The Institute of Energy Economics, Japan

Economic and Energy Outlook of Japan for FY2021

On the way back to a normal energy situation while ending the COVID-19 pandemic

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Summary of economic and energy outlook [Reference Scenario]

Macro economy | GDP growth will be +3.4%, but GDP will be lower than FY2019

While real GDP growth in FY2021 will achieve a high growth rate of +3.4%, GDP will remain lower than before COVID-19 due to the large fall of FY2020. Industrial production will increase (+7.5%) in heavy electric machinery, automobile and other manufacturers with the recovery of world and domestic economy but the industrial production will be only higher than the level of FY 2009 after the Lehman shock.

Total energy consumption will increase while natural gas (LNG) will significantly fall

Total energy consumption will increase (+2.6%) with recoveries in industrial production and transportation demand. Except for the previous year, it will be the lowest level since FY1987. For the second consecutive year, improvements of total energy consumption per GDP will slow down to less than 1%. With an increase in nuclear generation, LNG imports will fall for the first time since the earthquake to the same level as in FY2010.

While CO_2 will increase to 955Mt (+1.6%) due to the recovery of economic activities, the reduction rate of CO_2 relative to FY2013 will be -22.7%, fulfilling more than 90% of the Paris commitment. Note that identifying progress toward achieving the Paris reduction target is difficult because of the energy consumption decrease due to temporal downturn of economic activities

Energy sales | Lighting services will remain high and power services will recover, city gas sales will be higher than in FY2019, fuel oil sales will increase for the first time in nine years but the long-term decrease trend continues

Although electricity sales in FY2021 will increase by 1.2%, it will be 0.4% lower than FY2019 before COVID-19. Sales for power services will grow with production recovery in machinery and other industries (+1.8%) but they will be 2.5% lower than FY2019. Sales for lighting services will slightly decrease due to less Working From Home and the diffusion of rooftop PV and energy efficient technologies such as LED (-0.1%) despite the higher electrification rate for cooking and heating water due to the increase of all-electric home.

Overall total city gas sales will be 40.6 billion m³(+3.8%) in FY2021 and higher than FY2019. Note that the demand in FY2019 was lower due to the hottest winter since the availability of statistics in FY1897. While sales of general industry and commercial will increase in FY2021, they will be lower than FY2019.

Fuel oil sales in FY2021 will increase 3.1% with the recovery of industrial production and transportation demand from FY2020 but decrease 3.6% from FY2019. Sales of kerosene and heavy fuel oil A will fall due to energy saving and fuel switching with little effects from changes in temperature. Sales of naphtha will increase with less regular ethylene plant repairs. Sales of heavy fuel oil C will continuously decrease due to fuel switching, energy saving for industries and a lower availability of oil-fired power generation in Tokyo and Chubu area, the result of a long shut-off plan for after FY2020.

Renewable power generation | The FIT power generation capacity will reach 87 GW at the end of FY2021

The facilities under construction are expected to become operational, boosting installed renewable energy-based power generation capacity (including capacity subject to FIT contract expiration) to 86.8 GW by the end of FY2021. With a slowdown in the installation pace of solar PV, capacity will expand to 53.0 GW by the end of FY2021. Less opportunity to communicate with local people and difficulties in securing workers under COVID-19 will cause delays in construction work. Wind capacity will remain at 5.3GW because of the long time lead operation due to environmental assessment etc. Renewable energy-based power generation in FY2021 will total 166.2 TWh (including 79.8 TWh for solar PV, 39.9 TWh for small and medium-sized hydroelectric plants, 32.7 TWh for biomass, 10.1 TWh for wind etc.), accounting for 17% of Japan's total power generation.

Table 1 | Summary of Reference Scenario

		Historical				Projection		Year-over-year		
		FY2010	FY2017	FY2018	FY2019	FY2020	FY2021	FY2019	FY2020	FY2021
Energy	Primary energy supply (Mtoe)[1]	515.9	465.1	455.4	444.4	420.0	431.0	-2.4%	-5.5%	2.6%
	Oil[2] (GL)	232.3	202.8	192.8	186.1	170.8	176.0	-3.5%	-8.2%	3.1%
	Natural gas[2] (Mt of LNG equiv.)	73.3	85.6	81.6	78.3	77.5	73.1	-4.0%	-1.1%	-5.6%
	Coal[2] (Mt)	184.7	192.2	188.2	187.5	177.9	184.3	-0.3%	-5.1%	3.6%
	Nuclear (TWh)	288.2	31.3	62.1	61.0	44.2	79.7	-1.7%	-27.5%	80.0%
	Renewable electricity[3] (TWh)	111.2	169.4	177.1	187.9	197.8	205.6	6.1%	5.3%	3.9%
	FIT generation (TWh)	63.2	123.2	133.9	146.2	155.7	166.2	9.2%	6.5%	6.8%
	Self-sufficiency ratio	20.2%	9.4%	11.7%	12.1%	12.2%	14.4%	0.5p	0.1p	2.2p
	Electricity sales[4] (TWh)	(926.6)	863.2	852.6	836.0	823.1	832.7	-1.9%	-1.5%	1.2%
	City gas sales[5] (Billion m³)	39.28	42.43	41.58	40.40	39.07	40.55	-2.8%	-3.3%	3.8%
	Fuel oil sales (GL)	196.0	174.7	167.7	161.6	151.2	155.9	-3.6%	-6.5%	3.1%
	Energy-related CO_2 emissions (Mt)	1,137	1,110	1,065	1,029	939	955	-3.4%	-8.8%	1.6%
	(Changes from FY2013)	-8.0%	-10.1%	-13.8%	-16.7%	-24.0%	-22.7%	-2.9p	-7.3p	1.3p
Prices	Crude oil, import, CIF ($/bbl)	84	57	72	68	43	52	-6.2%	-36.0%	19.4%
	LNG, import, CIF ($/MBtu)	11.3	8.5	10.5	9.5	6.8	7.3	-9.8%	-28.6%	8.1%
	Steam coal, import, CIF ($/t)	114	103	121	101	81	93	-16.2%	-20.4%	14.8%
	Coking coal, import, CIF ($/t)	175	147	160	137	102	115	-14.2%	-25.8%	12.3%
Economy	Real GDP (JPY2015 trillion)	512.1	553.1	554.8	552.9	522.4	540.4	-0.3%	-5.5%	3.4%
	Industrial production (CY2015=100)	101.2	103.5	103.8	99.9	90.1	96.8	-3.7%	-9.9%	7.5%
	Balance of trade (JPY trillion)	5.3	2.4	-1.6	-1.3	2.7	10.6	-20%	-311.0%	289.6%
	Fossil fuel imports (JPY trillion)	18.1	16.3	19.1	16.6	10.2	11.8	-13.2%	-38.4%	15.4%
	Exchange rate (JPY/$)	86.1	111.1	110.6	108.8	105.8	105.0	-1.7%	-2.7%	-0.8%
	Cooling degree days	559	397	489	439	442	383	-10.2%	0.6%	-13.5%
	Heating degree days	1,079	1,071	865	818	998	1,014	-5.5%	22.1%	1.6%

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 m³ = 10,000 kcal

Topic |

1 Transportation energy consumption by mode

Transportation energy consumption in FY2020 is expected to fall by -10.2% the most largely since FY1953 when comparative data began to be statistically available. It will be lower than 70 Mtoe for the first time after 1988. This is due to the fact that passenger transportation sharply falls due to the popularity of Working From Home and the avoidance of unnecessary outings. Freight transportation also drops reflecting the lower activities in industrial production and the service industry affected by COVID-19. With some recovery of both passenger and freight transportation in FY2021, consumption will increase by 5.5% while remaining 5.2% below FY2019. It will be lower than 70 Mtoe for the second year in a row.

2 Impacts of fading-out inefficient coal-fired power plants

The Energy Basic Plan outlines the main policies and measures the government should take, including considering a mechanism to encourage efficiency by fading out the coal-fired power plants with the generation efficiency below-Ultra-Supercritical by FY2030. If the 30GW of inefficient coal capacities are removed, that would be equivalent to reduce generation by 165 TWh. As generation from renewables and the nuclear restarts is assumed constant, any loss of coal-fired power generation would be substituted by gas-fired power generation. As joint thermal power plant and plants owned by manufacturers consume heat from power plants, gas-fired power generation will be assumed to be newly built to replace of coal-fired power generation. CO_2 emissions would fall by 87Mt, the equivalent of 7.1% of 2013 while only fuel costs would rise JPY0.23/kWh (6.7%).The construction costs of 1.8 trillion for gas-fired power generation are added separately and costs for processing byproducts in another way will be plus. As this fading-out should be considered as one of the measures to reduce CO_2 emissions, the condition of each plant should be taken into account. Setting targets for coal-fired power generation efficiency including biomass, heat utilization and byproducts as well as regular reporting are required. Evaluating and preparing fading-out plans by operators are required irrespective of FY 2030. Reviewing in the macro view is important with whole CO_2 reduction progress and the impacts of fade-out based on the reports and plans.

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, 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 JPY100 billion, the self-sufficiency rate would be improved by 1.2 points, and CO_2 emissions would be reduced by 7 Mt. The number of plants which have a deadline for the completion of their counterterrorism facilities after FY2021 will increase. 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 [FY2021, compared with the Reference Scenario]