

Economic and Energy Outlook of Japan through FY2016

Is low oil price a silver bullet?

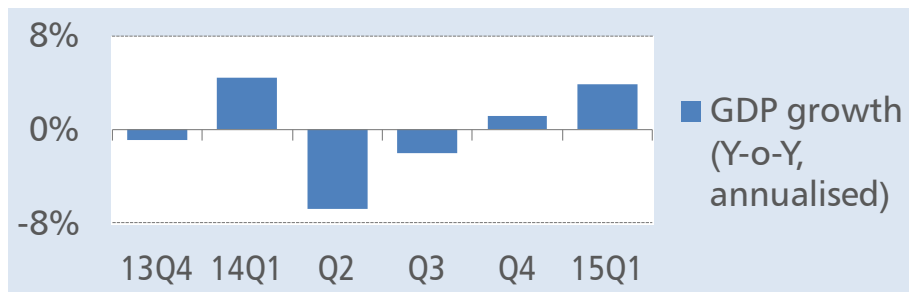
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Background

Japanese economy is recovering after unexpectedly long dullness by VAT rise.



Oil prices rebound from the lowest in the early 2015. LNG prices, which reflect oil prices with about three-month lag, are in the bottom now and will rise gradually toward the second half of 2015.

Hokkaido and Kansai Electric Power Companies hiked their rates due to delay of restart of nuclear power plants. Consumers' burdens by the Feed-in Tariff system have doubled.

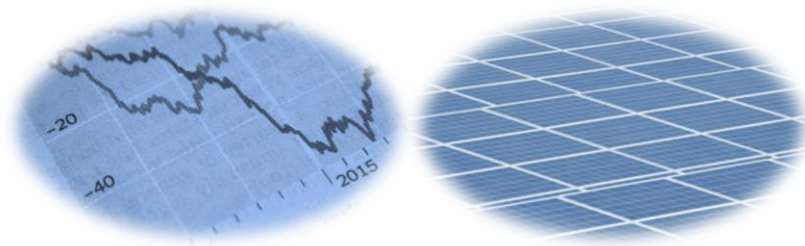
We projected Japanese economy, energy supply and demand and analysed various cases toward FY2016.

Outlook toward FY2016

- Macro economy and production activities
- Primary energy supply
- Final energy consumption
- Energy sales
- Renewable power generation

Special topics

- Restarting nuclear and macro economy, etc.
- Higher energy prices and related risks



Major assumptions

World economy

- United States: supported by low oil prices and unemployment
- Europe: slow recovery thanks to monetary easing with concern about the Greek issue
- Asia: keeping relatively fast growth though China slows down

Import CIF prices

May 2015 → FY2015 → FY2016

- Oil: \$59/bbl → 64 → 69
- LNG: \$459/t → 470 → 502
(\$8.9/MBtu → 9.1 → 9.7)
- Steam coal: \$82/t → 84 → 89
Referring to Kobayashi, Morikawa and Sagawa's research

Exchange rates

May 2015 → FY2015 → FY2016

- JPY121/\$ → 122 → 125

Nuclear power generation

- The first commercial operation resumes in late this summer or early fall 2015. Five plants restart by the end of FY2015, generating 10.6 TWh
- Eight more plants restart by the end of FY2016, generating 63.9 TWh in FY2016.

Electricity supply and demand

- Each electric utility will secure a reserve capacity of at least 3% by saving and interchange of electricity.
Based on a government's report

Weather conditions

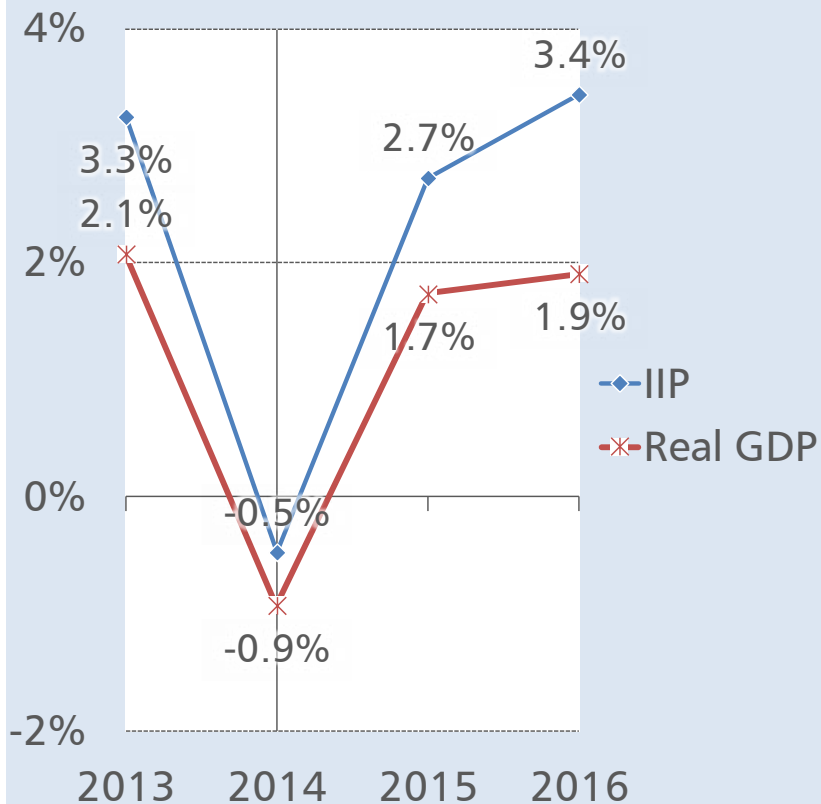
- Hotter late summer FY2015 than the previous year
- Temperatures in winter FY2015 and later are assumed to be same as in the average year, meaning winter FY2015 is colder by -0.3°C than the previous year.

Economy gets back to healthy growth

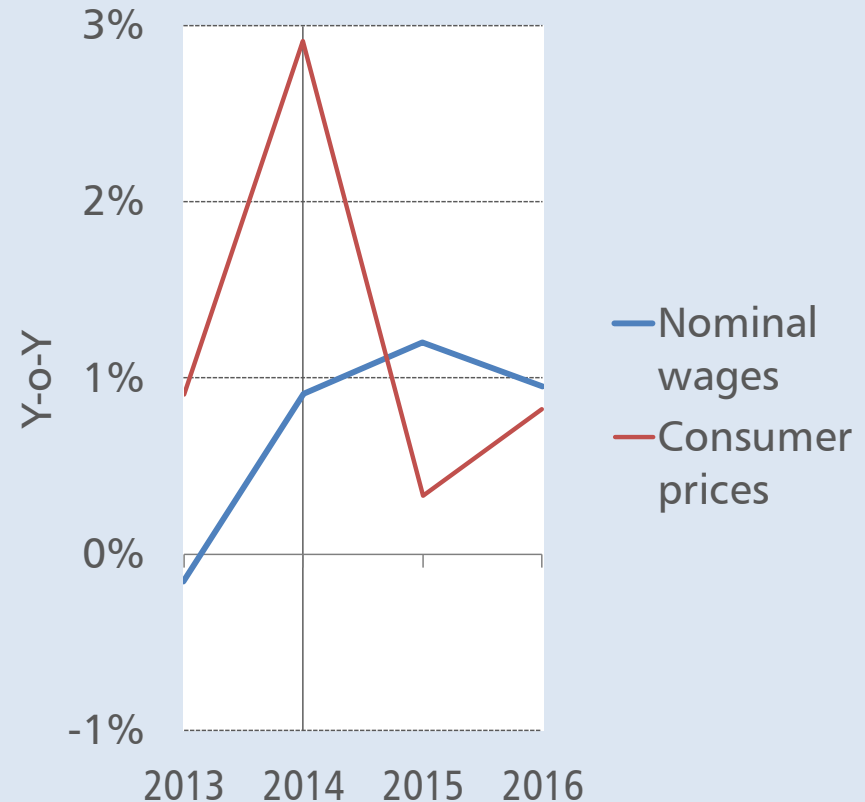
Production activity recovers apparently toward the latter part of FY2015. Domestic demand continues to be a major driver of the economy thanks to improving labour situation in FY2016.

Wages are hiked by around 1% for three straight years. Consumer prices also rise by about 1% in FY2016.

GDP and industrial production



Wages and inflation

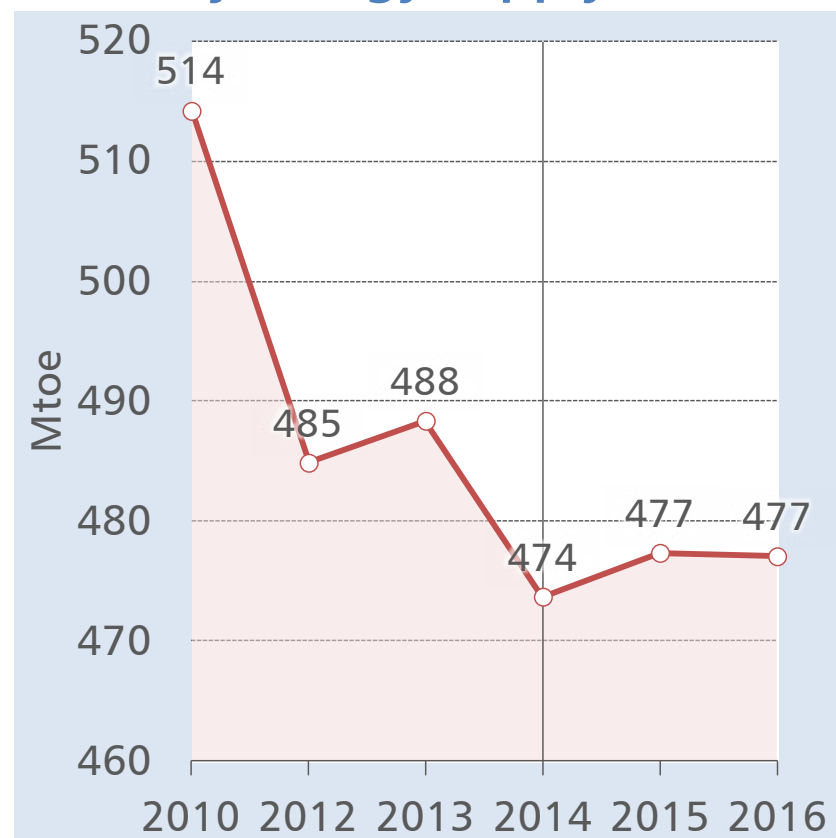


Little change in total consumption but in mix

■ Total primary energy supply rebounds from the low level in FY2014 due to economic and weather conditions, followed by a slight decrease in FY2016 because of energy conservation.

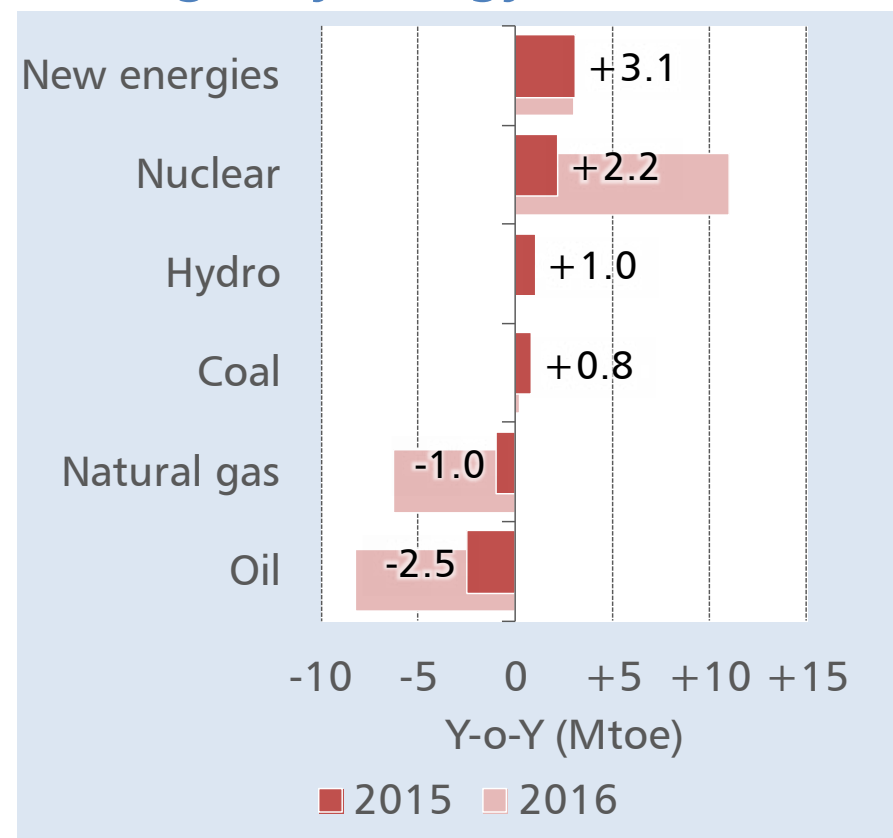
■ Oil dependency dips below 40% for the first time in 55 years. Natural gas falls from the historical high in FY2014. Only coal increases among fossil fuels in next two years.

Primary energy supply



New heat contents are applied since FY2013.

Changes by energy source

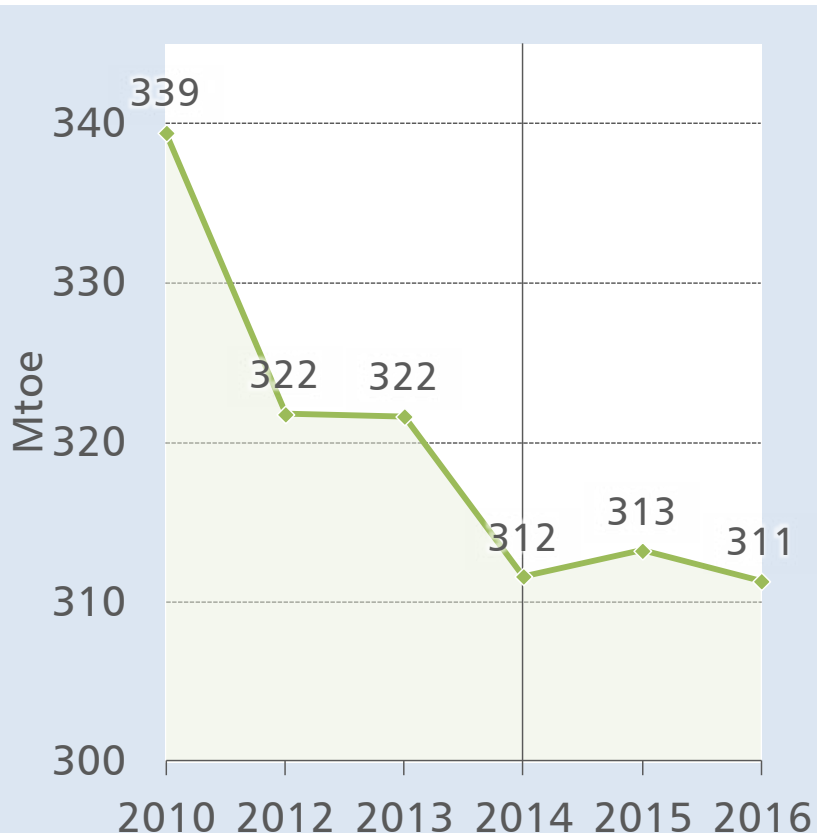


Final consumption shows transient increases

Total final energy consumption slightly increases for the first time since the Earthquake from the lowest in last quarter of a century. The increases, however, disappear owing to energy conservation in FY2016.

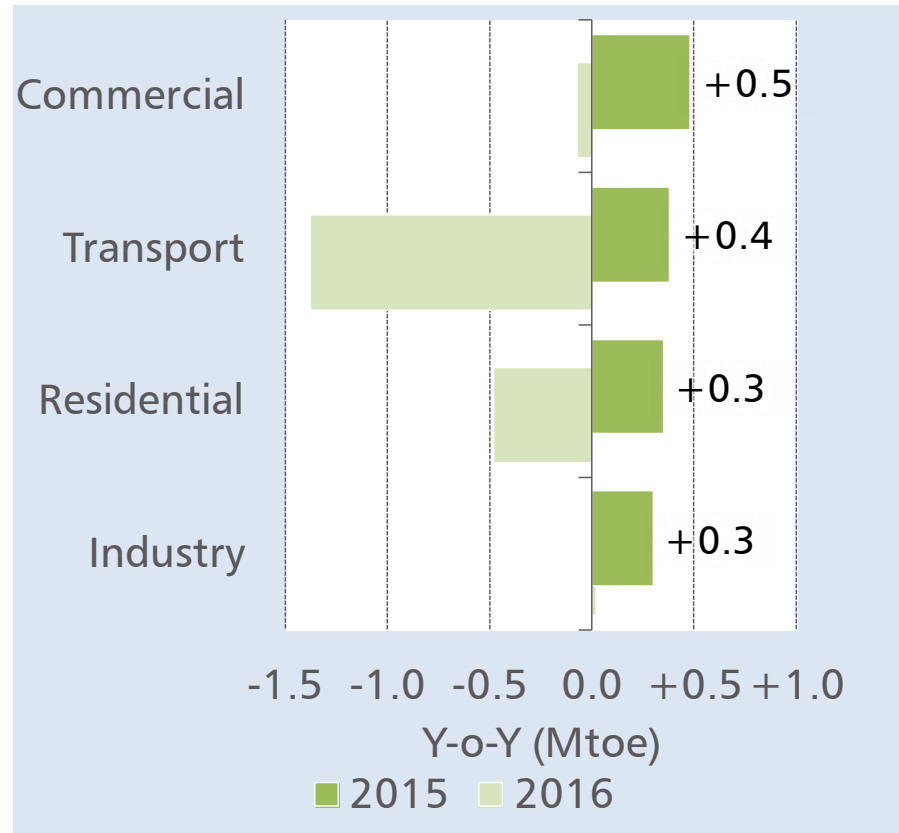
Economic recovery and weather conditions induce more energy use in all of the final sectors in FY2015. All but industry supported by brisk production activity, turn to decrease in FY2016.

Final energy consumption



New heat contents are applied since FY2013.

Changes by sector

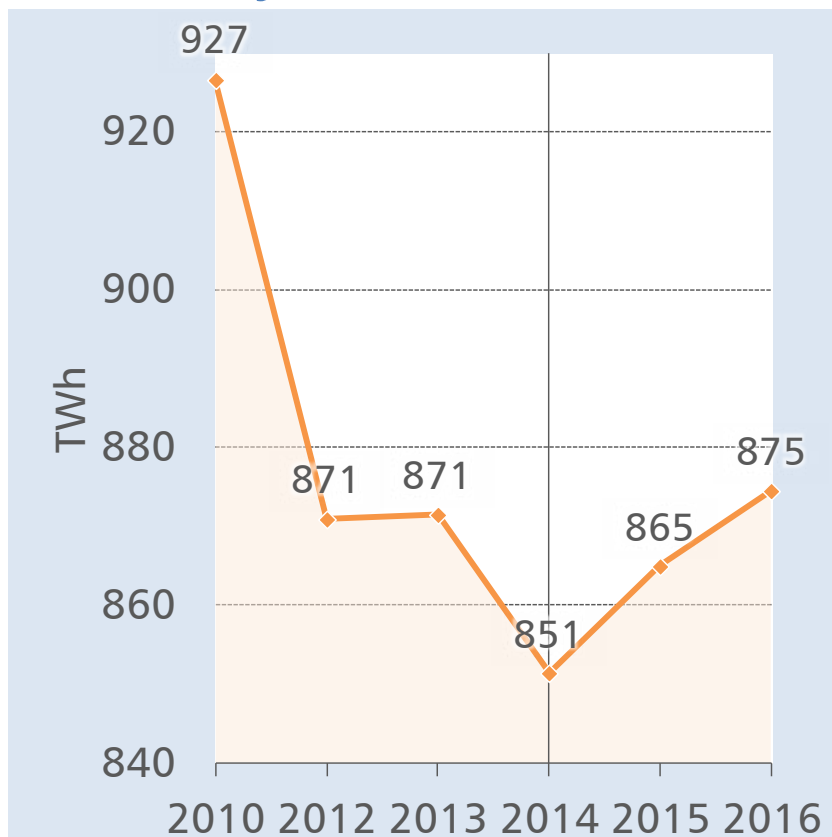


Decline trend in electricity sales ends

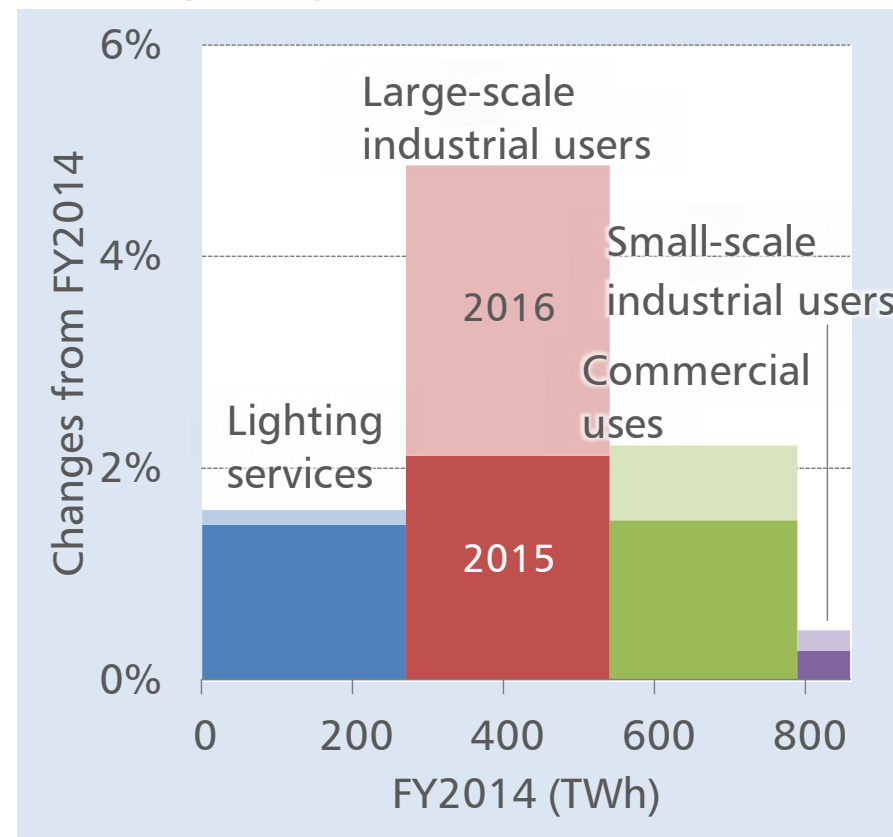
Electricity sales significantly increase from the unexpected dullness in FY2014. Still, the amounts are less than before the Earthquake by 5% or more.

Sales for any use grow in FY2015. Industrial users keep strong increases backed by production expansion whilst growth in lighting services slows due to no temperature effect in FY2016.

Electricity sales



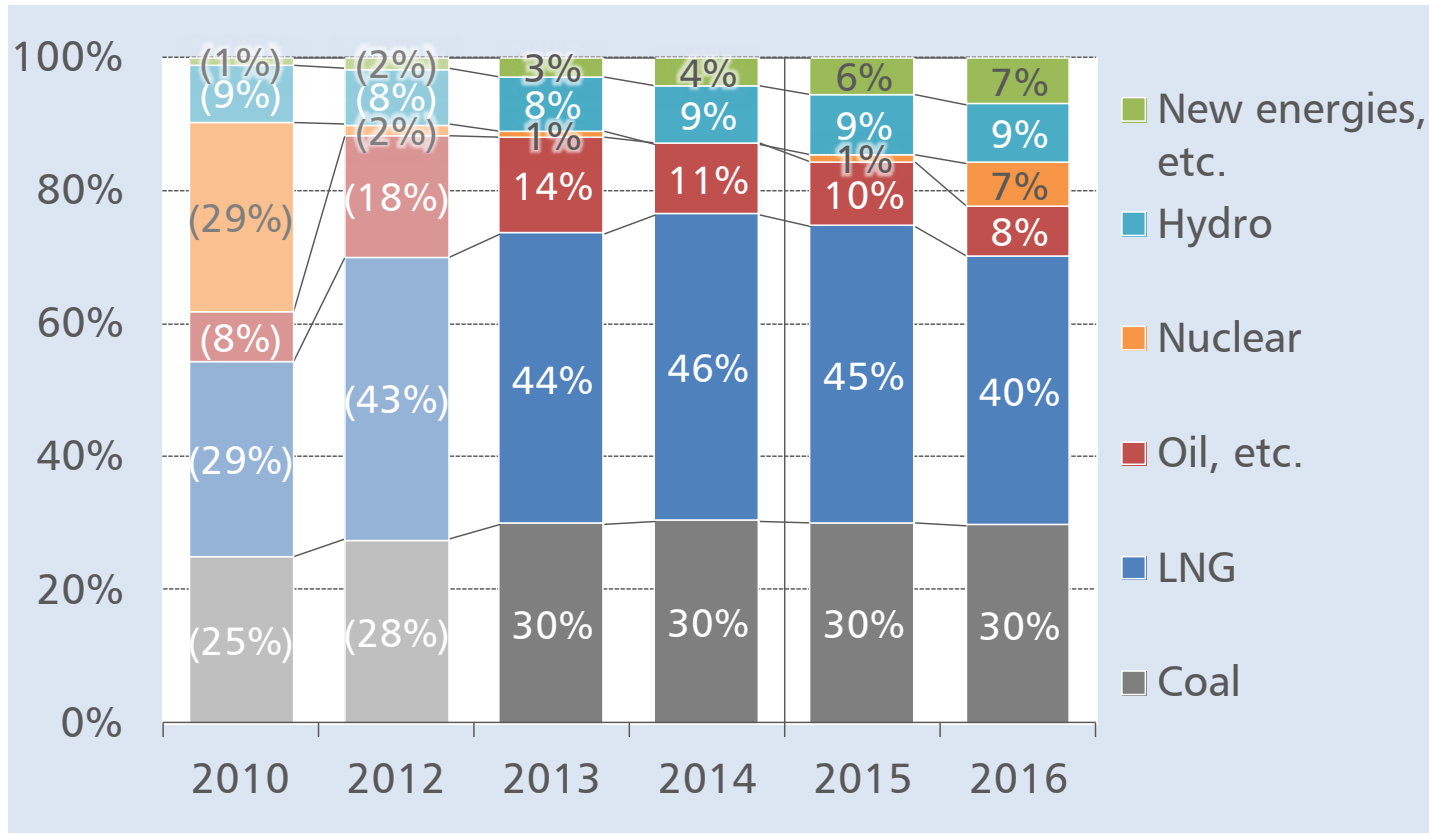
Changes by use



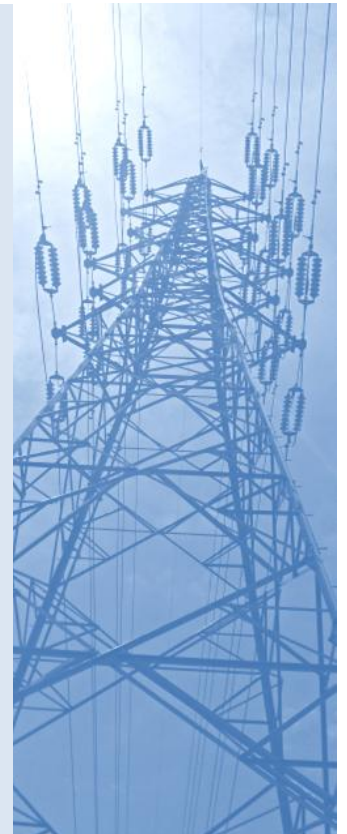
Thermal power generation declines to 78%

- Although some nuclear power plants restart, they generate electricity only 22% of that in FY2010.
- New energies continue growing to 7% as 63 gw of approved plants of 99 gw will be in operation by the end of FY2016. Most of the increases are brought by solar PVs.
- LNG shrinks to 40% but it is still more than before the Earthquake by about 10pt.

Power generation and purchased mixture by electric utilities



General electric utilities for FY2010 and FY2012

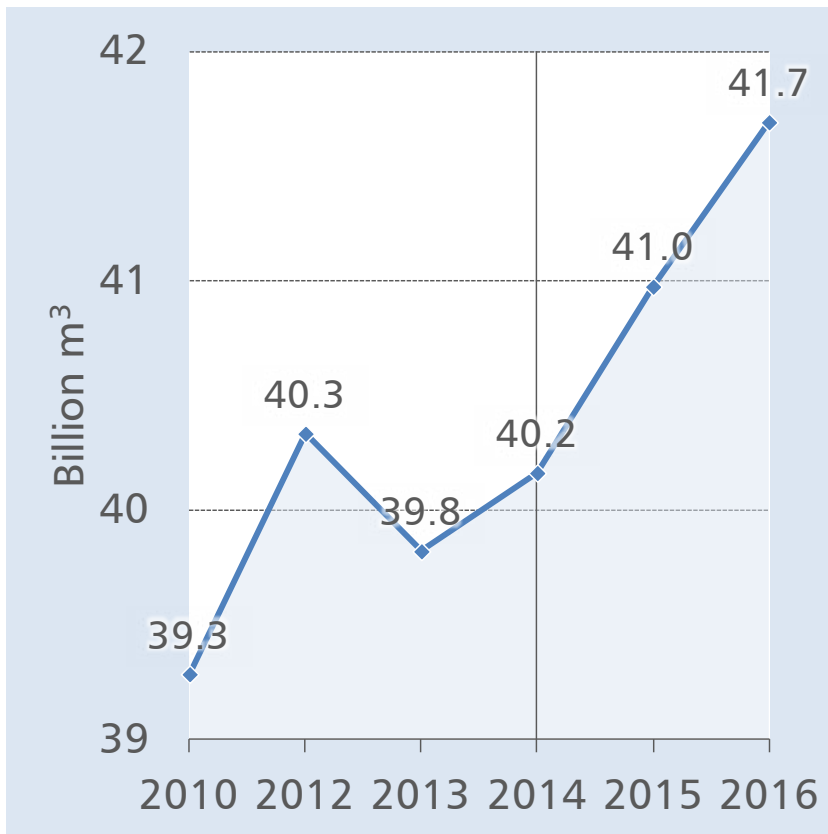


City gas hits a new high in two straight years

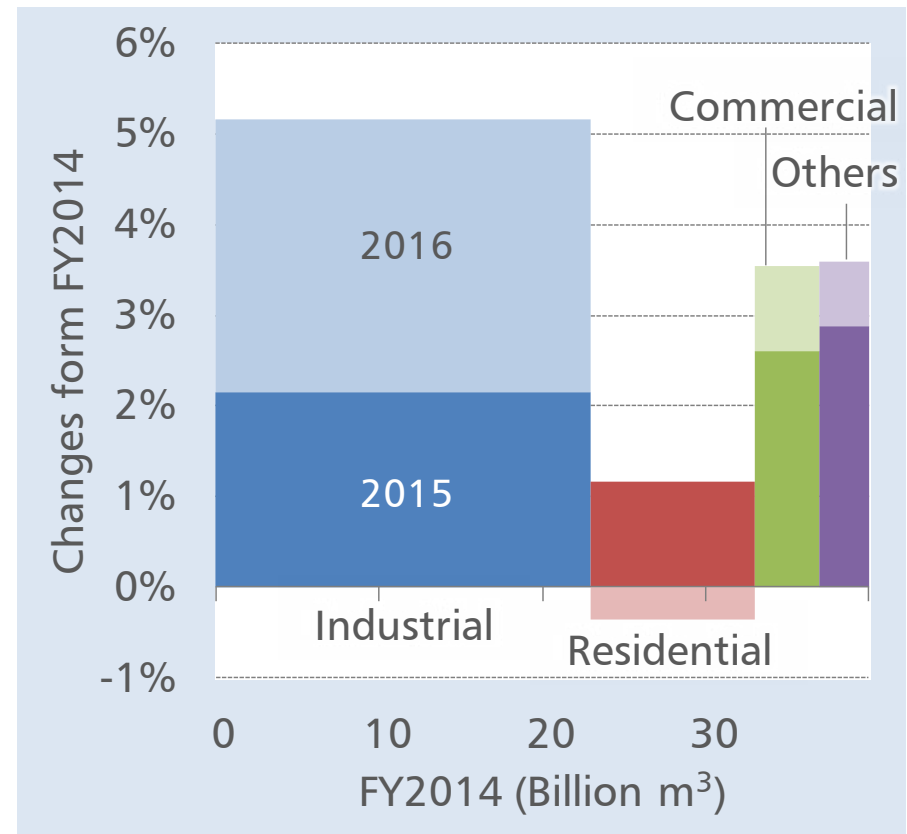
City gas sales reach an all-time high due to economic recovery and weather conditions for the first time in four years. The momentum continues in FY2016.

All uses show increases from the previous year in FY2015. Industrial use accounts for 96% of increases in FY2016.

City gas sales



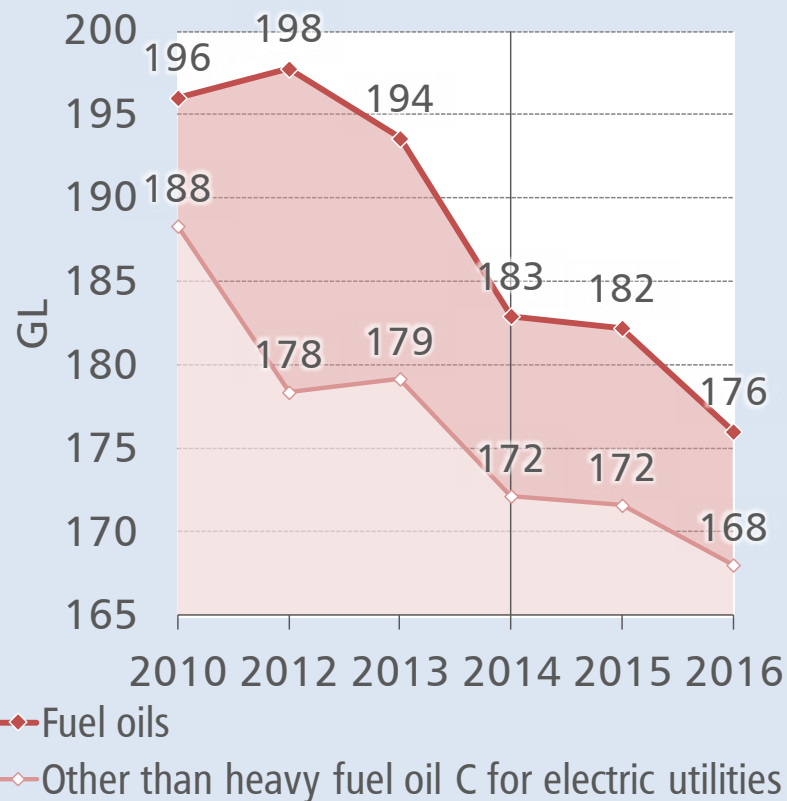
Changes by use



Fuel oil diminishes to the least since 1969

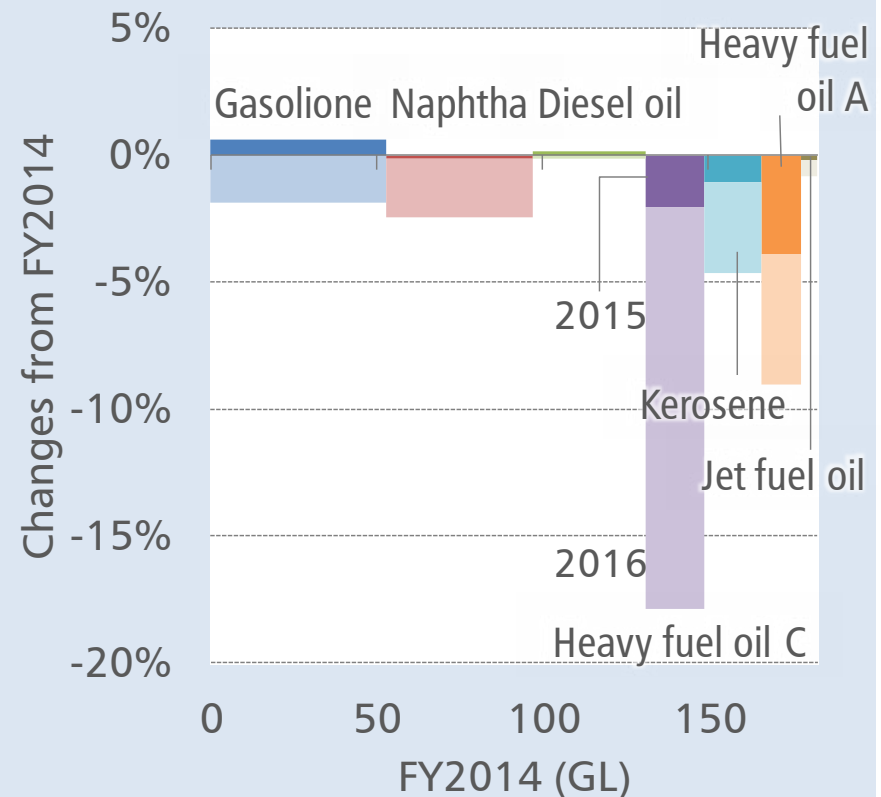
Fuel oil sales plunge in FY2016 owing to restarts of nuclear power plants and fuel switching after slight decreases in FY2015 because of weather conditions and the oil price drop.

Fuel oil sales



Gasoline shows the largest increases among the products in FY2015 for the first time in last decade. All products reduce in FY2016 from the previous year. Heavy fuel oil C shows especially sharp drop.

Changes by product

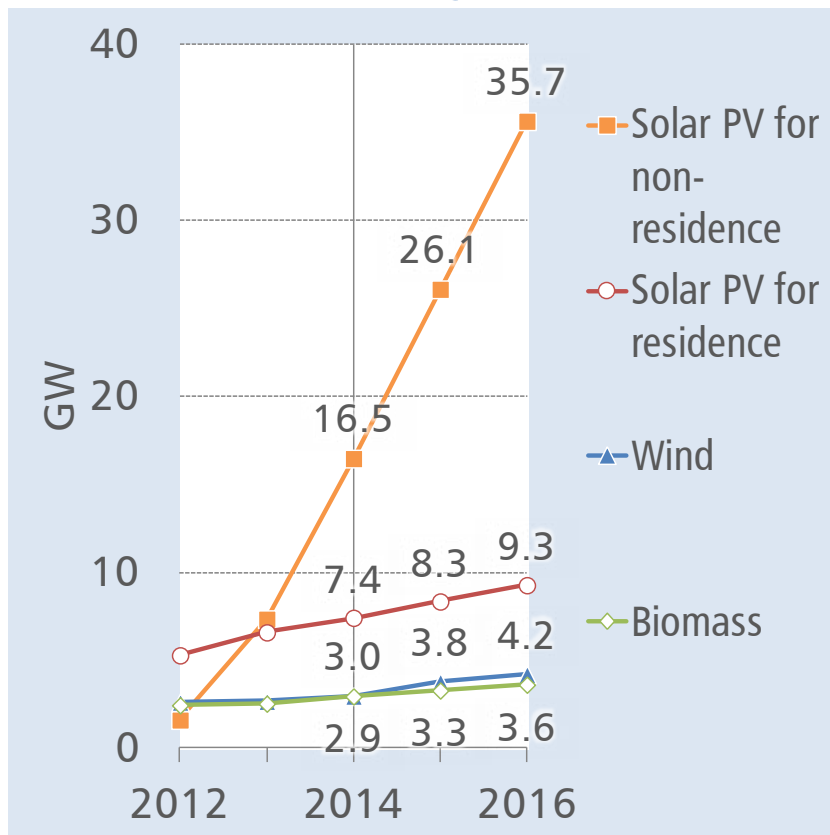


Solar PV leaves all the others, requiring grid measures

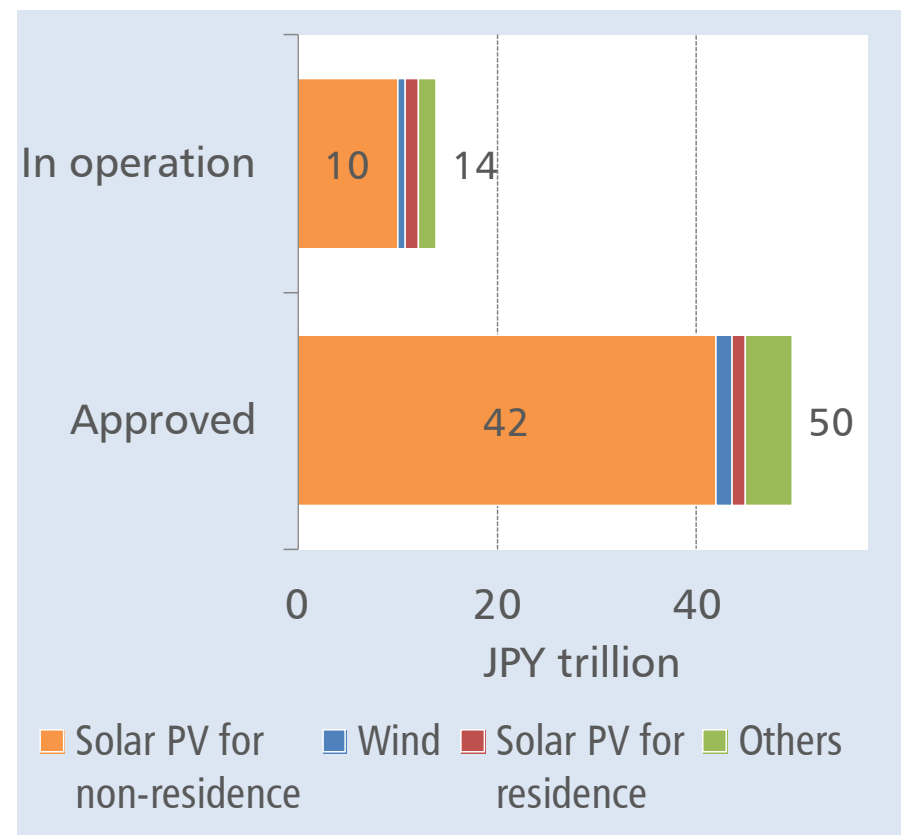
63 GW of FIT plants start their operation by the end of FY2016 generating about 10% of Japan's total electricity. Non-residence solar PVs account for 84% of new additions in next two years.

Cumulative burdens by FIT over 20 years expand to JPY50 trillion or JPY2,900/MWh – equivalent to 12% and 17% of residential and industrial rates, respectively – if all of the 99 GW* of approved plants start operation.

Installed capacity in operation



Cumulative burdens by FIT



Mini- and small-hydro, geothermal, etc. are omitted.

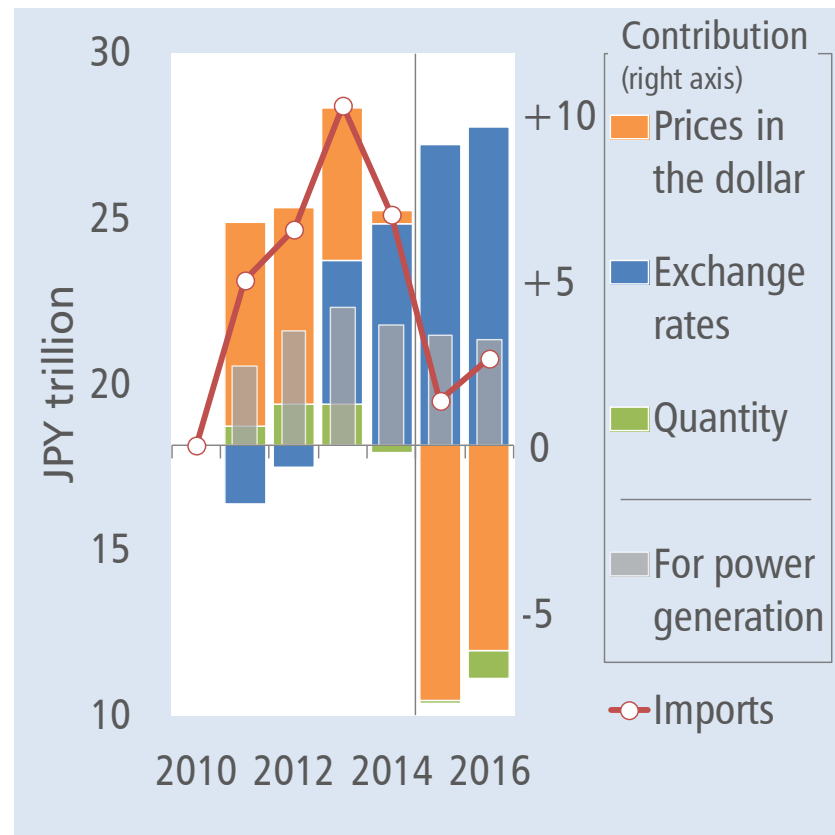
*: As of the end of February 2015

Low fuel prices | How long *Kamikaze*?

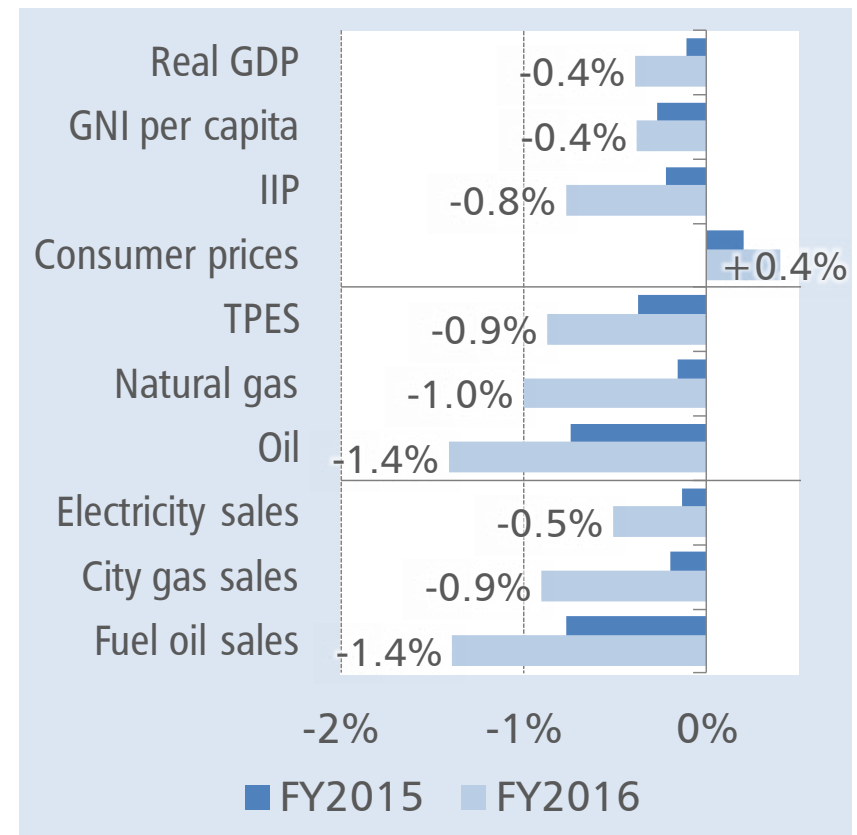
Whilst drop of prices in the dollar in FY2014 contributed to reduce fuel import spending by JPY4.2 trillion from the previous year, depreciation of the yen increased it by JPY2.4 trillion.

Higher oil price by \$10/bbl depresses real GDP and GNI per capita by 0.4% and JPY15 thousand, respectively. Higher fossil fuel dependency results in larger damage when oil price rises.

Fuel imports and contribution



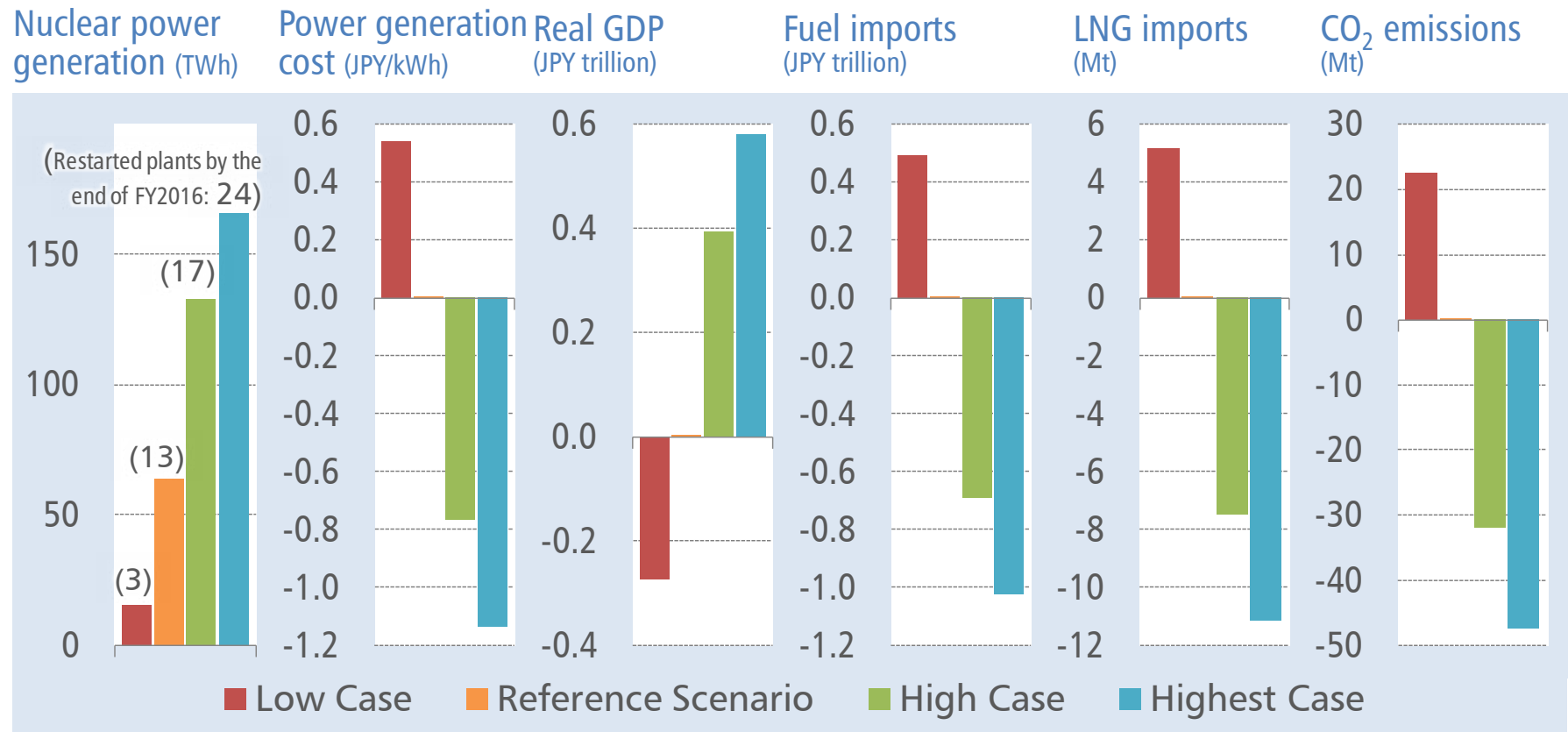
Impacts of oil price rises by \$10/bbl



Huge benefits by utilisation of nuclear

- Fuel import spending decreases by JPY1.5 trillion if nuclear generates more electricity by 151 TWh (Low Case vs. Highest Case). Whilst real GDP increases by 0.2%, CO₂ emissions reduce by 70 Mt.
- Power generation cost lowers by JPY1,700/MWh. Rational utilisation of nuclear brings enormous benefits even under a situation with low energy prices.

Impacts of nuclear power plants' restart [FY2016]



Changes from the Reference Scenario except for nuclear power generation

Impacts of nuclear power plants' restart

		FY2010	FY2016			
			Low Case	Reference Scenario	High Case	Highest Case
Cumulative number of	[FY2015]	..	[2]	[5]	[8]	..
restarted nuclear reactors ¹	FY20016	..	3	13	17	24
Average period for operation (months)		..	8	6	10	..
Electricity generation by nuclear (TWh)		288.2	15.3	63.9	132.7	165.9

Reference Scenario: The first commercial operation resumes in late summer or early fall 2015. Restarts of three to five plants follow in every about six months.

Low Case: The first restarts delay a bit compared with the Reference Scenario. The second group restarts about one year later.

High Case: The first commercial operation resumes in late summer or early fall 2015. Then one plant restarts about a month on average thanks to more efficient assessment.

Highest Case: A hypothetical case in which 24 applicant plants for the assessment generate electricity with 80% of capacity factor.

		FY2010	FY2016 (Changes from FY2010)			
			Low Case	Reference Scenario	High Case	Highest Case
Economy	Power generation cost ² (JPY/kWh)	(8.2)	+3.3	+2.7	+2.0	+1.6
	Total fossil fuel imports (JPY trillion)	18.1	+3.1	+2.6	+1.9	+1.6
	Oil	12.3	+1.2	+1.0	+0.8	+0.7
	LNG	3.5	+2.0	+1.7	+1.2	+1.0
	Trade balance (JPY trillion)	5.3	-9.2	-8.7	-8.1	-7.9
	Real GDP (JPY2005 trillion)	512.7	+32.1	+32.3	+32.7	+32.9
	Gross national income (JPY trillion)	493.8	+46.3	+46.7	+47.3	+47.5
Energy	Primary energy supply					
	Oil (GL)	232.3	-23.7	-26.7	-30.7	-32.6
	Natural gas (Mt of LNG equivalent)	73.3	+17.2	+12.0	+4.6	+0.9
	LNG imports (Mt)	70.6	+17.9	+12.7	+5.3	+1.6
	Self-sufficiency rate	18.0%	-8.5p	-6.4p	-3.4p	-2.0p
Environ-ment	Energy-related CO ₂ emissions (Mt)	1,139	+33	+10	-22	-37
	Changes from FY2013	[-7.8%]	[-5.1%]	[-6.9%]	[-9.5%]	[-10.8%]

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.