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
  - 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

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

Exchange rates
  - JPY121/$ → 122 → 125

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

- Oil: -2.5 Mtoe (2015) / +0.8 Mtoe (2016)
- Natural gas: -1.0 Mtoe (2015) / +0.0 Mtoe (2016)
- Hydro: +1.0 Mtoe (2015) / +0.0 Mtoe (2016)
- Nuclear: +2.2 Mtoe (2015) / +0.0 Mtoe (2016)
- Coal: +0.8 Mtoe (2015) / +0.0 Mtoe (2016)
- New energies: +3.1 Mtoe (2015) / +0.0 Mtoe (2016)
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

Changes by sector

New heat contents are applied since FY2013.
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
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 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.

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.
**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.

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**Installed capacity in operation**

- Solar PV for non-residence
- Solar PV for residence
- Wind
- Biomass

**Cumulative burdens by FIT**

- In operation
  - 10
  - 14

- Approved
  - 42
  - 50

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

*: As of the end of February 2015
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**

- Prices in the dollar
- Exchange rates
- Quantity
- For power generation
- Imports

**Impacts of oil price rises by $10/bbl**

- Real GDP
- GNI per capita
- IIP
- Consumer prices
- TPES
- Natural gas
- Oil
- Electricity sales
- City gas sales
- Fuel oil sales

The Reference Scenario in and after FY2015
### Huge benefits by utilisation of nuclear

- Fuel import spending decreases by JPY 1.5 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 JPY 1,700/MWh. Rational utilisation of nuclear brings enormous benefits even under a situation with low energy prices.

### Impacts of nuclear power plants’ restart [FY2016]

<table>
<thead>
<tr>
<th>Nuclear power generation (TWh)</th>
<th>Power generation cost (JPY/kWh)</th>
<th>Real GDP (JPY trillion)</th>
<th>Fuel imports (JPY trillion)</th>
<th>LNG imports (Mt)</th>
<th>CO₂ emissions (Mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Restarted plants by the end of FY2016: 24)</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td>(17)</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>(13)</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>(3)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Changes from the Reference Scenario except for nuclear power generation
## Impacts of nuclear power plants’ restart

**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.

### Table of 2016 (Changes from FY2010)

<table>
<thead>
<tr>
<th></th>
<th>FY2010</th>
<th>Reference Scenario</th>
<th>High Case</th>
<th>Highest Case</th>
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</thead>
<tbody>
<tr>
<td><strong>Cumulative number of</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>restarted nuclear reactors</td>
<td>[FY2015]</td>
<td>[2]</td>
<td>[5]</td>
<td>[8]</td>
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<tr>
<td>FY20016</td>
<td>..</td>
<td>3</td>
<td>13</td>
<td>17</td>
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<tr>
<td><strong>Average period for operation (months)</strong></td>
<td>..</td>
<td>8</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td><strong>Electricity generation by nuclear (TWh)</strong></td>
<td>288.2</td>
<td>15.3</td>
<td>63.9</td>
<td>132.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>FY2010</th>
<th>FY2016 (Changes from FY2010)</th>
<th>Reference Scenario</th>
<th>High Case</th>
<th>Highest Case</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economy</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Power generation cost</strong></td>
<td>(8.2)</td>
<td>+3.3</td>
<td>+2.7</td>
<td>+2.0</td>
<td>+1.6</td>
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<tr>
<td>(JPY/kWh)</td>
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<tr>
<td><strong>Total fossil fuel imports</strong></td>
<td>18.1</td>
<td>+3.1</td>
<td>+2.6</td>
<td>+1.9</td>
<td>+1.6</td>
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<tr>
<td>(JPY trillion)</td>
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<tr>
<td><strong>Oil</strong></td>
<td>12.3</td>
<td>+1.2</td>
<td>+1.0</td>
<td>+0.8</td>
<td>+0.7</td>
</tr>
<tr>
<td><strong>LNG</strong></td>
<td>3.5</td>
<td>+2.0</td>
<td>+1.7</td>
<td>+1.2</td>
<td>+1.0</td>
</tr>
<tr>
<td><strong>Trade balance</strong> (JPY trillion)</td>
<td>5.3</td>
<td>-9.2</td>
<td>-8.7</td>
<td>-8.1</td>
<td>-7.9</td>
</tr>
<tr>
<td><strong>Real GDP</strong> (JPY2005 trillion)</td>
<td>512.7</td>
<td>+32.1</td>
<td>+32.3</td>
<td>+32.7</td>
<td>+32.9</td>
</tr>
<tr>
<td><strong>Gross national income</strong> (JPY trillion)</td>
<td>493.8</td>
<td>+46.3</td>
<td>+46.7</td>
<td>+47.3</td>
<td>+47.5</td>
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<tr>
<td><strong>Energy</strong></td>
<td></td>
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<tr>
<td><strong>Primary energy supply</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Oil (GL)</strong></td>
<td>232.3</td>
<td>-23.7</td>
<td>-26.7</td>
<td>-30.7</td>
<td>-32.6</td>
</tr>
<tr>
<td><strong>Natural gas (Mt of LNG equivalent)</strong></td>
<td>73.3</td>
<td>+17.2</td>
<td>+12.0</td>
<td>+4.6</td>
<td>+0.9</td>
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<tr>
<td><strong>LNG imports (Mt)</strong></td>
<td>70.6</td>
<td>+17.9</td>
<td>+12.7</td>
<td>+5.3</td>
<td>+1.6</td>
</tr>
<tr>
<td><strong>Self-sufficiency rate</strong></td>
<td>18.0%</td>
<td>-8.5p</td>
<td>-6.4p</td>
<td>-3.4p</td>
<td>-2.0p</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Energy-related CO₂ emissions</strong> (Mt)</td>
<td>1,139</td>
<td>+33</td>
<td>+10</td>
<td>-22</td>
<td>-37</td>
</tr>
<tr>
<td><strong>Changes from FY2013</strong></td>
<td>[-7.8%]</td>
<td>[-5.1%]</td>
<td>[-6.9%]</td>
<td>[-9.5%]</td>
<td>[-10.8%]</td>
</tr>
</tbody>
</table>

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.

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