, are being forced to re-think their sales strategies. So, how is energy consumption (Figure 3) being affected?

Figure 3 | Primary energy supply (Jan.1995–Oct.2025)

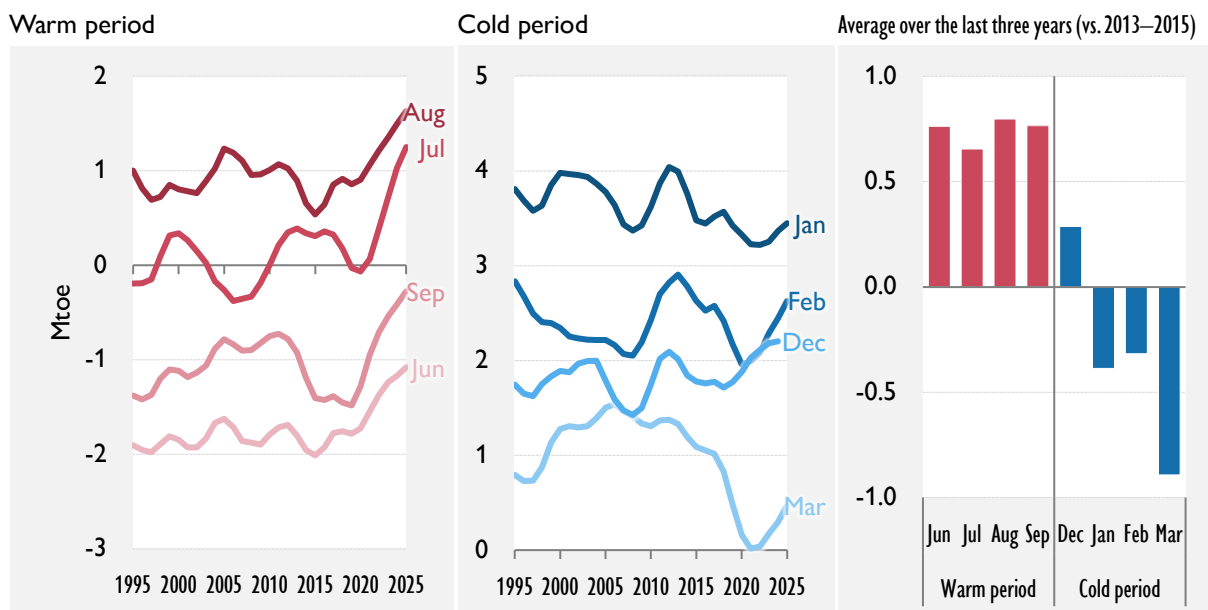


Source: IEEJ 'EDMC Energy Trend'

Over the past decade or so, the trend has been for warming during warm periods to increasingly contribute to higher energy consumption through rising demand for space cooling (Figure 4). This is particularly pronounced in September, where temperature rises have been steep, and in July over the last five years or so. Conversely, during cold periods, the earlier end to winter and earlier onset of spring exerts downward pressure on space and water heating demand in March. Naturally, this contributes to a reduction in energy consumption.

As seasonal transitions shift, September moves from a month where temperatures suppressed energy consumption towards a neutral month, whilst July transitions from a neutral month towards one where temperatures boost consumption. Conversely, March is shifting from a month where temperatures boosted energy consumption towards a neutral month. Should these trends persist, it will further necessitate enhancing energy supply capacity to cope with prolonged and more intense summers, reviewing inventory levels at the start of summer and late winter, and reconsidering the timing of regular inspections and maintenance of supply facilities, which are concentrated during periods of low energy demand.

Figure 4 | Contribution of temperatures (degree days) to seasonal factors of primary energy supply



Source: (Seasonal factors + trend when not using user variables in the X-13ARIMA-SEATS seasonal adjustment method) – (Seasonal factors + trend when using cooling degree days and heating degree days as user variables).

The EU relies on import regulations and levies

Takahiko Tagami *

The EU makes extensive use of import regulations and levies.

The Carbon Border Adjustment Mechanism (CBAM) is fully implemented from January 2026, ending a transitional period of reporting obligations. Starting with imports from January 2026, importers of CBAM-covered goods into the EU are required to surrender CBAM certificates equivalent to the embedded emissions (emissions released during the production of goods). Just prior to this, on December 17, 2025, the European Commission published implementing regulations on the methods for calculating emissions embedded in goods and on the establishment of default values. It also proposed a regulation on the extension of the scope of CBAM to downstream goods (assembled goods) of steel from January 2028. CBAM applies to six goods: cement, electricity, fertilizers, iron and steel, aluminum, and hydrogen. In its report on the application of the CBAM regulation, the European Commission stated that, as a first step, based on the proposals made at the end of 2025, extension to downstream products will be proceeded in 2026 and 2027, and that as a second step, extension to chemicals and polymers (plastics) will be considered in 2027, but this is one to two years behind the original schedule of the CBAM Regulation. During discussions on the 2040 climate target up until early November 2025, the effective implementation of CBAM and extension to downstream goods were made conditions from the perspective of protecting industry, and so there was a rush to present a draft regulation by the end of the year.

According to UN Comtrade (United Nations Commodity Trade Statistics Database), of the 2.6 trillion euro import value of the EU from other regions in 2024, mineral fuels account for 19.1%, electrical equipment 13.8%, machinery 11.5%, vehicles 5.6%, organic chemicals 4.0%, plastics 2.5%, apparel (knitted or crocheted) 1.7%, and apparel (not knitted or crocheted) 1.6%. 48% of electrical equipment, 35% of machinery, 28% of apparel, 27% of organic chemicals, and 25% of plastics are exported from China.

Imports of mineral fuels are subject to the Regulation on the Reduction of Methane Emissions in the Energy Sector (Methane Regulation). Under the Methane Regulation, from January 1, 2027, importers must demonstrate and report that the contracts concluded on or after August 4, 2024 for the supply of crude oil, natural gas, or coal produced outside the EU cover only natural gas and other fuels subject to monitoring, reporting, and verification (MRV) measures applied at the level of producer that are equivalent to those in the EU Methane Regulation. Furthermore, by August 5, 2028, and every year thereafter, for the supply contracts concluded on and after August 4, 2024, importers are required to report the methane intensity of the production of natural gas and other fuels. Furthermore, by August 5, 2030, and every year thereafter, importers of natural gas and other fuels

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under supply contracts concluded after August 5, 2030, must demonstrate that the methane intensity is below the maximum methane intensity values. As the EU increases its imports of U.S. LNG to replace gas from Russia, the European Commission, aimed at the Energy Council meeting scheduled for December 15, 2025, proposed “solutions for a simple and predictable implementation” for complex cases, such as in the U.S., where different supplies of gas and oil are mixed for transport. The proposal calls for a third-party verification “certification” method and a “trace-and-claim” method that assigns volumes of fuels a digital ID, which is attached to all oil and gas purchase and sale contracts. However, the United States has reportedly circulated a document before the Energy Council requesting that U.S. methane emission regulation be considered equivalent to the EU methane regulation and that the reporting of U.S. emissions data under the EU methane regulations be postponed until October 2035. While the Energy Council supported the “pragmatic implementation” approach/solutions proposed by the European Commission, discussions with the United States remain unresolved.

Regarding plastics, on December 23, 2025, the European Commission announced measures to ensure a fair market and competition as part of a pilot for boosting the circularity of plastics. In response to reports that virgin plastics are being sold at lower prices as “recycled” in order to meet EU targets, the Commission will implement the following measures in 2026: (1) amending the regulation for food contact materials to introduce stricter documentation requirements for imported recycled plastics, (2) conducting audits on the enforcement of recycling installations operating outside the EU, and (3) monitoring plastic imports under a newly created Import Surveillance Task Force and introducing protective measures if necessary.

Regarding apparel, on December 12, 2025, the Economic and Financial Council agreed to levy a 3-euro customs duty on small parcels valued at less than 150 euros from July 1, 2026, in response to the influx of parcels, largely of e-commerce fast fashion. Prior to this, on November 13, the Economic and Financial Council agreed to abolish the rule allowing goods worth under 150 euros to be imported without customs duties, with the new rule to be applied from 2028. At the same time, it made a commitment to work towards a simple, temporary solution to levy customs duties on such goods as soon as possible in 2026. However, the application of the 3-euro tariff was brought forward as France, Italy, and other countries indicated moves to introduce national-level levies from 2026.

The reasons behind the EU's recent frequent use of the above-mentioned import regulations and levies include the fact that the EU's industrial and competitiveness policies have not produced results, and that, following the US import tariff hikes, products that were intended to be exported to the US are now flowing into the EU.

However, import regulations and levies are likely to face several challenges soon. Regarding relations with countries outside the EU, as mentioned above, the Methane Regulation is a major source of conflict between the US and the EU. Conflicts also remain with various countries regarding the CBAM. When the CBAM was fully implemented on January 1, 2026, a spokesperson for China's Ministry of Commerce responded to a question by stating that the series of proposed and implementing regulations related to the CBAM announced by the EU in December 2025 constitutes

unfair and discriminatory treatment of China, and that China would resolutely take all necessary measures. Within the EU, aluminum product manufacturers and agricultural fertilizer users have expressed concerns and opposition over rising prices and reduced supplies of inputs. Farmers have expressed strong opposition due to the expected increase in cheap agricultural product imports following the signing of the EU-Mercosur (Southern Common Market) Free Trade Agreement. At an extraordinary meeting of agriculture ministers on December 7, ahead of the Council of the EU meeting on December 9, 2025, which was planned to discuss the EU-Mercosur Free Trade Agreement, the European Commission proposed suspending tariffs on ammonia, urea and other fertilizers in order to lower fertilizer prices, and announced that it would issue guidance on a new measure that would allow for a temporary suspension of CBAM on fertilizers and other goods. However, suspending the application of CBAM to fertilizers would also open Pandora's box. We are already seeing moves both within and outside the EU to tighten and loosen import regulations and levies.

The progress and the future of Alaska LNG project

-About the announcement of FEED completion for the pipeline portion-

Takafumi Yanagisawa *

On January 22, 2026, Glenfarne, the U.S. energy infrastructure company developing the Alaska LNG project¹, announced that the Front End Engineering Design (FEED)² for Phase One (739-mile longitudinal pipeline section) by Australian engineering company Worley had been completed by the end of 2025, and that conditional³ orders had been placed with several companies for this pipeline construction, with a view to making a Final Investment Decision (FID) and commencing construction. The pipeline is planned to run across Alaska from Prudhoe Bay, Alaska's largest northern oil field, which is currently producing crude oil and associated gas, to southern Alaska. In the announcement, Glenfarne also stated that it is targeting mechanical completion of the pipeline in 2028 and delivery of first gas in 2029.

In the same announcement, Glenfarne also mentioned that it had executed a Gas Sales Precedent Agreement⁴ for the purchase of raw gas with ExxonMobil, Hilcorp, and ConocoPhillips, which are the investors of Prudhoe Bay. ExxonMobil operates another oil field in northern Alaska, called Point Thomson, which is also currently producing associated gas. In this announcement, Glenfarne stated that Phase One may also include the construction of a short pipeline (63-mile) connecting Point Thomson and Prudhoe Bay. The announcement does not mention the progress or target for Phase Two (the liquefaction and export facility portion).

In the press releases on 11 September 2025, Glenfarne stated that it was targeting to complete the final engineering and FID for the domestic portion of the Alaska LNG pipeline within 2025 and FID for the LNG export components in 2026. The announcement on 22 January 2026 by Glenfarne revealed that the basic design for the pipeline portion was completed as planned within 2025, while the final investment decision for the pipeline portion is behind schedule.

Furthermore, there is no seen the updated cost estimate for the pipeline portion based on the FEED that is said to have been completed. The total cost estimate for the Alaska LNG project prior to the FEED is \$38.7 billion, announced in 2022 (breakdown: \$12.7 billion for the pipeline, \$16.8 billion for the liquefaction and export facilities, and \$9.2 billion for the raw gas treatment plant⁵), and \$44 billion announced in 2023 (breakdown not disclosed). Given the current inflationary trend, the

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¹ About the outline of the project, please kindly read my previous article titled “Now and the Future for Alaska LNG Project” on October 10, 2025. <<https://eneken.ieej.or.jp/data/12771.pdf>>

² To be accurate, Glenfarne mentions “engineering work sufficient for a final investment decision”, while Worley refers it as “FEED” in its press release on 23 January.

³ The detail of precedent conditions has not been announced.

⁴ Similarly, the detail of precedent conditions has not been announced.

⁵ It is for purifying raw natural gas by removing contaminants.

updated cost estimate for the pipeline portion based on the FEED will be a key factor in predicting the future of the Alaska LNG project.

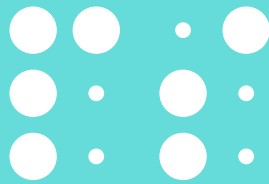
Regarding the Alaska LNG project, Japanese companies (JERA and Tokyo Gas), as well as Taiwan's CPC and Thailand's PTT, have already signed letters of interest (LOIs) for procurement. In addition, Korea's POSCO International has signed a strategic partnership, including the supply of steel for pipeline construction and the Heads of Agreement (HOA) for LNG offtake. The Alaska LNG project offers benefits to Asian LNG importers, including Japan, by eliminating chokepoints and allowing imports in approximately 10 to 15 days. However, the uncertainty surrounding the total project cost, the risk of potential policy changes (the liquefaction and export facilities are not expected to begin operation until 2030-31 at the earliest, which is after the Trump 2.0 administration), and the lack of concrete, effective U.S. public support measures to address these uncertainties make it difficult to make binding commitments. U.S. majors such as ExxonMobil and ConocoPhillips, which are investors in the Alaska upstream oil and gas fields, had previously considered participating in the pipeline and liquefaction facilities, but have currently suspended their consideration.

Glenfarne's report revealed some progress, with the completion of the FEED for the pipeline portion of the Alaska LNG project. However, the updated cost estimate based on the FEED has not been announced. Japan will need to continue to closely follow the update of the cost estimate and also to consider its involvement, including public-private partnerships in the Alaska LNG project, from the perspective of Japan's energy security.

IEEJ Energy Journal Vol. 21, No. 2 2026

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