

Economic and Energy Outlook of Japan for FY2023

*Energy prices keep remaining high
and energy policies keep remaining difficult to implement*

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Summary of economic and energy outlook [Reference Scenario]

Macro economy | GDP growth rate will rise for a third year, but at a slower pace

Real GDP for FY2023 will increase mainly the result of higher domestic demand but the level of increase will be slower (+1.3% from the previous year). The index of industrial production will rise for a third year in a row in FY2023 led by automobile and heavy electrical machinery (+2.1%). The index, however, will be lower than the level of FY2019.

Energy supply and demand | Total energy consumption will increase for the first time in two years with a recovery in transportation and an increase in industrial production. The CO₂ reduction will continue but at a reduced pace

Total energy consumption will increase with a recovery in transportation in addition to an increase in machinery production (+0.9%). With progress in energy savings led by high energy prices, total energy consumption per GDP will decline only slightly (-0.4%) because of an increase in energy intensive industries production. LNG imports will fall lower than 70Mt for the 13th year due to nuclear power plants restart and newly installed solar PV and coal-fired power plants.

CO₂ emissions will decrease by 1.4% to 963 Mt in FY2023, due to a large increase in the use of nuclear, and will be down 22.1% from FY2013, the base year for the Paris agreement. While the CO₂ reduction will continue for two years in a row, the reductions pace will slow down and is not sufficient to reach the halfway point of the Paris agreement target (cut by 45% by FY2030 from FY2013).

Energy sales | Electricity sales will rise for the first time in two years with larger increases for power services than the decreases in lighting services. City gas sales will increase for the third year and be the second highest after FY2017. Total fuel oil sales will decrease for the first time in three years, mainly due to a decrease in fuel use for power generation.

Electricity sales will be 0.2% higher than FY2022. Sales for power services will grow (+0.6%) with production recovery in automobile and service industries despite energy savings resulting from higher electricity prices. Sales for lighting services will decrease (-0.5%), primarily due to a decline in the stay-home rate and a cooler summer than in the previous year.

Overall city gas sales will increase slightly and FY2023 will be the second highest after FY2017 when summer was cool, and winter was cold. Note that a sharp increase in sales to electric utilities after FY2020 will contribute largely, while sales to general industry and the commercial sector will increase, they will remain lower than FY2019 before the COVID-19 pandemic.

Fuel oil sales in FY2023 will decrease slightly by 0.2% due to a decrease in fuel use for power generation, fuel switching and energy saving which was partly counter-balanced by increases in feedstock of ethylene.

Despite improved fuel efficiency, diesel oil and jet fuel oil will increase for a third year in a row with the recovery of transportation demand. Gasoline will slightly fall with improved fuel efficiency and diffusion of HV despite the recovery of transportation demand. Heavy fuel oil C will fall largely due to the decline of oil-fired power generation caused by the restart of nuclear and the newly installed solar PV and coal-fired power generation. It also fell because of fuel switching, and energy saving accelerated by higher oil prices.

Renewable power generation | The FIT power generation capacity will reach 99 GW by the end of FY2023

The installed renewable energy-based power generation capacity (including capacity subject to FIT contract expiration) will reach 99 GW by the end of FY2023. With less effects from COVID-19 that delayed the installation of solar PV power plant, capacity will expand to 60.6 GW. Wind capacity will accelerate and reach 6.1 GW due to growing pressures to get FIT brought by setting operation deadline and expiration date for non-operating plants. Renewable power generation in FY2023 will total 190.1 TWh (including 92.0 TWh for solar PV, 40.6 TWh for small and medium-sized hydro plants, 41.8 TWh for biomass, 11.9 TWh for wind), accounting for 18.6% of Japan's total power generation. With the inclusion of large-sized hydro, renewable power generation will account for 22.5%.

Table 1 | Summary of Reference Scenario

	Historical				Projection		Year-over-year			
	FY2010	FY2019	FY2020	FY2021	FY2022	FY2023	FY2021	FY2022	FY2023	
Energy	Primary energy supply (Mtoe) ¹	515.9	444.5	415.2	431.1	427.9	431.7	3.8%	-0.7%	0.9%
	Oil ² (GL)	232.3	186.1	169.7	175.8	177.1	175.7	3.6%	0.7%	-0.8%
	Natural gas ² (Mt of LNG equiv.)	73.3	78.3	78.4	73.9	72.0	65.1	-5.8%	-2.6%	-9.5%
	Coal ² (Mt)	184.7	187.6	174.6	184.6	185.4	190.8	5.7%	0.4%	2.9%
	Nuclear (TWh)	288.2	61.0	37.0	67.8	54.1	100.2	83.1%	-20.2%	85.1%
	Renewable electricity ³ (TWh)	110.4	187.9	197.8	209.0	220.0	230.1	5.7%	5.3%	4.6%
	FIT generation (TWh)	63.2	146.2	158.1	168.8	179.4	190.1	6.8%	6.2%	6.0%
	Self-sufficiency ratio	20.2%	12.1%	11.3%	13.4%	12.8%	15.7%	2.1p	-0.5p	2.9p
	Electricity sales ⁴ (TWh)	(926.6)	836.1	820.9	837.1	834.9	836.9	2.0%	-0.3%	0.2%
	City gas sales ⁵ (Billion m ³)	39.28	40.42	39.51	41.15	41.63	41.69	4.1%	1.2%	0.1%
	Fuel oil sales (GL)	196.0	161.7	152.0	153.5	155.5	155.1	1.0%	1.3%	-0.2%
	Energy-related CO ₂ emissions (Mt)	1,137	1,029	968	980	975	962	1.2%	-0.4%	-1.4%
	(Changes from FY2013)	-8.0%	-16.7%	-21.6%	-20.7%	-21.1%	-22.1%	0.9p	-0.4p	-1.1p
Prices	Crude oil, import, CIF (\$/bbl)	84	68	43	77	100	91	78.8%	28.7%	-8.8%
	LNG, import, CIF (\$/MBtu)	11.3	9.5	7.5	12.1	17.8	16.7	60.7%	47.6%	-6.5%
	Steam coal, import, CIF (\$/t)	114	101	80	161	366	340	101.2%	127.9%	-7.1%
	Coking coal, import, CIF (\$/t)	175	138	105	193	344	316	84.0%	78.5%	-8.0%
Economy	Real GDP (JPY2015 trillion)	512.1	550.1	527.4	540.8	550.1	557.3	2.5%	1.7%	1.3%
	Industrial production (CY2015=100)	101.2	99.9	90.3	95.5	96.8	98.8	5.8%	1.3%	2.1%
	Balance of trade (JPY trillion)	5.3	-1.3	1.0	-5.5	-20.7	-20.7	-649.9%	276.4%	0.2%
	Fossil fuel imports (JPY trillion)	18.1	16.6	10.6	19.8	36.4	32.8	87.4%	83.3%	-10.0%
	Exchange rate (JPY/\$)	86.1	108.8	106.0	111.9	137.1	135.0	5.6%	22.5%	-1.6%
	Cooling degree days	559	439	442	407	506	414	-8.0%	24.4%	-18.2%
Heating degree days	1,079	818	863	966	937	973	11.8%	-2.9%	3.9%	

Notes:

1. Mtoe = 10¹³ kcal

2. Conversion factors for oil: 9,126 kcal/L; Natural gas: 13,043 kcal/kg; Steam coal: 6,139 kcal/kg; Coking coal: 6,928 kcal/kg until FY2012.

Conversion factors for oil: 9,145 kcal/L; Natural gas: 13,016 kcal/kg; Steam coal: 6,203 kcal/kg; Coking coal: 6,877 kcal/kg since FY2013.

Conversion factors for oil: 9,139 kcal/L; Natural gas: 13,068 kcal/kg; Steam coal: 6,203 kcal/kg; Coking coal: 6,866 kcal/kg since FY2018.

3. Including large hydro 30 MW or more. 4. Figures in parentheses are old statistical figures. 5. Conversion factor: 1 m³ = 10,000 kcal

Topic |

1 Impacts on the economy and the energy situation of a weaker yen (+JPY10/\$)

If the yen is weaker by JPY10/\$ in comparison to the reference scenario of JPY135/\$ for FY2023, the value of real exports would increase by only 0.5%, while real imports would decrease by 0.2% and real GDP would increase slightly (+0.2%) from the reference scenario. A weaker yen would contribute to a slight increase of the index of industrial production and energy sales due to depressed domestic demand with an inflation brought by higher energy prices in addition to limited increase of exports. On the other hand, the increase in nominal GDP is limited by a deterioration of the trade balance in part due to an increase in fossil fuel imports. From an economic point of view, it would be important to increase inbound foreign demand, and from an energy point of view, it would be important to reduce the import dependency for energy by lowering the cost of renewable and smoothing the restart of nuclear power.

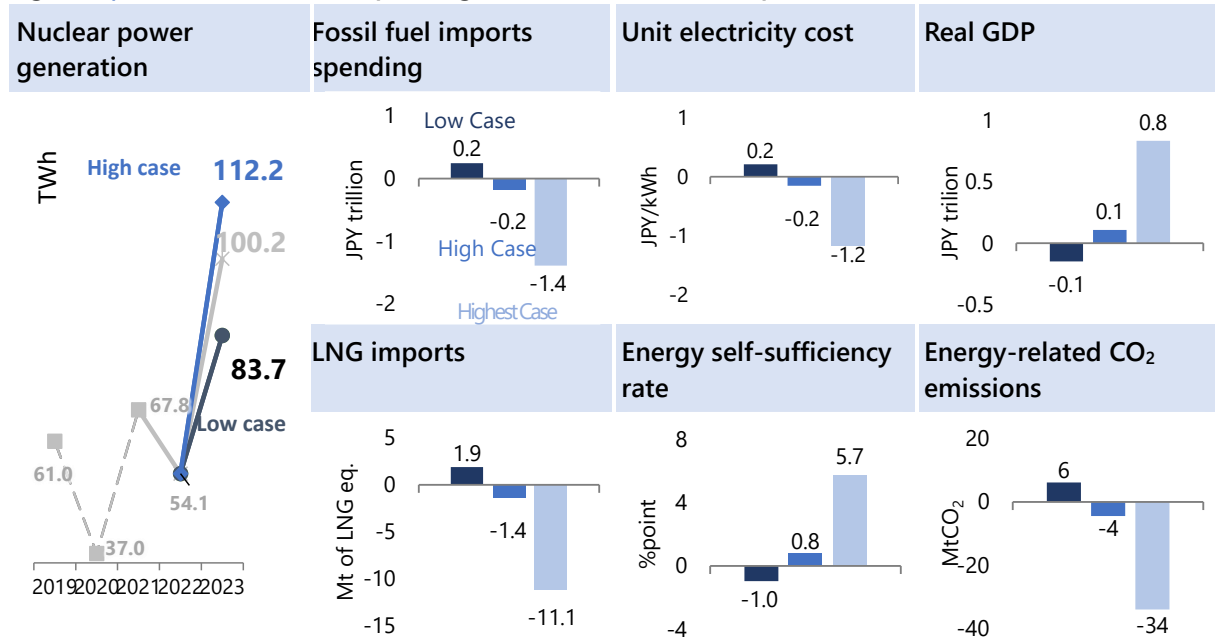
2 Impacts of the subsidy program for energy

A subsidy program for energy will be implemented from January through September 2023. The subsidy program, which represent a substantial government spending, is intended to provide relief from the soaring prices of electricity, city gas and fuel oil. Without the subsidy program, higher energy prices would hold back economic growth while, on the other hand, they would have had a downward impact on energy consumption and CO₂ emissions. As such, the subsidy program could be interpreted as temporarily delaying energy savings and reducing CO₂ emissions. In addition, without the subsidy program for energy, government spendings would be substantially reduced. Along with the introduction of the subsidy program for energy, appropriate phase-out actions to minimize the negative effects should be announced. In addition, reducing energy expenditures by enhancing efficiencies through energy saving assistance programs, in harmony with energy and environmental policies would be important.

3 Impacts of the completion of counterterrorism facilities and the delays in nuclear plant restarts

We assessed the impacts of nuclear power generation on 3Es – economy efficiency, energy security and environment. In the High Case compared to the reference scenario, more plants would be in full operation with their counterterrorism facilities completed within their respective deadlines. In such Case, the cost of fossil fuel imports would be reduced by JPY180 billion, the self-sufficiency rate would be improved by 0.8 points, and CO₂ emissions would be reduced by 4 Mt. Smoothing the restart of the nuclear power generation with the consideration of each plant contributes to achieving 3Es.

Figure 1 | Effect of the nuclear power generation [FY2023, compared with the Reference Scenario]



Overview

In the third quarter (July–September) of 2022, Japan posted a negative GDP growth (−0.2%) for the first time in four quarters. The largest contributor was the −0.6 growth in foreign demand caused by an increase in imports of goods and services. Private consumption, capital investment, and exports did not rebound so strongly due to the seventh wave of Covid-19 and high consumer prices. Nonetheless, they are still rising. There are concerns about an eighth wave, but hopefully, no restrictions on activities will be required allowing consumption to expand, chiefly in face-to-face services and for inbound travel business.

Oil import prices surpassed \$100/bbl in April 2022 and reached \$117/bbl in June as international economic sanctions against Russia exacerbated concerns toward Russian energy exports. Prices remain above \$100/bbl as of October and are weighing heavily on the Japanese economy still recovering from the pandemic.

Due to soaring energy prices and the rapidly weakening yen, the consumer price index rose by +3.6% year-on-year as of October. This is an historic increase and the largest in over 40 years (excluding the impact of increases in consumption tax). To ease the rise in consumer prices, a subsidy program to curb excessive price increases for electricity and gas will be launched in January 2023, following the existing one for fuel oil.

As for nuclear power, 27 plants have applied for the safety assessment in accordance with the new regulation standards: 17 have passed the assessment based on the installation permit standard and 10 have restarted. However, three out of those 10 reactors remained shut down for extended periods in FY2022 for not completing the construction of their specialized safety facilities (SSFs) in time.

Major Assumptions for the Reference Scenario

Covid-19

In FY2022, Japan's number of Covid cases soared with the seventh wave that began in July, though the number of serious cases was suppressed thanks to vaccinations. Restrictions on activities are expected to remain loose until the end of the fiscal year. In FY2023, government restrictions on activities are expected to be lifted almost entirely with the wider availability of medicines as well as vaccines, though the number of cases may fluctuate.

World economy

The global economic growth rate is estimated at +3.2% for 2022 and +2.7% for 2023. In 2022, growth slowed due to the war in Ukraine and interest rates rose in Europe and the US to combat inflation; these hikes will cause 2023 to be the weakest growth since 2001, excluding the aftermath of the global economic crisis and the peak of the pandemic.

Import CIF prices of fossil fuels

Japan's average oil import price is estimated at \$100/bbl for FY2022 (\$112/bbl in the first half, \$87/bbl in the second half) and at \$91/bbl for FY2023 based on international oil price forecasts of the Market Outlook referred to below. The LNG price tracks the oil price with a delay and is estimated at \$17.8/MBtu for FY2022 and \$16.7/MBtu for FY2023. The price of steam coal is estimated at \$366/t for FY2022 and \$340/t for FY2023, and that of coking coal is estimated at \$344/t for FY2022 and \$316/t for FY2023 ("Oil Market Outlook for 2023" by Morikawa, "Gas Market Outlook for 2023" by Hashimoto, and "Coal Market Outlook for 2023" by Sagawa, IEEJ).

Foreign exchange rates

The average USD/JPY exchange rate is estimated at JPY137.1/USD for FY2022 and at JPY135.0/USD for FY2023.

Subsidy program to curb price increases

For the subsidy program to curb excessive price increases for fuel oil, the subsidy cap will gradually be lowered from January 2023 and the program will be phased out starting in June. For city gas and electricity, the phasing-out is expected to start in September.

Nuclear power

Power plant restarts are expected to move forward with the progress in safety assessments in accordance with the new regulatory standards. In FY2022, the average operating period is estimated at 8 months, with three plants remaining closed for extended periods due to delays in the completion of their SSFs. The total estimated power output is 54.1 TWh (down 20.2% year-on-year). In FY2023, five plants are expected to restart in turn, bringing the total number of plants that have restarted since the Great East Japan Earthquake to 15. Two plants will be shut down due to delays in the SSFs, but 100.2 TWh of electricity will be produced (up 85.1% year-on-year) with an average operating period of 10 months.

Temperature

Based on the three-month forecast of the Japan Meteorological Agency, for the winter of FY2022, the temperature is likely to be somewhat higher than the average year, and is then expected to be similar to the average year thereafter. In FY2022, the summer was hotter than the previous year (+1.0°C) and the winter warmer (+0.3°C). For FY2023, the summer is forecast to be cooler than the previous year (−0.8°C) and the winter colder (−0.3°C).

Macroeconomy

In FY2023, real GDP will rise for a third year, though at a slower pace. With import prices remaining at high levels, Japan will suffer a third year of trade deficits.

Real GDP will grow 1.7% year-on-year (yoy) in FY2022 as people return to pre-Covid lifestyles. private demand will increase mainly in face-to-face services (+2.6%) and so will capital investment as companies' investment appetite returns (+3.7%), resulting in private sector demand contributing a 2.1% increase. Public sector demand will contribute a 0.1% increase as healthcare expenses increase, while foreign demand will have a negative contribution of 0.5% as exports decelerate due to a global economic slowdown.

In FY2023, real GDP will increase driven by domestic demand but at a slower pace of +1.3% yoy. The increase in private demand will slow as consumer prices continue to rise, but the impact will be eased by the excess savings during the pandemic and the comprehensive economic package (+1.3%). Capital investment will increase (+3.4%) despite an increase in import costs as corporate revenue picks up with the economic recovery. In addition to investment for streamlining and digitalizing business operations,

climate investment for decarbonization will accelerate. Private sector demand will contribute to an increase of 1.4%, though the demand will be smaller than in FY2018. Public sector demand will contribute to an increase of 0.3%, marking a record high with an increase in public investment such as for the Action Plan for National Resilience, and for the government spending on its comprehensive economic package, healthcare and nursing care costs, and so on. Despite the recovery of inbound business demand and auto exports, foreign demand will post a negative contribution of 0.3%, caused by a decrease in exports as mainly European and US consumers hold back on purchases due to inflation.

The monetary value of fossil fuel imports will decrease in FY2023 (-10.0%) as oil prices fall, but will still be the second highest on record after the previous year. Regarding the trade balance, the deficit will expand slightly, marking a new record high.

Table 1 | Macroeconomy

	Historical				Projection		Year-over-year		
	FY2010	FY2019	FY2020	FY2021	FY2022	FY2023	FY2021	FY2022	FY2023
Real GDP (JPY2015 trillion)	512.1	550.1	527.4	540.8	550.1	557.3	2.5%	1.7%	1.3%
Private demand	383.7	411.5	387.9	395.6	406.8	413.9	(1.4%)	(2.1%)	(1.4%)
Private consumption	290.5	299.5	284.4	288.6	296.1	300.0	1.5%	2.6%	1.3%
Private residential investment	18.2	20.4	18.9	18.6	17.9	18.0	-1.1%	-4.2%	0.8%
Private non-residential investment	73.7	90.6	85.4	87.2	90.4	93.5	2.1%	3.7%	3.4%
Public demand	124.2	139.0	143.3	145.3	146.0	147.1	(0.3%)	(0.1%)	(0.3%)
Government consumption	98.1	111.0	113.9	117.8	119.3	119.6	3.4%	1.2%	0.3%
Public investment	26.2	28.1	29.5	27.6	26.8	27.4	-6.4%	-2.6%	2.2%
Net exports of goods and services	4.7	-0.4	-4.1	0.4	-2.0	-3.2	(0.8%)	(-0.5%)	(-0.3%)
Exports of goods and services	83.8	102.6	92.3	103.7	108.2	108.0	12.3%	4.3%	-0.2%
Imports of goods and services	79.2	103.0	96.5	103.3	110.1	111.2	7.1%	6.6%	1.0%
Nominal GDP (JPY trillion)	504.9	556.8	537.6	550.5	562.4	577.9	2.4%	2.2%	2.7%
Balance of trade (JPY trillion)	5.3	-1.3	1.0	-5.5	-20.7	-20.7	-649.9%	276.4%	0.2%
Exports	67.8	75.9	69.5	85.9	103.1	107.0	23.6%	20.0%	3.8%
Imports	62.5	77.2	68.5	91.4	123.8	127.7	33.4%	35.4%	3.2%
Fossil fuels	18.1	16.6	10.6	19.8	36.4	32.8	87.4%	83.3%	-10.0%
Oil	12.3	10.1	5.8	11.2	17.5	16.1	93.9%	56.5%	-7.9%
LNG	3.5	4.1	3.2	5.0	9.3	7.7	58.8%	85.5%	-17.0%
Current account (JPY trillion)	18.3	18.6	16.7	20.3	10.1	8.2	21.0%	-50.1%	-19.2%
Domestic corporate goods price index (2020=100)	97.3	101.3	99.9	107.0	116.2	118.9	7.1%	8.6%	2.4%
Consumer price index (2020=100)	94.7	100.1	99.9	100.0	102.7	104.4	0.1%	2.7%	1.6%
Unemployment rate (%)	5.0	2.3	2.9	2.8	2.5	2.4	[-0.1p]	[-0.3p]	[-0.1p]

Notes: GDP components may not add up to the total GDP due to stock changes and minor data deviations.

() stands for contributions. [] stands for changes from the previous year.

Production Activity

In FY2023, industrial production will increase for a third year as production increases mainly in the auto sector which has been slow to recover, but the level will be lower than in FY2019. Crude steel and ethylene production will increase but will not reach FY2021 levels.

The industrial production index for FY2022 will increase yoy (+1.3%), thanks to an increase in the production of automobiles and industrial general-purpose devices which was partially offset by a decrease in production of electronic parts and devices, including semiconductor memory due to the shrinking demand for smartphones and PCs. In FY2023, the index will rise (+2.1%) for the third year due mainly to automobiles as they catch up with the delay in recovery and heavy electric equipment backed by robust investment, though it will be lower than in FY2019 before Covid hit.

In FY2022, crude steel production will decline yoy (-3.2%) as production of automobiles and construction materials falls, and due to repairs to the No.3 blast furnace at the Nagoya Works in the first half of the year and the No.6 blast furnace in the Chiba area of the East Nippon Works in the second half. Exports will decline significantly due to the slump in the Asian market in the first half of the year. In FY2023, production will increase (+1.5%) as global auto production recovers, despite the planned shutdown of the No.2 blast furnace in the Keihin area of the East Nippon Works. Production will be lower than FY2021 levels.

In FY2022, ethylene production will decrease yoy due to a large number of periodic plant outages, falling below the 6 million tonne mark for the first time since FY1993 (-3.7%). Domestic demand will increase due to the recovery of industrial output. Imports will increase and exports decrease as inventory levels for derivatives are rising in South Korea and elsewhere due to the lockdowns in China. In FY2023, ethylene production will increase as there will be few periodic plant outages (+2.3%). Exports of control valves to Asia will also increase due to a lower number of periodic plant outages.

In FY2022, cement production will decline as exports fall because of a rise in raw materials costs (-2.4%). Domestic demand will decline slightly due to failed bids in the public sector and labor shortages, even though redevelopment projects began mainly in the Kanto area. In FY2023, cement production will increase very slightly (+0.2%) because the decrease in exports, due to raw materials costs remaining high, will be offset by an increase in domestic demand reflecting the redevelopment projects in the Tokyo area and the normalization of construction periods for disaster prevention and mitigation works related to the Action Plan for National Resilience.

In FY2022, paper and paperboard production will decrease despite an increase in base paper for cardboards and sanitary paper, as paper demand declines for newspapers, events, and publishing amid the accelerating digitalization (-1.2%). Production will decrease in FY2023 as well due to the long-term decline of newspaper, office paper, etc. amid a structural change toward digitalization (-1.4%). Of this amount, domestic demand for paperboard will increase as tourism-related demand recovers and the use of e-commerce expands. While e-commerce will continue to grow in other countries as well, exports will decrease because shortages in used paper, which is the feedstock for paperboard in Japan, will be the bottleneck for production.

In FY2022, auto production will increase slightly from FY2020 levels due to shortages of on-vehicle semiconductors, combined with shortages of parts due to city lockdowns in China (+6.4%). Both domestic demand and exports will recover in FY2023, resulting in a production increase (+3.4%). However, note that the structural supply-demand crunch will not be resolved due to shortages of on-vehicle semiconductors, and production will be the lowest since the period of FY1976 to FY2019.

Table 2 | Production Activity

	Historical				Projection		Year-over-year			
	FY2010	FY2019	FY2020	FY2021	FY2022	FY2023	FY2021	FY2022	FY2023	
Production	Crude steel (Mt)	110.8	98.4	82.8	95.6	92.6	94.0	15.5%	-3.2%	1.5%
	Ethylene (Mt)	7.00	6.28	6.04	6.10	5.88	6.01	1.0%	-3.7%	2.3%
	Cement (Mt)	56.1	58.1	56.1	55.7	54.4	54.5	-0.6%	-2.4%	0.2%
	Paper and paperboard (Mt)	27.3	25.0	22.7	24.0	23.7	23.4	6.0%	-1.2%	-1.4%
	Automobiles (Million units)	8.99	9.49	7.97	7.55	8.03	8.30	-5.3%	6.4%	3.4%
Production indices	Mining and manufacturing (2015=100)	101.2	99.9	90.3	95.5	96.8	98.8	5.8%	1.3%	2.1%
	Food and tobacco	100.7	100.6	97.0	96.6	97.2	98.9	-0.4%	0.7%	1.8%
	Chemicals	99.6	103.8	94.5	99.7	102.9	105.5	5.5%	3.2%	2.5%
	Non-ferrous metals	100.0	99.2	90.0	96.4	97.7	100.1	7.1%	1.3%	2.4%
	Machinery	99.4	100.3	89.7	96.1	97.9	99.9	7.1%	1.8%	2.0%
Tertiary industry activity index (2015=100)	97.6	102.3	95.3	97.5	100.5	102.8	2.3%	3.1%	2.3%	

Notes: Chemicals include chemical fibers.

Machinery includes general machinery, electrical machinery, information and telecommunications equipment, electronic parts and devices, precision machinery and metal products.

Domestic Primary Energy Supply

In FY2023, energy demand will increase for the first time in two years as transportation recovers and industrial production increases. CO₂ emissions will continue to fall but the progress of reduction is lagging behind.

In FY2022, domestic primary energy supply will decrease yoy due to declining production in energy-intensive industries (-0.7%). In FY2023, the supply will increase as transportation recovers due to an increase in auto production, in addition to people's mobility (+0.9%). The supply will exceed that in FY2021. Energy efficiency will improve due to high energy prices, but the energy intensity per unit of GDP will improve only slightly as energy-intensive industries boost production (-0.4%).

In FY2022, new energy, etc. including solar PV, wind power and biomass will grow yoy for both electricity and non-electricity uses, thanks to the recovery from Covid-19 (+5.0%). In FY2023, solar PV will increase mainly among non-residential sources (+4.7%), accounting for 6% of the domestic primary energy supply.

In FY2022, nuclear power will decrease yoy as no new plants restarted and three plants remained under long-term shutdown in connection with the construction of SSFs (-20.3%). In 2023, nuclear power will increase significantly yoy, though two plants will not operate due to delays in the completion of SSFs. The shutdowns will be brief and five plants will be restarted (+82.5%).

In FY2022, oil supply will increase yoy as the availability factor of oil-fired thermal plants rises to meet the recovery in transportation demand and alleviate the electricity supply-demand crunch (+0.7%). In FY2023, the supply of light oil and jet fuel will increase as transportation recovers and so will naphtha with the increase in ethylene production, but

supply will decrease in net terms (-0.8%) due to efficiency improvements, fuel conversion, and a decrease in oil-fired thermal power.

In FY2022, despite four coal-fired thermal plants (3,020 MW) starting operations within the year, coal supply will decrease slightly yoy (-0.2%), as crude steel production declined significantly. In FY2023, the supply will increase yoy (+2.8%) as steel and cement production recovers and one coal-fired power plant (340 MW) will commence operations.

In FY2022, natural gas supply will decrease yoy (-2.6%) chiefly for power generation, though it increased for city gas production. In FY2023, the supply will decline significantly yoy (-9.5%) mainly for power generation due to a major increase in nuclear power generation, falling below 90 Mtoe for the first time since 2006. LNG imports will increase yoy in FY2022 due to the build-up of inventories, but will fall below 70 Mt in FY2023 for the first time in 13 years and since the Great East Japan Earthquake (-9.5%).

In FY2022, energy-related CO₂ emissions will decrease yoy for the first time in two years to 975 Mt (-0.4%). In FY2023, the emissions will decrease to 962 Mt due to an increase in nuclear power (-1.4%), down 22.1% from FY2013 levels. Although we are already past the halfway mark between FY2013 and FY2030, the reduction is just now almost reaching the halfway point toward the FY2030 CO₂ reduction goal (of 45% from FY2013 levels in FY2030), and is falling further behind even though emissions have decreased for two consecutive years.

Table 3 | Domestic Primary Energy Supply

	Historical				Projection		Year-over-year		
	FY2010	FY2019	FY2020	FY2021	FY2022	FY2023	FY2021	FY2022	FY2023
Primary energy supply (Mtoe)	515.9	444.5	415.2	431.1	427.9	431.7	3.8%	-0.7%	0.9%
Coal	119.1	120.4	110.6	118.9	118.7	122.1	7.5%	-0.2%	2.8%
Oil	212.0	170.1	155.1	160.7	161.9	160.6	3.6%	0.7%	-0.8%
Natural gas	95.7	102.4	102.5	96.6	94.0	85.1	-5.8%	-2.6%	-9.5%
LNG imports (Mt)	70.6	76.5	76.4	71.5	73.2	66.2	-6.4%	2.4%	-9.5%
Hydro	17.7	16.5	16.2	16.3	16.4	16.3	0.6%	0.6%	-0.8%
Nuclear	60.7	13.0	7.9	14.5	11.5	21.1	82.7%	-20.3%	82.5%
New energy, etc.	10.7	22.1	22.8	24.1	25.3	26.5	5.6%	5.0%	4.7%
Self-sufficiency rate	20.2%	12.1%	11.3%	13.4%	12.8%	15.7%	2.1p	-0.5p	+2.9p
Energy intensity (FY2013=100)	109.3	87.7	85.4	86.5	84.4	84.0	1.2%	-2.4%	-0.4%
Energy-related CO ₂ emissions (MtCO ₂)	1,137	1,029	968	980	975	962	1.2%	-0.4%	-1.4%
Change from FY2013	-8.0%	-16.7%	-21.6%	-20.7%	-21.1%	-22.1%	-0.9p	0.4p	1.1p

Notes: New energy includes solar photovoltaics, wind, biomass, solar heat, and geothermal, etc.

Self-sufficiency rate is based on IEA standard.

Electricity Sales, Power Mix (for electricity businesses), and Prices for Electric Power and Lighting

Electricity sales in FY2023 will increase for the first time in two years due to an increase in electric power, though they will decrease for lighting service. LNG-fired power will decrease significantly as non-fossil power sources and coal-fired power increase, falling below FY2010 levels for the first time since the Great East Japan Earthquake.

In FY2022, electricity sales will decrease yoy by 0.3%. The sales will increase for power service because of the hot summer, as well as the recovery in auto production and service business activity (+0.5%). Meanwhile, they will decrease for lighting service with the fall in the stay-at-home rate (-1.8%). In FY2023, electricity sales will increase by 0.2%. The sales will increase (+0.6%) for power service due to a significant recovery in auto production on top of a recovery in business activity for services, despite enhanced energy efficiency as electricity rates remain high. They will fall for lighting service (-0.5%) due to a decrease in the stay-at-home rate, in addition to a cooler summer than the previous year.

The price for power service and lighting service will increase yoy in FY2022 (+27.0%) as fossil fuel prices soar due to the invasion of Ukraine and other reasons and the rise in the surcharges for promoting renewable power, as well as the weak yen. The prices will also increase in FY2023 (2.8%), reaching record high levels. This is because the rise in the price for lighting service resulting from raising the cap for the regulated low-voltage electricity price (+8.8%) cancels out the decrease in the price of electricity (-0.5%) achieved by the subsidies to curb excessive price increases.

As for the power mix, in FY2022, nuclear power will decrease yoy with no new plants restarting and prolonged periodic outages (-1.4p). The share of nuclear power will rebound from the previous fiscal year in FY2023 as five plants are restarted (+4.9p). Renewables (excluding hydropower) will increase mainly for non-residential solar PV, rising 1.1p yoy in both FY2022 and FY2023. Non-fossil power sources will increase by 5.8p in FY2023 to 35.5%. This, however, is 2.7p lower than in FY2010 (38.2%), and further increases are needed.

In FY2023, the share of coal will increase (+1.1p) as one 500 MW coal-fired power plant (Saijo Unit 1) starts operation in FY2023, in addition to the four plants (3020 MW in total) that started in FY2022: Taketoyo Unit 5, Higashi Unit 3, Misumi Unit 2, and Kobe Unit 4. The share of oil, etc. will decrease in FY2023 (-1.5p) as the tight supply-demand balance eases and oil-fired thermal power (burning Bunker C and crude oil) decreases. The share of LNG will be 27.2% (-5.4p) in FY2023 due to the increase in non-fossil power sources, falling below FY2010 levels (29.3%) for the first time since the Great East Japan Earthquake.

Table 4 | Electricity Sales, Power Mix, and Prices for Power Service and Lighting Service (for electricity businesses)

	Historical				Projection		Year-over-year		
	FY2010	FY2019	FY2020	FY2021	FY2022	FY2023	FY2021	FY2022	FY2023
Electricity sales (TWh)	(926.6)	836.1	820.9	837.1	834.9	836.9	2.0%	-0.3%	0.2%
Lighting service	304.2	266.7	278.0	278.1	273.2	271.9	0.1%	-1.8%	-0.5%
Power service	(622.4)	569.4	543.0	559.0	561.7	565.0	2.9%	0.5%	0.6%
Extra-high and High voltage	(576.5)	533.2	506.6	523.2	525.8	529.1	3.3%	0.5%	0.6%
Low voltage	(45.9)	36.3	36.3	35.7	35.9	36.0	-1.6%	0.5%	0.1%
Electricity generated and purchased (TWh)	(1,028)	932.0	920.3	945.5	942.7	944.9	2.7%	-0.3%	0.2%
Hydro	(8.5%)	9.3%	9.5%	9.5%	9.6%	9.5%	0.0p	0.1p	-0.1p
Fossil fuels	(61.7%)	73.1%	74.0%	70.1%	70.3%	64.5%	-3.9p	0.2p	-5.8p
Coal	(25.0%)	28.4%	27.8%	27.7%	28.6%	29.7%	-0.1p	0.9p	1.1p
LNG	(29.3%)	38.1%	38.6%	33.8%	32.6%	27.2%	-4.8p	-1.2p	-5.4p
Oil, etc.	(7.5%)	6.6%	7.5%	8.6%	9.1%	7.6%	1.1p	0.5p	-1.5p
Nuclear	(28.6%)	6.5%	4.0%	7.2%	5.7%	10.6%	3.1p	-1.4p	4.9p
Renewables (excluding hydro), etc.	(1.1%)	11.0%	12.5%	13.2%	14.4%	15.4%	0.7p	1.1p	1.1p
Electricity prices (JPY/kWh)	(16.7)	21.7	20.5	22.2	28.2	29.0	8.4%	27.0%	2.8%
Lighting service	21.4	27.3	26.0	27.9	31.3	34.1	7.4%	12.3%	8.8%
Power service	(14.4)	18.9	17.5	19.0	26.7	26.6	8.2%	40.9%	-0.5%

Notes: Figures in brackets are based on old statistical definitions, and discontinuous with other values.

"Electricity sales" is for electricity utility use, and does not include own use and specified supply.

"Electricity generated and purchased" is only for general electric utilities in FY2010, and its figures since FY2016 are estimated values.

Hydro includes pumped, and LNG includes city gas.

City Gas Sales and Price for City Gas (for gas businesses)

City gas sales will increase for the third consecutive year in FY2023 due to increased industrial production. Sales for general industrial and commercial uses will reach the second-highest level since FY2017, but lower than in FY2019 before the pandemic.

City gas sales¹ will increase yoy in FY2022 (+1.2%) due to increases in general industrial, commercial, and power generation (electric utility) uses. They will increase slightly in FY2023 (+0.1%) to the second-highest level since FY2017, which had a harsh winter and cool summer. However, despite the significant increase in city gas for power generation in FY2020 onward, city gas sales will be lower than pre-Covid levels for both general industrial and commercial uses.

The sales of city gas for households will continue to decline structurally with the spread of induction heating (IH) appliances for kitchens and energy-efficient water heaters, as well as full electrification for hot water supply and heating. They will decrease yoy in FY2022 (-2.6%) due to a warmer winter than the previous year and a lower stay-at-home rate. They will fall slightly in FY2023 (-0.1%) despite a harsher winter than the previous year, as demand for hot water supply and heating decreases again due to a lower stay-at-home rate.

The sales for general industrial use will increase yoy in FY2022 (+0.5%) due to a recovery in industrial production. They will also increase in FY2023 as industrial production further recovers (+0.7%) despite progress in energy efficiency. However, the sales will be lower than in FY2019. In FY2023, the sales of city gas for power generation (electricity business) will remain flat as there are no plans for large city gas-fired power plants to start operation. Total sales for industrial use will increase 2.6% in FY2022 and 0.5% in FY2023.

The sales of city gas for business use (commercial and other uses) will increase yoy in FY2022 despite progress in energy conservation, driven by a strong cooling demand due to an extremely hot summer. The sales of city gas for commercial use will increase yoy (+3.7%) due to a recovery in activity from the previous year, particularly in the face-to-face activities such as accommodations, eating and drinking services sector and the living-related services and amusement services sectors. The sales for other uses will decrease (-0.9%), chiefly for hospitals. In FY2023, the winter will be colder than the previous year, resulting in an increase in demand for hot water supply and heating, but the summer will be cooler, driving down the demand for cooling. The sales will decrease for commercial use (-1.2%), due to progress in energy efficiency and a decline in cooling demand, though activity will continue to recover mainly in the face-to-face activities. The sales for other uses will decrease (-0.6%) due to a decrease in demand mainly from hospitals as society emerges from the pandemic, in addition to progress in energy saving.

The city gas price will increase yoy in FY2022 (+40.3%) due to soaring LNG prices caused by the invasion of Ukraine and other factors. This is the highest since the full liberalization of gas in FY2017. On the other hand, in FY2023, it will fall (-3.0%) due to the energy subsidy program. However, the price will increase for households as the price cap was raised in the second half of the previous year (+0.7%).

Table 5 | City Gas Sales and Price (for gas businesses)

	Historical				Projection		Year-over-year		
	FY2010	FY2019	FY2020	FY2021	FY2022	FY2023	FY2021	FY2022	FY2023
City gas sales (Billion m ³)	39.28	40.42	39.51	41.15	41.63	41.69	4.1%	1.2%	0.1%
Residential	9.79	9.38	10.02	9.91	9.66	9.65	-1.0%	-2.6%	-0.1%
Commercial	4.75	4.16	3.65	3.70	3.84	3.79	1.4%	3.7%	-1.2%
Industrial	21.61	23.83	22.76	24.37	25.01	25.13	7.1%	2.6%	0.5%
Manufacturing	20.28	19.68	17.43	18.91	19.00	19.13	8.5%	0.5%	0.7%
Electric utilities	1.34	4.15	5.33	5.46	6.00	6.00	2.4%	9.9%	0.0%
Others	3.13	3.05	3.08	3.16	3.13	3.11	2.4%	-0.9%	-0.6%
City gas prices (JPY/m ²)	92.8	93.1	83.3	96.0	134.7	130.7	15.3%	40.3%	-3.0%
Residential	172.1	178.1	165.4	175.0	207.6	209.2	5.8%	18.7%	0.7%
Commercial	88.10	95.50	85.75	95.55	136.1	130.0	11.4%	42.4%	-4.4%
Industrial	54.47	63.47	52.23	65.18	107.3	101.9	24.8%	64.6%	-5.1%
Others	82.42	88.67	78.05	88.00	129.3	123.2	12.8%	46.9%	-4.7%

Notes: Converted at 1 m³ = 41.8605 MJ (10,000 kcal). Figures in brackets are earlier statistical definitions.

¹ Gas businesses excluding former community gas utility

businesses

Fuel Oil and LPG Sales, and Crude Oil Throughput

In FY2023, fuel oil sales will decrease for the first time in three years due to a major decrease in sales for power generation, despite an increase in sales as feedstock for ethylene. Exports of transportation fuel will increase, and crude oil throughput will increase for the third consecutive year for the first time since 1994.

The sales of fuel oil will increase yoy in FY2022 (+1.3%) mainly for transportation and power generation. In FY2023, the sales will decrease slightly (-0.2%) due to a decline in sales for power generation, in addition to fuel conversion and energy saving, though sales as feedstock for ethylene will increase.

The sales of gasoline will increase yoy (+1.4%) in FY2022 due to a significant recovery in passenger car transport. They will decrease slightly in FY2023 (-0.1%) due to improved fuel efficiency and an increase in hybrid vehicles, even though the amount of transport will recover.

The sales of naphtha will decrease yoy in FY2022 (-2.4%) due to a large number of scheduled repairs at ethylene plants. They will increase in FY2023 (+1.9%) as there are fewer scheduled repairs.

The sales of jet fuel will soar in FY2022 (+36.5%) due to a strong recovery in aviation passenger traffic. They will also increase in FY2023 (+13.4%) and approach the pre-Covid levels, FY2019 as people go on the move again.

The sales of kerosene will decrease yoy in FY2022 (-2.6%) due to a warm winter and a decrease in the stay-at-home rate. In FY2023, they will continue to decrease due to fuel conversion (-0.4%), even though heating demand will increase due to a colder winter.

The sales of light oil will increase yoy in FY2022 (+2.5%) due to a recovery in industrial production and service sector activity, as well as transportation demand, even though fuel efficiency will improve for passenger and freight transportation. In FY2023, they will increase (+1.2%) as freight transportation demand, industrial production, and activity in the service sector continue to recover.

The sales of Bunker A will increase yoy in FY2022 (+1.5%) due to a recovery in activity in the service sector and fuel conversion from Bunker C for ships. They will also increase for power generation as the power supply tightens. In FY2023, sales will decrease (-3.7%) as energy efficiency and fuel conversion make progress for other uses, in addition to a decrease in sales for power generation.

The sales of Bunker B and C will increase overall in FY2022 (+7.3%) as sales for power generation increases, despite the decrease in sales for industrial use and ships caused by progress in energy efficiency and fuel conversion. In FY2023, sales will decline significantly for power generation (-18.7%) as surplus supply increases with the restarting of nuclear power plants and the commencement of new coal-fired power plants.

The sales of LPG will increase yoy in FY2022 (+1.5%) as the sales of LPG for calorific value adjustment of city gas soars, in addition to an increase in sales to restaurants, industry, and business-use vehicles, despite decreasing for households due to a lower stay-at-home rate and for use as chemical feedstock with the fall in the availability factor of ethylene plants. In FY2023, sales will increase (+0.8%) despite fuel conversion, as the availability factor of ethylene plants rises and the operation rate of restaurants recovers.

Regarding crude oil throughput, as exports of transportation fuel will increase (+5.5%), surpassing the increase rate of fuel oil sales in FY2022. It will also increase in FY2023 (+1.2%) as exports continue to increase while fuel oil sales decline. This will be the first time that crude oil throughput has increased for three consecutive years since FY1994.

Table 6 | Fuel Oil and LPG Sales, and Crude Oil Throughput

	Historical				Projection		Year-over-year		
	FY2010	FY2019	FY2020	FY2021	FY2022	FY2023	FY2021	FY2022	FY2023
Fuel oil sales (GL)	196.0	161.7	152.0	153.5	155.5	155.1	1.0%	1.3%	-0.2%
Gasoline	58.2	49.2	45.5	44.5	45.1	45.1	-2.2%	1.4%	-0.1%
Naphtha	46.7	42.5	40.3	41.7	40.7	41.5	3.3%	-2.4%	1.9%
Jet fuel	5.2	5.2	2.7	3.3	4.5	5.1	21.2%	36.5%	13.4%
Kerosene	20.3	13.6	14.5	13.5	13.2	13.1	-6.8%	-2.6%	-0.4%
Diesel oil	32.9	33.7	32.0	32.1	32.9	33.2	0.2%	2.5%	1.2%
Heavy fuel oil A	15.4	10.2	10.2	10.1	10.3	9.9	-0.9%	1.5%	-3.7%
Heavy fuel oils B and C	17.3	7.4	6.6	8.3	8.9	7.2	25.0%	7.3%	-18.7%
For electric utilities	7.7	2.6	2.8	4.4	5.2	3.8	60.4%	18.5%	-28.4%
For other users	9.7	4.7	3.9	3.9	3.6	3.5	-0.2%	-5.5%	-4.9%
LPG sales (Mt)	16.5	14.1	12.9	13.1	13.3	13.4	1.4%	1.5%	0.8%
Crude oil throughput (GL)	208.9	174.0	139.3	147.5	155.6	157.4	5.9%	5.5%	1.2%

Renewable Power Generation (FIT power sources)

Installed renewable capacity to reach 99 GW

The licensed FIT power capacity was 102.1 GW as of the end of June 2022. If all of this licensed capacity, including both approved and operating capacities², were to enter operation, the cumulative burden on consumers would be 73 trillion yen³. This is equivalent to a raise in rates of 2.9 yen/kWh—a 12% raise for households and 17% for industry.

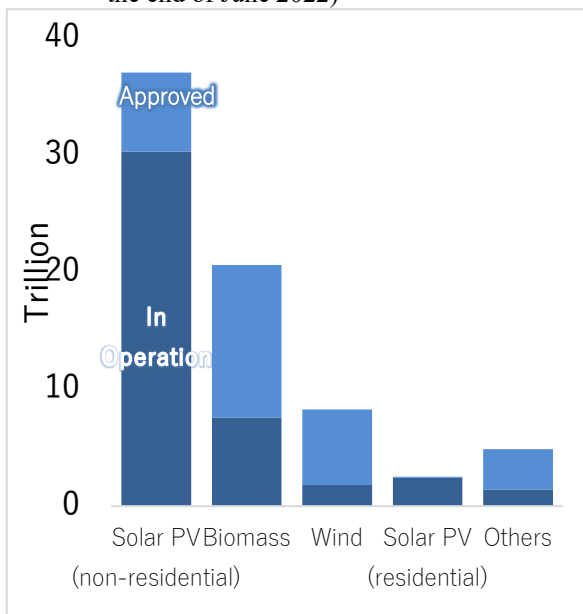
The installed capacity (including those whose purchase period has expired) will reach 99 GW at the end of FY2023. Non-residential solar PV will expand to 60.6 GW as the impact of construction delays caused by the pandemic will be resolved almost completely. Wind power will increase to 6.1 GW as the introduction of a deadline to commence operation and a license expiry date will push non-operating projects to start operating earlier. In FY2023, the FIT power output will reach 190.1 TWh (including 92.0 TWh of solar PV, 40.6 TWh of medium- and small-sized hydropower, 41.8 TWh of biomass power, and 11.9 TWh of wind power), accounting for 18.6% of the total power generation; renewable energy as a whole,

including large-scale hydropower, will account for 22.5%.

With the launch of the FIP (Feed-in Premium) system in FY2022 aiming to make renewable energy market-competitive, the bidding price finally fell below 10 yen/kWh for commercial solar PV. Moreover, bilateral power purchase agreements (PPAs) between renewable power producers and consumers are also gradually increasing. Measures like these are being implemented to encourage the spread of renewables without depending on the FIT system, which is based on surcharges paid by the public, to meet the target share of renewables of 36–38% in 2030.

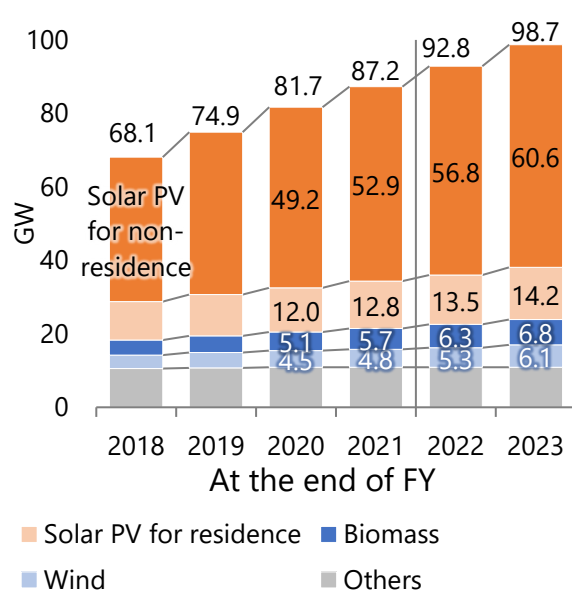
Meanwhile, a series of troubles have recently occurred between the operators of onshore wind power installation projects and local communities. In some cases, local governments have opposed projects due to concerns over impacts on the environment and landscape, and businesses have pulled out. This is a reminder that harmony with the environment and consensus-building with local residents are crucial for the smooth expansion of renewable energy capacity.

Figure 1 | Cumulative Cost Burden throughout the FIT Purchase Period (for capacities licensed or in operation as of the end of June 2022)



(Note) The purchase period is 10 years for residential solar PV, 15 years for geothermal, and 20 years for other sources.

Figure 2 | Installed Renewable Energy Capacity (in operation)



(Note) Includes capacities whose FIT purchase period has expired.

² A capacity that was installed before the start of the FIT system and was transferred to the system after it began.

³ The remaining purchase periods of the transferred systems are taken into account. Avoidable costs were

calculated from various materials. The utilization factor is estimated to be 24.8% for wind power, 13.7% for solar PV, 70% for geothermal, 45% for hydropower, and 70% for biomass.

Topic 1: The Impact of a Weaker Yen (+10 yen/\$) on the Economy and Energy

A further depreciation of the yen is unlikely to boost exports, but will push up energy import prices and have a small positive impact on business

Increase in production and energy sales will be limited

In the Weaker Yen Scenario in which the yen becomes +10 yen/\$ weaker than the Reference Scenario (RS) after 2Q of 2023, exports of goods and services increase by 0.6 trillion yen (RS +0.5%) while their imports decrease by 0.3 trillion yen (RS -0.2%), resulting in just a slight increase of 0.9 trillion yen in real GDP.

The weaker yen will cause only limited production increases in energy-intensive industries: an increase of 410 thousand tonnes of crude steel (RS +0.4%), 40 thousand units of automobiles (RS +0.4%), 40 thousand tonnes of paper and paperboard (RS +0.2%), 5 thousand tonnes of ethylene (RS +0.1%), and 10 thousand tonnes of cement (RS +0.0%).

Domestic demand for crude steel will grow slightly owing to weak but positive growth in electric machinery, but exports will not expand due to the sluggish global economy. Exports of automobiles will not expand either as on-vehicle semiconductor shortages linger. Exports of paper and paperboard are not likely to expand due to digitalization and relocation of factories overseas, and the same applies to ethylene and cement due to high prices of feedstock such as coal.

In addition to limited increases in exports, high consumer prices driven by high energy prices will suppress domestic demand, and as a result, a weak yen will have only a small positive impact on production for energy-intensive industries. The industrial production index and the sales of electricity, city gas, and fuel oil will also grow only slightly.

The value of fossil fuel imports will increase further

Meanwhile, under the Weaker Yen Scenario, the value of fossil fuel imports will increase. Under this Scenario, the value of imports will increase by 1.2 trillion yen for oil, 0.6 trillion yen for LNG, and 0.7 trillion yen for coal, adding 2.4 trillion yen in total.

The percentage of fossil fuel consumption in the domestic primary energy supply in FY2023 will remain high at 85% even under the Weaker Yen Scenario, unchanged from the (RS). As a result, a weak yen will push up the value of energy imports significantly.

Trade balance deteriorates while nominal GDP remains flat

Under the Weaker Yen Scenario, the trade balance will deteriorate in FY2023 as the increase in the export value remains small while the import value increases,

chiefly for energy. Japan posted its largest trade deficit in history of 11.0 trillion yen in the first half of FY2022 (April–September). The trade deficit will be even greater under the Weaker Yen Scenario, exceeding the deficit under the RS by 0.8 trillion yen with 21.5 trillion yen, the largest-ever trade deficit.

As such, a weaker yen, which was traditionally believed to be good news for the Japanese economy, will hardly benefit nominal GDP in FY2023, even if it weakens further (RS +0.1%).

Table 7 | The Impact of a Weaker Yen (+10 yen/\$) [FY2023]

	Reference	Weaker Japanese Yen (+10 Yen/\$)	Changes from Reference
Assumption			
Exchange rate (JPY/USD)	135.0	145.0	7.4%
Price			
Domestic corporate goods price index (2020=100)	118.9	120.2	1.0%
Consumer price index (2020=100)	104.4	104.6	0.2%
Nominal GDP (JPY trillion)	577.9	578.2	0.1%
Real GDP (JPY2015 trillion)	557.3	558.3	0.2%
Exports	108.0	108.5	0.5%
Imports	111.2	111.0	-0.2%
GDI per capita	4,914	4,925	0.2%
Trade balance (JPY trillion)	-20.7	-21.5	(-0.8)
Economy			
Index of industrial production (2015=100)	98.8	99.0	0.3%
Crude steel production (Mt)	94.0	94.4	0.4%
Ethylene production (Mt)	6.0	6.0	0.1%
Cement production (Mt)	54.5	54.5	0.0%
Paper and paperboard production (Mt)	23.4	23.4	0.2%
Automobile production (million)	8.30	8.34	0.4%
Value of nominal fossil fuel imports (trillion JPY)	32.27	34.69	7.5%
Energy			
Primary energy supply (Mtoe)	431.7	432.0	0.1%
Oil (GL)	175.7	175.8	0.0%
Natural gas (Mt of LNG equiv.)	65.1	65.2	0.1%
Coal (Mt)	190.8	191.1	0.2%
Electricity sales (TWh)	836.9	837.3	0.0%
City gas sales (Billion m ³)	41.69	41.67	0.0%
Fuel oil sales (GL)	155.1	155.2	0.0%
Environment			
Energy-related CO ₂ emissions (Mt)	954	955	0.1%

Boosting inbound travel consumption and producing domestic or semi-domestic energy is vital

As described in the preceding sections, a weaker yen will not be as beneficial as hoped for Japan's manufacturing industry, which includes energy-intensive industries.

One short-term method to take advantage of the weak yen is to further internationalize the service sector such as tourism, attract a large number of foreign tourists and business people, and boost inbound travel consumption.

Furthermore, to curb the rise in the fossil fuel import bill that a weaker yen would cause, it is important to lower the costs of domestic renewable energies and facilitate the restarting of nuclear power plants, thereby lowering the dependence on imports for energy.

Topic 2: Impact of Subsidy program of energy bills

Not implementing a scheme to reduce energy bills will weigh heavily on the economy, though it will save spending on fiscal stimulus. The impact of measures to reduce energy bills will be positive in the short term but could also be negative in the medium to long term. The exit plan will be important.

Subsidy program to curb excessive price increases to be extended for fuel oil and applied also to electricity and city gas starting in January 2023.

In the first half of FY2022, the CIF price of fossil fuel imports remained high while the yen continued to weaken. Subsidies have been introduced since January 2022 for all fuel oils except naphtha to curb excessive prices. On the other hand, electricity and city gas have been at historically high levels. As a means to combat consumer price increases, on October 28, 2022, the government announced a subsidy program to curb excessive price increases for fuel oil, electricity, and city gas⁴, to be implemented starting in January 2023. For fuel oil, the price of gasoline will continue to be kept at around 170 yen/L. For electricity, a subsidy of 7 yen/kWh will be provided for low-voltage electricity for households and 3.5 yen/kWh for high-voltage electricity for businesses. For city gas, a subsidy of 30 yen/m³ will be granted for businesses with an annual contract of up to 10 million m³, as well as households.

As per the government's announcement, the Reference Scenario assumes that the subsidy cap for fuel oil will be lowered gradually starting in January 2023 and the subsidy program itself will be phased out starting in June. The Scenario assumes that the subsidy program for electricity and gas will start to be cut back from September and be abolished in October. To analyze the

impact of this subsidy program, in this section, two scenarios were created to systematically quantify the impact on the economy and energy: a scenario in which the amount of subsidy paid in January 2023 will continue to be provided through FY2023, and one without the subsidy program in FY2023.

Without the energy subsidy program, consumer prices will rise and the economy will slump

As a vast range of industries consume energy, the beneficiaries of the government energy subsidy program are diverse, encompassing households, manufacturers, service businesses, agriculture, and transportation businesses. In the scenario where the subsidy program continues through FY2023, the consumer price index will be lower than in the Reference Scenario (-0.9%) as energy prices remain lower. Meanwhile, in the scenario without any subsidies, the consumer price index will be higher (+0.7%) as energy prices will rise. The impact will be even greater for the domestic corporate goods price index, which has a larger percentage of energy; in the scenario with the subsidy program, the index will be lower (-1.4%) while real GDP and the industrial production index will be pushed up (+0.1%, +0.1%). Meanwhile, in the case without the subsidy program, the domestic corporate goods price index will be higher (+0.8%) while real GDP and the industrial

Table 8 | Impact of the Subsidy Program to Curb Excessive Price Increases [FY2023]

	Reference	Subsidy program through FY2023	Without subsidy program	Changes from Ref		
				through FY2023	Without	
Price	Domestic corporate goods price index (2020=100)	118.9	117.3	119.9	-1.4%	0.8%
	Consumer price index (2020=100)	104.4	103.4	105.1	-0.9%	0.7%
Economy	Real GDP (JPY2015 trillion)	557.3	557.8	556.8	0.1%	-0.1%
	Trade balance (JPY trillion)	-20.7	-21.7	-20.0	(-1.0)	(0.7)
	Index of Industrial production (2015=100)	98.8	98.9	98.6	0.1%	-0.2%
	Fossil fuel imports (JPY trillion)	32.27	32.36	32.19	0.3%	-0.3%
Energy	Primary energy supply (Mtoe)	431.7	432.6	430.7	0.2%	-0.2%
	Oil (GL)	175.7	176.2	175.5	0.2%	-0.1%
	Natural gas (Mt of LNG equiv.)	65.1	65.6	64.6	0.7%	-0.9%
	Electricity sales (TWh)	836.9	839.4	834.3	0.3%	-0.3%
	City gas sales (Billion m ³)	41.7	41.9	41.4	0.4%	-0.7%
	Fuel oil sales (GL)	155.1	155.6	154.9	0.3%	-0.2%
Environment	Energy-related CO ₂ emissions (Mt)	954	956	952	0.3%	-0.2%

⁴ Comprehensive economic package to curb price increases and achieve economic recovery (approved by the Cabinet on October 28, 2022)

production index will be pushed down (-0.1%, -0.2%).

However, in the scenario with the subsidy program, the trade balance will worsen (-1.0 trillion yen) because energy consumption will increase while fossil fuel import prices remain unchanged. The opposite will occur in the scenario without the subsidy program, and the trade balance will improve (+0.7 trillion yen). In other words, the subsidy program will strengthen the dependence on energy imports and act against energy security.

Subsidy program drives up energy consumption, CO₂ emissions, and spending on fiscal stimulus

An extension of the subsidy program boosts energy sales by lowering the price, whereas not having the subsidy program causes energy prices to rise and energy sales to decrease. In terms of buyers, this will affect industry more than households or transportation because industry will see a change in production with fluctuations in domestic demand, and the progress of its energy conservation efforts will also be affected by changes in production costs. Among the types of energy sold, the rate of change will be the greatest for city gas sales. This is because city gas has a higher share of industrial use than fuel oil or electricity, and since the subsidy has just one standard rate of 30 yen/m³, its effect will be comparatively large for industrial city gas whose unit price is low.

Moreover, the scenario with the subsidy program will generate more CO₂ emissions (+0.3%) because its energy consumption will be larger (+0.2%) than in the Reference Scenario. Meanwhile, the scenario without the subsidy program will generate less CO₂ emissions because energy consumption will decrease (-0.2%). In other words, the subsidy program is expected to temporarily reverse the progress in energy efficiency

and CO₂ reduction, and the impact will grow the longer the program lasts.

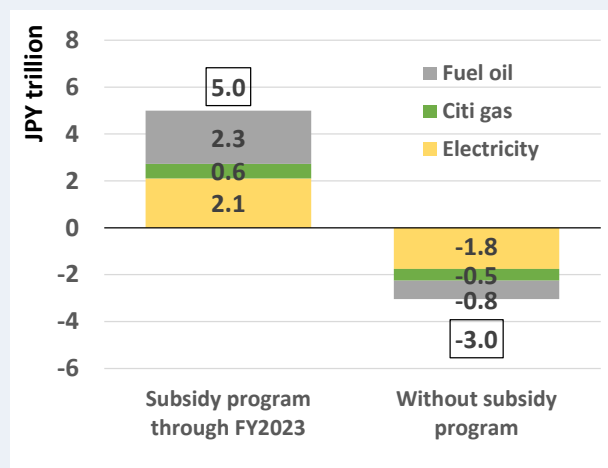
Furthermore, fiscal spending will vary tremendously between the scenarios. The total amount of subsidies under the scenario with the subsidy program in FY2023 on top of the Reference Scenario will be 5.0 trillion yen (2.3 trillion yen for fuel oil, 2.1 for electricity, and 0.6 for city gas). Meanwhile, in the scenario without the subsidy program, it will be possible to save 3.0 trillion yen compared to the Reference Scenario (0.8 trillion yen for fuel oil, 1.8 for electricity, and 0.5 for city gas). In other words, the program will weigh heavily on fiscal spending.

Essential to phase out the program by weighing the pros and cons

The energy subsidy program is positive in that it definitely curbs price increases in the short term, but also has negative aspects in the medium to long term, such as reversing the progress in energy security, energy conservation, and CO₂ reduction, and increasing fiscal spending.

An analysis of the scenario with the subsidy program shows that the negative aspects will grow the longer the program continues, so a soft-landing for the program will be an important issue. A policy to phase out the program starting January 2023 for fuel oil and September 2023 for electricity and city gas has been announced. Once the phase-out starts, it will be important to monitor the actual situation and determine how to minimize negative impacts during the phase-out. Further, to ensure compatibility with the energy and environmental policies, it will also be important to enhance energy efficiency by boosting energy conservation subsidies, thereby reducing energy-related spending.

Figure 3 | Difference in Subsidies with the Reference Scenario for Each Scenario [FY2023]



Topic 3: Completion of Specialized Safety Facilities (SSFs) for Nuclear Power Plants and Impact of the Delay in Restarting Plants on the 3E Principle

Significant contribution of nuclear power to the 3E principle

This section assesses the impact of varying amounts of nuclear power on energy security, the environment, and economic efficiency—collectively the 3E principle.

The Reference Scenario assumes that the number of operating plants will increase from 10 currently to 15 as of the end of FY2023, adding five. It also assumes that two plants may shut down in FY2023 due to delays in the completion of SSFs. On top of these two, one other plant will not be able to restart in FY2023 due to additional assessment, though it has obtained an installation and modification permit. The analysis is

systematically comparing a High Case, in which the SSFs of the two plants are completed early on, and the assessment of the remaining one plant finishes earlier than the Reference Scenario and the plant is restarted in FY2023. Another case is a Low Case, in which the risks of delays in assessment and construction materialize before the end of FY2023 and the three plants cannot be restarted. Furthermore, based on the Long-term Energy Supply-Demand Outlook of the Ministry of Economy, Trade and Industry, a third case, the Highest Case, is simulated assuming that 80% of the 27 plants that have applied for assessment based on the new regulation standards will be restarted.⁵

Table 8 | Impact of Different Amounts of Nuclear Power Output [FY2023]

		Low Case	Reference Scenario	High Case	Highest Case	Changes from Reference		
						Low	High	Highest
Nuclear assumptions	Restarted nuclear reactors	12	15	16	27	-3	+1	+12
	Power generation (TWh)	83.7	100.2	112.2	193.4	-16.4	+12.1	+93.2
	Share in generation and purchases	8.1%	9.7%	10.9%	18.8%	-1.6p	+1.2p	+9p
Economy	Electricity unit cost ¹ (JPY/kWh)	14.23	14.02	13.87	12.85	+0.21	-0.15	-1.17
	Fuel cost	10.88	10.67	10.52	9.50	+0.21	-0.15	-1.17
	FIT purchasing cost	3.35	3.35	3.35	3.35	-	-	-
	Total fossil fuel imports (JPY trillion)	33.00	32.76	32.57	31.36	+0.25	-0.18	-1.39
	Oil	16.12	16.09	16.08	16.00	+0.03	-0.02	-0.10
	LNG	7.93	7.71	7.55	6.41	+0.22	-0.16	-1.30
	Trade balances (JPY trillion)	-20.90	-20.70	-20.56	-19.63	-0.20	+0.14	+1.07
Real GDP (JPY2011 trillion)	557.20	557.35	557.46	558.18	-0.15	+0.11	+0.83	
Energy and environment	Primary energy supply							
	Oil (GL)	176.1	175.7	175.5	174.4	+0.3	-0.2	-1.3
	Natural gas (Mt of LNG eq.)	67.0	65.1	63.7	54.0	+1.9	-1.4	-11.1
	Self-sufficiency rate	14.7%	15.7%	16.5%	21.4%	-1.0p	+0.8p	+5.7p
	Energy-related CO ₂ (Mt)	968	962	957	928	+6	-4	-34
Changes from FY2013	-21.6%	-22.1%	-22.5%	-24.9%	+0.5p	-0.4p	-2.8p	

1. Sum of fuel cost, FIT purchasing cost and grid stabilising cost divided by total power generation.

In terms of economic efficiency, the value of fossil fuel imports will be lower than the Reference Scenario by 180 billion yen in the High Case and by 1,390 billion yen in the Highest Case. If oil and LNG prices rise due to changes in the international situation, the saving effect would be even greater as Japan would depend less on thermal power. As a result of reducing fuel import payments to other countries, disposable income

will increase, pushing up real GDP by 110 billion yen in the High Case and 830 billion yen in the Highest Case.

The unit cost of electricity will decrease by 0.15 yen/kWh in the High Case and 1.17 yen/kWh in the Highest Case.

⁵ Japan aims for a share of around 20–22% for nuclear power in the FY2030 energy mix, and considers that this is

achievable as energy conservation will make progress and electricity demand will decrease.

Amid mounting geopolitical risks due to the Ukraine situation, there is heightened interest in energy security. LNG import will be lower than the Reference Scenario by 1.4 Mt in the High Case and 111 Mt in the Highest Case. The self-sufficiency rate, which is a major indicator of energy security, will be 0.8p higher for the High Case and 5.7p higher for the Highest Case than the Reference Scenario.

CO₂ emissions, as an environmental indicator, will be 4 Mt lower in the High Case and 34 Mt lower in the

Highest Case than the Reference Scenario. Compared to FY2013 levels, which is the base year for Japan's targets in the Paris Agreement, the emissions will be lower by 22.5% in the High Case and by 24.9% in the Highest Case⁶.

The government has reaffirmed its policy to restart additional seven nuclear power plants in the summer of 2023 and beyond. Facilitating restarts by conducting appropriate assessments in line with the situation of each plant will contribute to Japan's 3E policy.

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⁶ Japan's target is to reduce greenhouse gases by 46% by FY2030 from FY2013 levels, including a 45% reduction in energy-related CO₂. Japan expects that it will be able to

meet the target through energy efficiency and introduction of renewables, in addition to nuclear power.