

Economic and Energy Outlook of Japan for FY2015

What about benefit of oil price plunge for stagnating Japanese economy after VAT increase?

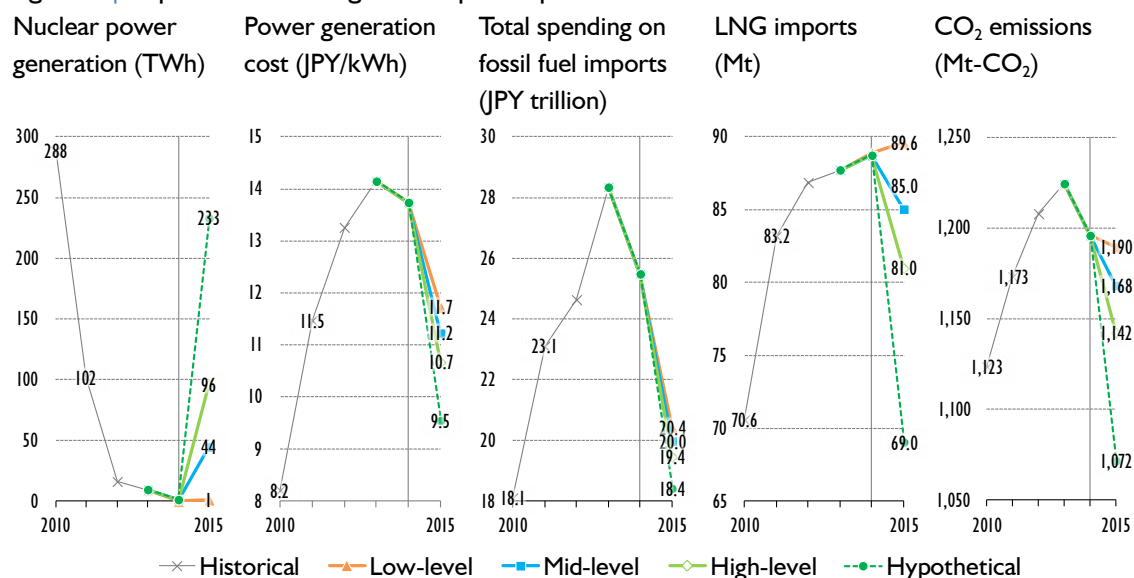
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Executive summary of topics

Restart of nuclear power generation | Delayed restart may call more efficient process

- Although two units from the Sendai Nuclear Power Station were approved in September 2014 as conforming to the new regulation standards, developments toward restart takes time in general. They are assumed to be in operation by the end of FY2014 and they will be the first ones since the Great East Japan Earthquake in 2011. In the “Nuclear Mid-level Case,” the assumptions are that three review teams will be provided in FY2015, and they reflect the assessment of the observed developments, the necessity for large-scale construction, and the order of the applications, etc. Based on those assumptions, a total of nine units will restart by the end of FY2015, operating on average for six months in the Case.
- Even if nine nuclear power plants restart, the electricity generated by nuclear power for FY2015 is still less than one sixth of its FY2010 level, raising the average power generation cost by about JPY3,000/MWh compared to FY2010. Relative to FY2010, total spending on fossil fuel imports increases by JPY1.9 trillion, of which the LNG additional imports of 14.5 Mt will account for JPY1.6 trillion. Under this Case, the energy-related carbon dioxide (CO₂) emissions increase by 45 Mt-CO₂ whilst the self-sufficiency rate decreases by 8.0% point.
- If the assessment period turns out to be longer than the one assumed in the Nuclear Mid-level Case, only the two units already approved would restart by the end of FY2015, generating electricity on average for one month during FY2015 [Low-level Case]. If the Authorities can further increase their staff and if the procedures become more efficient, 20 plants could restart and operate on average for seven months during FY2015 [High-level Case]. The “Hypothetical Case” assumes that 32 of the relatively new plants do generate electricity with a capacity factor of 80% throughout the entire year.
- The extent to which nuclear power plants can restart and operate has huge impacts on the Japanese economy, with serious implications regarding the environment and energy security. For example, the power generation cost under the Low-level Case is JPY2,200/MWh more expensive than under the Hypothetical Case, requiring an additional spending on fossil fuel imports of JPY2.0 trillion. The Hypothetical Case accelerates GDP by 0.3% while decreasing CO₂ emissions by 117.8 Mt, or 9.8% of the emissions in FY2005, and improving the self-sufficiency rate by 9.9 percentage point. The difference in LNG import volume between the two cases would reach 20.6 Mt meaning Japan would import less LNG in the Hypothetical Case than the country did just before the Earthquake. The resulting significant decrease in Japan's LNG imports, combined with the anticipated LNG exports from the United States, beginning in 2016, and others would contribute to a more balanced supply-demand of the international LNG markets in the future.

Figure 1 | Impacts of restarting nuclear power plants



Impacts of lower energy prices | Exertion required for a secure energy supply and demand structure

- Oil prices have further plummeted after the OPEC decision not to cut its production at its meeting in November 2014. The decline in oil prices for the period of August to October 2014 saved JPY150 billion in income transfer from Japan to oil producing countries. Households and corporations benefit from decreases in prices of petroleum products e.g. gasoline and kerosene, and lower electricity and gas tariffs.
- A risk of re-rising international oil price remains. A rise in oil prices of \$10/bbl reduces Japanese GDP by 0.3% and worsens its trade balances by JPY2.0 trillion. While less corporate profits depress private investments, and decline income, a rise in prices also harm purchasing power impeding recovery of private consumption. The establishment of secure energy supply and demand structure is required to achieve stability in economic growth without continuously be at the mercy of international hick-ups.

Household energy spending exceeds JPY300 thousand for the first time

- Energy burdens household with expenditures of more than JPY300 thousand in 2014 for the first time ever, raising its proportion of consumption expenditures to 8.6%, a historical high. The burdens, mainly affected by electricity prices, slip to JPY290 thousand in 2015 thanks to lower international energy prices. The amount, however, is still comparable with that in 2008 when oil price skyrocketed.
- Proportion of energy spending of household expenditures for rural households, which is higher than national average, exceeds 10% in 2014. Although it falls in 2015, the gap of the proportion between rural area and large city remains almost unchanged, burdening local economy. Hokkaido and Tohoku regions, in which kerosene-fuelled space heating is widespread, and intensive gasoline consuming regions benefit relatively more from lower oil price.

Executive summary of outlook for FY2015 (Base Scenario)

Macro economy | Japanese economy recovers, and grows by 1.8% due to improvements of private consumption and investments, etc. in FY2015

Japan sees 0.6% of economic contraction in FY2014, primarily due to the rise in the VAT rate. For FY2015, depreciation of the yen and lower international energy prices expand corporate profits, stimulating private non-residential investments. Private consumption is also pushed by improvement of wages. The economy grows at 1.8% led by domestic demand.

Energy supply and demand | Whilst total energy increases in FY2015, oil and natural gas decrease

Total primary energy supply in FY2014 reduces sharply by 13 Mtoe due to dull economic and weather conditions. Economic recovery leads a 0.9% increase in energy consumption in FY2015. Oil and natural gas, however, see decreases affected by restarts of nuclear power plants, resulting in fossil fuel import spending of JPY20 trillion, the lowest since the Earthquake.

Final energy consumption decreases also in FY2014, followed by a rebound in FY2015. Whilst industry and transportation sectors see increases in energy consumption – the first time in the last five years for the transport sector – due to recovery of production and freight activities and fall of fuel prices, the decreasing trend in consumption for the buildings sector continues.

Energy sales | City gas maintains growing tone. Electricity regains. Fuel oil is in declining trend

Electricity sales by utilities reduce in FY2014 affected by slow economic activity after the VAT raise and a chilly summer. Sales for lighting contract, mainly for household, will increase for the first time in the last five years in FY2015. Additionally, industrial uses, represented by large-scale power users and backed by the recovery of production activity, also drive increases in total sales.

Whilst temperature factor depresses city gas sales by utilities for commercial and other uses combined in FY2014, sales to electric utilities show strong growth. The increase in total sales to industry will be seen again in FY2015. Sales to industry uses will hit a historical record due to the recovery of production activities. Sales to household uses will decline slightly with penetration of efficient city gas-fuelled equipments.

Fuel oil sales show sharp decreases due to fuel switching, the economic situation and weather conditions in FY2014. In FY2015, gasoline, naphtha and diesel oil regain and total sales, except for fuel oil C for electric utilities, level off. Fuel oil C for electric utilities, however, diminishes enormously, resulting in decreases in total fuel oil sales for three straight years.

Renewable power generation | Operational capacities will soon be 50 GW. The cumulative cost burden could be JPY46 trillion

Renewable power generation continues to expand supported by high fixed rates under FIT contracts. Five electric utilities facing excess applications to connection, which may destabilise their power grid, reserve temporarily to answer the applications. Despite such situation, the capacities expected to be in operation by the end of FY2015 will reach 50 GW. Coincidentally, the unavoidable burden expands also. The cumulative cost burden for 20 years could be JPY46 trillion if all of the authorised 93 GW (of which 75 GW is solar PVs) by the end of August 2014 become operational. This is equivalent to an increase of

JPY2,600/MWh above the rates in place just before FIT started – an increase of 11% for household and 21% for large-scale industry consumers.

CO₂ emissions | Turns to reduce for the first time in the last five years but much more than before the Earthquake

Energy-related CO₂ emissions in FY2014 decreases for the first time in five years due to reduced consumption of oil and electricity. The emissions, which recorded a historical high in FY2013, will be less than 1,200 Mt. The emission reductions in FY2015 expand by restarts of nuclear power plants, making the emission amount 2.9% less than that in FY2005. Energy consumption will be less than before the Earthquake but CO₂ emissions will remain more.

Table 1 | Summary of Base Scenario

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Primary energy supply (Mtoe) ¹	514.2	491.2	484.9	488.2	474.9	479.0	0.7%	-2.7%	0.9%
Oil ² (GL)	232.3	238.9	242.8	234.1	221.5	215.8	-3.6%	-5.4%	-2.6%
Natural gas ² (Mt of LNG equivalent)	73.3	85.7	89.2	89.7	89.8	87.0	0.6%	0.1%	-3.0%
LNG imports (Mt)	70.6	83.2	86.9	87.7	88.7	85.0	1.0%	1.1%	-4.2%
Coal ² (Mt)	184.7	175.2	183.4	194.6	189.8	190.4	6.1%	-2.5%	0.3%
Nuclear ³ (TWh)	288.2	101.7	15.9	9.3	1.0	44.4	-41.6%	-88.8%	4148%
Final energy consumption (Mtoe)	339.4	327.2	321.8	321.0	311.7	315.6	-0.2%	-2.9%	1.2%
Industry ⁴	158.3	152.2	148.4	150.8	146.0	148.6	1.6%	-3.2%	1.8%
Buildings	98.0	93.7	92.9	91.1	88.8	88.6	-1.9%	-2.5%	-0.3%
Transport	83.1	81.4	80.4	79.1	76.4	77.9	-1.7%	-3.4%	1.9%
Petroleum products	176.2	169.3	165.7	163.4	156.1	156.9	-1.4%	-4.4%	0.5%
Natural gas and city gas	34.3	35.1	34.7	34.1	33.8	34.8	-1.8%	-0.7%	2.7%
Coal and coal products	35.9	34.7	34.3	36.3	36.7	37.8	6.0%	1.0%	3.1%
Electricity	89.8	85.5	84.6	84.7	82.4	83.4	0.1%	-2.7%	1.2%
Electricity sales (TWh)	926.6	879.5	870.9	871.5	849.5	862.9	0.1%	-2.5%	1.6%
City gas sales ⁵ (Billion m ³)	39.28	40.39	40.33	39.82	40.14	41.09	-1.3%	0.8%	2.4%
Fuel oil sales (GL)	196.0	196.3	197.8	193.5	184.1	180.5	-2.1%	-4.9%	-2.0%
Energy-related CO ₂ emissions (Mt-CO ₂)	1,123	1,173	1,208	1,224	1,196	1,168	1.4%	-2.3%	-2.3%
(FY2005=100)	93.4	97.6	100.4	101.8	99.4	97.1
Crude oil, import, CIF (\$/bbl)	84	114	114	110	92	67	-3.6%	-16.4%	-27.1%
LNG, import, CIF (\$/t)	584	823	866	837	759	508	-3.3%	-9.4%	-33.1%
Steam coal, import, CIF (\$/t)	114	144	127	108	95	95	-15.1%	-12.3%	0.2%
Nominal GDP (JPY trillion)	480.2	473.9	474.5	483.1	489.0	500.0	1.8%	1.2%	2.2%
Real GDP (JPY2005 trillion)	512.4	514.4	519.6	530.6	527.3	536.8	2.1%	-0.6%	1.8%
Industrial production index (2010=100)	99.4	98.8	95.8	99.0	98.5	100.5	3.3%	-0.5%	2.1%
Exchange rate (JPY/\$)	86.1	79.0	82.6	100.0	111.3	120.0	20.9%	11.3%	7.8%

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: 9,154 kcal/L; Natural gas: 13,141 kcal/kg; Steam coal: 6,203 kcal/kg; Coking coal: 6,887 kcal/kg since FY2013.

3. The Mid-level Case

4. Industry includes non-energy use.

5. Conversion factors: 1 m³ = 10,000 kcal

Introduction

The Japanese economy had been expected to promptly recover after an increase in the consumption or value added tax in April 2014. But the recovery has been slower than anticipated. Expectations and concerns are mixed about how the Bank of Japan's additional monetary easing and the government's decision to postpone another consumption tax increase would support the real economy.

In the past six months, the yen depreciated against major foreign currencies further, while international oil prices declined by \$50/bbl from the FY2014 peaks in June. LNG import prices, which reflect oil price changes with about three-month lag, will begin to drop in early 2015. Within Japan, a delay in the restart of nuclear power plants has led Hokkaido Electric Power Co. to raise electric rates again, while consumers' burden accompanying the feed-in tariff system for renewable energy promotion has been increasing rapidly. Particularly, reported grave energy costs for rural regions and small companies have become burning problems as well as gap in improvements in income.

Under the situation, we have projected the Japanese economy and energy supply and demand and analysed various implications of the projection.

Major assumptions in the Base Scenario

World economy

We assume that the world economy will continue a moderate recovery in FY2015. The United States will achieve the fastest economic growth among major developed countries. Although the impacts of an end to monetary easing and the interest rate hike are a matter of concern, the United States economy is assumed to retain a growth trend, with its annual growth rate rising close to 3% in 2015. As the European economy has been plagued with destabilising factors including its soured relations with Russia, Eurozone GDP has contracted for the second consecutive year. But European economy is assumed to post a moderate annual growth rate of 1% in 2015 with support from the European Central Bank as financial markets escape the worst phase. The Asian economy including emerging countries is still on a robust growth path despite China's growth deceleration, driving global economic growth. The Indian economy, which had been a matter of concern once, is firm now and assumed to retain a growth rate of 6% or more in 2015.

Oil, LNG and coal CIF prices

In response to a decision against any oil production reduction at an OPEC meeting in November 2014, oil prices have fallen further. We have assumed an oil import CIF price for Japan of \$67/bbl in FY2015. The liquefied natural gas price in FY2015 is assumed to decline to \$9.8/MBtu with weak spot prices. As the coal supply-demand balance is projected to tighten, the price in FY2015 is assumed to rise to \$95/t and \$118/t for steam coal and coking coal, respectively.

Yen exchange rate

We have assumed the average yen/dollar exchange rate at JPY120/\$ for the projection period.

Nuclear power generation

Given data submission for the assessment of nuclear reactors' conformity with the new regulatory standards and progress in the

assessment, we have assumed that nuclear reactors will gradually restart from around the end of FY2014. In the Nuclear Mid-level Case adopted for the Base Scenario, two reactors at the Sendai Nuclear Power Plant will restart within FY2014, generating a total of 1.0 TWh in electricity. In FY2015, total nine reactors will restart with electricity generated of 44.4 TWh.

Electricity supply and demand

Based on discussions at the government's Electricity Supply-Demand Verification Subcommittee, we have assumed that each electric utility will secure a reserve capacity rate of at least 3% in its service area through electricity conservation and other measures. But there are many potential risks including the unscheduled suspension of outdated fossil fuel-fired power plants and meteorological effects.

Temperature

Based on the three-month weather forecast by the Japan Meteorological Agency, we have assumed a colder winter in FY2014 than in the previous year (-0.3 degrees Celsius) and a normal summer and winter in FY2015, which means the same average summer temperature as in the previous year and a colder winter than in the previous year (-0.1°C).

Macro economy

The Japanese economy in FY2014 will contract by 0.6% from the previous year due to the consumption tax increase for the first decline in five years

Among private demand components, private consumption in each quarter will slip below the year-before level due to the consumption tax increase and import price hikes. But non-residential investment will increase as companies expand earnings through business efficiency improvements. Overall private demand will contribute to reduce GDP by 1.2%. Among public demand components, public investment will slightly increase. Government expenditure including social security spending will expand. Overall public demand will contribute to expand GDP by 0.1%. Exports will gradually increase toward the end of FY2014 as the brisk United States economy and still robust emerging economies even after some deceleration are coupled with effects of the yen's depreciation. As exports grow faster than imports for the first time in four years, external demand will contribute to boost GDP by 0.5%. Trade deficits will narrow to JPY9.8 trillion, still the second highest ever.

The Japanese economy will grow by 1.8% in FY2015 as private consumption recovers in addition to non-residential investment and exports

Among private demand components, private consumption will increase as consumers'

purchasing power improves due to wage hikes and asset effects under a stock market upsurge. Non-residential investment will expand substantially thanks to corporate earnings improvements accompanying domestic demand and export growth. Nominal investment will exceed JPY70 trillion for the first time since the Lehman Shock, achieving a target in the government's Japan Revitalization Strategy. Private demand will contribute to expand real GDP by 1.5%. Among public demand components, social security spending will increase while public investment will decline. Overall public demand will remain unchanged from the previous year. Exports will continue increasing as the yen remains weak due to bold monetary easing, with foreign economies growing. Imports will go up on domestic demand expansion. External demand will contribute to boost real GDP by 0.3%. Nominal GDP will top JPY500 trillion for the first time in eight years.

Fossil fuel imports will decline to JPY20 trillion, the lowest since the Great East Japan Earthquake, as nuclear power plants restart with oil and LNG prices falling. Trade deficits will fall to JPY7.4 trillion.

Monetary easing and economic recovery will push up Japan's inflation rate close to the target of 2%. While energy prices will exert downward pressure on inflation, wage and import price hikes will help accelerate the inflation rate to 1.6% in the first quarter of 2016.

Table 2 | Macroeconomic indicators

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Real GDP (JPY2005 trillion)	512.4	514.4	519.6	530.6	527.3	536.8	2.1%	-0.6%	1.8%
Private demand	377.1	383.6	390.7	399.9	393.5	400.9	2.4%	-1.6%	1.9%
Private consumption	299.7	304.0	309.5	317.1	308.0	313.3	2.5%	-2.9%	1.7%
Private residential investment	12.5	12.9	13.7	14.9	13.3	13.4	9.3%	-11.0%	0.7%
Private non-residential investment	64.9	68.0	68.8	71.5	72.2	74.4	4.0%	0.9%	3.1%
Public demand	118.5	119.2	120.8	124.5	125.1	125.1	3.1%	0.4%	0.0%
Government consumption	97.9	99.1	100.6	102.2	102.6	103.6	1.6%	0.4%	1.0%
Public investment	20.7	20.1	20.3	22.4	22.5	21.5	10.3%	0.6%	-4.3%
Net exports of goods and services	16.8	12.0	8.4	7.3	10.3	12.4	-12.8%	40.3%	20.4%
Exports of goods and services	83.6	82.3	81.3	85.1	89.8	94.4	4.7%	5.5%	5.1%
Imports of goods and services	66.8	70.3	72.9	77.7	79.5	82.0	6.7%	2.2%	3.2%
Nominal GDP (JPY trillion)	480.2	473.9	474.5	483.1	489.0	500.0	1.8%	1.2%	2.2%
Balance of trade (JPY trillion)	5.3	-4.4	-8.2	-13.8	-9.8	-7.4	68.6%	-28.7%	-25.0%
Exports	67.8	65.3	63.9	70.9	74.3	79.5	10.8%	4.8%	7.1%
Imports	62.5	69.7	72.1	84.6	84.1	86.9	17.4%	-0.6%	3.4%
Fossil fuels	18.1	23.1	24.6	28.3	25.5	20.0	15.1%	-10.1%	-21.7%
Domestic corporate goods price index (2010=100)	100.2	101.6	100.5	102.4	106.0	106.5	1.8%	3.5%	0.5%
Consumer price index (2010=100)	99.9	99.8	99.5	100.4	103.4	104.1	0.9%	2.9%	0.7%
GDP deflator (2005=100)	93.7	92.1	91.3	91.1	92.7	93.2	-0.3%	1.9%	0.4%

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

Industrial production

Crude steel production will increase in FY2015 due to brisk electric furnace production and high value added products exports, exceeding 110 Mt tons for the third straight year

In FY2014, crude steel production will remain above 110 Mt (though with a fall of 0.9% from the previous year) as demand for steel for reconstruction from the Great East Japan Earthquake and external demand are firm despite adverse effects of the consumption tax increase on steel demand. In FY2015, domestic demand for electric furnace products for construction will continue to be firm. Cheaper general-purpose product imports (including scaffolding materials for construction sites) will remain as high as in the previous year. Backed by the yen's appreciation, external demand for high value added products will expand. Crude steel production in FY2015 will increase by 1.0% from the previous year to the highest level since the Lehman Shock, topping the FY2013 level.

Ethylene production will reach a full capacity level in FY2015 after regular production facility checks end

In FY2014, ethylene production will fall by 1.3% from the previous year due to some ethylene plant shutdowns and more regular plant checks. Some more plants will be closed in FY2015. But production will rise by 0.2% from the previous year to a full capacity level to meet growing domestic and external demand including a switch from imports to domestically produced products in Japan and exports to the rest of Asia.

Cement production will top 62 Mt for the third straight year due to brisk domestic demand including post-disaster reconstruction and construction.

In FY2014, cement production will stay above 62 Mt, though posting a 0.6% drop from the previous year, as post-disaster reconstruction demand continues to be brisk as in the previous

year. In FY2015, cement production will remain unchanged from the previous year at a full capacity level against the backdrop of robust fixed capital formation. After a capacity reduction to meet a medium to long-term demand fall, cement facilities will continue operating at their full capacity.

Paper and paperboard production will continue a downward trend due to a shift from paper to electronic media, despite some freight transport recovery

In FY2014, paper and paperboard production will decline by 0.5% from the previous year as a long-term shift from paper to electronic media is coupled with the consumption tax increase, despite increase in paperboard due to freight transport recovery. In FY2015, paperboard production will fall due to a switch to thinner, lighter products, although demand for paperboards for processed food, mail-order shopping and parcels will grow robust on a private consumption recovery. Paper production will continue the long-term downward trend. Paper and paperboard production will drop by 0.6%.

Automobile production will recover in the second half of FY2014 after dropping on the consumption tax increase. In FY2015, the production will rise to 9.8 million

Domestic automobile demand fell on the tax increase in the first half of FY2014 before recovering gradually in the second half. Production in the year will fall by 2.2% from the previous year, with Japanese automakers continuing to move production plants from Japan to foreign countries. In FY2015, automobile production will increase by 1.1% from the previous year to 9.81 million as private consumption recovers with exports expanding due to the yen's depreciation. Since the Lehman Shock, FY2015 production will be the second highest after the FY2013 level.

Table 3 | Industrial activities

	Historical				Projections		Year-to-year changes			
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015	
Production	Crude steel (Mt)	110.8	106.5	107.3	111.5	110.5	111.6	3.9%	-0.9%	1.0%
	Ethylene (Mt)	7.00	6.47	6.26	6.76	6.68	6.69	8.0%	-1.3%	0.2%
	Cement (Mt)	56.1	57.6	59.5	62.4	62.0	62.0	4.9%	-0.6%	0.0%
	Paper and paperboard (Mt)	27.3	26.5	25.7	26.7	26.5	26.4	3.6%	-0.5%	-0.6%
	Automobiles (Million)	8.99	9.27	9.55	9.91	9.70	9.81	3.8%	-2.2%	1.1%
Production indices	Mining and manufacturing (2010=100)	99.4	98.8	95.8	99.0	98.5	100.5	3.3%	-0.5%	2.1%
	Food	98.1	97.3	96.7	97.7	95.9	96.5	1.0%	-1.9%	0.6%
	Chemicals	99.8	98.3	96.5	98.4	98.0	99.8	2.0%	-0.4%	1.8%
	Non-ferrous metals	98.9	97.5	96.6	97.9	98.1	99.5	1.4%	0.2%	1.4%
	General and electrical machinery, etc.	101.3	100.3	93.1	97.4	98.0	102.8	4.6%	0.6%	5.0%
Tertiary industry activity index (2005=100)		97.8	98.4	99.2	100.4	99.1	100.4	1.2%	-1.3%	1.3%

Note: Chemicals include chemical fibre.

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

Primary energy supply

Primary energy supply in Japan in FY2014 will decline sharply by as much as 13 Mtoe. In FY2015, oil and natural gas will decrease as nuclear power plants restart

Primary energy supply in Japan in FY2014 will decline by 2.7% from the previous year due to the consumption tax increase, lower temperatures and more rain in summer and energy conservation. Oil and coal will drop substantially. In FY2015, primary energy supply will increase by 0.9% from the previous year for the first rise in two years thanks to an economic recovery. But the increase will be limited to one-third of the decline in the previous year due to energy conservation. Under the impact of nuclear power plants' restart, natural gas and oil will plunge.

Oil in FY2014 will decrease by 5.4% from the previous year because of a stall in economic recovery following the consumption tax hike, a shift from expensive oil-fired power generation to LNG-fired generation, and a fuel switch from oil to natural gas. Oil in FY2015 will drop by 2.6% to slip below 200 Mtoe for the first time in a half century as oil-fired power generation decreases further.

Natural gas in FY2014 will increase by 0.1% from the previous year to rewrite a record for the fifth straight year due to growth in LNG-fired power generation and city gas consumption. In FY2015, natural gas will fall by 3.0% for the first drop in six years as LNG-fired power generation declines substantially on the

restart of nuclear power plants, though with city gas consumption being robust.

Coal in FY2014 will decline by 2.4% from the previous year for the first drop in three years as the operating rate of coal-fired power plants falls on an unscheduled suspension of some plants. In FY2015, coal will increase by 0.4% due to a rise in industrial coal consumption amid a recovery in steel and other industrial production, although some coal-fired power generation plants will be suspended for delayed checks.

Nuclear power generation in FY2014 will slightly increase from the previous year as two nuclear power plants restart late in the FY2015 since more nuclear power plants restart in the year. Japan will end the absence of nuclear power generation at last. nuclear energy will score the largest supply growth among energy sources in the year. Nevertheless, nuclear power generation in the year will be limited to 44.4 TWh or one-sixth of the level before the Great East Japan Earthquake.

Energy-related carbon dioxide emissions will decline in FY2014 for the first time in five years after hitting a record 1,224 Mt-CO₂ in FY2013. As coal and oil consumption falls amid a natural gas consumption increase, CO₂ emissions will slip below 1,200 Mt for the first time in three years. As fossil fuel consumption declines further on the restart of nuclear power plants in FY2015, CO₂ emissions will decline further. But they will still be above the level for FY2010 that ended in March 2011 when the Great East Japan Earthquake occurred.

Table 4 | Primary energy supply

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Primary energy supply (Mtoe)	514.2	491.2	484.9	488.2	474.9	479.0	0.7%	-2.7%	0.9%
Coal	119.2	112.8	117.7	126.1	123.1	123.6	7.2%	-2.4%	0.4%
Oil	212.0	218.0	221.6	214.3	202.7	197.5	-3.3%	-5.4%	-2.6%
Natural gas	95.6	111.7	116.4	117.9	118.0	114.4	1.3%	0.1%	-3.0%
Hydro	18.2	18.5	16.7	16.9	17.3	17.7	1.2%	2.3%	2.3%
Nuclear	60.7	21.4	3.4	1.9	0.2	9.2	-42.5%	-88.8%	4148%
Others	8.7	8.8	9.2	11.0	13.6	16.5	19.5%	23.7%	21.5%
Self-sufficiency rate	18%	11%	7%	7%	7%	10%
Energy intensity (FY2005=100)	94.2	89.6	87.6	86.4	84.5	83.7	-1.4%	-2.1%	-0.9%
Energy-related CO ₂ emissions (Mt)	1,123	1,173	1,208	1,224	1,196	1,168	1.4%	-2.3%	-2.3%
(FY2005=100)	93.4	97.6	100.4	101.8	99.4	97.1

Note: "Others" include geothermal, new energies, etc.
Heat contents have been revised since FY2013.

Final energy consumption

Japan's final energy consumption will decrease substantially due to the consumption tax increase and cooler summer weather in FY2014 before rising in FY2015 for the first time in five years to a level that will still be 7% less than before the Great East Japan Earthquake

Final energy consumption in FY2014 will decline by as much as 2.9% from the previous year to the lowest level in a quarter century due to the consumption tax increase, cooler summer weather and electricity/energy conservation efforts. As mainly the industry and transport sectors expand energy consumption thanks to an economic recovery in FY2015, final energy consumption will increase by 1.2% to a level that will still be down 7% from before the Great East Japan Earthquake.

In the industry sector, final energy consumption in FY2014 will fall by 3.2% from the previous year due primarily to the tax increase. In FY2015, coal, naphtha and electricity will increase due to a recovery mainly in iron and steel, automobile and petrochemical production, while diesel and heavy fuel oils will decrease. Final energy consumption as a whole in the industry sector will expand by 1.8%. As a fuel switch makes further progress, city gas will post the highest growth among energy sources.

In the residential sector, city gas and liquefied petroleum gas will increase in FY2014 as water-heating demand expands due to lower summer and winter temperatures. But kerosene in the sector will decrease due to a fuel switch to city gas and electricity. Electricity, however, will also fall substantially because of a drop in space-cooling demand. Overall, the residential

sector's final energy consumption will drop by 1.6% from the previous year to less than 50 Mtoe. In FY2015, electricity will recover slightly due to firm demand for "all electrification." City gas will decline under the long-term trends of falling population and energy-efficient equipment penetration. Kerosene and LPG will fall on a fuel switch to electricity and city gas. The residential sector's final energy consumption as a whole will decrease by 1.0% for the fifth straight year, continuing the downward trend after the earthquake disaster.

In the commercial sector, final energy consumption in FY2014 will log a substantial drop of 3.6% from the previous year due to tax hike-induced economic stagnation coinciding with a drop in space-cooling demand under lower temperatures in summer. In FY2015, the sector's final energy consumption will increase by 0.7% for the first rise in three years as economic activities expand. Electricity and city gas will increase while kerosene and heavy fuel oil A will continue declining amid the fuel switch.

In the transport sector, final energy consumption will continue a downward trend due to a plateauing vehicle fleet and fuel efficiency improvements accompanying fuel efficient and mini vehicles' growing share of the fleet. In FY2014, the sector's final energy consumption will post a substantial decline of 3.4% due to fuel price rises amid the tax hike and the yen's depreciation as well as lower temperatures and heavy rainfall in summer. In FY2015, the consumption will increase by 1.9% for the first rise in five years as freight transport expands on an economic recovery, with gasoline and diesel oil prices falling on crude oil price drops.

Table 5 | Final energy consumption

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Final energy consumption (Mtoe)	339.4	327.2	321.8	321.0	311.7	315.6	-0.2%	-2.9%	1.2%
Industry	158.3	152.2	148.4	150.8	146.0	148.6	1.6%	-3.2%	1.8%
Buildings	98.0	93.7	92.9	91.1	88.8	88.6	-1.9%	-2.5%	-0.3%
Residential	54.6	52.8	51.8	50.5	49.7	49.1	-2.6%	-1.6%	-1.0%
Commercial	43.4	40.9	41.1	40.6	39.2	39.4	-1.2%	-3.6%	0.7%
Transport	83.1	81.4	80.4	79.1	76.4	77.9	-1.7%	-3.4%	1.9%
Coal and coal products	35.9	34.7	34.3	36.3	36.7	37.8	6.0%	1.0%	3.1%
Petroleum products	176.2	169.3	165.7	163.4	156.1	156.9	-1.4%	-4.4%	0.5%
City and natural gases	34.3	35.1	34.7	34.1	33.8	34.8	-1.8%	-0.7%	2.7%
Electricity	89.8	85.5	84.6	84.7	82.4	83.4	0.1%	-2.7%	1.2%
Others	3.2	2.7	2.5	2.6	2.7	2.7	1.1%	3.3%	0.3%

Note: Industry includes non-energy use.

Electricity sales and power generation mix (electric utilities)

In FY2015, electricity sales for lighting contracts will increase for the first rise in five years and those for large-scale power contracts will recover

Electricity sales in FY2014 will fall by 2.5% from the previous year due to a plunge in sales for lighting and commercial contracts under cooler summer weather in the first half. Sales for power contracts with large industrial users will decline for the first time in two years because of production's stagnant recovery.

In FY2015, electricity sales will increase by 1.6% as the supply and demand balance eases on the restart of nuclear power plants. Sales for lighting contracts mainly for the residential sector will turn upward for the first time since the earthquake disaster, supported by firm "all electrification" demand. Sales for power contracts will expand for the first time in two years as industrial electricity consumption drives the sales growth due to recovering production in manufacturing industries.

Table 6 | Electricity sales (electric utilities)

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Total (TWh)	926.6	879.5	870.9	871.5	849.5	862.9	0.1%	-2.5%	1.6%
Lighting contracts	304.2	288.9	286.2	284.3	274.6	276.1	-0.7%	-3.4%	0.5%
Power contracts	622.4	590.5	584.7	587.2	574.9	586.8	0.4%	-2.1%	2.1%
of which: Large-scale industrial users	283.2	274.1	267.4	269.3	267.9	273.1	0.7%	-0.5%	2.0%
Mining and manufacturing	234.4	227.9	221.3	222.8	222.0	227.3	0.7%	-0.4%	2.4%
Chemicals	28.1	27.2	26.3	26.6	26.4	26.8	0.9%	-0.8%	1.5%
Iron and steel	36.3	36.5	36.0	37.3	37.7	38.1	3.8%	0.9%	1.1%
Machinery	74.6	71.6	69.0	69.2	68.6	71.3	0.4%	-0.9%	4.0%

Note: Power contracts and total include specified-scale demand.

In FY2015, electric utilities' electricity generated and purchased will recover slightly. Fossil fuel-fired power generation's share will fall to 81%

Fossil fuel-fired power generation's share of electric utilities' electricity generated and purchased will stand at a high level of 87% in FY2014. LNG-fired power generation, for which new plant construction is making progress, will boost its share to 46%, while expensive oil-fired power generation's share will decline. Coal-fired power generation will decrease slightly as the operating rate falls due to increasing unscheduled facility suspension.

Nuclear and new energy power generation will increase in FY2015, accounting for more than 10% of utilities' total electricity generated and purchased. New energy's share will rise to rival the share for oil, etc. New LNG-fired power generation capacity in FY2015 will include Units 4 to 6 at the Himeji Daini Thermal Power Plant (starting operation from August 2014 to March 2015) and Unit 3 of the Shin Sendai Thermal Power Plant (starting operation in December 2015). The capacity factor for LNG-fired plants, however, will decline since nuclear power plants restart with postponed regular checks conducted on some LNG-fired capacity. Generation at plants fired by oil, etc. will also decrease.

Table 7 | Power generation mix (electric utilities)

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Electricity generated and purchased (TWh)	1,028	976.2	962.7	963.5	935.7	950.2	0.1%	-2.9%	1.6%
Share							Year-to-year changes		
Hydro	(8%)	(9%)	(8%)	8%	9%	9%	-0.0p	+0.4p	+0.0p
Fossil fuel-fired thermal	(60%)	(79%)	(90%)	88%	87%	81%	-1.6p	-1.0p	-5.9p
Coal	(23%)	(24%)	(25%)	30%	30%	30%	+4.9p	-0.1p	-0.2p
Natural and city gases	(32%)	(43%)	(48%)	44%	46%	42%	-4.1p	+1.8p	-3.2p
Oil, etc.	(6%)	(13%)	(17%)	14%	12%	9%	-2.4p	-2.7p	-2.5p
Nuclear	(31%)	(12%)	(2%)	1%	0%	5%	-1.0p	-0.8p	+4.5p
Others	(0%)	(0%)	(0%)	3%	4%	6%	+2.6p	+1.4p	+1.4p

Note: Only for general electric utilities until FY2012.

City gas sales (city gas utilities)

In FY2014, city gas sales will increase on the strength of growing city gas-fired power generation. In FY2015, those sales will hit a record as industrial sales expand

City gas sales to the residential use will reflect water-heating demand growth under cooler summer weather in FY2014. But those to the commercial sector (commercial and “other” uses) will indicate a fall in space-cooling demand. Under lower winter temperatures, those to the residential and commercial uses will increase thanks to water- and space-heating demand growth. City gas sales to electric utilities will increase substantially as a city gas-fired power generation plant starts operation in the Kanto region. Sales to the commercial use and the industry use (other than electric utilities) will decline due to stagnant economic activities following the tax hike. Overall city gas sales in FY2014 will increase by 0.8% from the previous year. In FY2015, water-heating demand in the residential sector and air-conditioning demand in the commercial sector will remain unchanged from the previous year as summer and winter temperatures stay unchanged. City gas use for cooking in the residential and commercial sectors will fall slightly amid the long-term trends of falling population and energy-efficient equipment penetration. Steam generation, water heating and other heat demand in the commercial sector and the industry sector (other than electric utilities) will increase thanks to an economic recovery. Overall city gas sales in FY2015 will post a greater increase of 2.4%, hitting a record high.

City gas sales to the residential use in FY2014 will increase by 1.1% from the previous year for the first rise in two years due to water-heating demand growth under lower summer temperatures. Those sales in FY2015, though benefitting from leap-year effects, will fall by 0.1% due to the long-term trends of falling population and energy conservation. While the number of contracts for the residential use will

increase, sales per contract will decline due to shrinking household sizes and the penetration of more efficient water-heating equipment. The residential use’s share of total city gas sales will narrow to 23% in FY2015.

City gas sales to the commercial sector (commercial and “other” uses) in FY2014 will decrease as space-cooling demand falls due to sharp growth amid heat waves in the previous year and energy conservation. City gas sales will decline by 3.7% for commercial uses and by 4.0% for “other” uses (including medical and public sector users). In FY2015, city gas sales to the sector will increase due to unchanged temperatures and the penetration of city gas-fuelled air-conditioning equipment and city gas-fired cogeneration systems. Sales will expand by 2.7% and 2.3% for commercial uses and “other” uses, respectively.

Of city gas sales to the industry use in FY2014, those to electric utilities will increase by 800 Mm³ from the previous year due to the start of commercial operation at the Kashima Thermal Power Plant’s Unit 7, a large combined-cycle generator. Sales to the others including manufacturers will fall due to stagnant production activity. City gas sales to the industry use in the year will increase by 2.4% from the previous year thanks to the growth in those to electric utilities. In FY2015, sales to the others in the industry use will turn up for the first time in four years. As the capacity utilisation rate for existing equipment of manufacturers increases on a production recovery, sales to the industry use as a whole will rise by 3.4% for the second straight year of increase. The use’s share of city gas sales will increase to 57% in FY2015.

Under the city gas sales deregulation program started in 1995, sales to large industrial users consuming 100,000 m³ or more per year have been liberalised. New gas suppliers’ sales to large industrial users have declined since FY2011 as the capacity utilisation rate has fallen for existing consumers’ equipment. New gas

suppliers' share of sales to all large industrial users dropped from 17% in FY2011 to 11% in the first half of FY2014. But the number of applicants for entry into gas supply has increased. City gas users subject to suppliers'

sales competition have shifted from a small number of large users to a large number of relatively smaller users, indicating a growing number of users benefitting from competition.

Table 8 | City gas sales (city gas utilities)

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Total (Billion m ³)	39.28	40.39	40.33	39.82	40.14	41.09	-1.3%	0.8%	2.4%
Residential	9.79	9.79	9.80	9.55	9.66	9.64	-2.5%	1.1%	-0.1%
Commercial	4.75	4.50	4.52	4.49	4.32	4.44	-0.6%	-3.7%	2.7%
Industrial	21.61	23.12	22.92	22.20	22.72	23.49	-3.2%	2.4%	3.4%
For electric utilities	1.43	1.53	1.89	1.94	2.75	2.89	2.6%	41.7%	4.9%
For other users	20.18	21.59	21.03	20.26	19.97	20.61	-3.7%	-1.4%	3.2%
Others	3.13	2.97	3.09	3.58	3.43	3.51	15.6%	-4.0%	2.3%

Notes: Converted at 1 m³ = 41.8605 MJ (10,000 kcal)

Fuel oil and LPG sales

A long-term downward trend will continue. In FY2015, fuel oil sales excluding heavy fuel oil C for electric utilities will level off from the previous year

Fuel oil sales in FY2014 will post a large decline of 4.9% from the previous year due to fuel switching, the consumption tax hike and cooler summer weather. In FY2015, fuel oil sales excluding heavy fuel oil C for electric utilities will level off as gasoline, naphtha and diesel oil sales turn up on an economic recovery. As heavy fuel oil C sales for electric utilities plunge, however, overall fuel oil sales will decline by 2.0% for the third straight year of fall. The fuel oil sales drop from FY2013 to FY2015 will total 13 GL of which heavy fuel oil C for electric utilities will account for more than half.

Gasoline sales have continued a long-term downward trend due to the growing penetration of low fuel cost vehicles and fuel efficiency improvements accompanying expansion of the mini-vehicle fleet. In FY2014, gasoline sales will log a substantial drop of 3.6% from the previous year due to gasoline price rises and abnormal summer weather. In FY2015, however, gasoline sales will increase by 1.5% for the first rise in five years thanks to an economic activity recovery, gasoline price drops on a crude oil price plunge and leap-year effects.

Naphtha sales in FY2014 will decline by 4.3% due to the shutdown of some ethylene capacity and regular inspections covering more plants than usual. In FY2015, naphtha sales will increase by 1.3% in response to domestic demand growth including a switch from imported ethylene to domestically produced ethylene. Naphtha's share of total fuel oil sales in FY2015 will rise to around 25%.

Kerosene sales in FY2014 will decrease by 5.6% from the previous year as a long-term trend of

switching from kerosene to electricity or city gas continues. Although kerosene price drops amid weak crude oil prices will ease the long-term downward trend, kerosene sales in FY2015 will decline by 1.5% to a level seen 44 years ago.

Diesel oil sales in FY2014 will fall by 0.6% from the previous year for the first drop in three years due to the tax hike and a slowdown in truck transportation demand accompanying reconstruction from the Great East Japan Earthquake. In FY2015, diesel oil sales will post a small rise of 0.2% as freight transport increases on an economic recovery.

Heavy fuel oil A sales will decline by 4.4% and 5.5% in FY2014 and FY2015, respectively, as demand for agriculture and ships decreases due to the penetration of energy efficient equipment and energy conservation efforts and their downward trend continues through a switch from heavy fuel oil A to other fuels for environmental conservation.

Heavy fuel oil C sales for electric utilities in FY2014 will record a substantial decline of 23.6% because of a shift to other electricity sources. In FY2015, those sales will drop by a further 32.7% due to the restart of nuclear power plants as well as the shift. Heavy fuel oil C sales for others will decline by 4.6% and 6.3% in FY2014 and FY2015, respectively, due to a fuel switch and energy conservation. Heavy fuel oil B and C sales' share of total fuel sales in FY2015 will decline to a record low of 7.8%.

Liquefied petroleum gas sales in FY2014 will increase by 0.4% from the previous year for the first rise in two years due to an increase in residential water-heating demand under cooler summer weather. In FY2015, LPG sales will decrease by 0.8% as a switch from LPG to other energy continues. Annual LPG sales between FY2013 and FY2015 will thus remain around 15.5 Mt.

Table 9 | Fuel oils and LPG sales

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Fuel oils (GL)	196.0	196.3	197.8	193.5	184.1	180.5	-2.1%	-4.9%	-2.0%
Gasoline	58.2	57.2	56.2	55.4	53.4	54.2	-1.4%	-3.6%	1.5%
Naphtha	46.7	43.7	43.2	45.7	43.8	44.4	6.0%	-4.3%	1.3%
Jet fuel	5.2	4.2	4.0	5.1	5.1	5.1	27.1%	0.9%	-0.3%
Kerosene	20.4	19.6	18.9	17.9	16.9	16.6	-5.2%	-5.6%	-1.5%
Diesel oil	32.9	32.9	33.4	34.1	33.9	33.9	2.1%	-0.6%	0.2%
Heavy fuel oil A	15.4	14.7	13.8	13.4	12.8	12.1	-2.3%	-4.4%	-5.5%
Heavy fuel oil B and C	17.3	24.0	28.4	21.9	18.1	14.1	-22.9%	-17.1%	-22.3%
For electric utilities	7.7	14.9	19.4	14.4	11.0	7.4	-25.7%	-23.6%	-32.7%
For other users	9.7	9.1	9.0	7.5	7.1	6.7	-16.8%	-4.6%	-6.3%
LPG (Mt)	16.5	16.4	16.6	15.5	15.6	15.4	-6.5%	0.4%	-0.8%

Renewable energy power generation

Cumulative burdens for authorised renewable power generation capacity would be JPY46 trillion, equivalent to 11% of electric rates for households and 21% of those for large industrial users. At the end of FY2015, renewable power generation capacity in operation will reach 50 GW

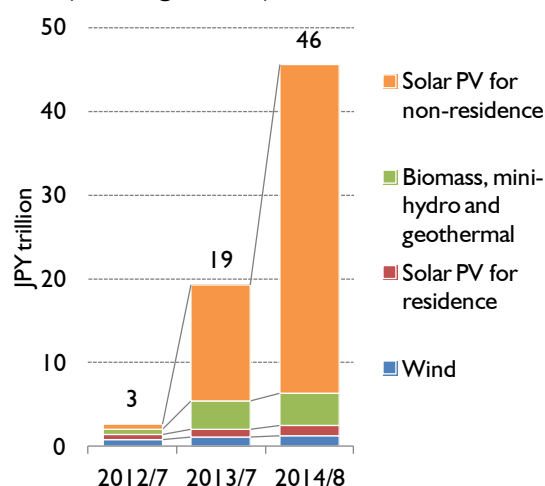
Two years and a half have passed since the feed-in tariff system started for renewable energy power generation. Great hopes have been placed on renewables that is a purely domestic resource and emits no carbon dioxide.

But challenges to tackle have increased. Renewables power generation capacity has increased too rapidly, resulting in a fast burden expansion and turmoil. Authorisation has been cancelled for some projects for which land and equipment have yet to be secured. FIT contract applications have increased too rapidly in some regions, threatening to destabilise electricity supply. Five electric utilities have frozen response to grid connection contract applications.

By the end of August 2014, authorised renewable power generation capacity totalled 92.7 GW (including 74.6 GW in solar photovoltaics and 3.9 GW in wind). If all authorised capacity is put into operation, cumulative burdens for consumers for 20 years will reach JPY46 trillion¹ amounting to JPY2,600/MWh, equivalent to 11% of electric rates for households and 21% of those for large industrial users.

¹ A residual period for electricity purchases from capacity introduced before the FIT system launch is taken into account. The marginal avoidance cost has been computed at JPY10,400/MWh, based on "Renewable Energy FIT System" on the website of the Agency for Natural Resources and Energy. The capacity factors are assumed at 20% for wind power generation, 12% for solar PV, 70% or geothermal, 45% for hydro and 70% for biomass.

Figure 2 | Cumulative burden of FIT over 20 years (as of August 2014)

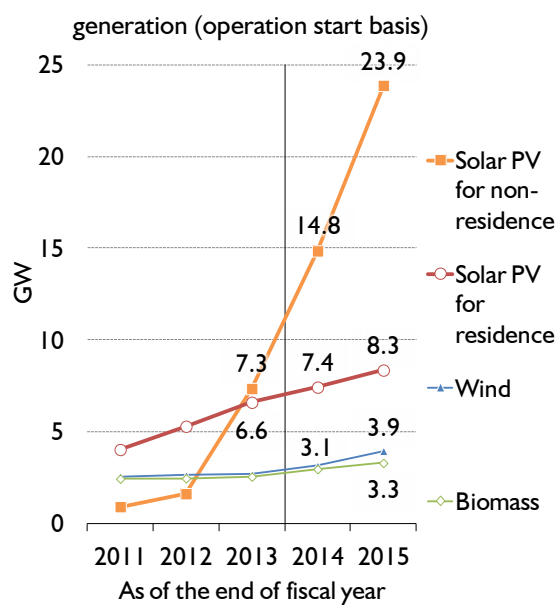


Particularly, the rapid penetration of solar PV for which the feed-in tariff is higher has boosted the total burdens. As authorised non-residential solar PV (mega- and middle-solar) projects are implemented, the burdens will increase further.

The massive penetration of solar PV and wind power generation as variable electricity sources threatens to destabilise grid networks and lower electricity quality. The government is now verifying the feasibility of grid connection for renewable energy. On 16 December, the government released tentative estimates of capacity for renewable energy grid connection. In the face of rejected applications for grid connection and growing requests for grid stabilisation measures, renewable energy power generators may reconsider their plans. If so, growth will decelerate mainly in non-residential solar PV generation. Even in this case, operational renewable power generation capacity subject to the FIT system will reach 50.0 GW by the end of FY2015 as new capacity under construction is put into operation. Non-residential solar PV generation capacity will expand rapidly to 23.9 GW. Residential and non-residential solar PV generation capacity will account for two-thirds of the total renewable power generation capacity. As wind power generation projects take some five years before

starting generation, wind power generation capacity will be limited to 3.9 GW. Total renewable electricity generation in FY2015 will reach 102.1 TWh (including 34.0 TWh in solar PV, 6.9 TWh in wind and 37.9 TWh in small-scale hydro), accounting for some 10% of Japan's total electricity generation.

Figure 3 | Installed capacity of renewable power



Impacts of nuclear power plant restart on economy and energy

The Sendai nuclear power plant's restart, though later than expected initially, is approaching. Regulators are expected to improve plant assessment efficiency

In September 2014, the Nuclear Regulation Authority concluded Units 1 and 2 of Kyushu Electric Power Co.'s Sendai Nuclear Power Plant as conforming to Japan's new regulation standards. In November, the local government of the region hosting the station and the Kagoshima Prefecture governor agreed to its restart. The Sendai Nuclear Power Plant will restart after the NRA's approval of a relevant construction plan and security rule revisions and its final pre-operation inspection.

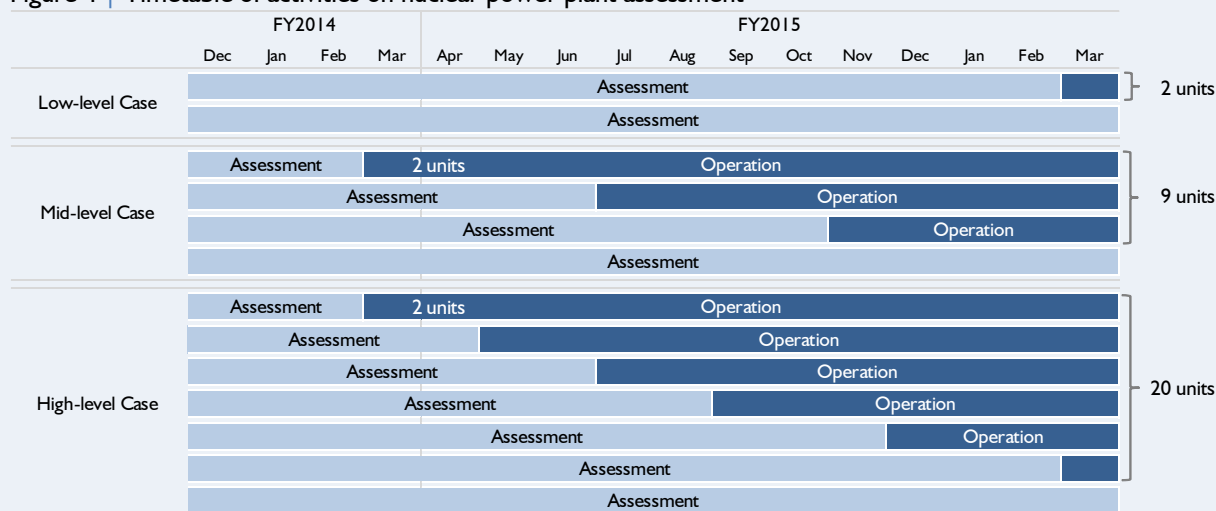
In the "Nuclear Mid-level Case," the NRA is assumed to restore a three-team nuclear power plant examination setup after the Sendai Nuclear Power Plant restarts in around the end of FY2014. An assumption for the later restart of nuclear power plants is based on the present

progress in examination, the presence or absence of large construction operations, the order of applications, etc. In the Mid-level Case, two units will restart in FY2014 with 1.0 TWh of electricity generated. By the end of FY2015, a total of nine units will restart, operating for six months on average to generate 44.4 TWh within the year.

In the "Nuclear High-level Case" where the future examination of nuclear power plants will be completed earlier with the assumption for FY2014 being the same as in the Mid-level Case, a total of 20 units will restart by the end of FY2015, operating for seven months on average to generate 95.8 TWh within the year. The NRA is expected to achieve the High-level Case by expanding its staff and rationalising nuclear power plant examination procedures based on the experiences.

We also developed the Hypothetical Case as a reference case where 32 relatively new units will operate at 80% of their capacity factor.

Figure 4 | Timetable of activities on nuclear power plant assessment



In the Mid-level Case, total fossil fuel imports in FY2015 will be JPY1.9 trillion more than in FY2010. LNG import volume will total 85.0 Mt, 14.5 Mt more than in FY2010. The average power generation cost will be JPY3,000/MWh higher than in FY2010. Energy-related CO₂ emissions will be 45 Mt-CO₂ more. Energy

self-sufficiency rate will be 8.0 percentage points lower.

In the Reference Case [Nuclear High-level Case], fossil fuel imports in FY2015 will be JPY2.0 trillion [JPY1.0 trillion] less than in the Low-level Case. The average power generation

cost will be JPY2,200/MWh [JPY1,100/MWh] less. GDP growth will be 0.3 percentage points [0.1 point] higher. CO₂ emissions will be 117.8 Mt [47.2 Mt] less. Self-sufficiency rate will be 9.9 percentage points [4.1 points] higher. LNG import volume will be 20.6 Mt [8.6 Mt] less than 89.6 Mt in the Low-level Case. In the Reference Case, LNG import volume will be less than before the earthquake disaster. A substantial drop in Japan's LNG imports and the expansion of United States LNG exports from 2016 will

become major factors to ease the supply and demand balance in the international LNG market.

Over a medium to long term, nuclear power plant examination and restart procedures featuring a combination of strictness and promptness after the earthquake disaster, and taking advantage of Japan's nuclear technology and management skills in the international community are required.

Table 10 | Impacts of restarting nuclear power plants

	FY2010	FY2015				
		Low-level	Mid-level	High-level	Hypothetical	
Cumulative number of restarted nuclear reactors ¹	[FY2014]	-	[0]	[2]	[2]	[2]
	FY2015	-	2	9	20	32
Average period for operation (months)		-	1	6	7	10
Electricity generation by nuclear (TWh)	288.2	1.0	44.4	95.8		233.0

	FY2010	FY2015 (Changes from FY2010)				
		Low-level	Mid-level	High-level	Hypothetical	
Economy	Power generation cost ² (JPY/kWh)	8.2	+3.5	+3.0	+2.5	+1.3
	Total fossil fuel imports (JPY trillion)	18.1	+2.3	+1.9	+1.3	+0.3
	Oil	12.3	+0.4	+0.2	-0.0	-0.2
	LNG	3.5	+1.9	+1.6	+1.4	+0.7
	Trade balance (JPY trillion)	5.3	-13.1	-12.7	-12.2	-11.4
	Real GDP (JPY2005 trillion)	512.4	+24.0	+24.4	+24.7	+25.5
	Gross national income (JPY trillion)	493.5	+24.3	+24.7	+25.2	+26.0
Energy	Primary energy supply					
	Oil (GL)	232.3	-13.0	-16.5	-21.4	-25.1
	Natural gas (Mt of LNG equivalent)	73.3	+18.4	+13.8	+9.7	-2.3
	LNG imports (Mt)	70.6	+19.0	+14.5	+10.4	-1.5
Self-sufficiency rate	18.0%	-9.9p	-8.0p	-5.8p	+0.1p	
Environment	Energy-related CO ₂ emissions (Mt-CO ₂)	1,123	+66	+45	+19	-52
	Changes from FY2005	-6.6%	-1.1%	-2.9%	-5.0%	-10.9%
	Local pollutants by electric utilities ³ (kt)					
	NO _x	151	+38	+21	-3	-36
	SO _x	137	+33	+17	-9	-39
PM	3.84	+0.65	+0.44	+0.05	-0.69	

Low-level Case: Only two plants in Sendai Nuclear Power Station restart by the end of FY2015.

Mid-level Case: Two plants in Sendai Nuclear Power Station restart by around the end of FY2014, followed by other plants under the current assessment system and condition.

High-level Case: A case in which the assessment system is enhanced and procedures become more efficient.

Hypothetical Case: A hypothetical case in which relatively new 32 plants generate electricity with 80% of capacity factor.

1. Thirty-nine reactors operated at the end of 2010.

2. Power generation cost in FY2010 is for the general electric utilities, estimated based on their profit-and-loss statements.

3. Local pollutants are estimated based on emission intensity by Keisuke Nansai and Yuichi Moriguchi (2012),

"NO_x, SO_x and PM emissions factors of Japanese stationary sources," National Institute for Environmental Studies.

International energy price changes' impacts on economy and energy

Positive impacts of falling international oil prices

In response to a decision to refrain from cutting crude oil production quotas at a general meeting of the Organization of the Petroleum Exporting Countries on 27 November 2014, oil prices accelerated their decline. The Dubai oil price plunged by more than \$50/bbl from \$108.2/bbl in June to \$57.5/bbl on 15 December. The spot LNG assessment price for Northeast Asia fell by more than \$2.0/MBtu from \$12.1/MBtu six months ago to \$10.0/MBtu. As the dollar rose from JPY102 in June to JPY118 on 15 December, however, yen-denominated domestic prices' declines have been about 14% less than international price drops.

The oil price plunge brought about some JPY150 billion in oil import spending savings for Japan in only initial three months from August 2014. The oil price plunge has yet to bring about any great savings in spending for LNG imports since LNG import prices are linked to oil import prices three months ago. In 2015, however, Japan will benefit from LNG import spending savings similar to oil.

Those positive impacts on imports are spilling over to households and companies. From early June to early December 2014, the average gasoline price in Japan fell from JPY167/L to JPY155/L and the average kerosene price from JPY1,919 per 18 litres to JPY1,800. Electricity prices also declined by about JPY170 per month in six months for a standard Tokyo household. As LNG import prices start a full-blown decline in the future, city gas and electricity price drops will grow more remarkable.

In this way, international oil and LNG price drops have net positive impacts on Japan.

Japan should develop a resilient energy supply and demand structure to prepare for potential rises in international energy prices

Some predict oil prices to drop further as Saudi Arabia is reluctant to cut oil production. On the other hand, there is a risk that cold waves, OPEC's policy turnaround, a stall in shale oil production expansion or some other factor could lead oil prices to rise back. So we have analysed the impacts of higher import prices than in the Base Scenario (\$10/bbl higher than \$67/bbl for crude oil and \$73/t higher than \$507/t for LNG) and lower import prices (\$10/bbl lower for crude oil and \$73/t lower for LNG) on economy, and energy supply and demand.

If the oil price rises by \$10/bbl, real GDP will shrink by 0.3%. Fossil fuel imports will increase by JPY2.4 trillion, leading the trade balance to deteriorate by JPY2.0 trillion. Gross national income per capita will decrease by JPY22,000. Corporate earnings deterioration through increases in raw materials costs will work to reduce private non-residential investment by 0.4%. The income drop and import price rises will reduce the real purchasing power, preventing private consumption from recovering. Japan has grown more vulnerable to international energy price changes than earlier because of the yen's depreciation and the absence of nuclear power generation.

Japan must develop a resilient energy supply and demand structure to achieve stable economic growth without alternating between optimism and pessimism in response to overseas developments. To this end, the nation should develop and pursue the best energy mix through the restart and construction of nuclear power plants over a medium to long term, adopt a reasonable LNG pricing formula, improve and develop institutions for penetrating renewable energy and hydrogen and implement electricity and gas system reform including the diversification of energy sources and procurement sources.

Table II | Impacts of changes in oil price (FY2015)

		Base Scenario (\$67/bbl)	High prices (\$77/bbl)		Low prices (\$57/bbl)	
				Changes from Base		Changes from Base
Economy	Real GDP (JPY2005 trillion)	536.8	535.1	-0.3%	538.5	+0.3%
	Gross national income per capita (JPY million)	4.08	4.06	-0.5%	4.10	+0.5%
	Balance of trade (JPY trillion)	-7.4	-9.4	+28.2%	-5.3	-28.3%
	Fossil fuels	20.0	22.4	+12.4%	17.5	-12.4%
Energy	Primary energy supply (Mtoe)	479.0	476.6	-0.5%	481.8	+0.6%
	Oil (GL)	215.8	214.1	-0.8%	217.7	+0.9%
	Natural gas (Mt of LNG equivalent)	87.0	86.6	-0.5%	87.7	+0.7%

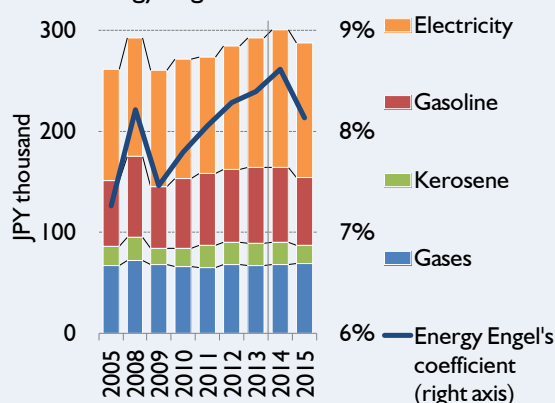
Household energy spending exceeds JPY300,000, remaining high in 2015

Despite spreading electricity and energy conservation efforts, household energy cost in 2014 hits a record high

Each household has redoubled electricity and energy conservation efforts since the Great East Japan Earthquake. Nevertheless, household energy cost has increased.

Earlier, the household² energy cost had peaked in 2008. When the oil import price hit a record \$135/bbl in August 2008, the household energy cost reached JPY290,000 (including a record high of more than JPY100,000 for gasoline and kerosene combined). The energy cost's share of household consumption expenditures (an effective cost indicator, hereinafter referred to as "Energy Engel's coefficient") was 8.2%.

Figure 5 | Household expenditures for energy and "Energy Engel's coefficient"



Source: Compiled and estimated by Statistical Bureau "Family Income and Expenditure Survey"

When the oil import price exceeded \$100/bbl between 2011 and 2013, the household energy cost expanded. In 2014, the household energy cost tops JPY300,000 for the first time ever, with the Energy Engel's coefficient hitting a record 8.6%, due partly to the yen's depreciation. In 2015, the cost will ease slightly on international energy price drops. Nevertheless, the cost will

² Households with two or more persons are covered here.

be almost the same as JPY290,000 in 2008, with the Energy Engel's coefficient at 8.3%, higher than in 2008. Among energy expenses, the electricity expense has gradually increased since the Great East Japan Earthquake. The electricity expense's share of household consumption expenditures exceeded 3.5% in 2011 for the first time ever and rises to 3.9% in 2014 and 3.8% in 2015.

The electricity expense growth has been a major factor in the rising household energy cost in major cities and rural regions since the shutdown of all nuclear power plants

Since Japan began to depend on fossil fuel-fired power generation on the gradual shutdown of nuclear power plants, the rising electricity expense has become a major factor boosting the household energy cost in major cities, small cities and rural municipalities.

The electricity expense is increasing rapidly in large cities from 2013 to 2015. The electricity expense accounted for 40% of household energy cost growth from 2010 in 2013 and will account for 50% in 2014 and for 60% in 2015. In small cities and rural municipalities, the share was 60% in 2013 and will be two-thirds in 2014 and almost 100% in 2015. In this way, the Energy Engel's coefficient in small cities and rural municipalities in 2014 will top 10% for the first time ever.

The future restart of nuclear power plants and declines in oil and LNG import prices will reduce the electricity cost in both large cities, and small cities and rural municipalities. In large cities, LNG import price drops will slightly lower the gas cost in 2015. In small cities and rural municipalities, gasoline and kerosene prices will drop substantially in line with the oil price plunge in 2015 after rising between 2011 and 2014. But Energy Engel's coefficient gaps between large and small cities will fail to narrow so much as energy spending gaps narrow with consumption gaps widening.

If the restart of nuclear power plants fails to make progress, with oil prices resuming spikes under the yen weakened by bold monetary easing, small cities and rural municipalities will particularly be affected. This is because gasoline and kerosene prices will rise back rapidly while the electricity cost will remain high. Japan

should recognise the risk of a steep energy cost increase through hikes in both electricity and gasoline/kerosene prices facing small cities and rural municipalities, and consider and implement measures to avoid the risk with a view to revitalising rural communities.

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