

The Short-Term Energy Supply/Demand Outlook

- Forecast through FY2008 and Analysis on the Effects of Crude Oil Prices, Economic Growth, and Temperatures -

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<Abstract>

Background:

The Japanese economy is continuing to expand, although slowly, over the most extended period since World War II. However, due to stagnant growth in wages, the benefits of economic expansion are hardly felt by households, failing to bring about the anticipated growth in personal consumption. Moreover, the amendment of the Building Standard Law has depressed the housing and construction industries. Even though Japan's exports to Asia and Europe are growing favorably, the U.S. economy, which is pivotal in world economic trends, is beginning to slow down due to financial unrest such as the sub-prime lending issue.

The rising crude oil price over an extended period has begun to bring about a major change in the energy supply/demand structure. The emergency shutdown of nuclear power plants in July 2007 due to the Niigata-ken Chuetsu-oki Earthquake impacted on the supply and demand of power generation fuels.

In consideration of these situations, this report presents **forecasts on the energy supply and demand in Japan for FY2007 and FY2008**. When producing forecasts for FY2008, we first estimated energy supply and demand by assuming a "**base case**" scenario, and then analyzed how variations in the **crude oil price, economic growth, ambient temperature and nuclear power availability** may affect energy supply and demand.

Major conclusions:

(1) Outlook on the economy for FY2007 and FY2008

For FY2007, the Japanese economy continued to expand, even though the pace was slow. A decrease in residential investments due to the amendment of the Building Standard Law seems to be temporary. Driven chiefly by a growth in exports to Asia and Europe, the **real GDP growth rate** for FY2007 is expected to be **1.5% higher** compared with the previous fiscal year. With high production activities in industrial sectors

such as steel, automobile, electrical machinery and industrial machinery, the **indices of industrial production in total** for FY2007 are expected to be **2.6% higher** compared with the previous fiscal year.

For FY2008, the U.S. economy may continue to suffer from the sub-prime lending issue but it is expected to expand in the second half of the fiscal year. With growth in export and private investment, Japan's real GDP growth for FY2008 is expected to be **2.1% higher** compared with the previous fiscal year. With continued growth in production activities in both raw material and machinery sectors, the **indices for industrial production in total** for FY2008 are expected to be **2.7% higher** compared with the previous fiscal year. As for the **crude oil price (CIF-based import price)** upon which our forecasts are based, we assume that the price will remain high in FY2008 at the average of **\$76/barrel**, even though this is lower than the price at the end of 2007.

* The estimation is based on "Prospects for the International Market and Crude Oil Prices in 2008" by Ken Koyama, December 20, 2007.

(2) Outlook on energy supply and demand for FY2007 and FY2008

<Primary energy supply and final energy consumption>

For FY2007, **final energy consumption** is expected to be **0.2% higher** compared with the previous fiscal year. Despite high production activities in the machinery sector, for example, the progress of energy saving will offset the growth, resulting in a 0.1% decrease in energy consumption by the industrial sector compared with the previous fiscal year. Energy consumption by the consumer sector, which depends largely on ambient temperatures, is expected to be 1.9% higher than in the previous fiscal year that was characterized by an exceptionally warm winter. Energy consumption by the transportation sector in FY2007 is expected to be 1.1% lower compared with the previous fiscal year, due mainly to improvements in the fuel efficiency of automobiles. The **domestic primary energy supply** in FY2007, inclusive of energy consumption within the energy conversion sector (power generation sector, etc.), is expected to be **0.7% higher** compared with the previous fiscal year, with greater consumption of power generation fuels. **Energy-derived CO₂ emission** in FY2007 is expected to be **2.4% higher** compared with the previous fiscal year due to increased energy consumption and less availability of nuclear power plants.

For FY2008, the **final energy consumption** is expected to be **0.2% lower** compared with the previous fiscal year. Even though production activities will continue to be firm, the growth will be offset by progress in energy saving and a decrease in demand for automobile fuels. With firm production activities, energy consumption by the industrial sector in FY2008 is expected to be 0.4% higher compared with the previous fiscal year. With further improvements in the fuel efficiency of automobiles, energy consumption by the transportation sector in FY2008 is expected to be 1.4% lower compared with the previous fiscal year.

Assuming little impact from ambient temperatures, energy consumption by the consumer sector in FY2008 is expected to remain the same as in the previous fiscal year (zero growth). The **domestic primary energy supply** in FY2008 is expected to be **0.1% higher** compared with the previous fiscal year. **CO₂ emission** generally increases with energy demand. Nevertheless, with greater availability of nuclear power plants, CO₂ emission in FY2008 is expected to be **1.8% lower** compared with the previous fiscal year.

(We assume that the Kashiwazaki Kariwa Nuclear Power Station, shutdown since the Niigata-ken Chuetsu-oki Earthquake, will remain unavailable throughout the period covered by the present forecasts.)

<Outlook on energy demand, based on sales>

Electricity sales in FY2007 are expected to be **3.0% higher** compared with the previous year, due to favorable growth in production activities in general, increased cases of switching from auto generation to grid power, and increased space heating demand in the consumer sector (compared with the warm winter in the previous fiscal year). With continued firmness in production activities and with increased cases of switching to electricity, electricity sales in FY2008 are expected to be **1.6% higher** compared with the previous fiscal year.

The **town gas sales** in FY2007 are expected to be **5.9% higher** compared with the previous fiscal year, due to significant growth in demand in the industrial sector with increased cases of switching from oil for environmental reasons or due to higher crude oil prices, and due also to a growth in space and water heating demand in the consumer sector. With continued growth in demand in the industrial sector, town gas sales in FY2008 are expected to be **3.6% higher** compared with the previous fiscal year.

Fuel oil sales in FY2007 are expected to be **0.9% lower** compared with the previous year despite significant growth in the demand for heavy fuel oil-C for power generation due to factors such as the switching to alternative fuels in the consumer sector, less use of auto generation, and decreased demand for automobile fuels. With continued switching of fuels, further improvement in the fuel efficiency of automobiles, and decreased demand for power generation fuel oil, fuel oil sales in FY2008 are expected to be **2.5% lower** compared with the previous fiscal year.

(3) Evaluation of possible impacts on the energy supply and demand in FY2008

In comparison with the base case, a **crude oil price (import price)** of \$12.5 higher will **decrease real GDP growth by 0.1 percentage point and the domestic primary energy supply by 0.2 percentage point**. In the short term, the impact of higher crude oil prices on the Japanese economy will be minor. In terms of impacts on different sectors, impacts on the industrial and transportation sectors will be relatively large because these sectors are expected to suffer from the slowdown in economic growth. In terms of

impacts on different energy sources, impacts on oil will be large while impacts on electricity and town gas will be small.

In comparison with the base case, a **real GDP growth** of 1.0% lower will **decrease the domestic primary energy supply by 0.5 percentage point**. A change in energy supply and demand will be less than a change in economic growth. In terms of impacts on different sectors, impacts on the industrial sector will be the largest. In terms of impacts on different energy sources, impacts on oil will be the largest.

The **mean ambient temperature in summer (July to September)** of 1°C higher than in the average year will **increase the domestic primary energy supply by 1.4%**. In terms of impacts on different sectors, impacts on the commercial sector will be relatively large due to a larger proportion of the space cooling demand while impacts on the residential sector will be relatively small. Energy demand in the transportation sector will also increase due to decreased fuel efficiency (a higher load on automotive air conditioners). In terms of impacts on different energy sources, impacts on electricity (higher demand) will be the largest while impacts on town gas will be small.

The **mean ambient temperature in winter (January to March)** of 1°C lower than in the average year will **increase the domestic primary energy supply by 1.2%**. In terms of impacts on different sectors, the pattern will be the reverse of the higher temperature case in summer. That is to say, higher demand for space and water heating will significantly increase energy demand in the residential sector. In terms of impacts on different energy sources, impacts on town gas (higher demand) will be the largest.

The operation of a **single nuclear power plant** (1.1 million kW class) throughout the year will **decrease the contribution of fossil fuels to the primary energy supply and CO₂ emission by 0.5%**.

<Overview>

		FY2005	FY2006 (Actual)			FY2007 (Forecast)			FY2008
		Actual	1H	2H	Total	1H	2H	Total	Forecast
Key economic indicators	GDP (Chained to year 2000, in billion yen)	540,770 (2.4)	271,824 (2.1)	281,616 (2.5)	553,440 (2.3)	276,462 (1.7)	285,477 (1.4)	561,939 (1.5)	573,706 (2.1)
	Private demand	406,076 [2.1]	206,468 [1.8]	210,464 [2.2]	416,932 [2.0]	208,376 [0.7]	212,700 [0.8]	421,076 [0.7]	429,944 [1.6]
	Public demand	118,025 [-0.1]	55,788 [-0.5]	60,128 [-0.3]	115,916 [-0.4]	55,901 [0.0]	59,902 [-0.1]	115,803 [-0.0]	115,932 [0.0]
	External demand	17,062 [0.6]	9,972 [0.9]	11,520 [0.8]	21,491 [0.8]	12,714 [1.0]	13,342 [0.6]	26,056 [0.8]	28,795 [0.5]
	Corporate goods price index (Year 2005=100)	100.5 (1.8)	102.5 (2.4)	102.6 (1.6)	102.6 (2.0)	104.2 (1.6)	104.8 (2.1)	104.5 (1.9)	105.3 (0.8)
	Consumer price index (Year 2005=100)	100.0 (-0.3)	100.4 (0.4)	100.0 (0.1)	100.2 (0.3)	100.3 (-0.1)	100.3 (0.2)	100.3 (0.1)	100.6 (0.3)
	Indices of industrial production (*Year 2000=100)	102.1 (1.5)	104.9 (5.1)	109.1 (4.5)	107.0 (4.8)	107.6 (2.6)	112.0 (2.6)	109.8 (2.6)	112.8 (2.7)
	Crude steel production (in '000t)	112,718 (-0.2)	58,052 (2.2)	59,693 (6.7)	117,745 (4.5)	59,799 (3.0)	58,550 (-1.9)	118,349 (0.5)	119,359 (0.9)
	Ethylene production (in '000t)	7,549 (-0.1)	3,642 (-0.9)	4,020 (3.7)	7,661 (1.5)	3,745 (2.8)	4,013 (-0.2)	7,758 (1.3)	7,728 (-0.4)
	Exchange rate (Yen/US\$)	113.3 (5.4)	115.3 (5.3)	118.6 (1.3)	116.9 (3.3)	119.3 (3.4)	110.0 (-7.3)	114.6 (-2.0)	110.0 (-4.0)
	Crude oil CIF price (US\$/Bbl)	55.4 (43.5)	67.9 (28.9)	59.1 (1.5)	63.5 (14.5)	67.9 (0.1)	80.8 (36.7)	74.3 (17.1)	75.8 (1.9)
	Heating degree-days	1,116 (15.6)	64 (32.5)	800 (-25.0)	865 (-22.5)	56 (-12.7)	940 (17.5)	997 (15.3)	980 (-1.6)
	Cooling degree-days	449 (-8.7)	377 (-15.1)	- (-100.0)	377 (-16.1)	434 (15.3)	3 -	437 (16.0)	422 (-3.3)
	Key energy indicators	Primary energy supply (10 ¹⁰ kcal = KTOE)	538,743 (-0.4)	260,473 (-0.5)	272,349 (-1.7)	532,822 (-1.1)	260,249 (-0.1)	276,434 (1.5)	536,683 (0.7)
Final energy consumption (10 ¹⁰ kcal = KTOE)		372,213 (0.0)	174,921 (-0.8)	192,305 (-1.8)	367,226 (-1.3)	173,809 (-0.6)	194,086 (0.9)	367,895 (0.2)	367,282 (-0.2)
Industrial sector		176,636 (-1.0)	84,731 (0.6)	92,316 (1.0)	177,047 (0.2)	84,713 (-0.0)	92,103 (-0.2)	176,816 (-0.1)	177,467 (0.4)
Consumer sector		104,787 (2.7)	45,246 (0.1)	55,447 (-6.9)	100,693 (-3.9)	44,576 (-1.5)	58,020 (4.6)	102,597 (1.9)	102,599 (0.0)
Transportation sector		90,790 (-1.0)	44,944 (-1.9)	44,542 (-0.9)	89,486 (-1.4)	44,520 (-0.9)	43,963 (-1.3)	88,483 (-1.1)	87,216 (-1.4)
Electricity sales (billion kWh)		913.3 (2.4)	463.6 (2.2)	458.8 (-0.2)	922.4 (1.0)	473.0 (2.0)	477.3 (4.0)	950.2 (3.0)	965.1 (1.6)
Town gas sales (million m ³ /10,000kcal)		32,459 (7.7)	15,743 (7.1)	18,021 (1.5)	33,762 (4.0)	16,526 (5.0)	19,241 (6.8)	35,767 (5.9)	37,049 (3.6)
Fuel oil sales (1,000kl)		236,109 (-0.5)	104,476 (-4.9)	119,367 (-5.5)	223,843 (-5.2)	101,832 (-2.5)	120,032 (0.6)	221,864 (-0.9)	216,243 (-2.5)
CO ₂ emissions (million t-C)	328 (7.5)			323 (-1.6)			331 (2.4)	324 (-1.8)	

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

Notes:

1. Bracketed figures indicate % changes year-on-year, except GDP contributions.
2. GDP contributions may not add up to total due to minor data deviations.
3. The industrial sector consumption includes non-energy uses.

<Effects of Economic Growth and Crude Oil Price Changes>

	Base case estimations				Sensitivity analysis for FY2008 (difference from base case estimations)			
	FY2005 (Actual)	FY2006 (Actual)	FY2007 (Forecast)	FY2008 (Forecast)	Crude Oil Price*		Economic Growth	
					High-price case	Low-price case	Low-growth case	High-growth case
					88\$/bbl	58\$/bbl	GDP:1.1%	GDP:3.1%
Real GDP Growth Rate (%)	2.4	2.3	1.5	2.1	▲0.1	+0.2	▲1.0	+1.0
Private demand [Contribution to GDP]	[+2.1]	[+2.0]	[+0.7]	[+1.6]	[-0.1]	[+0.1]	[-0.9]	[+0.9]
Public demand [Contribution to GDP]	[-0.1]	[-0.4]	[-0.0]	[+0.0]	[-0.0]	[+0.0]	[-0.1]	[+0.1]
External demand [Contribution to GDP]	[+0.6]	[+0.8]	[+0.8]	[+0.5]	[+0.0]	[-0.0]	[-0.1]	[+0.1]
Consumer price index (%)	-0.3	0.3	0.1	0.3	+0.1	▲0.1	▲0.2	+0.2
Indices of industrial production (%)	1.5	4.8	2.6	2.7	▲0.2	+0.3	▲1.1	+1.1
Crude oil CIF price (US\$/Bbl)	55	63	74	* 76	+13	▲18	-	-
Primary energy supply (%)	-0.4	-1.1	0.7	0.1	▲0.2	+0.4	▲0.5	+0.5
Final energy consumption (%)	0.0	-1.3	0.2	-0.2	▲0.3	+0.5	▲0.5	+0.5
Industrial sector (%)	-1.0	0.2	-0.1	0.4	▲0.4	+0.6	▲0.7	+0.7
Consumer sector (%)	2.7	-3.9	1.9	0.0	▲0.1	+0.2	▲0.3	+0.3
Transportation sector (%)	-1.0	-1.4	-1.1	-1.4	▲0.3	+0.5	▲0.3	+0.3
Electricity sales (%)	2.4	1.0	3.0	1.6	▲0.0	+0.0	▲0.5	+0.5
Town gas sales (%)	7.7	4.0	5.9	3.6	▲0.2	+0.3	▲0.6	+0.6
Fuel oil sales (%)	-0.5	-5.2	-0.9	-2.5	▲0.5	+0.8	▲0.7	+0.7
LPG sales (%)	1.6	-0.1	1.7	0.1	▲0.1	+0.1	▲0.7	+0.7
CO ₂ emissions (%)	7.5	-1.6	2.4	-1.8	▲0.3	+0.5	▲0.6	+0.6

* The estimation is based on "Prospects for the International Market and Crude Oil Prices in 2008" by Ken Koyama, the Institute of Energy Economics, Japan, December 20, 2007.

<Effects of Temperature Changes>

	1°C rise in summer (July-September)		1°C fall in winter (January-March)	
	Changes in demand	% change	Changes in demand	% change
Domestic primary energy supply (10 ¹⁰ kcal)	1,809	(1.4)	1,682	(1.2)
Final energy consumption (10 ¹⁰ kcal)	624	(0.7)	1,035	(1.0)
Industrial sector	41	(0.1)	178	(0.4)
Residential sector	93	(1.0)	598	(3.0)
Commercial sector	384	(3.0)	259	(2.1)
Transportation sector	106	(0.5)	-	(0.0)
Electricity sales (million kWh)	6,334	(2.5)	3,268	(1.3)
Town gas sales (million m ³ /10,000kcal)	33	(0.4)	291	(2.6)
Fuel oil sales (1,000kl)	525	(1.0)	612	(1.0)
LPG sales (1,000t)	-64	(-1.5)	123	(2.3)

<Effects of a Nuclear Power Plant>

<Assumptions for sensitivity analyses>	
-	Effects from the operation of a 1.1 million kW-class nuclear power plant for a single year
-	The generated power amounts to 9,636 million kWh (1.0% of the power generated by electric power utilities).
-	The fuel mix of the substituted thermal power is as follows: 25% coal, 25% LNG, and 50% oil. (*)

	Decrease	(% change from the base case)
Decrease in the consumption of fossil fuels (10 ¹⁰ kcal)	2,102	(-0.5)
Coal (1,000t)	844	(-0.5)
LNG (1,000t)	378	(-0.5)
Oil (1,000kL)	1,142	(-0.5)
Fuel oil-C sales (1,000kL)	545	(-2.5)
Decrease in CO ₂ emissions (million carbon-equivalent ton)	1.7	(-0.5)

* In reality, the fuel mix of the substituted thermal power differs among electric power companies.

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