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Economic and Energy Outlook of Japan for FY2022

Increasing energy expenditure and CO_2 emissions while back to a normal economic situation

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Summary of economic and energy outlook [Reference Scenario]

Macro economy | GDP growth rate will be 3% range for the second years

Real GDP for FY2022 will be larger than FY2018 and hit a record high on the back of the recovery from the COVID-19 pandemic (+3.3% from the previous year). Supported by released pent-up demand, the index of industrial production will be higher than the level of FY2019, rising 5.5% in FY2022 led by automobile and heavy electrical machinery.

Energy supply and demand | With a return to a normal economic situation, total energy consumption will increase for the second years in a row and the CO_2 reduction pace will slow down

Total energy consumption per GDP will be improved with recoveries in machinery production and service industries but total energy consumption will increase (+0.4%). LNG imports will fall for the sixth consecutive year due to install of zero-emission power sources and coal-fired power plants. They will be almost same before the Great East Japan Earthquake (0.6% higher than FY2010).

CO_2 emissions will increase by 0.9% to 995 Mt in FY2022, due to more coal and oil energy use from the previous year and will be down 19.5% from FY2013, the base year for the Paris agreement. The reductions will not reach the halfway point of the Paris agreement target (cut by 45% by FY2030 from FY2013).

Energy sales | Lighting services will decrease primarily due to a decline in the less stay-home rate, but power services will grow with recovery in the machinery production and the service industry. City gas sales will be the second highest after FY2017. Total fuel oil sales will decrease mainly due to the decrease of ethylene production.

Electricity sales will be 1.1% higher than FY2021 and higher than FY2019 before the COVID-19 pandemic with the recovery of economic activities in addition to the temperature effect. Sales for power services will grow 1.9% with production recovery in industries, mainly with the machinery. Despite an increase in all-electrified houses, sales for lighting services will slightly decrease (-0.4%) primarily due to a decline in the less stay-home rate and diffusion of PV and energy efficient technologies such as LED.

Overall city gas sales will be nearly 42.0 billion m^3 (2.2% higher than FY2021). FY2022 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 commercial will increase, they will be lower than FY2019.

Fuel oil sales in FY2022 will decrease by 0.7% due to the non-energy use such as naphtha with more regular ethylene plant repairs while fuel oil sales in energy use will increase. While fuel efficiency will be improved, sales of gasoline, diesel oil, and jet fuel oil will increase two years in a row with higher transportation demand.

Despite an increase in industrial production, sales for industries such as heavy fuel oil A and heavy fuel oil C will fall due to fuel switching and energy saving accelerated by higher oil prices. Sales of kerosene will also fall due to energy saving and fuel switching with little effects from changes in temperature.

Renewable power generation | The FIT power generation capacity will reach 95 GW by the end of FY2022

The installed renewable energy-based power generation capacity (including capacity subject to FIT contract expiration) will boost to 95 GW by the end of FY2022. Although COVID-19 delayed installation by restricting solar PV power plant builders' communications with residents near plant sites and by making it difficult to secure construction workers, capacity will expand to 57.8 GW. Wind capacity will be limited to 5.3 GW because of the long lead time to operation due to environmental assessment, etc. Renewable energy-based power generation in FY2022 will total 183.0 TWh (including 87.4 TWh for solar PV, 40.9 TWh for small and medium-sized hydro plants, 38.2 TWh for biomass, 12.8 TWh for wind), accounting for 17.8% of Japan's total power generation. With the inclusion of large-sized hydro, renewable power will generation account for 22.4%.

Table 1 | Summary of Reference Scenario

		Historical				Projection		Year-over-year		
		FY2010	FY2018	FY2019	FY2020	FY2021	FY2022	FY2020	FY2021	FY2022
Energy	Primary energy supply (Mtoe)[1]	515.9	455.4	444.6	414.9	427.6	429.6	-6.7%	3.1%	0.5%
	Oil[2] (GL)	232.3	192.8	186.1	169.7	174.8	175.0	-8.8%	3.0%	0.1%
	Natural gas[2] (Mt of LNG equiv.)	73.3	81.6	78.3	78.5	74.1	72.3	0.1%	-5.6%	-2.3%
	Coal[2] (Mt)	184.7	188.1	187.6	174.4	184.3	189.7	-7.0%	5.6%	2.9%
	Nuclear (TWh)	288.2	62.1	61.0	37.0	67.6	71.8	-39.4%	82.7%	6.2%
	Renewable electricity[3] (TWh)	110.4	177.0	187.9	197.8	213.3	223.5	5.3%	7.8%	4.8%
	FIT generation (TWh)	63.2	133.9	146.2	158.1	171.2	177.3	8.1%	8.3%	3.5%
	Self-sufficiency ratio	20.2%	11.6%	12.0%	11.2%	13.5%	13.8%	-0.8p	2.3p	0.3p
	Electricity sales[4] (TWh)	(926.6)	852.6	836.1	820.9	831.5	841.0	-1.8%	1.3%	1.1%
	City gas sales[5] (Billion m^3)	39.28	41.58	40.42	39.51	41.07	41.99	-2.3%	3.9%	2.2%
	Fuel oil sales (GL)	196.0	167.7	161.6	151.5	154.5	153.4	-6.2%	1.9%	-0.7%
	Energy-related CO_2 emissions (Mt)	1,137	1,065	1,029	967	986	995	-6.0%	1.9%	0.9%
	(Changes from FY2013)	-8.0%	-13.8%	-16.7%	-21.7%	-20.2%	-19.5%	-5.0p	1.5p	0.7p
Prices	Crude oil, import, CIF ($/bbl)	84	72	68	43	71	68	-36.3%	63.9%	-4.6%
	LNG, import, CIF ($/MBtu)	11.3	10.5	9.5	7.5	10.6	11.1	-20.8%	40.3%	5.4%
	Steam coal, import, CIF ($/t)	114	120	102	79	144	142	-22.4%	82.7%	-1.7%
	Coking coal, import, CIF ($/t)	176	160	138	104	182	198	-24.5%	75.4%	8.2%
Economy	Real GDP (JPY2015 trillion)	512.1	554.3	550.6	525.7	540.4	558.3	-4.5%	2.8%	3.3%
	Industrial production (CY2015=100)	101.2	103.8	99.9	90.4	96.7	102.1	-9.5%	7.1%	5.5%
	Balance of trade (JPY trillion)	5.3	-1.6	-1.3	1.3	0.5	1.5	-201%	-63.0%	215.8%
	Fossil fuel imports (JPY trillion)	18.1	19.1	16.6	10.6	17.9	18.2	-36.2%	69.5%	1.6%
	Exchange rate (JPY/$)	86.1	110.6	108.8	106.0	111.6	113.5	-2.6%	5.3%	1.7%
	Cooling degree days	559	489	439	442	407	414	0.6%	-8.0%	1.6%
	Heating degree days	1,079	865	818	863	956	974	5.6%	10.7%	1.9%

Notes:

1. Mtoe = 10^{13} 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 m^3 = 10,000 kcal

Topic |

1 Impacts on the economy and the energy situation of a decline in the production of automobiles

From August to October 2021, the automobile production decreased by about 710 thousand from the production plan. Assuming the volume is not caught up through FY2022, production will be lower by 7.3% from the reference scenario and IIP will be lower by 2.6%. GDP will fall 0.3% less than IIP because service industries are less affected. City gas sale will fall the most (-0.8%) among energy sales with high share of industries. Primary energy supply will fall more than GDP (-0.7%) with the fall of manufactures such as iron and steel as a material of automobiles.

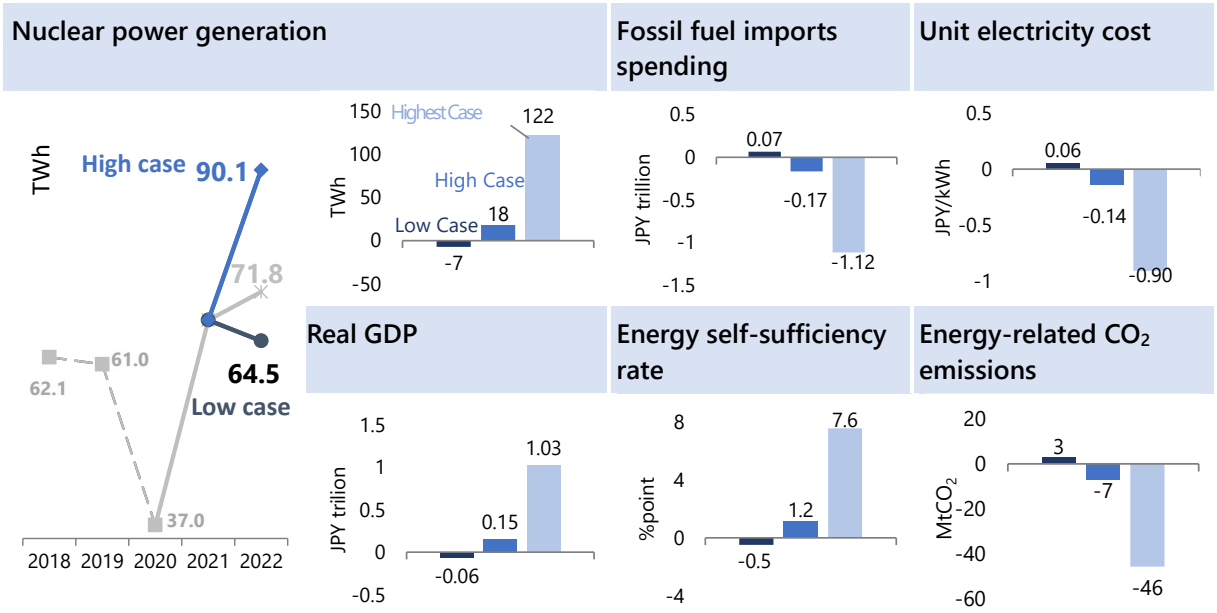
2 Impacts of the temperature changes on household energy expenditures

With a very little temperature impacts and lower stay-home rates, energy purchase will decrease while expenditures will rise to the highest level in seven years by 3.6% due to the higher energy prices. If the summer (Jul-Sep) is hotter by 1℃ and the winter (Dec-Feb), colder by 1℃, energy expenditures will reach to FY2013, the highest year. As a response to the temperature effect, the Energy Engel's coefficient will rise and this would affect more for lower-income household or household with reduced income due to the COVID pandemic. To reduce energy expenditures at the normal condition, additional expenditures brought by hotter summer and colder winter for lower-income household, mixing energy and environmental policies such as enhancing energy efficiencies and redistribution policies is expected.

3 Impacts of the completion of counterterrorism facilities and of 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, where more plants would be in full operation with their counterterrorism facilities completed within their respective deadlines, the cost of fossil fuel imports would be reduced by JPY160 billion, the self-sufficiency rate would be improved by 1.2 points, and CO_2 emissions would be reduced by 7 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 [FY2022, compared with the Reference Scenario]



4 The impacts of the oil price changes on Japan's economy and energy situation

If the average crude oil price is $10/bbl higher (lower) than in the Reference Scenario, GDP and IIP would be pushed down(up). It is therefore important for Japan to reduce renewable energy costs and facilitate the restart of nuclear power plants to prepare for such risks.

Table 2 | Macroeconomic indicators

	Historical				Projection		Year-over-year		
	FY2010	FY2018	FY2019	FY2020	FY2021	FY2022	FY2020	FY2021	FY2022
Real GDP (JPY2015 trillion)	512.1	554.3	550.6	525.7	540.4	558.3	-4.5%	2.8%	3.3%
Private demand	383.7	415.9	411.8	386.2	396.0	411.6	(-4.7%)	(1.9%)	(2.9%)
Private consumption	290.5	302.4	299.3	282.9	290.1	299.7	-5.5%	2.5%	3.3%
Private residential investment	18.2	19.9	20.4	18.8	18.8	19.0	-7.8%	0.1%	0.9%
Private non-residential investment	73.7	91.3	90.8	83.9	86.2	89.9	-7.5%	2.7%	4.3%
Public demand	124.2	136.2	139.1	143.3	144.2	145.9	(0.8%)	(0.2%)	(0.4%)
Government consumption	98.1	108.7	111.0	113.8	116.0	117.3	2.5%	2.0%	1.1%
Public investment	26.2	27.6	28.1	29.5	28.3	28.7	5.1%	-4.3%	1.4%
Net exports of goods and services	4.7	2.3	-0.2	-4.2	0.0	0.6	(-0.6%)	(0.8%)	(0.1%)
Exports of goods and services	83.8	105.0	102.7	91.9	103.0	107.9	-10.5%	12.1%	4.8%
Imports of goods and services	79.2	102.7	102.9	96.0	103.0	107.3	-6.6%	7.2%	4.2%
Nominal GDP (JPY trillion)	504.9	556.3	557.3	535.5	547.1	567.4	-3.9%	2.2%	3.7%
Balance of trade (JPY trillion)	5.3	-1.6	-1.3	1.3	0.5	1.5	-201.2%	-63.0%	215.8%
Exports	67.8	80.7	75.9	69.5	84.6	88.7	-8.4%	21.8%	4.8%
Imports	62.5	82.3	77.2	68.2	84.2	87.2	-11.6%	23.4%	3.6%
Fossil fuels	18.1	19.1	16.6	10.6	17.9	18.2	-36.2%	69.5%	1.6%
Oil	12.3	11.3	10.1	5.8	10.0	10.0	-42.9%	74.2%	-0.4%
LNG	3.5	4.9	4.1	3.1	4.6	4.7	-23.1%	45.7%	1.4%
Current account (JPY trillion)	18.3	19.4	18.7	16.3	17.4	19.1	-12.7%	6.9%	9.5%
Domestic corporate goods price index (2015=100)	97.6	101.5	101.6	100.2	106.2	107.2	-1.4%	6.0%	0.9%
Consumer price index (2020=100)	94.7	99.6	100.2	99.9	99.7	100.5	-0.3%	-0.1%	0.8%
Unemployment rate (%)	5.0	2.4	2.3	2.9	2.8	2.6	[+0.6p]	[-0.1p]	[-0.2p]

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.

Table 3 | Production activities

		Historical				Projection		Year-over-year		
		FY2010	FY2018	FY2019	FY2020	FY2021	FY2022	FY2020	FY2021	FY2022
Production	Crude steel (Mt)	110.8	102.9	98.4	82.8	93.3	96.9	-15.9%	12.7%	3.8%
	Ethylene (Mt)	7.00	6.19	6.28	6.04	6.21	5.93	-3.8%	2.7%	-4.5%
	Cement (Mt)	56.1	60.2	58.1	56.1	56.8	57.9	-3.6%	1.3%	2.0%
	Paper and paperboard (Mt)	27.3	26.0	25.0	22.7	23.7	23.7	-9.5%	4.6%	-0.1%
	Automobiles (Million units)	8.99	9.75	9.49	7.97	8.65	9.68	-16.0%	8.5%	11.9%
Production indices	Mining and manufacturing (2015=100)	101.2	103.8	99.9	90.4	96.7	102.1	-9.5%	7.1%	5.5%
	Food and tobacco	100.7	99.6	100.6	96.9	97.8	99.7	-3.7%	0.9%	2.0%
	Chemicals	99.6	107.5	103.8	94.7	98.9	103.0	-8.8%	4.4%	4.1%
	Non-ferrous metals	100.0	104.3	99.2	90.0	98.6	104.4	-9.3%	9.5%	5.9%
	Machinery	99.4	105.6	100.3	89.7	98.0	105.1	-10.5%	9.2%	7.3%
Tertiary industry activity index (2015=100)		97.6	103.0	102.3	95.3	98.2	102.4	-6.9%	3.1%	4.3%

Notes: Chemicals include chemical fibers.
Machinery includes general machinery, electrical machinery, information and telecommunications equipment, electronic parts and devices, precision machinery and metal products.

Table 4 | Primary energy supply

	Historical				Projection		Year-over-year		
	FY2010	FY2018	FY2019	FY2020	FY2021	FY2022	FY2020	FY2021	FY2022
Primary energy supply (Mtoe)	515.9	455.4	444.6	414.9	427.6	429.6	-6.7%	3.1%	0.5%
Coal	119.1	121.5	120.4	110.6	116.0	118.8	-8.1%	4.9%	2.4%
Oil	212.0	176.2	170.1	155.1	159.8	160.0	-8.8%	3.0%	0.1%
Natural gas	95.7	106.6	102.4	102.5	96.8	94.5	0.1%	-5.6%	-2.3%
LNG imports (Mt)	70.6	80.6	76.5	76.4	73.8	71.1	-0.2%	-3.4%	-3.6%
Hydro	17.7	16.7	16.5	16.2	16.7	16.4	-1.6%	3.3%	-1.8%
Nuclear	60.7	13.3	13.0	7.9	14.3	15.1	-39.2%	80.0%	5.6%
New energy, etc.	10.7	21.1	22.2	22.6	24.0	24.7	1.6%	6.5%	3.0%
Self-sufficiency rate	20.2%	11.6%	12.0%	11.2%	13.5%	13.8%	-0.8p	2.3p	0.3p
Energy intensity (FY2013=100)	105.2	85.8	84.3	82.4	82.6	80.3	-2.2%	0.2%	-2.8%
Energy-related CO_2 emissions ($MtCO_2$)	1,137	1,065	1,029	967	986	995	-6.0%	1.9%	0.9%
Change from FY2013	-8.0%	-13.8%	-16.7%	-21.7%	-20.2%	-19.5%	-5.0p	1.5p	0.7p

Notes: New energy includes solar photovoltaics, wind, biomass, solar heat, and geothermal, etc.
Self-sufficiency rate is based on IEA standard.

Table 5 | Electricity sales and power generation / purchase mix (electric utility use)

	Historical				Projection		Year-over-year		
	FY2010	FY2018	FY2019	FY2020	FY2021	FY2022	FY2020	FY2021	FY2022
Electricity sales (TWh)	(926.6)	852.6	836.1	820.9	831.2	840.3	-1.8%	1.3%	1.1%
Lighting service	304.2	270.3	266.7	278.0	271.9	270.6	4.2%	-2.2%	-0.5%
Power sercice	(622.4)	582.2	569.4	543.0	559.4	569.7	-4.6%	3.0%	1.9%
Extra-high and High voltage	(576.5)	544.6	533.2	506.6	522.7	532.3	-5.0%	3.2%	1.9%
Low voltage	(45.9)	37.6	36.3	36.3	36.7	37.4	0.2%	1.1%	1.9%
Electricity generated and purchased (TWh)	(1,028)	957.0	932.0	920.3	932.0	941.3	-1.3%	1.3%	1.0%
Hydro	(8.5%)	9.1%	9.3%	9.5%	9.6%	9.4%	0.2p	0.2p	-0.3p
Fossil fuels	(61.7%)	74.6%	73.1%	74.0%	69.4%	68.2%	0.9p	-4.6p	-1.2p
Coal	(25.0%)	28.5%	28.4%	27.8%	27.7%	28.7%	-0.6p	-0.2p	1.0p
LNG	(29.3%)	39.3%	38.1%	38.6%	34.7%	32.7%	0.5p	-3.9p	-2.0p
Oil, etc.	(7.5%)	6.9%	6.6%	7.5%	7.1%	6.8%	0.9p	-0.5p	-0.3p
Nuclear	(28.6%)	6.5%	6.5%	4.0%	7.2%	7.6%	-2.5p	3.2p	0.4p
Renewables (excluding hydro), etc.	(1.1%)	9.8%	11.0%	12.5%	13.7%	14.8%	1.5p	1.2p	1.1p
	(1%)	0%	0%	0%	0%	0%	0.0p	0.0p	0.0p
Electricity prices (JPY/kWh)	(16.7)	21.7	21.6	20.4	22.5	23.9	-5.4%	10.4%	6.2%
Lighting service	21.4	27.2	27.3	26.0	28.3	29.7	-4.9%	8.9%	5.1%
Power sercice	(14.4)	19.1	18.9	17.5	19.7	21.1	-7.0%	12.3%	7.3%

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.

Table 6 | City gas sales (gas utilities)

	Historical				Projection		Year-over-year		
	FY2010	FY2018	FY2019	FY2020	FY2021	FY2022	FY2020	FY2021	FY2022
City gas sales (Billion m^3)	39.28	41.58	40.42	39.51	41.06	41.96	-2.3%	3.9%	2.2%
Residential	9.79	9.24	9.38	10.02	9.90	9.84	6.8%	-1.2%	-0.6%
Commercial	4.75	4.26	4.16	3.65	3.78	4.02	-12.2%	3.6%	6.3%
Industrial	21.61	25.03	23.83	22.76	24.28	25.00	-4.5%	6.7%	3.0%
Manufacturing	(20.28)	20.51	19.68	17.43	18.75	19.47	-11.5%	7.6%	3.8%
Electric utilities	(1.34)	4.52	4.15	5.33	5.53	5.53	28.4%	3.8%	0.0%
Others	3.13	3.05	3.05	3.08	3.09	3.11	1.1%	0.3%	0.4%
City gas prices(円/m^2)	83.79	87.62	88.64	80.10	92.22	101.9	-9.6%	15.1%	10.5%
Residential	160.1	165.3	165.7	153.9	169.2	180.1	-7.1%	9.9%	6.5%
Commercial	81.95	87.84	88.84	79.76	91.86	102.4	-10.2%	15.2%	11.4%
Industrial	50.67	58.52	59.08	48.70	61.52	71.56	-17.6%	26.3%	16.3%
Others	76.67	90.68	82.50	72.60	87.51	97.59	-12.0%	20.5%	11.5%

Table 7 | Fuel oil / LPG sales and crude oil throughput

	Historical				Projection		Year-over-year		
	FY2010	FY2018	FY2019	FY2020	FY2021	FY2022	FY2020	FY2021	FY2022
Fuel oil sales (GL)	196.0	167.7	161.6	151.5	154.5	153.4	-6.2%	1.9%	-0.7%
Gasoline	58.2	50.6	49.1	45.2	45.8	45.9	-7.9%	1.2%	0.3%
Naphtha	46.7	43.9	42.5	40.3	41.2	39.2	-5.2%	2.1%	-4.9%
Jet fuel	5.2	5.0	5.2	2.7	3.8	4.9	-46.9%	38.0%	30.1%
Kerosene	20.3	14.5	13.6	14.5	14.2	14.0	6.4%	-2.0%	-1.5%
Diesel oil	32.9	33.8	33.7	31.9	32.9	33.5	-5.3%	3.3%	1.7%
Heavy fuel oil A	15.4	11.1	10.2	10.2	10.1	9.9	0.7%	-0.8%	-2.6%
Heavy fuel oils B and C	17.3	8.8	7.4	6.7	6.5	6.1	-9.8%	-2.5%	-6.4%
For electric utilities	7.7	4.0	2.6	2.8	2.3	2.1	4.1%	-16.2%	-10.4%
For other users	9.7	4.9	4.7	3.9	4.2	4.0	-17.5%	7.1%	-4.1%
LPG sales (Mt)	16.5	14.2	14.1	12.9	13.5	13.8	-8.4%	4.4%	1.8%
Crude oil throughput (GL)	208.9	176.7	174.0	139.3	145.1	154.5	-19.9%	4.2%	6.5%

Table 8 | Effects of differing nuclear power generation [FY2022]

		Low Case	Reference Scenario	High Case	Highest Case	Changes from Reference		
						Low	High	Highest
Nuclear assumptions	Restarted nuclear reactors	10	12	14	27	-2	+2	+15
	Power generation (TWh)	64.5	71.8	90.1	193.4	-7.3	+18.2	+121.5
	Share in generation and purchases	6.5%	7.2%	9.0%	19.4%	-0.7p	+1.8p	+12p
Economy	Electricity unit cost[1] (JPY/kWh)	9.40	9.34	9.21	8.44	+0.06	-0.14	-0.90
	Fuel cost	5.75	5.69	5.55	4.79	+0.06	-0.14	-0.90
	FIT purchasing cost	3.65	3.65	3.65	3.65	-	-	-
	Total fossil fuel imports (JPY trillion)	18.56	18.49	18.33	17.38	+0.07	-0.17	-1.12
	Oil	10.00	9.99	9.97	9.90	+0.01	-0.02	-0.09
	LNG	5.00	4.94	4.79	3.91	+0.06	-0.15	-1.03
	Trade balances (JPY trillion)	1.31	1.36	1.50	2.27	-0.06	+0.14	+0.91
	Real GDP (JPY2011 trillion)	558.18	558.24	558.39	559.27	-0.06	+0.15	+1.03
Energy and environment	Primary energy supply							
	Oil (GL)	175.2	175.1	174.7	173.3	+0.2	-0.4	-1.8
	Natural gas (Mt of LNG eq.)	73.0	72.2	70.1	57.5	+0.9	-2.1	-14.7
	Self-sufficiency rate	13.3%	13.8%	15.0%	21.4%	-0.5p	+1.2p	+7.6p
	Energy-related CO_2 (Mt)	997	995	988	949	+3	-7	-46
	Changes from FY2013	-19.3%	-19.5%	-20.0%	-23.2%	+0.2p	-0.6p	-3.7p

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

The full text will be available later.

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