

Economic and Energy Outlook of Japan towards FY2015 - Energy risk casts a shadow over the recovery of the Japanese economy -

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◆ Executive summary of topics

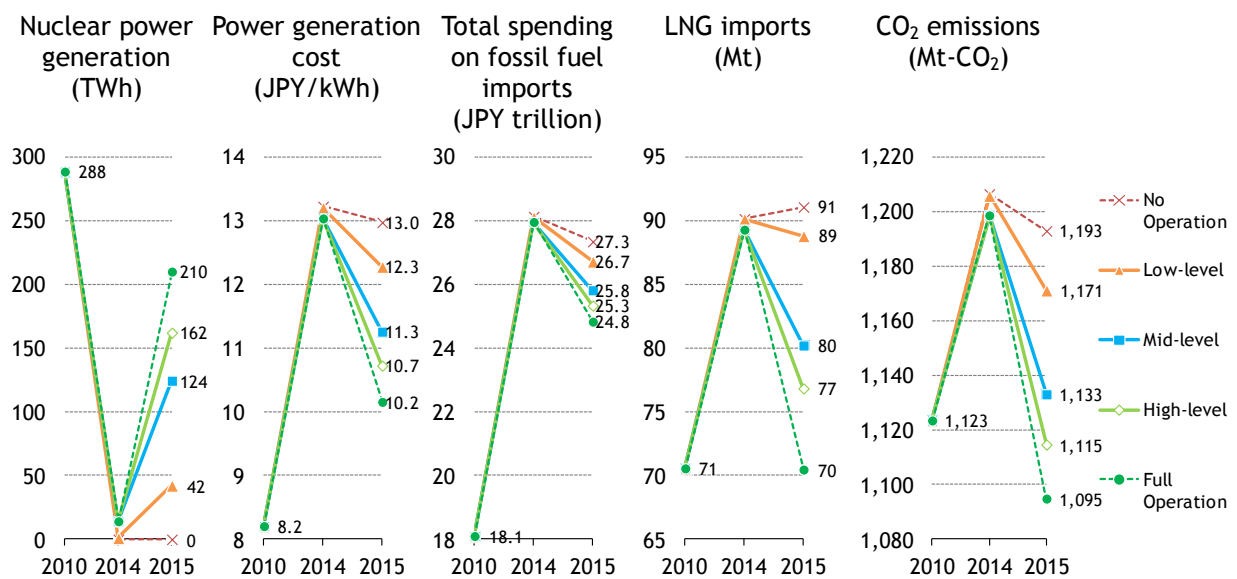
1. Impacts of restarting nuclear power plants - big advantages are expected from a swift completion of the rigorous assessment

- Despite the request for priority treatment, the nuclear safety assessment process remains behind its expected schedule, with the first restart not to occur until early autumn. Following that first approval, the assumptions are that three teams will be provided for the assessment and consideration of the observed developments, the necessity for large-scale construction, the order of the applications, etc... Based on those assumptions, only a total of seven (7) units can be approved by the end of FY2014, operating on average for three months. By the end of FY2015, 19 units, which had already filed applications, can be restarted, for an average operating period of nine months [Nuclear Mid-level Case].
- Under the Mid-level Case, the electricity generated using nuclear power for FY2015 is still less than half of its FY2010 level, raising the average power generation cost by about JPY3,000/MWh compared to FY2010; that's equivalent to an increase in power tariff of 17% for industry and 13% for households. Relative to FY2010, total spending on fossil fuel imports increases by JPY7.7 trillion, of which the LNG additional imports of 9.6 Mt will account for JPY2.8 trillion. Under this scenario, the energy-related carbon dioxide (CO₂) emissions increase by 10 Mt-CO₂, or by 0.9%, while the self-sufficiency rate decreases by 4.6% point.
- If the assessment period turns out to be longer than the one assumed in the Nuclear Mid-level Case, only nine plants (instead of 19) would be allowed to restart by the end of FY2015, generating electricity on average for seven months during FY2015 [Low-level Case]. If the Authorities were able to increase their staff and if more applications were submitted, up to thirty-two (32) plants could restart and operate on average for seven months during FY2015 [High-level Case]. The hypothetical "Full Operation Case," assumes that the 32 plants of the High-level Case do generate electricity throughout the period (rather than just for seven months on average) with an operating rate of 80%. The "No Operation Case" assumes no restart by the end of FY2015.
- 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

This outlook is based on the relevant information available at the time of estimation.

security. For example, the power generation cost under the No Operation Case is JPY2,800/MWh more expensive than under the Full Operation Case. In the No Operation Case the additional spending on fossil fuel imports reaches as much as JPY2.5 trillion. The Full Operation Case accelerates GDP by 0.26% while decreasing CO₂ emissions by 98 Mt-CO₂ and improving the self-sufficiency rate by 9.0% point. The difference in LNG import volume between the two cases would reach 20.6 Mt. The resulting significant decrease in Japan's LNG imports, combined with the anticipated LNG exports from the United States, beginning in 2016, would contribute to a more balanced supply-demand of the international LNG markets in the future.

Impacts by nuclear power plants' restart



2. Risk of higher energy prices - higher risk to be expected with higher dependence on thermal power generation

- International energy prices are highly dependent on the development of the Middle East and Ukrainian situations and may continue to increase. If oil prices increase by \$10/bbl and LNG price goes up by \$50/t, the value of imported fossil fuels into Japan would increase by JPY1.9 trillion. The resulting domestic energy price hike and reduction of wage and profits would decrease real GDP by 0.2% and gross national income would diminish by 0.3%.
- A slowing down of the economic activity would also decrease total primary energy supply. Fuel oil sales would suffer the biggest decrease due to bigger influence on the domestic prices. City gas and electricity would each experience 0.2% sales reduction respectively because of the reduced production activities, income reduction and price hikes.

3. Impact of the Yen depreciation - Higher economic growth induces slight demand increase for city gas and electricity while export's increase effect diminishes

- The Yen depreciation of JPY10/\$ increases real GDP by 0.4% and expands the value of exports by more than 7%. It also increases the value of imports by a similar amount owing to the price hike. Consumer prices should increase by 0.3%, more as the result of the "cost-push" than the "demand-pull."
- Economic expansion induces an increase in energy demand while the JPY-based energy price hike has a cancelling effect and thus total primary energy supply remains relatively unchanged. LNG import volume increases by 0.3%. City gas and electricity sales increase by 0.2% respectively due to production activity expansion while on the other hand, fossil fuel sales, mainly gasoline, decrease by 0.5%.

◆ Executive summary of economic and energy outlook for FY2015 (Base Scenario)

1. Macro economy - sharp growth recovery as raised consumption tax effects reach saturation

- Despite some downward influence from the consumption tax increase, Japan economy grows by 0.9% in FY2014 due to active private non-residential investments and increases in external demand. The trade deficit diminishes to JPY12.1 trillion. For FY2015, the economy grows at 1.6%, higher than the potential growth rate. This is due to higher exports and private non-residential investments as well as to the recovery of private consumption pushed by an improved labour environment.

2. Energy supply and demand - after marking a record high in FY2014, natural gas demand is expected to decrease

- Total primary energy supply in FY2014 slightly decreases for the first time in two years due to a mixed influence of economic, energy conservation and weather factors and remains substantially almost the same in FY2015. With the assumed return of nuclear power plants as in the "Nuclear Mid-Level Case," Japan's self-sufficiency rate regains 13%. Fossil fuels decrease, with oil reaching levels lower than the 200 Mtoe recorded in FY1969.
- Total final energy consumption drops slightly in FY2014 and remains the same in FY2015. Industrial sector's energy consumption increases due to more production activities while consumption in residential and commercial sectors shows sign that the fall is ending, after decreases for four consecutive years since the Great East Japan Earthquake. Transport energy consumption continues the near 1% annual decrease due to fuel efficiency and transport efficiency improvement.

3. Energy sales - city gas goes strong while electricity regains. Tougher situation for fuel oil

- Electricity sales by utilities increase for three consecutive years, led by large industrial users in manufacturing sector. Even the sales for lighting contract mainly for the residential sector grow after the third quarter in 2015, and for the first time since the earthquake.
- City gas sales by general gas utilities increase, recording a historical high for the fifth year in a row. Sales for industrial use show steady growth, remaining to be a key driver. Except for the rebound from the hot summer, the residential sales keep a long downward trend.
- Fuel oil sales show a clear downward trend and may fall below 180 GL for the first time in half a century by FY2016. Gasoline drops to 53 GL, which is the lowest level since FY1996, immediately after the abolishment of Special Petroleum Act¹.

4. Renewable Power Generation - operational capacities will soon be 55 GW. If all the authorised 89 GW become operational, the accumulated cost burden could be JPY44 trillion

- Supported by high fixed prices under FIT contracts, renewable power generation will continue to expand. The capacities expected to be in operation by the end of FY2015, mainly Mega-solar, will reach 55 GW. By the end of March 2014, 89 GW (of which 71 GW is solar PV) had been authorised. If all of this capacity becomes operational, consumers' cumulative burdens for the 20 years will reach JPY44 trillion.

5. CO₂ emissions - decrease in FY2014 after recording new high in FY2013

- Energy-related CO₂ emissions in FY2014 will be less than 1,200 Mt, decreasing for the first time in five years despite the new high consumption of natural gas. The decrease in oil and coal consumption reduces the emissions. It is a decrease of 0.3% compared to the FY2005 emissions while an increase of 13.2% compared to the FY1990 emissions. The CO₂ emissions will decrease even further in FY2015 due to the restart of nuclear power plants. Energy consumption will be less than before the earthquake but the level of CO₂ emissions will remain high.

¹ Act on Interim Measures concerning the Importation of Designated Petroleum Products

Summary (Base Scenario)

		Historical				Projections		Year-to-year changes		
		FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Energy	Primary energy supply (Mtoe) ¹	514.3	491.1	484.6	486.4	485.0	486.8	0.4%	-0.3%	0.4%
	Oil ² (GL)	232.4	238.4	242.4	234.6	225.0	214.6	-3.2%	-4.1%	-4.6%
	Natural gas ² (Mt)	73.2	85.8	89.4	90.1	92.4	83.2	0.8%	2.6%	-10.0%
	LNG imports (Mt)	70.6	83.2	86.9	87.7	89.3	80.2	1.0%	1.8%	-10.2%
	Coal ² (Mt)	184.6	175.1	183.3	194.2	193.4	188.0	6.0%	-0.4%	-2.7%
	Nuclear ³ (TWh)	288.2	101.7	15.9	9.3	14.1	124.3	-41.6%	51.9%	779.4%
	Final energy consumption ⁶ (Mtoe)	343.6	334.4	329.9	331.5	330.5	330.7	0.5%	-0.3%	0.1%
	Industry ⁴	162.9	159.0	156.0	158.2	158.2	159.2	1.4%	0.0%	0.6%
	Buildings	97.3	93.8	92.5	91.5	91.3	91.2	-1.1%	-0.3%	-0.1%
	Transport	83.4	81.7	81.4	81.7	80.9	80.2	0.4%	-0.9%	-0.8%
	Petroleum products	178.1	172.1	168.8	169.2	167.6	166.4	0.2%	-0.9%	-0.8%
	Natural gas and city gas	35.0	36.3	36.3	37.6	38.3	39.2	3.6%	1.9%	2.4%
	Coal and coal products	38.0	37.8	37.7	38.5	38.3	38.6	2.2%	-0.4%	0.8%
	Electricity	88.9	84.8	83.9	83.0	83.0	83.3	-1.1%	0.1%	0.3%
	Electricity sales (TWh)	926.6	879.5	870.9	871.5	873.0	876.8	0.1%	0.2%	0.4%
	City gas sales ⁵ (Billion m ³)	35.28	35.91	36.32	36.69	37.48	38.05	1.0%	2.1%	1.5%
	Fuel oil sales (GL)	196.0	196.3	197.8	193.5	187.9	181.7	-2.1%	-2.9%	-3.3%
Energy-related CO ₂ emissions ⁶ (Mt-CO ₂) (FY2005=100)	1,123 93.4	1,173 97.6	1,207 100.3	1,218 101.2	1,199 99.7	1,133 94.2	0.9% ..	-1.6% ..	-5.5% ..	
Prices	Crude oil, import, CIF (\$/bbl)	84	114	114	110	110	108	-3.6%	0.2%	-2.1%
	LNG, import, CIF (\$/t)	584	823	866	837	821	776	-3.3%	-2.0%	-5.5%
	Steam coal, import, CIF (\$/t)	114	144	127	108	101	110	-15.1%	-6.1%	8.6%
Economy	Nominal GDP (JPY trillion)	480.2	473.7	472.6	481.7	492.8	505.7	1.9%	2.3%	2.6%
	Real GDP (JPY2005 trillion)	512.4	514.1	517.5	529.4	534.4	542.8	2.3%	0.9%	1.6%
	Industrial production index (CY2010=100)	99.4	98.8	95.8	99.0	100.1	102.2	3.3%	1.1%	2.1%
	Exchange rate (JPY/\$)	86.1	79.0	82.6	99.7	102.0	102.0	20.6%	2.3%	-0.0%

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
3. The Mid-level Case
4. Industry includes non-energy use.
5. Conversion factors; 1 m³ = 10,000 kcal
6. Final energy consumption and CO₂ emissions in FY2013 are estimation.

1. Introduction

Prospects for the Japanese economy, though being patchy, have brightened thanks to Prime Minister Shinzo Abe's Abenomics economic policy, business confidence improvements and greater business efficiency. Regarding energy, however, there are many challenges including the tight electricity supply-demand balance, continuously high fuel costs, the risk of renewable energy power generation biased toward photovoltaics, and the destabilising Middle East and Ukraine situations. These challenges must be mitigated or resolved for Japan's sustainable economic growth. In order to contribute to analysing challenges for the immediate future and considering a desirable energy mix, we have projected the Japanese economy and energy supply and demand through FY2015 and assessed and analysed various implications of the projection.

2. Major assumptions in the Base Scenario

(1) World economy

We assume that the world economy will continue a moderate expansion from FY2014 through FY2015. The United States economy will retain an overall upward trend due mainly to a continuous increase in private consumption accounting for 70% of its gross domestic product, boosting its annual growth rate to a 2.5-3.0% range in 2015. The European economy, though plagued with uncertain factors such as tense relations with Russia and disinflation, will achieve a moderate recovery with an annual growth rate in a 1.0-1.5% range on the strength of stabilised financial markets. The Asian economy will maintain an annual growth rate of 6% or more, although China, India and some members of the Association of Southeast Asian Nations will decelerate economic growth.

(2) Oil, LNG and coal CIF prices

We assume the oil import CIF price for Japan will rise to \$112/bbl toward the end of this year before averaging \$108/bbl in FY2015. The liquefied natural gas import price will fall to \$828/t towards the end of this year before averaging \$776/t in FY2015. The steam coal import price will rise to \$110/t in FY2015 as the international supply-demand balance tightens. For details, see "Latest International Oil, Natural Gas and Coal Market Outlook," a report given at the 415th Forum on Research Work.

(3) Exchange rate

We assume the average dollar-to-yen exchange rate at JPY102/\$ in and after the second half of 2014.

(4) Taxes

We assume the consumption tax will be raised to 10% in October 2015, with the corporate tax rate beginning to be cut in FY2015.

(5) Nuclear power generation

Based on progress in the submission of data for the assessment of nuclear power plants' conformity with new regulation standards and in the assessment, we assume that nuclear power plants will gradually restart from the second half of FY2014. In the Nuclear Mid-level Case for the Base Scenario, seven nuclear reactors will restart by the end of FY2014. By the end of FY2015, 19 reactors will restart in FY2015, generating 124 TWh in the year.

(6) Electricity supply and demand

Based on discussions at the government's Electricity Supply-Demand Verification Subcommittee, we assume that the supply-demand balance in this summer will be tighter than last summer, with Kansai Electric Power Co. and Kyushu Electric Power Co. failing to secure a reserve capacity rate of 3%. Electric utilities in western Japan will enhance their supply capacity by receiving supply from those in eastern Japan. But there are potential risks including the unscheduled suspension of fossil fuel-fired power plants and temperature changes.

(7) Temperatures

Based on the three-month weather forecast by the Japan Meteorological Agency, we assume a cooler summer for FY2014 than for the previous year (-1.3 degrees Celsius), a slightly colder winter for FY2014 (-0.3°C) and average temperatures throughout for FY2015.

3. Macro economy

In FY2014, the Japanese economy will grow by 0.9% on robust non-residential investment and exports despite the impact of the consumption tax increase

Among private demand components, non-residential investment will increase thanks to government economic measures and corporate earnings improvements through companies' business efforts. Private consumption, though affected by the consumption tax increase, will start to recover from this summer. Private demand as a whole will contribute to 0.6 percentage points of the FY2014 economic growth. Among public demand components, public investment will peak out, while social security and other expenditures will increase. Public demand as a whole will expand slightly. Exports will increase due to firm overseas economies coupled with the depreciation of the yen. Imports will also rise in line with the domestic demand expansion. As exports grow faster than imports for the first time in four years, however, the trade balance will improve. Japan's trade deficit in FY2014 will narrow to JPY12.1 trillion from a record JPY13.8 trillion in FY2013. Even the narrower deficit will be the second largest ever. The Bank of Japan's extraordinary monetary easing will exert some impact on prices. Due partly to the consumption tax hike, nominal economic growth will exceed real growth for the first time in 17 years. But it will not be easy for the central bank to achieve the target inflation rate of 2% (excluding the impact of the consumption tax hike) within FY2014.

In FY2015, the Japanese economy will grow by 1.6% on recovery in private consumption as well as non-residential investment and exports. Nominal gross domestic product will top JPY500 trillion for the first time in eight years.

Among private demand components, non-residential investment will expand for the utilisation of accumulated capital, further productivity improvements and other purposes, exceeding JPY70 trillion to achieve the target in the government's Japan Revitalisation Strategy. Backed by improvements in employment environment, private consumption will absorb the impact of the consumption tax hike in October and post an increase. Private demand as a whole will contribute to 1.0 percentage point of the economic growth in FY2015. Among public demand components, social security and some other outlays will increase, while public investment will be curtailed. Public demand as a whole will level off from the previous year. Exports will continue increasing due mainly to the deeper-rooted correction to the earlier appreciation of the yen and overseas economic growth. While imports will top JPY90 trillion for the first time ever, fossil fuel imports in value will decline in line with the restart of nuclear power plants. Japan's trade deficit will fall to JPY7.2 trillion.

Table 1: Macroeconomic indicators

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Real GDP (JPY2005 trillion)	512.4	514.1	517.5	529.4	534.4	542.8	2.3%	0.9%	1.6%
Private demand	377.1	383.3	388.7	397.4	400.0	404.8	2.2%	0.7%	1.2%
Private consumption	299.7	303.9	308.4	316.2	314.1	316.6	2.5%	-0.7%	0.8%
Private residential investment	12.5	12.9	13.6	14.9	13.8	13.8	9.5%	-7.6%	0.2%
Private non-residential investment	64.9	68.0	68.5	69.7	72.6	74.7	1.7%	4.2%	2.8%
Public demand	118.5	119.2	120.9	126.1	126.8	126.8	4.3%	0.5%	-0.0%
Government consumption	97.9	99.1	100.6	102.7	103.7	104.8	2.1%	1.0%	1.0%
Public investment	20.7	20.1	20.3	23.4	23.1	22.0	15.3%	-1.4%	-4.7%
Net exports of goods and services	16.8	12.0	8.4	7.1	8.7	12.4	-15.5%	23.0%	42.6%
Exports of goods and services	83.6	82.3	81.3	85.2	89.7	95.5	4.7%	5.3%	6.5%
Imports of goods and services	66.8	70.3	72.9	78.1	81.0	83.1	7.1%	3.7%	2.7%
Nominal GDP (JPY trillion)	480.2	473.7	472.6	481.7	492.8	505.7	1.9%	2.3%	2.6%
Balance of trade (JPY trillion)	5.3	-4.4	-8.2	-13.8	-12.1	-7.2	68.6%	-12.2%	-40.2%
Exports	67.8	65.3	63.9	70.9	77.5	83.9	10.8%	9.4%	8.3%
Imports	62.5	69.7	72.1	84.6	89.6	91.2	17.4%	5.9%	1.8%
Fossil fuels	18.1	23.1	24.6	28.3	27.9	25.8	15.0%	-1.4%	-7.7%
Domestic corporate goods price index (CY2010=100)	100.2	101.6	100.6	102.3	106.4	108.3	1.8%	3.9%	1.8%
Consumer price index (CY2010=100)	99.9	99.8	99.5	100.4	103.2	104.9	0.9%	2.8%	1.7%
GDP deflator (CY2005=100)	93.7	92.1	91.3	91.0	92.2	93.2	-0.4%	1.3%	1.0%

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

4. Industrial production

Crude steel production, though affected by the consumption tax hike, will rise to a high level on recovery in domestic demand in FY2015.

In FY2014, crude steel output will decrease by 0.7% from the previous year due to a substantial decline in automobile production under the impact of the consumption tax hike in Japan and oversupply in China and Republic of Korea. In FY2015, recovery in demand for steel for vehicles in Japan and improvements in exports amid the robust world economy will allow crude steel output to rise 0.5% to a level representing full-capacity operation.

Ethylene production will exceed 6.7 Mt for the third straight year with domestic demand and exports maintained.

In FY2014, ethylene exports will be robust with domestic demand remaining stable. Ethylene output in the year will fall by 0.6% as production recovers in the second half after decreasing due to regular checks on many production facilities. In FY2015, ethylene output will expand by 0.5% due to a shift from imports to domestic products and unchanged exports, despite a levelling-off in domestic demand. The capacity factor will remain above 90%.

Cement production will top 62 Mt for the third straight year thanks to domestic demand including reconstruction after the March 2011 Great East Japan Earthquake and robust construction.

In FY2014, cement output will exceed 62 Mt, representing a ceiling under capacity and personnel constraints as in the previous year, while posting a 0.1% drop. In FY2015, cement production will remain robust, increasing by 0.3% from the previous year. After a production capacity cut, full-capacity operation will continue.

Paper and paperboard production will fall due mainly to a shift to electronic media, despite the impact of an economic pickup including recovery in private consumption.

In FY2014, paperboard production will benefit from an economic pickup. But paper output will be affected by a long-term shift from paper to electronic media and a demand drop after a last-minute increase before the consumption tax hike. Paper and paperboard production in the year will thus post a 1.5% decline. In FY2015, paperboard output will slightly increase due mainly to a rise in demand for paperboard for processed food products amid a private consumption recovery. But paper demand will continue a long-term downward trend. Paper and paperboard output in the year will drop by 0.3%.

Automobile production will decline due to a substantial domestic demand drop attributable to the consumption tax hike, before rising back to 9.5 million units in FY2015.

In FY2014, domestic demand for automobiles will decrease substantially due to the consumption tax hike. Exports will benefit from the depreciation of the yen. But the yen depreciation's effects have declined due to Japanese automakers' expansion of overseas production. Automobile production will thus decrease by 5.0% from the previous year. In FY2015, automobile production will rebound with a 1.5% gain as domestic demand expands on the economic recovery.

Table 2: 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	110.8	111.4	3.9%	-0.7%	0.5%
	Ethylene (Mt)	7.00	6.47	6.26	6.76	6.72	6.75	8.0%	-0.6%	0.5%
	Cement (Mt)	56.1	57.6	59.5	62.4	62.3	62.5	4.9%	-0.1%	0.3%
	Paper and paperboard (Mt)	27.3	26.5	25.7	26.7	26.3	26.2	3.6%	-1.5%	-0.3%
	Automobiles (Million units)	8.99	9.27	9.55	9.91	9.42	9.57	3.8%	-5.0%	1.5%
Production indices	Mining and manufacturing (CY2010=100)	99.4	98.8	95.8	99.0	100.1	102.2	3.3%	1.1%	2.1%
	Food	98.1	97.3	96.7	97.7	99.1	99.4	1.0%	1.4%	0.3%
	Chemicals	99.8	98.3	96.5	98.4	99.0	100.5	2.0%	0.6%	1.4%
	Non-ferrous metals	98.9	97.5	96.6	97.9	98.5	99.5	1.4%	0.6%	1.0%
	General and electrical machinery, etc.	101.3	100.3	93.1	97.4	99.8	103.0	4.6%	2.4%	3.2%
Tertiary industry activity index (CY2005=100)		97.8	98.4	99.2	100.4	101.3	102.3	1.2%	0.8%	1.1%

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.

5. Primary energy supply

Primary energy supply in Japan in FY2014 will fall slightly for the first time drop in two years while natural gas supply will hit a new high. In FY2015, Japan's energy self-sufficiency rate will rise back to 13%.

Primary energy supply in Japan in FY2014 will log a small fall of 0.3% from the previous year due mainly to temperature changes and electricity and energy conservation, although manufacturing industry output will recover gradually. In FY2015, primary energy supply will substantially level off as continuous energy conservation efforts offset the impact of an economic expansion.

Coal demand in FY2014 will turn down with a 0.4% drop due to the oil and coal tax hike coupled with a drop in crude steel production, although coal-fired power generation capacity will increase. In FY2015, the coal demand decline will widen to 2.6% despite a crude steel production recovery as coal-fired power generation decreases in line with the restart of nuclear power plants.

Oil demand in FY2014 will decrease by 4.1% as high-cost oil-fired power generation drops in accordance with an increase in LNG-fired power generation. Oil consumption at 205 Mtoe in the year is equivalent to the FY1970 level before the first oil crisis. In FY2015 when the restart of nuclear power plants will make progress, oil demand will slip below 200 Mtoe for the first time in almost half a century, with oil's share of total primary energy supply falling to 40%.

Demand for natural gas for power generation will increase further in FY2014 as the impact of the restart of nuclear power plants is still limited. City gas sales mainly for the industrial sector will be firm due mainly to a switch to gas from other fuels. As some thermal power generation plants using LNG and city gas launch operation, the year's overall natural gas demand will expand by 2.6%, hitting a new high for the fifth consecutive year. In FY2015, natural gas demand will turn down with a 10.0% plunge to the lowest level since the Great East Japan Earthquake as nuclear power plants restart.

In FY2014, nuclear power generation in FY2014 will remain unchanged from FY2012 or 2013 despite the restart of some nuclear power plants as the number of nuclear reactors in operation and periods for their operation are still limited. In FY2015, nuclear power generation will score a rapid nine-fold increase. But it will still be limited to less than half the level before the earthquake.

Energy-related carbon dioxide emissions in FY2014 will drop for the first time in five years as coal and oil consumption decreases despite a natural gas consumption increase, slipping below 1,200 Mt for the first time in three years. In FY2015, CO₂ emissions will decline further as fossil fuel consumption falls further on progress in the restart of nuclear power plants. The emissions will fall short of dropping below the level before the earthquake.

Table 3: Primary energy supply

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Primary energy supply (Mtoe)	514.3	491.1	484.6	486.4	485.0	486.8	0.4%	-0.3%	0.4%
Coal	119.1	112.8	117.7	125.4	124.9	121.6	6.6%	-0.4%	-2.6%
Oil	212.0	217.6	221.2	214.1	205.3	195.8	-3.2%	-4.1%	-4.6%
Natural gas	95.5	112.0	116.6	117.5	120.5	108.5	0.8%	2.6%	-10.0%
Hydro	18.2	18.5	16.7	17.2	18.3	18.2	2.7%	6.4%	-0.4%
Nuclear	60.7	21.4	3.4	2.0	3.0	26.2	-41.6%	51.9%	779.4%
Others	8.7	8.8	9.1	10.3	13.0	16.5	13.6%	26.5%	26.6%
Self-sufficiency	18%	11%	7%	7%	8%	13%
Energy intensity (FY2005=100)	94.1	89.6	87.8	86.1	85.1	84.1	-1.9%	-1.2%	-1.2%
Energy-related CO ₂ emissions (Mt)	1,123	1,173	1,207	1,218	1,199	1,133	0.9%	-1.6%	-5.5%
(FY2005=100)	93.4	97.6	100.3	101.2	99.7	94.2

Note: "Others" include geothermal, new energies, etc.

6. Final energy consumption

Japan's final energy consumption will fall slightly in FY2014 and level off in FY2015. It will be stable at levels some 4% less than before the earthquake.

Final energy consumption in FY2014 will post a small drop of 0.3% from the previous year due mainly to slower economic growth and progress in electricity and energy conservation. Consumption changes will differ from sector to sector in FY2015. But overall consumption will almost level off. As a result, final energy consumption will remain stable in the 330-331 Mtoe range since FY2012.

The industrial sector will gradually recover production in FY2014 as the demand fall following a last-minute increase before the consumption tax hike is limited. Its energy consumption in the year will remain unchanged from the previous year. Due mainly to progress in fuel switching, city gas and electricity consumption will expand, with kerosene, diesel and fuel oil consumption declining. Coal and naphtha consumption will also decrease because of drops in energy-intensive crude steel and petrochemical output. In FY2015, the industrial sector will expand energy consumption by 0.6% as industrial production including crude steel and ethylene expands more remarkably.

The residential sector, which has continued a downward trend of energy consumption since the earthquake, will narrow its energy consumption reduction to 0.2% in FY2014 and FY2015. In FY2014, city gas and liquefied petroleum gas consumption will increase as water-heating demand expands due to lower-than-usual winter temperatures. Meanwhile, kerosene consumption vulnerable to fuel switching will decrease along with electricity consumption affected by electricity conservation and a reaction to heat waves last summer. In FY2015, the sector will post a small fall in energy consumption. But its electricity consumption will stop falling for the first time since the earthquake.

The commercial sector will log a 0.4% drop in energy consumption in FY2014 before expanding consumption slightly, although electricity and energy conservation will continue. In FY2014, electricity consumption will increase while oil and city gas consumption will decrease. In FY2015, the sector will expand electricity and city gas consumption on the strength of the robust economy. But its kerosene and heavy fuel oil A consumption will continue declining due to fuel switching.

The transportation sector will return to a long downward trend for energy consumption due to a ceiling on the domestic automobile fleet, fuel efficiency improvements accompanying expanding market shares for mini-vehicles and other fuel-efficient cars and transportation efficiency improvements through cooperative programs. The sector's energy consumption reduction in FY2014 and FY2015 will total 1.4 Mtoe, making the sector the largest consumption reducer in the two-year period for this outlook. The sector's consumption in FY2015 will come to 80.2 Mtoe, a level seen 22 years ago.

Table 4: Final energy consumption

	Historical			Estimated	Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Final energy consumption (Mtoe)	343.6	334.4	329.9	331.5	330.5	330.7	0.5%	-0.3%	0.1%
Industry	162.9	159.0	156.0	158.2	158.2	159.2	1.4%	0.0%	0.6%
Buildings	97.3	93.8	92.5	91.5	91.3	91.2	-1.1%	-0.3%	-0.1%
Residential	54.6	52.8	52.0	51.2	51.1	51.0	-1.5%	-0.2%	-0.2%
Commercial	42.7	41.0	40.5	40.3	40.1	40.2	-0.6%	-0.4%	0.1%
Transport	83.4	81.7	81.4	81.7	80.9	80.2	0.4%	-0.9%	-0.8%
Coal and coal products	38.0	37.8	37.7	38.5	38.3	38.6	2.2%	-0.4%	0.8%
Petroleum products	178.1	172.1	168.8	169.2	167.6	166.4	0.2%	-0.9%	-0.8%
City gas and natural gas	35.0	36.3	36.3	37.6	38.3	39.2	3.6%	1.9%	2.4%
Electricity	88.9	84.8	83.9	83.0	83.0	83.3	-1.1%	0.1%	0.3%
Others	3.7	3.4	3.3	3.2	3.2	3.2	-0.5%	-0.4%	-0.1%

Note: Industry includes non-energy use.

7. Electricity sales (electric utilities)

Electricity sales in FY2014 will continue increasing. In FY2015, electricity sales will rise to the highest level since the earthquake as sales under lighting contracts turn up.

In the summer of FY2014, the electricity supply-demand balance in central and western Japan will be far tighter than a year earlier due to the absence of nuclear power generation and trouble at the second unit of the Matsuura coal-fired power plant. Electricity sales under lighting contracts mainly for the residential sector in FY2014 will decline as summer temperatures are lower than a year earlier. But sales to the industrial sector including large-scale industrial users will increase firmly. Overall electricity sales will post a small rise of 0.2% in FY2014. In FY2015, the supply-demand balance will ease substantially due to the restart of nuclear power plants. The impact of the last-minute demand increase before the consumption tax hike and the reactionary fall after the hike will be small for the whole of the year. Sales to manufacturers will score a strong increase. Electricity sales excluding those under lighting contracts will reach the highest level since the earthquake. Sales under lighting contracts will increase toward the second half of the year. Overall electricity sales in FY2015 will increase by 0.4%.

Table 5: 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	873.0	876.8	0.1%	0.2%	0.4%
Lighting contracts	304.2	288.9	286.2	284.3	282.6	282.7	-0.7%	-0.6%	0.0%
Power contracts	622.4	590.5	584.7	587.2	590.4	594.1	0.4%	0.6%	0.6%
of which: Large-scale industrial users	283.2	274.1	267.4	269.3	272.0	275.3	0.7%	1.0%	1.2%
Mining and manufacturing	234.4	227.9	221.3	222.8	225.3	228.2	0.7%	1.1%	1.3%
Chemicals	28.1	27.2	26.3	26.6	26.8	27.1	0.9%	0.9%	0.9%
Iron and steel	36.3	36.5	36.0	37.3	37.7	38.1	3.8%	1.1%	1.1%
Machinery	74.6	71.6	69.0	69.2	70.5	71.9	0.4%	1.8%	2.1%

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

LNG-fired plants' share of power generation will exceed 50% in FY2014 for the first time ever before falling sharply due to the restart of nuclear power plants in FY2015.

In FY2014, LNG-fired plants will account for more than 50% (412 TWh) of power generation by electric utilities. Coal-fired power generation will level off, while generation with oil, etc. will decline. In FY2015, generation with oil, etc. will decline further as nuclear power generation increases. Coal power generation will also decrease as delayed regular checkups are implemented. While LNG power generation capacity will increase with the addition of the fourth to sixth units at the Himeji Daini plant (launching operation between August 2014 and March 2015) and the third unit at the Shin Sendai plant (in December 2015), the capacity

factor will fall back to the level before the earthquake. LNG power generation will thus decline to 347 TWh, still some 20% more than 290 TWh in FY2010.

Table 6: Power generation mix (electric utilities)

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Electricity generation (TWh)	918.2	857.4	822.0	823.7	822.3	821.0	0.2%	-0.2%	-0.2%
Share							Year-to-year changes		
Hydro	8%	9%	8%	8%	9%	9%	+0.1p	+0.6p	-0.0p
Fossil fuel-fired thermal	60%	79%	90%	90%	89%	76%	+0.7p	-1.2p	-13.4p
Coal	23%	24%	25%	28%	29%	27%	+3.5p	+0.1p	-1.6p
Natural gas and city gas	32%	43%	48%	49%	50%	42%	+0.7p	+1.6p	-7.9p
Oil, etc.	6%	13%	17%	13%	10%	6%	-3.5p	-2.8p	-3.9p
Nuclear	31%	12%	2%	1%	2%	15%	-0.8p	+0.6p	+13.4p
Others	0%	0%	0%	0%	0%	0%	-0.0p	+0.0p	+0.0p

Note: Electricity purchased is not included.

8. City gas sales (general gas utilities)

City gas sales will rise to 38 billion m³ in FY2015, rewriting the record high for the fifth straight year.

City gas sales for commercial and other (medical and public) uses in FY2014 will decline as air conditioning demand falls due to lower summer temperatures than in the previous year. In the residential sector, water-heating demand will increase due to a lower average temperature than in the previous year. Sales for industrial uses will also expand substantially thanks to power generation demand in the Kanto region and fuel switching. City gas sales as a whole will increase by 2.1%. While city gas sales for residential uses will slightly decline in FY2015, those for commercial and other uses will increase due to the spread of gas-powered air-conditioning and gas-fired cogeneration systems. City gas sales for industrial uses will also increase firmly due mainly to fuel switching. Overall city gas sales will rise by 1.5%, rewriting the record high for the fifth straight year.

City gas sales for residential sector in FY2014 will increase by 1.1% for the first rise in two years due mainly to greater water-heating demand under a lower average temperature than in the previous year. In FY2015 when temperatures are assumed to remain unchanged, sales will fall by 0.1% due primarily to the spread of energy-saving systems. While the number of contracts for sales for residential uses will increase due chiefly to the expansion of gas utilities' service areas and fuel switching from LPG and kerosene, a long-term trend in which sales for residential uses decline moderately continues (if without the impact of lower summer temperatures) due chiefly to the spread of more efficient equipment, such as water heaters, and shrinking household sizes. Residential uses' share of total city gas sales, which had exceeded 60%, will shrink to a quarter in FY2015.

Sales for commercial and other uses in FY2014 will decrease (by 1.3% for commercial uses and 1.1% for other uses) due mainly to a decline in air-conditioning demand in reaction to heat waves in 2013, and energy and electricity conservation. In FY2015, sales for these uses will increase (by 2.5% for commercial uses and 2.0% for other uses) as the effects of the penetration of gas air-conditioning and gas cogeneration systems exceed those of energy and electricity conservation. Gas cogeneration capacity will continue increasing on growing interests in disaster-resistant energy systems in the wake of the Great East Japan Earthquake. Gas air-conditioning systems can contribute to easing peak summer demand for power and will diffuse further.

Sales for industrial uses in FY2014 will expand substantially thanks primarily to the launch of commercial operation at a large gas-fired combined cycle power unit (the seventh unit at the Kashima power station) and recovery in manufacturers' production in and after the second half of the year. Annual sales for industrial uses will rise by 3.9%, topping 20 billion m³ for the first time ever. In FY2015, they will increase by 2.0% for the sixth straight

year of growth due mainly to new demand through fuel switching and higher operating rates for existing equipment in line with manufacturers' production expansion. Over recent years, city gas sales per contract for industrial uses have increased rapidly because of large-scale users' introduction of natural gas mainly for power generation, while the number of contracts for industrial uses has declined. This trend is expected to continue in the future. Industrial uses' share of city gas sales will reach 55% in FY2015, compared with some 40% in the first half of the 2000s. Industrial uses will continue contributing greatly to growth in overall city gas sales.

Table 7: City gas sales (general city gas utilities)

	Historical				Projections		Year-to-year changes		
	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2013	FY2014	FY2015
Total (Billion m ³)	35.28	35.91	36.32	36.69	37.48	38.05	1.0%	2.1%	1.5%
Residential	9.79	9.79	9.80	9.55	9.66	9.65	-2.5%	1.1%	-0.1%
Commercial	4.74	4.48	4.50	4.47	4.41	4.52	-0.6%	-1.3%	2.5%
Industrial	17.63	18.67	19.03	19.63	20.40	20.81	3.2%	3.9%	2.0%
Others	3.13	2.97	3.00	3.04	3.00	3.06	1.3%	-1.1%	2.0%

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

9. Fuel oil and LPG sales

Fuel oil and LPG sales will see a clearer downward trend again. In two years, these sales could slip below 180 GL for the first time in half a century.

Fuel oil sales will continue a downward trend because of fuel switching, energy conservation progress including improvements in vehicle fuel economy, a decline in heavy fuel oil C consumption for power generation accompanying the restart of nuclear power plants, and high oil prices. Drops in FY2014 and FY2015 will total nearly 12 GL.

Gasoline sales will continue a year-on-year fall of around 1.5% due mainly to improvements in vehicle fuel economy through the penetration of fuel efficient vehicles and growth in the mini-vehicle fleet. In FY2015, gasoline sales will slip below 54 GL for the first time since FY1996 just after the abolition of the special petroleum law.

Naphtha sales in FY2014 will decline by 0.6% from the previous year as ethylene plants undergo regular checkups or are shut down. In FY2015, they will increase by 0.5% on recovery in ethylene production. Naphtha sales have fared relatively well while other fuel oil sales have continued a downward trend. In FY2015, naphtha's share of total fuel oil sales will top a quarter for the first time ever.

Kerosene sales will follow a long-term downward trend due to continuous fuel switching to electricity and city gas. In FY2015, kerosene sales will decline to some 60% of the decade-ago level.

Diesel oil sales in FY2014 will level off as such factors as a decline in the diesel vehicle fleet offset the effects of firm reconstruction demand after the earthquake. Although production and transportation will become active in line with economic growth in FY2015, diesel oil sales will log a small fall of 0.1% for the first drop in four years due to improvements in transportation efficiency.

Heavy fuel oil A sales will continue a year-on-year drop in a 4.5-5.0% range as users switch from heavy fuel oil A to city gas and other fuels against the background of environmental conservation and high oil prices, with energy conservation making progress.

Heavy fuel oil C sales for power generation will decline substantially (by 16.1% in FY2014 and 30.5% in FY2015) due to switching to other electricity sources. Those for other uses will also decrease due mainly to fuel switching and energy conservation. In FY2015, heavy fuel oil B and C sales' share of total fuel oil sales will dropped to a new low of 7.8%.

LPG sales will increase by 1.9% in FY2014 as those for chemical feedstocks and residential uses recover. Because of switching to other fuels, however, LPG sales will continue an overall levelling-off trend (remaining unchanged in FY2015).

Table 8: Fuel oil 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	187.9	181.7	-2.1%	-2.9%	-3.3%
Gasoline	58.2	57.2	56.2	55.4	54.6	53.8	-1.4%	-1.4%	-1.4%
Naphtha	46.7	43.7	43.2	45.7	45.5	45.7	6.0%	-0.6%	0.5%
Jet fuel	5.2	4.2	4.0	5.1	5.0	5.0	27.1%	-0.4%	-0.4%
Kerosene	20.4	19.6	18.9	17.9	17.3	16.8	-5.2%	-3.2%	-2.9%
Diesel oil	32.9	32.9	33.4	34.1	34.1	34.0	2.1%	0.0%	-0.1%
Heavy fuel oil A	15.4	14.7	13.8	13.4	12.8	12.2	-2.3%	-4.8%	-4.7%
Heavy fuel oil B and C	17.3	24.0	28.4	21.9	18.6	14.1	-22.9%	-15.1%	-24.2%
For electric utilities	7.7	14.9	19.4	14.4	12.1	8.4	-25.7%	-16.1%	-30.5%
For other users	9.7	9.1	9.0	7.5	6.5	5.7	-16.8%	-13.0%	-12.6%
LPG (Mt)	16.5	16.4	16.6	15.5	15.8	15.8	-6.5%	1.9%	0.0%

10. Renewables

Renewable energy power generation capacity will reach 55 GW with authorised facilities' cost burden on consumers totalling JPY44 trillion.

Two years have passed since Japan launched the feed-in-tariff, or FIT, system in which utilities purchase electricity generated with renewable energy sources at fixed prices. As great expectations are placed on renewable energy that represents purely domestic resources and emits no CO₂, renewable energy has diffused rapidly. Meanwhile, various relevant challenges have emerged.

Available renewable energy power generation capacity subject to the FIT system will increase by 12.9 GW to 42.1 GW in FY2014 and by 12.7 GW to 54.9 GW in FY2015 if the diffusion retains the present pace. Remarkable growth is emerging in solar photovoltaic power generation that features shorter lead times and higher tariffs. Particularly, non-residential solar PV generation capacity (including “mega-solar” systems) will expand to 18.2 GW by the end of FY2014 and 28.6 GW by the end of FY2015, accounting for a majority of total renewable energy power generation. As some five years are required for any wind power generation project to start generation, meanwhile, wind power generation capacity will still be limited to 3.3 GW at the end of FY2014 and 4.1 GW at the end of FY2015. Renewable energy power generation will total 92.1 TWh (including 27.1 TWh by solar PV, 5.8 TWh by wind and 37.9 TWh by small and medium-scale hydro facilities) in FY2014 and 108.8 TWh (including 39 TWh by solar PV, 7.2 TWh by wind and 37.9 TWh by small and medium-scale hydro facilities) in FY2015, accounting for some 10% of Japan's total power generation.

The very rapid diffusion of renewable energy power generation has sharply expanded the cost burden on consumers. The government has called for the steady and stable operation of the FIT system in its 2014 revision to the Japan Revitalisation Strategy and cancelled the authorisation for renewable energy projects that have failed to secure lands and equipment. If 88.9 GW in renewable energy power generation capacity authorised by the end of March 2014 (including 70.9 GW for solar PV and 3.6 GW for wind) is all put into operation, however, the cost burden on consumers over 20 years may total JPY44 trillion². The burden amounts to a hike of JPY2,500/MWh in electricity bills – 10% for the residential sector and 14% for the industrial sector. Particularly, the rapid expansion of solar PV generation subject to higher tariffs will push up the burden. As authorised mega-solar facilities are completed and put into operation, the estimated burden increase will come about.

² The remaining FIT periods for capacity introduced before the FIT system launching are taken into account. The marginal avoidance cost is estimated at JPY10,400/MWh based on the renewable energy FIT system on the website of the Agency for Natural Resources and Energy.

Figure 1: Installed capacity of renewable power generation (Operation start basis)

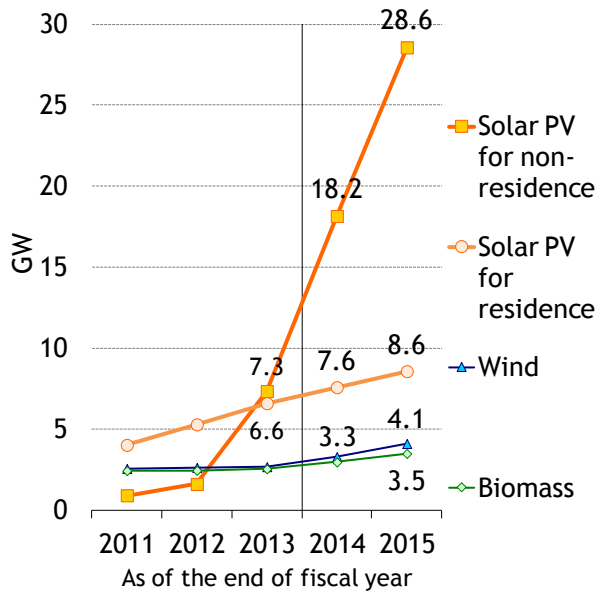
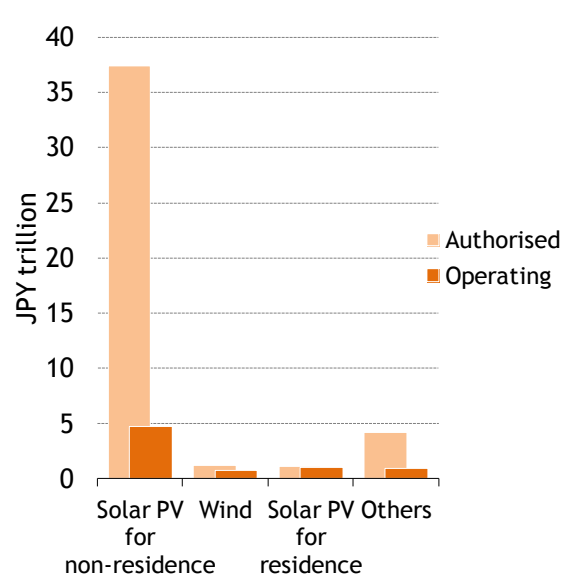


Figure 2: Cumulative burden of FIT over 20 years (As of March 2014)



Grid measure costs: Battery costs will total JPY18 trillion. Output curtailment may be utilised to cut the costs to JPY4 trillion.

Measures for allowing electric grids to respond to sharp fluctuations in solar and wind power generation are required to achieve stable electricity supply. They may include backup thermal power generation systems, storage batteries and curtailment of renewable energy-based power generation output. Storage batteries are now under demonstration tests. Some European countries, which give feeding priority to renewable energy power sources, do restrict renewable energy-based power generation output depending on conditions.

If 88.9 GW in renewable energy power generation capacity authorised by the end of March 2014 (including 70.9 GW for solar PV and 3.6 GW for wind) is all put into operation, the grid measure cost as well as the purchase cost will be massive. Fossil fuel-fired power generation will decline in line with the expansion of renewable energy power generation. But a fall in operating rates for fossil fuel plants will result in a rise in operation cost. The rise will total JPY1.3-1.4 trillion over the 20 years. In addition, storage batteries for responding to fluctuations in renewable energy power generation output will cost JPY18.1 trillion³. If curtailment of renewable energy power generation output are adopted, such curtailment may be imposed for a little more than 1% of a year. Even if a 100% monetary compensation is

³ The estimate is for a case in which nine regional electric utilities will independently take grid measures for their respective service areas. Storage batteries' unit cost is set at JPY70 million/MWh, an average for NAS sodium-sulphur and lithium-ion batteries based on materials distributed at the fifth meeting of the Cost Review Committee (on 25 November 2011).

adopted for the curtailment, the total cost may be limited to JPY2.6 trillion⁴. Among regions in Japan, Kyushu, which accounts for 26% of non-residential solar PV generation capacity in Japan, will see the largest cost for grid measures.

Figure 3: Cumulative costs for power grid over 20 years for authorised capacity (As of March 2014)

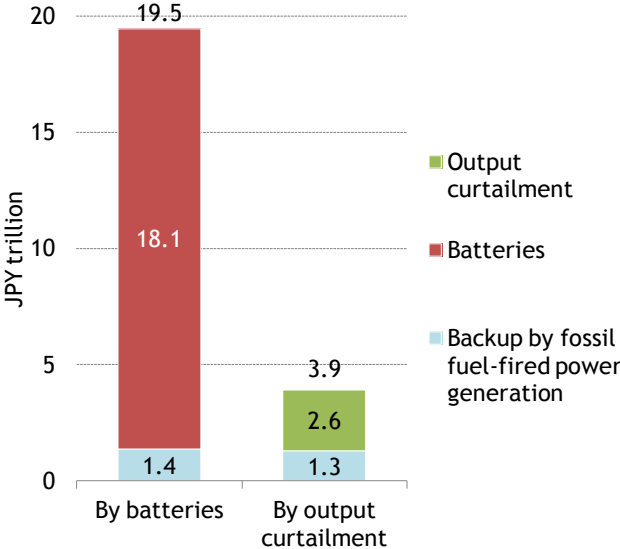
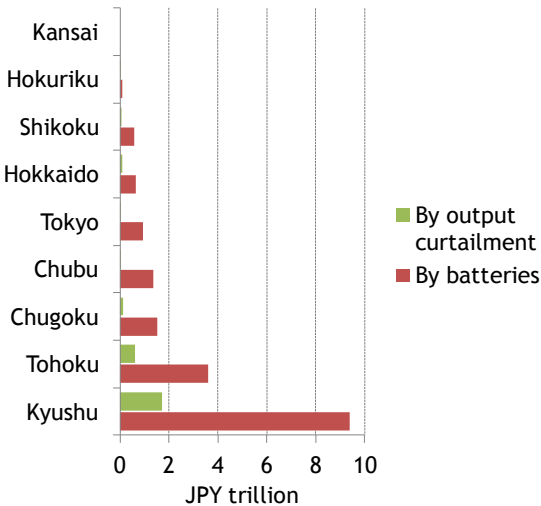


Figure 4: Cumulative costs for power grid over 20 years for authorised capacity by region (As of March 2014)



Note: Excludes costs for backup by fossil fuel-fired power generation

Inter-regional grid connection systems to link grids of different electric utilities must be enhanced to effectively utilise renewable energy power generation facilities located away from users. But such enhancement may cost much money and time. For the immediate future, therefore, storage batteries and output curtailment will be required. Particularly, it is desirable to adopt output curtailment that cost less and are realistic. In order to smartly utilise renewable energy, Japan should set tariffs at appropriate levels for rebalancing among renewable energy sources and take measures to prevent costs from rising further.

⁴ Non-residential solar PV power generation is assumed to be subject to the output curtailment. Electricity lost due to the curtailment is assumed to be purchased at fixed tariffs. The purchase cost is deemed the output curtailment cost.

Topic 1: Impacts of nuclear power plants' restart on the economy and energy supply and demand

Safety assessment exceeds one year, reaching the final phase. Progress in final procedures for the Sendai plant and the assessment of other plants will make a difference.

Japan's new regulatory standards for nuclear power plants took effect more than one year ago, when the assessment of nuclear power plants under the new standards was expected to take six to 12 months. However, no nuclear power plant has restarted. The assessment of the Sendai nuclear power plant, though given priority, has been prolonged substantially due to the addition of many findings and points to be checked. As a result, the Nuclear Regulation Authority managed to complete a draft assessment report on 16 July.

The assessment report is expected to be finalised after a public comment procedure taking about one month. Given the past developments, however, it is uncertain whether things will go as expected. Also uncertain is the time to be taken for subsequent checks before the restart and simultaneous efforts to get approval by relevant local governments on the restart. This means that the Sendai plant restart is expected to come in or after early October.

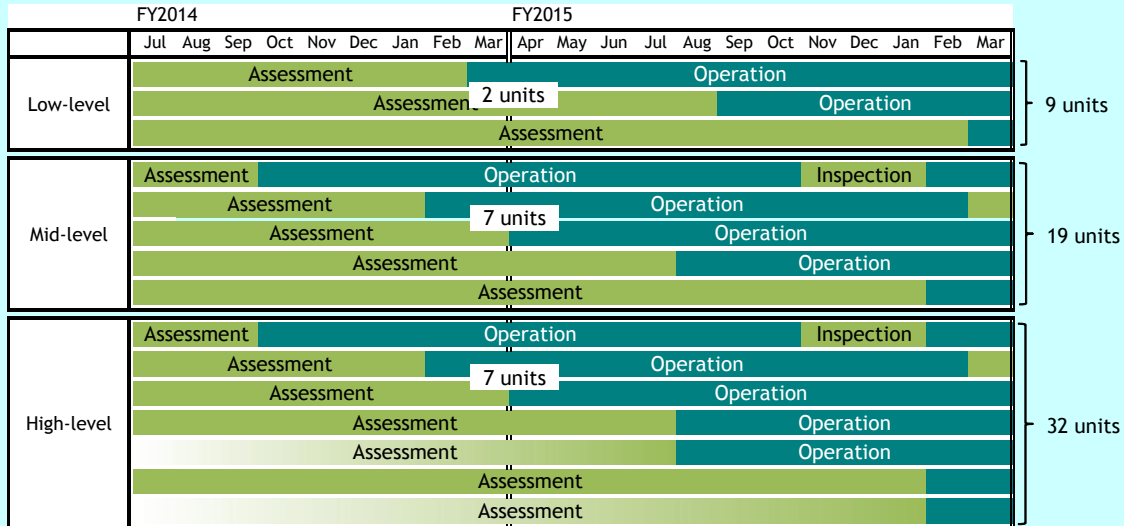
In the Nuclear Mid-level Case, the NRA will restore a three-team assessment setup after the Sendai nuclear power plant restarts in early October. We assume the restart of other nuclear power plants in consideration of assessment progress reports, the presence or absence of large-scale construction and the assessment application order. We assume that nuclear reactors restarting by the end of FY2015 will be limited to 19 units for which their owners have filed assessment applications. We assume that seven reactors will restart by the end of FY2014, operating for three months on average with their electricity generation totalling 14 TWh in the year. Nineteen reactors will restart by the end of FY2015, operating for nine months on average with their generation totalling 124 TWh in the year.

In the Low-level Case, we assume that the restart of the Sendai nuclear power plant will be delayed until the end of FY2014 and that one group will restart every six months later. In this case, we assume that two reactors will restart by the end of FY2014, operating for one month on average with their electricity generation totalling 1 TWh in the year. Nine will restart by the end of FY2015, operating for seven months on average with their electricity generation totalling 42 TWh in the year.

We have also developed a High-level Case in which the NRA will expand its assessment setup with electric utilities filing additional assessment applications in FY2015. Our assumption for FY2014 in this case is the same as in the Mid-level case. But the High-level Case assumes that 32 reactors will restart by the end of FY2015, operating for seven months on average with their generation aggregating 162 TWh in the year.

We have also developed and analysed the virtual “Full Operation Case” where the 32 reactors in the High-level Case will operate at 80% of their capacity in FY2015 and the “No Operation Case” where no reactors will restart by the end of FY2015.

Figure 5: Timetable of activities on nuclear power plant assessment



In the Mid-level Case, Japan’s fossil fuel imports in FY2015 will increase by JPY7.7 trillion from FY2010. LNG imports will expand by 9.6 Mt to 80.2 Mt. The unit power generation cost will increase by JPY3,000/MWh – equivalent to 17% of the electricity price for the industrial sector and 13% of that for the residential sector – from FY2010. CO₂ emissions will increase by 10 Mt-CO₂. Japan’s energy self-sufficiency rate will decline by 4.6 percentage points.

In the Full Operation Case, fossil fuel imports in FY2015 will be JPY2.5 trillion less than in the No Operation Case where no reactors will restart by the end of FY2015. The power generation cost will decline by JPY2,800/MWh from the No Operation Case. The cost cuts will work to boost real GDP by 0.26%, reduce CO₂ emissions by 98 Mt-CO₂ and raise the energy self-sufficiency rate by 9.0 percentage points. LNG imports will decrease by 20.6 Mt from a record 91.0 Mt in the No Operation Case. The substantial decline in Japan’s LNG imports and the United States’ expansion of LNG exports in and after 2016 will work to ease the supply-demand balance in the international LNG market.

The first nuclear power plant assessment under the new regulatory standards has come closer to its completion, while it is still uncertain whether the remaining steps of the first assessment would be taken smoothly. Later, the NRA is expected to take procedures for restarting the Sendai plant with no delay and to implement the efficient assessment of other plants taking full advantage of the past experiences while retaining the strictness.

Table 9: Impacts of nuclear power plants' restart (FY2015)

		FY2010 Historical	FY2015				
			No Operation Case	Low-level Case	Mid-level Case	High-level Case	Full Operation Case
Cumulative number of restarted nuclear reactors ¹	[FY2014]	-	[0]	[2]	[7]	[7]	[7]
	FY2015	-	0	9	19	32	32
Average period for operation (months)		-	-	7	9	7	10
Electricity generation by nuclear (TWh)		288.2	0.0	42.2	124.3	162.0	209.8

		FY2010 Historical	FY2015 (Changes from FY2010)					
			No Operation Case	Low-level Case	Mid-level Case	High-level Case	Full Operation Case	
Economy	Power generation cost ² (JPY/kWh)	8.2	+4.8	+4.1	+3.0	+2.5	+1.9	
	Primary energy supply							
		Oil (GL)	232.4	-9.5	-15.2	-17.8	-20.5	-20.5
		Natural gas (Mt of LNG equivalent)	73.2	+21.0	+18.7	+9.9	+6.5	+0.0
		LNG imports (Mt)	70.6	+20.5	+18.2	+9.6	+6.3	-0.1
		Total fossil fuel imports (JPY trillion)	18.1	+9.2	+8.6	+7.7	+7.2	+6.7
		Oil	12.3	+5.5	+5.0	+4.8	+4.6	+4.6
		LNG	3.5	+3.7	+3.5	+2.8	+2.5	+2.0
		Balance of trade (JPY trillion)	5.3	-13.9	-13.3	-12.6	-12.1	-11.7
	Real GDP (JPY2005 trillion)	512.4	+29.6	+29.9	+30.4	+30.7	+31.0	
	Gross national income (JPY trillion)	493.5	+28.5	+29.0	+29.8	+30.2	+30.6	
Environment	Energy-related CO ₂ emissions (Mt-CO ₂)		1,123	+69	+48	+10	-9	-29
	Changes from FY2005		-6.6%	-0.8%	-2.6%	-5.8%	-7.3%	-9.0%
	Local pollutants by electric utilities ³ (kt)	NO _x	151	+54	+27	+8	-7	-12
		SO _x	137	+57	+24	+7	-9	-10
PM		3.8	+1.0	+0.5	+0.2	-0.0	-0.0	
Security	Self-sufficiency rates		18.0%	-10.0p	-8.1p	-4.6p	-3.0p	-1.0p
	Recurrence interval of loss of power generation fuel ⁴ (years)		50	35	35	42	53	62

No Operation Case <for reference>: Hypothetical case where no re-start of nuclear plant until the end of FY2015 is assumed.

Low-level Case: Re-start of the plants with prioritized assessment to be delayed until the end of FY2014. Other re-starts would follow at six months' intervals.

Mid-level Case: Sendai plant starts in early autumn. Other plants which had submitted application would re-start under the current assessment scheme and condition.

High-level Case: More efficient assessment process and more applications than in the Mid-level Case. 32 re-starts by the end of FY2015.

Full Operation Case <for reference>: Hypothetical case where 32 units as defined in the High-level Case would operate throughout FY2015 at 80% operating rate.

Note: 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.

4. Probability of loss of 2% or more fuel for power generation due to country risks such as wars of import origin.

Topic 2: Impacts of oil and LNG price hikes on the Japanese economy and energy supply and demand

Price hikes will work to lower consumption, causing the economy to contract by 0.2%. Oil consumption and energy demand in the transportation sector will plunge.

While the shale revolution has become a buzzword, Japan's shale gas imports from the United States will reportedly start in 2016 at the earliest. Japan will not benefit directly from the revolution for the immediate future. Meanwhile, international energy prices are likely to rise depending on developments in the complicated Middle East and Ukraine situations. As Japan's fossil fuel imports have risen to a high level, fuel price fluctuations can exert great impacts on the Japanese economy. Based on the Outlook for International Oil Market by Yoshikazu Kobayashi (11 July 2014) and other information, we have assessed the impacts of the oil price's hike of \$10/bbl from \$108/bbl in the Base Scenario and the LNG price's increase of \$50/t from \$776/t.

The hikes will lead Japan's fossil fuel imports to expand by JPY1.9 trillion – JPY1.5 trillion for oil and JPY0.4 trillion for LNG. Due to the oil price hike, the retail price will rise by 6.2% for kerosene and by 4.3% for gasoline. The overall consumer price index will increase by 0.2%. The LNG price hike will cause the city gas price for enterprises to increase by 3.4%. Although oil and LNG price hikes can influence electricity prices, the increase in the electricity price for enterprises will be limited to 1.2% due to the use of other fuels for power generation and the large capital cost ratio. These domestic energy price increases and drops in wages and profits will exert downward pressure on the economy. The oil and LNG price hikes will lead to a 0.2% contraction in real GDP and a JPY13,000 drop in gross national income per capita.

Primary energy supply in Japan will decline due to the economic deceleration. But impacts will differ from energy source to source. Oil supply will post a larger decline than other energy supply due to the high oil price hike. Meanwhile, coal consumption, though affected by the economic deceleration, will post only a small drop in the absence of any price hike.

Final energy consumption will drop by 0.5%. The consumption decline will be larger in the transportation sector whose energy consumption is dominated by petroleum products including gasoline and diesel oil. In the industrial sector vulnerable to economic trend and price changes, energy consumption will decrease by 4%. The commercial and residential sectors will post the smallest energy consumption drop due to lower price hikes and price elasticity.

In sales in volume, fuel oil vulnerable to the import price hike will post a large decline. Any drop in city gas and electricity sales will be smaller. As sales to the industrial sector account for a large share of city gas sales and the price hike is sharper for city gas, however, the drop in city gas sales will be slightly larger than for electricity sales.

Table 10: Impacts of high energy prices (FY2015)

		Base Scenario	High Prices Case	
				Changes
Prices	Oil (\$/bbl)	108	118	+9.3%
	LNG (\$/t)	776	826	+6.5%
Economy	Real GDP (JPY2005 trillion)	542.8	541.8	-0.2%
	GNP per capita (JPY thousand)	4,118	4,106	-0.3%
	Industrial production index (CY2010=100)	102.2	101.9	-0.3%
	Balance of trade (JPY trillion)	-7.2	-8.8	+21.2%
	Fossil fuel imports	25.8	27.7	+7.2%
	Consumer price index (CY2010=100)	104.9	105.2	+0.2%
Energy	Primary energy supply (Mtoe)	486.8	485.0	-0.4%
	Oil (GL)	214.6	213.0	-0.8%
	Natural gas (Mt of LNG equivalent)	83.2	83.0	-0.2%
	Coal (Mt)	188.0	187.9	-0.0%
	Final energy consumption (Mtoe)	330.7	329.2	-0.5%
	Industry	159.2	158.6	-0.4%
	Buildings	91.2	90.9	-0.3%
	Transport	80.2	79.6	-0.8%
	Electricity sales (TWh)	876.8	875.5	-0.2%
	City gas sales (Billion m ³)	38.05	37.96	-0.2%
	Fuel oil sales (GL)	181.7	180.2	-0.8%
Energy-related CO ₂ emissions (Mt-CO ₂)	1,133	1,128	-0.4%	

Note: Industry includes non-energy use.

Topic 3: Impacts of yen depreciation on the Japanese economy and energy supply and demand

Exports in volume cannot be expected to increase as much as earlier. City gas and electricity sales will increase slightly while fuel oil sales will decrease.

In autumn 2012 when the excessive appreciation of the yen was corrected after the growing expectations of a government change, the correction was expected to push up exports. Yen-denominated exports in value have actually expanded due to the depreciation of the yen. But exports in volume have not increased as much as expected.

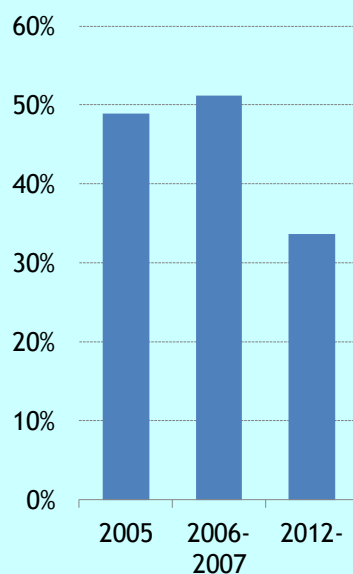
During the depreciation of the yen, the relationship between progress in the depreciation and yen-denominated export price hikes has grown stronger. This means that while the depreciation of the yen has created room for foreign currency-denominated prices of exports to be lowered, actual price cuts have been limited. Exporters' choice to secure earning power without joining any price-cutting race has become a factor behind failure of the export volume to increase as much as expected.

Global economic conditions have contributed to the weakness of export volume growth. Global economic growth during the current depreciation of the yen has been more moderate than during the past two yen depreciation periods (2005 and 2006-2007). A structural factor behind the weakness of export volume growth is Japanese enterprises' enhancement of moves to transfer production bases overseas and increase transactions invulnerable to foreign exchange rate changes during the yen appreciation period. Some people have cited a decline in Japanese products' export competitiveness as another factor behind the export weakness.

If the yen depreciates by JPY10 to the dollar from the Base Scenario to JPY112 to the dollar, Japan's real GDP will grow by 0.4%. Exports will be promoted to some extent, expanding by 7% or more. But imports will also increase by a similar rate due to import price hikes. As a result, the yen depreciation will fall short of improving the trade balance. Consumer prices will rise by 0.3%, supporting the Bank of Japan's inflation target. But the price increase may represent cost-push inflation rather than the more desirable demand-pull inflation.

The economic expansion will support an energy demand increase mainly in the industrial sector. Due to the effects of energy price hikes, however, primary energy supply may remain almost unchanged. But the effects may differ from energy source to source. Natural gas and coal demand will increase thanks to brisker industrial production, while oil demand will decline mainly in the transportation sector due to a large price hike. Electricity and city gas sales will expand by 0.2% in volume in line with increased industrial production. But fuel oil sales will decrease by 0.5% in volume due mainly to a gasoline sales fall, although naphtha sales will increase.

Figure 6: Pass-through of depreciation of yen to export prices in dollar



Note: Ratio of actual cuts of export price in the dollar against room of price cuts caused by depreciation of the yen

Table 11: Impacts of depreciation of the yen (FY2015)

		Base Scenario	Depreciation of the Yen Case	
		JPY102/\$	JPY112/\$	Changes
Economy	Real GDP (JPY2005 trillion)	542.8	545.0	+0.4%
	Industrial production index (CY2010=100)	102.2	102.9	+0.7%
	Balance of trade (JPY trillion)	-7.2	-7.6	+5.8%
	Exports	83.9	90.3	+7.6%
	Imports	91.2	97.9	+7.4%
	Consumer price index (CY2010=100)	104.9	105.2	+0.3%
Energy	Primary energy supply (Mtoe)	486.8	486.9	+0.0%
	Oil (GL)	214.6	213.8	-0.4%
	Natural gas (Mt of LNG equivalent)	83.2	83.4	+0.3%
	Coal (Mt)	188.0	188.7	+0.4%
	Electricity sales (TWh)	876.8	878.4	+0.2%
	City gas sales (Billion m ³)	38.05	38.11	+0.2%
	Fuel oil sales (GL)	181.7	180.9	-0.5%