

**Short-Term Energy Supply/Demand Outlook**  
**– Forecast through FY2010 and Analysis on Effects of Crude Oil Price, Economic Growth**  
**and Ambient Temperature Changes –**

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**<Summary>**

**[ Background ]**

The world economy plunged into a recession on the so-called “Lehman Shock” in September 2008. But it passed the worst phase from the spring to summer in 2009. Recovery has been seen in many countries. Particularly, the Asian region including China has achieved remarkable recovery. The Japanese economy apparently hit a trough in the January-March 2009 quarter. Backed by growing exports to the Asian region, Japan’s manufacturers have been recovering. But domestic demand, though supported by the so-called Eco-Point system, tax breaks, subsidies and other consumption stimuli, has stagnated on worsening employment and income conditions. Generally, Japan has remained under a deflationary economy. Energy demand declined substantially before a recent sign of a lull in the decline amid the production recovery. Meanwhile, Japan saw a historical government change in September 2009. Economic, energy and environmental policy directions are changing dramatically.

Given such conditions, this report presents **forecasts on energy supply and demand in FY2009 and FY2010**. For FY2010, we have made energy supply and demand forecasts for the “**base case**” and analyzed effects of **crude oil price, economic growth and ambient temperature** changes on energy supply and demand.

**[ Key Conclusion ]**

**(1) Outlook on Key Economic Indicators for FY2009 and FY2010**

During FY2009, Japan’s domestic demand has remained weak despite an export-led production recovery on a global economic upturn. Although the entire economy is recovering slowly, Japan’s **GDP** in FY2009 is expected to post a **real contraction of 2.7%** from the previous year due to a negative carryover in the January-March 2009 quarter. As for production, **the Index of Industrial Production** for FY2009 is predicted to **drop 10.2%** from the previous year as a recovery in auto, electrical machinery, steel and other production in the second half of the year is likely to fall short of offsetting a plunge in the first half.

In FY2010, the **Index of Industrial Production** is projected to **jump 9.9%** from the previous year on an export-led machinery production recovery and a reaction to the FY2009 plunge. But the index is likely to fall short of rising back to levels before the financial crisis, leaving overcapacity. Meanwhile, **GDP** is estimated to score a **positive real growth rate of 1.3%** on a domestic and overseas demand recovery as the new government's policies including child allowances are expected to boost household consumption. For our outlook, the mean **CIF-based crude oil import price**<sup>(see note)</sup> in FY2010 is assumed at **\$70/barrel**, the same level as at present.

Note: Based on "Prospects for the International Oil Market and Crude Oil Prices in 2010" by Ken Koyama (December 25, 2009).

## **(2) Outlook on Energy Supply and Demand in FY2009 and FY2010**

### **<Primary energy supply and final energy consumption>**

In FY2009, **final energy consumption** is projected to **decline 2.2%** from the previous year. Final energy consumption is expected to decrease 2.7% on slack production in the first half of the year in the industrial sector, 1.1% on a fall in demand for air-conditioning in the consumer sector and 2.3% on decreased transportation demand and improvements in vehicle fuel efficiency in the transportation sector. **Domestic primary energy supply**, including consumption in the energy conversion sector including electricity generators, is predicted to **fall 2.9%**. Energy-based **carbon dioxide emissions** are expected to **drop 4.8%** from the previous year on less energy consumption and an increase in nuclear power generation.

In FY2010, **final energy consumption** is projected to **increase 1.9%** from the previous year on a production recovery. The industrial sector is expected to expand final energy consumption 4.5% on the production expansion. But the transportation sector is predicted to cut consumption 2.0% on continued improvements in fuel and transportation efficiencies. The consumer sector is projected to increase energy consumption 1.0% on ambient temperature changes and a recovery in services. **Domestic primary energy supply** is predicted to expand **2.8%** from the previous year. **CO<sub>2</sub> emissions** are estimated to **increase 2.6%** from the previous year on the energy consumption growth. CO<sub>2</sub> emissions are thus expected to turn up on an economic recovery after declining due to the recession in FY2008 and FY2009.

Note: Our outlook does not take into account the new government's energy and environmental policies (including a global warming tax and a feed-in tariff system for purchases of all electricity generated with renewable energy). The outlook does not give considerations to the planned termination of the provisional gasoline tax rate and the planned elimination of expressway tolls that are likely to affect energy supply and demand.

**<Sales-based energy demand>**

In FY2009, **electricity sales** are expected to **decline 2.8%** from the previous year as a production recovery in the second half fails to offset a plunge in the first half. In FY 2010, electricity sales are projected to **rise 4.2%** from the previous year on growing demand in the consumer sector amid ambient temperature changes in addition to the production recovery.

In FY2009, **town gas sales** are expected to **decrease 2.2%** from the previous year due to a production slump's great impact on industrial demand and a plunge in air-conditioning demand in the commercial sector. In FY2010, town gas sales are predicted to **expand 5.9%** from the previous year on a sharp reactionary gain in industrial and commercial demand as well as a small increase in household demand amid ambient temperature changes.

In FY2009, **fuel oil sales** are projected to **fall 3.2%** from the previous year despite an increase in naphtha sales amid a fast chemical industry recovery as demand has decreased generally on slack economic activities. In FY2010, fuel sales are estimated to **decrease 2.6%** from the previous year in a continuation of a downtrend as production recovery effects are more than offset by a growing shift from fuel oil to other energy sources and improvements in vehicle fuel efficiency.

**(3) Evaluating Possible Impacts of Factors Affecting Energy Supply/Demand in FY2010**

**If the crude oil import price is \$20/barrel higher** than in the base case, **growth will fall by 0.1 percentage point in real GDP and by 0.5 point in domestic primary energy supply**. Impacts on the industrial sector will be larger than on other sectors due to the economic slowdown. Higher crude oil prices will have greater adverse impacts on oil and town gas consumption, while working to boost electricity sales. This is because lower relative price of electricity to other fuels are expected to encourage households to shift from kerosene-based heaters to air-conditioners and firms to shift from auto-generations to purchases.

If a slower-than-expected recovery in the world economy leads the **real GDP growth rate** to be 1.0 percentage point lower than in the base case, **domestic primary energy supply will decline by 1.4%**. Lower economic growth will affect mainly export-oriented manufacturers, bringing about a sharp decline in energy consumption in the industrial sector.

If a faster-than-expected recovery in domestic demand under policy effects leads the **real GDP growth rate** to be 1.0 percentage point higher than in the base case, **domestic primary energy supply will increase by 0.5%**. The industrial sector will post a relatively greater increase in energy consumption. But the impacts of higher economic growth on overall energy consumption will be far

different from those of lower growth.

If the mean ambient temperature in summer (July to September) is 1°C higher than the average-year level, **domestic primary energy supply will increase by 0.3%**. The higher temperature will boost energy demand in the commercial sector with greater air-conditioning demand faster than in the household sector. It will also increase energy demand in the transportation sector as greater air-conditioning demand in cars deteriorates fuel efficiency. Under the higher temperature, electricity will post the largest demand growth among energy sources. A town gas demand rise will be limited.

If the mean ambient temperature in winter (January to March) is 1°C lower than the average-year level, **domestic primary energy supply will increase by 0.3%**. Reversing the higher summer temperature case, the lower winter temperature will have a greater impact on the household sector than on the commercial sector by expanding heating and hot-water demand. Under the lower winter temperature, town gas will post the largest demand growth among energy sources.

Summary Table (Base Case)

|   |   | FY2007<br>(Actual)                                      | FY2008 (Actual)   |                    |                    | FY2009 (Forecast) |                   |                   | FY2010<br>(Forecast) |
|---|---|---|-------------------|--------------------|--------------------|-------------------|-------------------|-------------------|----------------------|
|   |   |   | 1st half          | 2nd half           | Total              | 1st half          | 2nd half          | Total             |                      |
| Key economic indicators   | GDP<br>(Chained to year 2000, in billions of yen)   | 562,435<br>(1.8)  | 274,120<br>(-0.9) | 267,375<br>(-6.5)  | 541,494<br>(-3.7)  | 259,157<br>(-5.5) | 267,980<br>(0.2)  | 527,137<br>(-2.7) | 534,135<br>(1.3)     |
|   | Private demand                                      | 417,575<br>[0.5]  | 203,751<br>[-1.3] | 201,022<br>[-3.2]  | 404,773<br>[-2.3]  | 192,400<br>[-4.1] | 196,821<br>[-1.6] | 389,221<br>[-2.9] | 393,399<br>[0.8]     |
|   | Public demand                                       | 117,210<br>[0.0]  | 55,541<br>[-0.3]  | 60,258<br>[-0.2]   | 115,799<br>[-0.3]  | 57,273<br>[0.6]   | 61,647<br>[0.5]   | 118,920<br>[0.6]  | 118,170<br>[-0.1]    |
|   | External demand                                     | 28,082<br>[1.2]   | 15,123<br>[0.8]   | 6,324<br>[-3.1]    | 21,447<br>[-1.2]   | 8,628<br>[-2.4]   | 9,572<br>[1.2]    | 18,200<br>[-0.6]  | 22,554<br>[0.8]      |
|   | Corporate goods price index<br>(Year 2005 = 100)    | 104.9<br>(2.3)  | 110.5<br>(6.1)    | 106.0<br>(0.4)     | 108.3<br>(3.2)     | 102.9<br>(-6.9)   | 102.6<br>(-3.3)   | 102.7<br>(-5.1)   | 101.2<br>(-1.5)      |
|   | Consumer price index<br>(Year 2005 = 100)           | 100.6<br>(0.4)  | 102.1<br>(1.8)    | 101.2<br>(0.4)     | 101.7<br>(1.1)     | 100.5<br>(-1.6)   | 99.6<br>(-1.6)    | 100.0<br>(-1.6)   | 99.0<br>(-1.1)       |
|   | Index of industrial production<br>(Year 2005 = 100) | 108.1<br>(2.7)  | 105.2<br>(-0.3)   | 83.6<br>(-24.4)    | 94.4<br>(-12.7)    | 80.0<br>(-24.0)   | 89.5<br>(7.1)     | 84.7<br>(-10.2)   | 93.2<br>(9.9)        |
|   | Crude steel production<br>(In thousands of tons)    | 121,511<br>(3.2)  | 61,507<br>(2.9)   | 43,993<br>(-28.7)  | 105,500<br>(-13.2) | 43,329<br>(-29.6) | 54,131<br>(23.0)  | 97,460<br>(-7.6)  | 110,143<br>(13.0)    |
|   | Ethylene production<br>(In thousands of tons)       | 7,559<br>(-1.3)   | 3,472<br>(-7.3)   | 3,048<br>(-20.1)   | 6,520<br>(-13.7)   | 3,514<br>(1.2)    | 3,708<br>(21.6)   | 7,222<br>(10.8)   | 7,171<br>(-0.7)      |
|   | Exchange rate<br>(Yen/US\$)                         | 114.2<br>(-2.3)   | 106.1<br>(-11.1)  | 94.9<br>(-13.1)    | 100.5<br>(-12.0)   | 95.4<br>(-10.0)   | 90.0<br>(-5.1)    | 92.7<br>(-7.7)    | 90.0<br>(-2.9)       |
|   | Crude oil CIF price<br>(US\$/Bbl)                   | 77.9<br>(22.4)  | 119.8<br>(76.5)   | 60.3<br>(-31.4)    | 90.1<br>(15.6)     | 61.7<br>(-48.5)   | 69.8<br>(15.7)    | 65.7<br>(-27.0)   | 69.5<br>(5.7)        |
|   | Heating degree-days                                 | 996<br>(15.2)   | 36<br>(-36.5)     | 863<br>(-8.1)      | 899<br>(-9.7)      | 35<br>(-2.2)      | 958<br>(11.0)     | 993<br>(10.4)     | 980<br>(-1.3)        |
|   | Cooling degree-days                                 | 437<br>(16.1)   | 398<br>(-8.2)     | -<br>(-100.0)      | 398<br>(-8.8)      | 328<br>(-17.6)    | 1<br>-            | 329<br>(-17.3)    | 411<br>(24.6)        |
|   | Key energy indicators                               | Primary energy supply<br>(10 <sup>10</sup> kcal = KTOE) | 537,872<br>(0.2)  | 257,760<br>(-0.4)  | 253,763<br>(-9.1)  | 511,523<br>(-4.9) | 234,496<br>(-9.0) | 261,975<br>(3.2)  | 496,471<br>(-2.9)    |
| Final energy consumption<br>(10 <sup>10</sup> kcal = KTOE)                                  |   | 362,256<br>(-0.9)                                       | 168,144<br>(-2.4) | 171,420<br>(-9.8)  | 339,564<br>(-6.3)  | 155,375<br>(-7.6) | 176,833<br>(3.2)  | 332,208<br>(-2.2) | 338,559<br>(1.9)     |
| Industrial sector   |   | 176,770<br>(-0.4)                                       | 84,213<br>(-1.3)  | 76,555<br>(-16.3)  | 160,768<br>(-9.1)  | 73,706<br>(-12.5) | 82,724<br>(8.1)   | 156,430<br>(-2.7) | 163,425<br>(4.5)     |
| Consumer sector   |   | 98,131<br>(-0.4)  | 41,232<br>(-3.0)  | 53,359<br>(-4.0)   | 94,591<br>(-3.6)   | 40,226<br>(-2.4)  | 53,304<br>(-0.1)  | 93,530<br>(-1.1)  | 94,507<br>(1.0)      |
| Transportation sector   |   | 87,355<br>(-2.6)  | 42,699<br>(-3.9)  | 41,506<br>(-3.3)   | 84,205<br>(-3.6)   | 41,443<br>(-2.9)  | 40,805<br>(-1.7)  | 82,249<br>(-2.3)  | 80,628<br>(-2.0)     |
| Electricity sales<br>(billion kWh)  |   | 954.7<br>(3.5)  | 473.2<br>(0.1)    | 447.6<br>(-7.1)    | 920.8<br>(-3.6)    | 436.2<br>(-7.8)   | 459.0<br>(2.5)    | 895.2<br>(-2.8)   | 933.1<br>(4.2)       |
| Town gas sales<br>(million m <sup>3</sup> /10,000kcal)                                      |   | 35,896<br>(6.3)   | 16,713<br>(1.1)   | 17,793<br>(-8.1)   | 34,505<br>(-3.9)   | 15,299<br>(-8.5)  | 18,445<br>(3.7)   | 33,744<br>(-2.2)  | 35,743<br>(5.9)      |
| Fuel oil sales<br>(1,000kl)   |   | 218,421<br>(-2.4)                                       | 96,834<br>(-4.9)  | 104,208<br>(-10.7) | 201,042<br>(-8.0)  | 89,828<br>(-7.2)  | 104,686<br>(0.5)  | 194,513<br>(-3.2) | 189,527<br>(-2.6)    |
| CO <sub>2</sub> emissions (energy-based)<br>(million t-CO <sub>2</sub> )<br>(FY 1990 = 100) |   | 1,219<br>(2.8)  |                   |                    | 1,138<br>(-6.7)    |                   |                   | 1,083<br>(-4.8)   | 1,111<br>(2.6)       |
|   |   | 115.1   |                   | 107.4              |                    |                   | 102.2             | 104.9             |                      |

Sources: Actual results data prepared from various publications; forecasts by IEEJ

Notes:

- Figures in parentheses indicate year-to-year percentage changes, except contributions to GDP growth.
- Contributions to GDP growth may not add up to the total due to minor data deviations.
- The industrial sector consumption includes non-energy uses.

### Effects of Economic Growth and Crude Oil Price Changes

|  | Base Case |          |            |            | Sensitivity analysis [Gaps with base case (FY2010)] |             |                                      |  |
|--|-----------|----------|------------|------------|---|-------------|--------------------------------------|--|
|  | FY2007    | FY2008   | FY2009     | FY2010     | Crude oil price *                                   |             | Economic growth                      |  |
|  | (Actual)  | (Actual) | (Forecast) | (Forecast) | Higher price  | Lower price | Lower growth                         | Higher growth                          |
|  |           |          |            |            | 90\$/bbl  | 50\$/bbl    | World economy stagnation<br>GDP:0.3% | Domestic demand-led growth<br>GDP:2.3% |
| Real GDP growth (%)                      | 1.8       | -3.7     | -2.7       | 1.3        | ▲0.1  | +0.1        | ▲1.0                                 | +1.0                                   |
| Private demand [contribution to growth]  | [+0.5]    | [-2.3]   | [-2.9]     | [+0.8]     | [-0.1]  | [+0.1]      | [-0.5]                               | [+1.0]                                 |
| Public demand [contribution to growth]   | [+0.0]    | [-0.3]   | [+0.6]     | [-0.1]     | [-0.0]  | [+0.0]      | [+0.0]                               | [+0.1]                                 |
| External demand [contribution to growth] | [+1.2]    | [-1.2]   | [-0.6]     | [+0.8]     | [+0.0]  | [-0.0]      | [-0.6]                               | [-0.1]                                 |
| Consumer price index (%)                 | 0.4       | 1.1      | -1.6       | -1.1       | +0.1  | ▲0.1        | ▲0.1                                 | +0.1                                   |
| Industrial production index (%)          | 2.7       | -12.7    | -10.2      | 9.9        | ▲0.2  | +0.2        | ▲5.1                                 | +1.2                                   |
| Crude oil CIF price \$/bbl               | 78        | 90       | 66         | * 70       | +20   | ▲20         | -                                    | -                                      |
| Primary energy supply (%)                | 0.2       | -4.9     | -2.9       | 2.8        | ▲0.5  | +0.7        | ▲1.4                                 | +0.5                                   |
| Final energy consumption (%)             | -0.9      | -6.3     | -2.2       | 1.9        | ▲0.8  | +1.0        | ▲1.4                                 | +0.5                                   |
| Industrial sector (%)                    | -0.4      | -9.1     | -2.7       | 4.5        | ▲1.0  | +1.3        | ▲2.7                                 | +0.7                                   |
| Consumer sector (%)                      | -0.4      | -3.6     | -1.1       | 1.0        | ▲0.5  | +0.8        | ▲0.3                                 | +0.4                                   |
| Transportation sector (%)                | -2.6      | -3.6     | -2.3       | -2.0       | ▲0.6  | +0.7        | ▲0.3                                 | +0.3                                   |
| Electricity sales (%)                    | 3.5       | -3.6     | -2.8       | 4.2        | +0.1  | ▲0.1        | ▲1.2                                 | +0.6                                   |
| Town gas sales (%)                       | 6.3       | -3.9     | -2.2       | 5.9        | ▲1.0  | +1.4        | ▲1.6                                 | +0.6                                   |
| Fuel oil sales (%)                       | -2.4      | -8.0     | -3.2       | -2.6       | ▲1.1  | +1.4        | ▲0.9                                 | +0.5                                   |
| LPG sales (%)                            | -0.2      | -6.9     | -4.1       | 0.6        | ▲0.4  | +0.6        | ▲0.6                                 | +0.9                                   |
| CO <sub>2</sub> emissions (%)            | 2.8       | -6.7     | -4.8       | 2.6        | ▲0.6  | +0.9        | ▲1.8                                 | +0.7                                   |

\* Based on "Prospects for the International Oil Market and Crude Oil Prices in 2010" by Ken Koyama (IEEJ, December 25, 2009)

### Effects of Temperature Changes

|  | 1°C rise in summer<br>(July-September) |                  |              | 1°C fall in winter<br>(January-March) |                  |              |
|--|--|------------------|--------------|---------------------------------------|------------------|--------------|
|  | Change in demand                       | % change         |              | Change in demand                      | % change         |              |
|  |  | Period on period | Year on year |                                       | Period on period | Year on year |
| Domestic primary energy supply (10 <sup>10</sup> kcal) | <b>1,386</b>                           | (1.1)            | (0.3)        | <b>1,310</b>                          | (1.0)            | (0.3)        |
| Final energy consumption (10 <sup>10</sup> kcal)       | <b>544</b>                             | (0.7)            | (0.2)        | <b>874</b>                            | (1.0)            | (0.3)        |
| Industrial sector                                      | <b>49</b>                              | (0.1)            | (0.0)        | <b>130</b>                            | (0.3)            | (0.1)        |
| Household sector                                       | <b>86</b>                              | (0.9)            | (0.2)        | <b>550</b>                            | (2.9)            | (1.0)        |
| Commercial sector                                      | <b>349</b>                             | (3.0)            | (0.8)        | <b>194</b>                            | (1.7)            | (0.5)        |
| Transportation sector                                  | <b>60</b>                              | (0.3)            | (0.1)        | -                                     | (0.0)            | (0.0)        |
| Electricity sales (million kWh)                        | <b>5,646</b>                           | (2.3)            | (0.6)        | <b>3,004</b>                          | (1.2)            | (0.3)        |
| Town gas sales (million m <sup>3</sup> /10,000kcal)    | <b>59</b>                              | (0.7)            | (0.2)        | <b>263</b>                            | (2.5)            | (0.7)        |
| Fuel oil sales (1,000kl)                               | <b>404</b>                             | (0.9)            | (0.2)        | <b>431</b>                            | (0.8)            | (0.2)        |
| LPG sales (1,000t)                                     | <b>-63</b>                             | (-1.6)           | (-0.4)       | <b>122</b>                            | (2.7)            | (0.7)        |

Note: The industrial sector consumption includes non-energy uses.

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