

Economic and Energy Outlook of Japan for FY2020

Domestic situation affected by growing uncertainty of international developments

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Summary of economic and energy outlook [Reference Scenario]

Macro economy | Growth will decelerate up to FY2020

The Japanese economic growth will slow down until 2020 due to a stall in private investments. The negative impacts of the planned hike in VAT will be smaller than the previous one in FY2014. Industrial production will fall for the first time in four years, reflecting in part the slowdown of the Chinese economy. The trade deficit will shrink significantly, thanks to a fall in energy prices.

Energy supply and demand | Primary energy supply will increase slightly in FY2019 but will decrease slightly in FY2020. CO₂ will increase for the first time since FY2013

Despite a fall in industrial production concentrated on machinery, primary energy supply will increase slightly in FY2019 because of an increase in energy demand for space heating due to a return from a mild winter in the previous year (+0.3%). Reflecting a decline in material production and further progress in energy saving, primary energy supply will decrease slightly in FY2020 (-0.3%). The trend away from fossil fuels towards nuclear and renewable energy will continue but at a much slower pace, reflecting the slow restart of nuclear power plants and the absence of counterterrorism facilities after FY2019.

In FY2019, CO₂ emissions will increase slightly for the first time after FY2013 due to a small growth in total energy consumption and a decrease in nuclear power generation. In FY2020, however, CO₂ emissions will be lower at 1,065 Mt which, according to the statistics, is the lowest level after FY1990. This corresponds to a reduction of -13.8% from FY2013.

Energy sales | Electricity sales will increase gradually and city gas sales will hit a record high due to increased sales to electric utilities, whilst fuel oil sales will decline for an eighth consecutive year and comprise just two-thirds of the record high

Overall electricity sales in FY2019 will increase by 0.6%. Lighting services will increase sharply due to colder temperatures, and power services will increase slightly reflecting a growth in the iron and steel production. In FY2020, electricity sales will increase by 0.4%. Power services will increase in line with the gradual expansion of production activities concentrating on machinery industry while lighting services should decrease slightly, due to the further penetration of energy-efficient equipment.

Total city gas sales in FY2019 will grow by 1.1% with increases for electric utilities, due to the operation of new city gas-fired power plants, and increase for space and water heating requirements in household due to a return from the previous year's milder winter. The sales of city gas for general industrial use will decrease reflecting the overall production decline. In FY2020, due to the increase in sales for electric utilities, the overall sales will hit a record high (+2.4%).

Table 1 | Summary of Reference Scenario

	Historical				Projection		Year-over-year			
	FY2010	FY2016	FY2017	FY2018	FY2019	FY2020	FY2018	FY2019	FY2020	
Energy	Primary energy supply (Mtoe) ¹	515.9	462.6	464.7	455.7	457.2	455.9	-1.9%	0.3%	-0.3%
	Oil ² (GL)	232.3	205.1	202.8	192.8	190.9	187.0	-4.9%	-1.0%	-2.0%
	Natural gas ² (Mt of LNG equiv.)	73.3	88.1	85.6	81.7	82.6	80.6	-4.5%	1.1%	-2.4%
	Coal ² (Mt)	184.7	188.0	192.2	188.4	189.1	193.0	-2.0%	0.4%	2.0%
	Nuclear (TWh)	288.2	17.3	31.3	62.1	59.0	62.4	98.6%	-4.9%	5.7%
	Renewable electricity ³ (TWh)	111.2	154.9	169.4	176.8	187.2	195.6	4.4%	5.8%	4.5%
	FIT generation (TWh)	63.2	112.8	123.2	133.8	143.3	151.7	8.6%	7.1%	5.9%
	Self-sufficiency ratio	20.3%	8.2%	9.6%	11.9%	12.1%	12.7%	2.3p	0.2p	0.6p
	Electricity sales ⁴ (TWh)	(926.6)	850.5	863.2	852.6	857.3	860.3	-1.2%	0.6%	0.4%
	City gas sales ⁵ (Billion m ³)	39.28	41.53	42.48	41.58	42.03	43.06	-2.1%	1.1%	2.4%
	Fuel oil sales (GL)	196.0	176.9	174.8	167.9	166.1	162.7	-4.0%	-1.1%	-2.1%
	Energy-related CO ₂ emissions (Mt)	1,137	1,129	1,111	1,069	1,070	1,065	-3.8%	0.1%	-0.5%
	(Changes from FY2013)	-7.9%	-8.6%	-10.1%	-13.5%	-13.4%	-13.8%	-3.4p	0.1p	-0.4p
Prices	Crude oil, import, CIF (\$/bbl)	84	48	57	72	65	61	26.7%	-10.1%	-6.8%
	LNG, import, CIF (\$/MBtu)	11.3	7.0	8.5	10.6	10.0	9.2	24.9%	-5.9%	-7.9%
	Steam coal, import, CIF (\$/t)	114	81	103	121	96	90	17.5%	-20.6%	-6.5%
	Coking coal, import, CIF (\$/t)	175	111	147	160	149	135	8.9%	-7.2%	-9.4%
Economy	Real GDP (JPY2011 trillion)	493.0	522.0	531.8	535.5	539.1	542.0	0.7%	0.7%	0.5%
	Industrial production (CY2015=100)	101.2	100.6	103.5	103.8	103.5	103.9	0.2%	-0.2%	0.3%
	Balance of trade (JPY trillion)	5.3	4.0	2.4	-1.6	-0.2	-0.2	-166%	-86.8%	-26.9%
	Fossil fuel imports (JPY trillion)	18.1	13.1	16.3	19.1	16.9	15.5	17.5%	-11.2%	-8.6%
	Exchange rate (JPY/\$)	86.1	108.4	111.1	110.6	110.3	110.0	-0.4%	-0.3%	-0.2%
	Cooling degree days	559	431	397	489	393	381	23.2%	-19.8%	-3.0%
Heating degree days	1,079	965	1,071	866	1,025	1,018	-19.2%	18.4%	-0.7%	

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.

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

Fuel oil sales in FY2019 will continue to decrease for many reasons, including a decline in the need for naphtha due to lower ethylene production, a decline in the use of oil-fired power plants, and a drop in gasoline sales due to the improvement in automobile fuel efficiency. On the other hand, kerosene sales for heating will increase due to a return from the mild winter in the previous year (-1.1%). In FY2020, while the sales of diesel oil will continue to increase slightly, the sales of naphtha will decrease due to more periodic maintenance at ethylene plants and a fall in the operation of oil-fired power plants. Overall, fuel oil sales will decline for an eighth consecutive year and will comprise just two-thirds of the peak.

Renewable power generation | The FIT power generation capacity will reach 78 GW at the end of FY2020

As a deadline was set for approved capacity to become operational under the revised FIT Act, some of the approved capacity, including non-residential solar PV facilities such as mega-solar plants, was cancelled, reducing the approved capacity from 105 GW in March 2017 to 90 GW in December 2018. The plants under construction are expected to become operational by the end of FY2020, with a FIT capacity of 78 GW (including solar PV for residential cut off from the financial support measures and 47 GW for non-residential solar PV). Accounting for 14% of Japan's total electricity generation in FY2020, renewable electricity generation will reach 151.7 TWh (70.3 TWh for solar PV, 39.2 TWh for small and medium-sized hydro, and 30.2 TWh for biomass-fired etc). On the other hand, in exchange for promoting the introduction of the system, the burden on consumers is increasing. If all of the 90 GW of approved equipment as of December

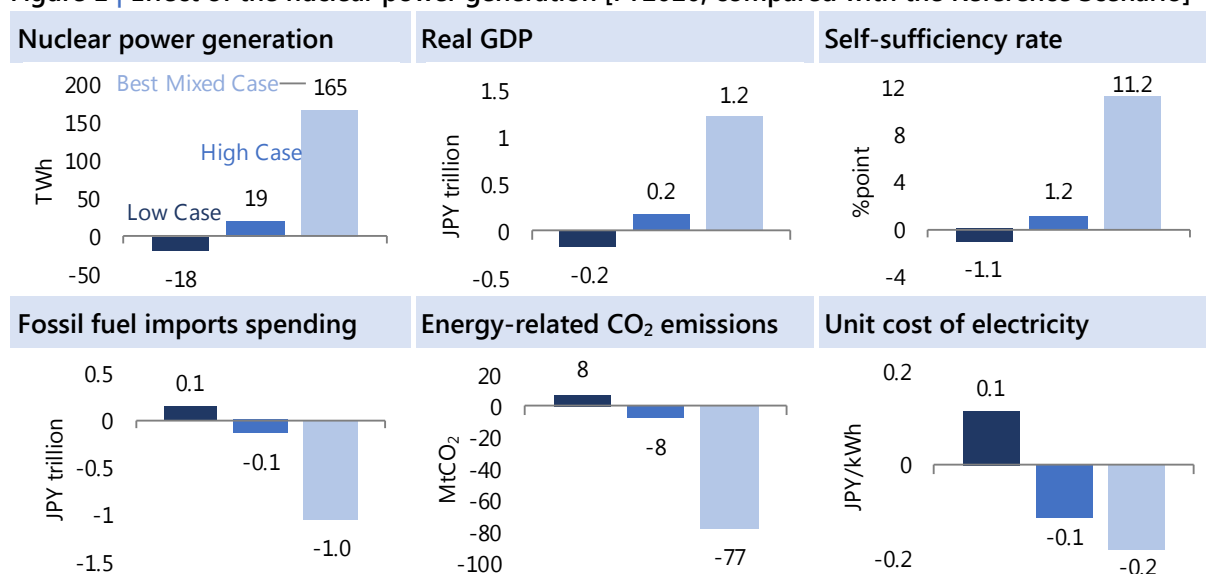
2018 were in operation, the cumulative cost to consumers, including operating and transition equipment, would be JPY60 trillion in the purchase period, equivalent to boosting electricity rates by JPY3,500/MWh – 15% for households and 21% for industries.

Topic |

1/ The effect of the completion of counterterrorism facilities and the restart of nuclear power plants

We assessed the impact of nuclear power generation on 3Es – economy, energy security and environment. In the High Case, which assumes the completion of counterterrorism facilities by the prescribed deadline, the cost of fossil fuel imports would be reduced by JPY100 billion, the self-sufficiency rate would be improved by 1.2 points, and CO₂ emissions would be reduced by 8 Mt. Smoothing the restart of the nuclear power generation contributes to achieving 3Es. Specifying the review standard and considering the inherent circumstances of each plant are important.

Figure 1 | Effect of the nuclear power generation [FY2020, compared with the Reference Scenario]



2/ The impacts of an oil price rise caused by increased geopolitical risks in the Middle East

If oil prices increase by \$15/bbl from the Reference Scenario, due to the volatile Middle East with a focus on the relation between U.S. and Iran and if LNG prices increase accordingly, the growth of the Japanese economy would be held back by 0.2%. Among sales of energy, fuel oils fall the most and total primary energy supply drops by 0.4%, a larger fall than GDP. While energy saving has been progressing in Japan, the jump in fossil fuel dependency since the Great East Japan Earthquake still remains high, thus, Japan is among the countries vulnerable to any rise in oil prices. Lowering the costs of renewable energy, smoothing the restart of the nuclear power generation as well as introducing actions to reduce the tension in the Middle East are all important for lessening the risks.

3/ The impacts of a trade war on world's energy supply and demand

In the event that world GDP would decrease by 0.8%, due to a trade war, world primary energy consumption would be reduced by 0.7%. Coal would drop the most mainly due to a decrease in electricity demand in China. Oil and natural gas would decrease 670kb/d and 27Bcm respectively (0.7% for both). This could

potentially change the current flow of energy trade and the energy market will continue to be influenced by the trade war.

Note: Referring the analysis by IMF which simulated the economic impacts of the tariffs that have been imposed between the United States and several of its trading partners as well as some trade measures that have been announced or considered, but not imposed to. From the analysis, we cited the results where world economy slows down the most including the potential impacts on confidence and market reaction as well as direct impacts of tariffs

Table 2 | Macroeconomic indicators

	Historical				Projection		Year-over-year		
	FY2010	FY2016	FY2017	FY2018	FY2019	FY2020	FY2018	FY2019	FY2020
Real GDP (JPY2011 trillion)	493.0	522.0	531.8	535.5	539.1	542.0	0.7%	0.7%	0.5%
Private demand	369.3	393.0	400.2	404.5	406.6	408.1	(0.8%)	(0.4%)	(0.3%)
Private consumption	286.6	295.8	298.9	300.2	301.6	303.1	0.4%	0.5%	0.5%
Private residential investment	13.9	16.2	16.0	15.3	15.7	15.4	-4.3%	2.2%	-1.6%
Private non-residential investment	67.6	80.8	84.4	87.4	88.6	89.2	3.5%	1.3%	0.7%
Public demand	122.6	131.7	132.5	132.3	133.7	134.9	(-0.0%)	(0.2%)	(0.2%)
Government consumption	98.1	106.0	106.4	107.4	108.2	109.1	0.9%	0.8%	0.8%
Public investment	24.7	25.8	26.0	24.9	25.4	25.7	-3.9%	1.9%	1.2%
Net exports of goods and services	1.3	-3.2	-1.3	-1.9	-1.7	-1.6	(-0.1%)	(0.1%)	(0.0%)
Exports of goods and services	74.7	85.9	91.4	92.6	93.1	94.0	1.3%	0.5%	1.0%
Imports of goods and services	73.4	89.1	92.7	94.6	94.8	95.6	2.0%	0.2%	0.9%
Nominal GDP (JPY trillion)	499.4	536.8	547.5	550.3	559.1	565.8	0.5%	1.6%	1.2%
Balance of trade (JPY trillion)	5.3	4.0	2.4	-1.6	-0.2	-0.2	-166%	-86.8%	-26.9%
Exports	67.8	71.5	79.2	80.7	82.3	83.1	1.9%	2.0%	0.9%
Imports	62.5	67.5	76.8	82.3	82.5	83.3	7.2%	0.3%	0.9%
Fossil fuels	18.1	13.1	16.3	19.1	16.9	15.5	17.5%	-11.2%	-8.6%
Oil	12.3	7.8	9.6	11.3	9.9	9.0	18.3%	-12.9%	-8.4%
LNG	3.5	3.3	4.1	4.9	4.6	4.1	19.4%	-5.5%	-10.3%
Current account (JPY trillion)	18.3	21.7	22.2	19.4	20.4	21.5	-12.4%	5.0%	5.2%
Domestic corporate goods price index (2015=100)	97.6	96.7	99.3	101.5	102.4	102.9	2.2%	0.9%	0.4%
Consumer price index (2015=100)	96.4	100.0	100.7	101.4	102.4	102.9	0.7%	1.0%	0.5%
GDP deflator (2011=100)	101.3	102.8	102.9	102.8	103.7	104.4	-0.2%	0.9%	0.7%
Unemployment rate (%)	5.0	3.0	2.7	2.4	2.5	2.4	[-0.3%]	[0.1%]	[-0.1%]

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	FY2016	FY2017	FY2018	FY2019	FY2020	FY2018	FY2019	FY2020	
Production	Crude steel (Mt)	110.8	105.2	104.8	102.9	104.6	104.8	-1.9%	1.7%	0.2%
	Ethylene (Mt)	7.00	6.29	6.46	6.19	6.14	5.97	-4.2%	-0.7%	-2.8%
	Cement (Mt)	56.1	59.3	60.4	60.2	61.2	60.9	-0.2%	1.7%	-0.6%
	Paper and paperboard (Mt)	27.3	26.3	26.4	26.0	25.9	25.8	-1.4%	-0.3%	-0.5%
	Automobiles (Million units)	8.99	9.36	9.68	9.75	9.81	9.90	0.7%	0.6%	0.9%
Production indices	Mining and manufacturing (2015=100)	101.2	100.6	103.5	103.8	103.5	103.9	0.2%	-0.2%	0.3%
	Food and tobacco	100.7	100.8	100.2	99.7	97.7	96.9	-0.5%	-2.0%	-0.8%
	Chemicals	99.6	102.6	105.6	107.8	109.8	111.6	2.1%	1.8%	1.7%
	Non-ferrous metals	100.0	101.5	103.5	104.2	104.2	104.3	0.7%	0.0%	0.1%
	Machinery	99.4	100.3	105.0	105.6	104.5	105.1	0.5%	-1.1%	0.7%
Tertiary industry activity index (2010=100)	99.9	103.9	105.0	106.2	107.1	107.6	1.1%	0.8%	0.5%	

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	FY2016	FY2017	FY2018	FY2019	FY2020	FY2018	FY2019	FY2020
Primary energy supply (Mtoe)	515.9	462.6	464.7	455.7	457.2	455.9	-1.9%	0.3%	-0.3%
Coal	119.1	121.9	123.7	121.2	121.7	124.1	-2.0%	0.4%	2.0%
Oil	212.0	187.6	185.5	176.3	174.6	171.0	-4.9%	-1.0%	-2.0%
Natural gas	95.7	114.7	111.4	106.4	107.5	104.9	-4.5%	1.1%	-2.4%
LNG imports (Mt)	70.6	84.7	83.9	80.6	80.4	78.5	-4.0%	-0.2%	-2.4%
Hydro	17.7	16.6	17.5	16.9	17.0	17.0	-3.6%	1.0%	0.1%
Nuclear	60.7	3.7	6.8	13.5	12.8	13.5	97.3%	-4.7%	5.5%
New energy, etc.	10.7	18.2	19.8	21.5	23.5	25.2	8.8%	9.2%	7.4%
Self-sufficiency rate	20.3%	8.2%	9.6%	11.9%	12.1%	12.7%	2.3p	0.2p	0.6p
Energy intensity (FY2011=100)	105.1	89.0	87.8	85.5	85.2	84.5	-2.6%	-0.4%	-0.8%
Energy-related CO ₂ emissions (MtCO ₂)	1,137	1,129	1,111	1,069	1,070	1,065	-3.8%	0.1%	-0.5%
Change from FY2013	-7.9%	-8.6%	-10.1%	-13.5%	-13.4%	-13.8%	-3.4p	0.1p	-0.4p

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	FY2016	FY2017	FY2018	FY2019	FY2020	FY2018	FY2019	FY2020
Electricity sales (TWh)	(926.6)	850.5	863.2	852.6	857.3	860.3	-1.2%	0.6%	0.4%
Lighting service	304.2	271.8	279.3	270.3	274.3	274.0	-3.2%	1.5%	-0.1%
Power service	(622.4)	578.7	583.9	582.2	583.0	586.3	-0.3%	0.1%	0.6%
Extra-high and High voltage	(576.5)	540.3	544.9	544.6	545.3	548.3	0.0%	0.1%	0.6%
Low voltage	(45.9)	38.5	39.0	37.6	37.8	38.0	-3.5%	0.4%	0.6%
Electricity generated and purchased (TWh)	(1,028)	963.1	973.5	956.6	961.7	964.9	-1.7%	0.5%	0.3%
Hydro	(9%)	9%	9%	9%	9%	9%	-0.1p	0.0p	-0.0p
Fossil fuels	(62%)	83%	80%	75%	75%	74%	-4.2p	-0.6p	-1.1p
Coal	(25%)	29%	29%	28%	28%	29%	-0.8p	-0.2p	1.1p
LNG	(29%)	43%	41%	39%	40%	37%	-1.5p	0.2p	-2.2p
Oil, etc.	(8%)	11%	10%	8%	7%	7%	-1.9p	-0.7p	0.0p
Nuclear	(29%)	2%	3%	6%	6%	6%	3.3p	-0.4p	0.3p
Renewables (excluding hydro), etc.	(1%)	7%	8%	9%	10%	11%	1.1p	0.9p	0.8p

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	FY2016	FY2017	FY2018	FY2019	FY2020	FY2018	FY2019	FY2020
Total (Billion m ³)	39.28	41.53	42.48	41.58	42.03	43.06	-2.1%	1.1%	2.4%
Residential	9.79	9.41	9.88	9.24	9.48	9.47	-6.4%	2.6%	-0.1%
Commercial	4.75	4.32	4.37	4.26	4.23	4.22	-2.5%	-0.6%	-0.3%
Industrial	21.61	24.20	24.52	24.54	24.80	25.87	0.1%	1.1%	4.3%
Manufacturing	(20.18)	19.29	19.96	19.83	19.77	19.83	-0.6%	-0.3%	0.3%
Electric utilities	(1.43)	4.90	4.55	4.71	5.03	6.04	3.4%	7.0%	20.0%
Others	3.13	3.61	3.71	3.53	3.51	3.50	-4.7%	-0.6%	-0.5%

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

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

	Historical				Projection		Year-over-year		
	FY2010	FY2016	FY2017	FY2018	FY2019	FY2020	FY2018	FY2019	FY2020
Fuel oil sales (GL)	196.0	176.9	174.8	167.9	166.1	162.7	-4.0%	-1.1%	-2.1%
Gasoline	58.2	52.5	51.8	50.6	49.7	48.8	-2.3%	-1.8%	-2.0%
Naphtha	46.7	44.8	45.1	43.9	43.7	43.0	-2.6%	-0.5%	-1.6%
Jet fuel	5.2	5.3	5.0	5.2	5.2	5.3	3.7%	0.5%	0.3%
Kerosene	20.4	16.3	16.6	14.5	15.2	14.7	-12.9%	4.9%	-3.5%
Diesel oil	32.9	33.3	33.8	33.8	33.8	33.9	-0.1%	0.2%	0.2%
Heavy fuel oil A	15.4	12.0	11.5	11.1	10.7	10.4	-3.9%	-3.1%	-3.1%
Heavy fuel oils B and C	17.3	12.8	10.8	8.8	7.7	6.7	-18.9%	-12.4%	-12.6%
For electric utilities	7.7	7.9	6.0	4.0	3.5	2.9	-34.3%	-12.8%	-17.6%
For other users	9.7	4.8	4.8	4.8	4.2	3.9	0.4%	-12.2%	-8.5%
LPG sales (Mt)	16.5	14.4	14.8	14.2	14.3	14.0	-4.1%	0.8%	-2.1%
Crude oil throughput (GL)	208.9	190.6	184.2	176.7	175.3	172.1	-4.1%	-0.8%	-1.8%

Table 8 | Effects of differing nuclear power generation [FY2020]

		Low	Reference	High	Best	Changes from Reference		
		Case	Scenario	Case	Mixed	Low	High	Best
						Case		Mixed
Nuclear assumptions	Restarted nuclear reactors	4	9	14	..	-5	+5	..
	Power generation (TWh)	44.2	62.4	81.4	227.0	-18.2	+19.0	+164.6
	Share in generation and purchases	4%	6%	7%	21%	-2p	+2p	+15p
Economy	Electricity unit cost ¹ (JPY/kWh)	7.2	7.1	6.9	6.9	+0.1	-0.1	-0.2
	Fuel cost	4.4	4.3	4.2	3.6	+0.1	-0.1	-0.8
	FIT purchasing cost	2.7	2.7	2.7	3.3	0.0	0.0	+0.6
	Total fossil fuel imports (JPY trillion)	15.6	15.5	15.3	14.4	+0.1	-0.1	-1.0
	Oil	9.1	9.0	9.0	8.9	+0.0	-0.0	-0.1
	LNG	4.2	4.1	4.0	3.3	+0.1	-0.1	-0.8
	Trade balances (JPY trillion)	-0.3	-0.2	0.0	0.8	-0.1	+0.1	+0.9
	Real GDP (JPY2011 trillion)	541.8	542.0	542.1	543.2	-0.2	+0.2	+1.2
Energy and environment	Primary energy supply							
	Oil (GL)	187.8	187.0	186.4	183.7	+0.8	-0.7	-3.3
	Natural gas (Mt of LNG eq.)	82.6	80.6	78.4	65.6	+2.0	-2.2	-15.0
	Self-sufficiency rate	9.0%	10.2%	11.4%	21.4%	-1.1p	+1.2p	+11.2p
	Energy-related CO ₂ (Mt)	1,072	1,065	1,057	987	+8	-8	-77
Changes from FY2013	-13.2%	-13.8%	-14.4%	-20.1%	+0.6p	-0.6p	-6.3p	

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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