FY2008
Annual Energy Report
(Outline)
Points of FY2008 Annual Energy Report

Part 1

Section 1. Analyses of Factors and Impact of Ups and Downs of Crude Oil Prices

- Crude oil prices had intensified their rising trend since 2004 but started declining after peaking at $147 per barrel in July 2008, then down to the $30 level. Since then, crude oil prices have remained at about $40-50.

- As steep rise and decline in crude oil prices had significant impact on the world economy, the factors and impact thereof are analyzed.

  1) The factors of steep rise and decline in crude oil prices are classified into supply-and-demand fundamental factors and premium factors. Of these, as for the financial market, the developments and factors of inflows and outflows of money are analyzed.

  2) While the impact of steep rise and decline in crude oil prices on the economy is analyzed, the impact thereof on upstream development, energy conservation, new energy and the nuclear power business is analyzed.

- Various adverse effects due to excessive fluctuations in crude oil prices are clarified and the direction of measures against such effects is shown from a long-term point of view.

Section 2. Measures to Cope with Global Warming Issues

- The first commitment period prescribed by the Kyoto Protocol started in 2008. Full-fledged discussions are underway both at home and abroad to reach an agreement on the next framework at the end of this year.

- We present the approaches of Japan and other countries as well as the circumstances of international negotiations to deepen the understanding of the people about global warming issues, and the importance of Japan’s initiative (sectoral approach) in international negotiations and international cooperation.

- Rather than a declaration with no endorsement, we present the approach to discussions leading to develop Japan’s mid-term targets that are economically viable and contribute to the creation of an international framework in a “total participation” manner.
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2. Effects of ups and downs of crude oil prices on economy
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4. Effects of downfall in crude oil prices on energy conservation, new energy and nuclear energy

Section 2. Measures to Cope with Global Warming Issues

1. Circumstances around global warming issues
2. Japan’s approaches to reduce greenhouse gas emissions
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Section 1. Analyses of Factors and Impact of Ups and Downs of Crude Oil Prices

1. Analyses of factors of ups and downs of crude oil prices

Changes in crude oil prices

- Crude oil prices had intensified their rising trend since 2004 but started declining after peaking at $147 per barrel in July 2008, then down to the $30 level.

Factors of crude oil prices

- It is considered that the fluctuations in crude oil prices were made larger by premium factors, in addition to supply and demand fundamental factors.

![Figure: Changes in Crude Oil Prices in the New York Crude Oil Futures Market (WTI Crude Oil Prices)](image)

- Immediate demand
- (Inventory)
- Immediate supply
- Concern about supply and demand in the future
- Financial factors
- Geopolitical risk factors

… Information involving uncertain future outlook, etc.

… Interest rates, exchange rates, stock prices, fund inflows into and fund outflows from the market, changes in makeup of market participants, etc.

… Disputes, terrorism, riots, etc.
The circumstances of crude oil prices radically changed at such turning points as a rapid increase in demand in 2004, revelation of subprime loan issues in 2007, and a financial crisis in September 2008.

Table: Circumstances of Crude Oil Prices

<table>
<thead>
<tr>
<th>[From 2004 to 2007 before revelation of subprime loan issues]</th>
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<tbody>
<tr>
<td>- Crude oil prices that had remained stable until 2003 started rising in 2004 because of such factors as the medium-to-long term outlook for growing demand in emerging countries including China as well as geopolitical risks as seen in Iraq War.</td>
</tr>
<tr>
<td>- In the U.S., pension funds, petromoney, foreign currency reserves and other similar money flowed into the financial market to cope with an economic boom under low interest rates and expansion of current account deficit. Such money also flowed into the crude oil futures market through commodity index funds and others.</td>
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<table>
<thead>
<tr>
<th>[After revelation of subprime loan issues]</th>
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<tbody>
<tr>
<td>- As a result of the revelation of subprime loan issues, funds flowed from the sluggish stock market into the crude oil market where crude oil prices continued to rise against the backdrop of bullish outlook for demand.</td>
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<td>- The dollar's value declines due to a low interest policy, and relatively inexpensive crude oil was purchased more.</td>
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<tr>
<th>[Signs of down - decrease]</th>
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<tbody>
<tr>
<td>- In 2008, immediate demand slackened due to an economic slowdown and a steep rise of crude oil prices. It became a dominant view that the supply and demand balance would be eased in a short term.</td>
</tr>
<tr>
<td>- The awareness of the issues of overheated crude oil market was raised, and dialogues for market stabilization were continuously made between oil producing and consuming countries.</td>
</tr>
<tr>
<td>- Even in such circumstances, bullish forecasts for market tendency still continued and prices went up, but all of the factors to support high prices were lost and crude oil prices started declining after the peak of $147 per barrel on July 11.</td>
</tr>
<tr>
<td>- Policy shift toward a higher value of the dollar declined sense of undervalued crude oil prices, contributing to a further drop in crude oil prices.</td>
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<table>
<thead>
<tr>
<th>[After the financial crisis in September 2008]</th>
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<tbody>
<tr>
<td>- As the real economy began slowing down, the demand for oil declined, leading to further decrease of crude oil prices.</td>
</tr>
<tr>
<td>- The financial crisis and credit crunch were aggravated by the failure of Lehman Brothers as a major investment bank on September 15, and all markets including crude oil markets were seriously affected.</td>
</tr>
</tbody>
</table>
Trends of supply and demand of oil

- Until about 2003, oil supply rose in keeping pace with the increase in oil demand, and crude oil prices remained stable.
- A surge in demand for oil mainly in China in 2004 triggered a sharp rise in crude oil prices.

Slackening of demand in 2008

- Oil demand increased mainly in emerging countries. In 2008, however, oil demand drastically decreased in OECD countries, including the U.S., among others.
- The growth of oil demand in non-OECD countries began slowing down in the fourth quarter of 2008.
Changes in prices in excess of supply-and-demand fundamental factors

- According to model analyses, crude oil prices in and after 2004 changed in excess of the prices that reflected supply-and-demand fundamental factors.
- It is considered that this is because the concerns about supply and demand in the future, financial factors, geopolitical risk factors, etc. amplified price fluctuations and as a result premium prices increased.
- After the financial crisis, premium prices shrunk and further declined to the price level that reflected supply and demand fundamental factors in the first quarter of 2009.

Figure: Fundamental Prices and Premium Prices

Notes:
- Trend factors: Prices in terms of supply and demand balance (prices in the case where there was no total shock of demand, supply, and price)
- Non-trend demand factors: Contribution of non-trend demand increase and decrease such factors as a rapid increase in demand in China in 2004
- Non-trend supply factors: Contribution of non-trend supply increase and decrease such factors as hurricanes and unexpected increase and decrease in production
Concerns about increase in demand in the future

- Forecasts of medium-to-long term expansion of in oil demand give rise to concerns about tight supply and demand balance.

![Figure: Forecast of Oil Demand by Region until 2030 (IEA)](image)

**Source:** World Energy Outlook 2008, IEA

Concerns about supply capacity in the future

- An upsurge of resource nationalism makes it difficult to develop oilfields where crude oil can be produced at low cost.
- Costs of exploration and development businesses continued to rise, leading to the concerns about crude oil supply in the future.

![Figure: Cost Index of Investments in Exploration and Development Businesses (The Year 2000: 100)](image)

**Source:** Developed based on the website of IHS/CERA (Cambridge Energy Research Associates).
Invigoration of crude oil futures

- Dealings in the crude oil futures market are rapidly increasing.

Figure: Changes in Trading Volumes in the New York Crude Oil Futures Market (Yearly)

Source: Developed based on the website of the New York Mercantile Exchange (NYMEX).

Changes in dealing trends due to steep rise in crude oil prices.

- Price fluctuations expanded due to a steep rise in crude oil prices.
- Consequently, option deals to hedge the risk of price fluctuation soared. Particularly, option deals rapidly increased in and after August 2007.

Figure: Changes in Open Interest in Futures and Options at New York Crude Oil Futures Market

Source: Developed based on data of the U.S. Commodity Futures Trading Commission (CFTC).

Figure: Changes in WTI Prices and Difference from the Previous Day

Source: Energy Information Administration of the U.S.
Change in makeup of market participants

- The market scale expanded in keeping pace with an increase in index investments and an increase in speculations by hedge funds, and the makeup of market participants has also changed.
- However, detailed information about the trends of dealings by market participants has not been disclosed, and there are various views and theories about which participants had effects on the steep rise in prices.

Note: Swap dealers use the futures market to hedge the risks to be caused by over-the-counter trading.
Decrease in investment and speculative funds in downfall phase

- Amid declining crude oil prices since August 2008 and financial crisis, the funds of commodity index funds and that of hedge funds decreased.
- It is considered that the credit crunch was aggravated and they could not help but downsize the scale of investments.

**Effects of exchange rates**

- The dollar depreciation process that had started in 2006 continued until May 2008, and accelerated the flow of funds to crude oil of which the price became comparatively inexpensive.
- The dollar began appreciating in July 2008, helping crude oil prices fall down. (The exchange rate changed to the dollar’s depreciation in November, but crude oil prices did not rise because of the large effect of credit crunch.)

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Source: OPEC Monthly Oil Market Report, March 2009

Source: Developed based on data of the Bank for International Settlements (BIS) and the Federal Reserve Board (FRB).
Flow of funds into the U.S. financial market (background of expansion of crude oil futures market)

- As a result of an increase in the current account deficit of the U.S., petromoney and foreign reserves flowed into the financial market of the U.S.

**Figure: Current Account Balances of Major Countries**
(U.S., China, EU, Japan, Middle East and Russia)


**Figure: Status of Offshore Investments of Petromoney from Oil Producing Gulf Countries**


Effects of credit crunch (subprime loan issues and financial crisis)

- After the revelation of subprime loan issues in August 2007, stock prices remained sluggish, and funds headed for the commodity market (funds also shifted from subprime-related securities whose risks increased and from national bonds whose returns decreased).
- After the financial crisis in September 2008, both stock prices and crude oil prices fell down due to credit crunch.

**Figure: Changes in WTI and Stock Prices**

- Source: Developed based on data of EIA and Yahoo Finance.
Move of oil producing and consuming countries toward the crude oil market

- As violent fluctuations in crude oil prices are disadvantageous to both oil producing and consuming countries, they reinforced dialogues to share their recognitions for the purpose of stabilizing the market.
- Japan’s resource diplomacy has thus far yielded certain results such as the commitment made by Saudi Arabia for a boost in oil production.

Ministerial meeting of oil consuming countries in Davos, Switzerland (January 2008)
International Energy Forum (April 2008)
Energy ministerial meeting (June 2008)
Ministerial meeting of oil producing and consuming countries in Saudi Arabia (June 2008)
G8 Hokkaido Toyako Summit (July 2008)
Agreement between the Ministry of Economy, Trade and Industry and the Ministry of Agriculture, Forestry and Fisheries of Japan and the Commodity Futures Trading Commission (CFTC) on the framework concerning the monitoring of cross-border trading, etc. (October 2008)
Ministerial meeting of major oil producing and consuming countries in London (December 2008)
Proposal by commodity futures market task force of the International Organization of Securities Commissions (IOSCO) (March 2009)
Ministerial meeting of Asian energy producing and consuming countries (April 2009)

Ministerial meeting of Asian energy producing and consuming countries (April 2009)
Cochaired by Japan’s Economy, Trade and Industry Minister Toshihiro Nikai and Qatar’s Deputy Prime Minister Abdullah Bin Hamad Al-Attiya, it was decided to require regulatory authorities to take more cooperative actions concerning reinforced monitoring of commodity futures markets and improvement of transparency thereof for stabilization of oil markets, and it was also agreed to promote specific projects from now on including: 1) formulating the outlook for supply and demand in Asia; 2) sharing examples of advanced projects concerning energy conservation and new energy; and 3) providing opportunities for mutual training.

Measures for market stabilization

[1] Approaches to improve supply and demand balance

- Approaches from a supply point of view
  - Steady investments in upstream businesses by oil producing countries and petroleum development companies
  - Flexible production adjustment by OPEC and other organizations in accordance with demand

- Approaches from a demand point of view
  - Energy conservation and introduction of new energy and nuclear energy are promoted to reduce oil consumption from a long-term point of view.


- Measures to make it difficult to manipulate prices and make illegal trades, and create the market where price fluctuations out of step with supply and demand by making the crude oil futures market more transparent and thicker
- Establish a system to increase the transparency of deals in an internationally harmonized way
- Invigorate markets other than NYMEX (multipolarization of markets)
- Measures to control excessive price fluctuations in the crude oil futures market
  - Reinforce monitoring and penal regulations of unfair dealings
  - Establish petroleum statistics from the viewpoints of accuracy, timeliness and comprehensiveness
  - Disseminate appropriate information concerning future outlook for supply and demand
2. Effects on economy

Effects on economy of oil consuming countries

- In the phase of steep rise in crude oil prices, there were such effects as price rises, strain on household expenses, deterioration in business earnings, sluggish investment and others.
- There were some countries where people who were seriously hit by economic damage caused riots and, on the other hand, some countries where public expenditures such as subsidies were planned and implemented.

(The sharp fall in crude oil prices retarded transfer of incomes to oil producing countries and brought about positive effects including price decreases and reduction in burdens on household finances, among others. However, the macro economy is worsening due to the global recession at the present time. So, it is difficult to have a real feeling of such positive effects.)

<table>
<thead>
<tr>
<th>Name of country</th>
<th>Effects of steep rise in crude oil prices</th>
</tr>
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<tbody>
<tr>
<td>EU</td>
<td>✓ In May and June 2008, fishermen actively went on strike. In July, EU decided to provide the fishing industry with an emergency assistance of 2 billion euro.</td>
</tr>
<tr>
<td>U.S.</td>
<td>✓ In May 2008, small-to-medium truck forwarding agents made a nationwide protest for one week for reduction of fuel prices, while electricity price remaining fixed.</td>
</tr>
<tr>
<td>China</td>
<td>✓ In July 2008, the producer price index was fixed at a high level of 10% increase from the year-earlier month for the first time in 12 years. While electricity prices were fixed, electric power generation decreased due to a rise in coal prices.</td>
</tr>
<tr>
<td>South Korea</td>
<td>✓ In June 2008, labor unions of truck drivers went on a nationwide strike for reduction of fuel prices and increase in fares. Physical distribution was confused to a great extent.</td>
</tr>
<tr>
<td>Vietnam</td>
<td>✓ Prices sharply rose. Consumer prices in June 2008 went up by 26% from the year-earlier month.</td>
</tr>
<tr>
<td>Indonesia</td>
<td>✓ In May 2008, protest demonstrations were caused in Jakarta and other cities against a hike in petroleum fuels.</td>
</tr>
</tbody>
</table>

Changes in prices of petroleum products

- Storefront retail prices of petroleum products drastically declined in and after the summer of 2008 due to the downfall of crude oil prices. The range of reduction in petroleum product prices in comparison with their peak prices is larger than that of the reduction in crude oil prices.

**Figure: Changes in Prices of Petroleum Products and Crude Oil**

Source: Regular gasoline, gas oil and kerosene (storefront): “Surveys on Gas Stations and Petroleum Products” by the Oil Information Center

Crude oil: Surveyed by Nihon Keizai Shimbun (average from 26th day to 25th day)
Amount of oil imported by Japan

- The ratio of oil imported by Japan to the total amount of Japan’s imports increased from about 15% in 2000 to about 23% in 2007 (the value increased by about 9 trillion yen)

**Figure: Crude Oil Imported by Japan, CIF Prices and the Ratio Thereof to the Total Amount of Imports**

Note: The ratio of imported oil to the total value of imports includes not only crude oil but also petroleum products.

Source: Developed based on customs statistics and other data.

- In the phase of price downfall, the monthly value of imported oil reduced from about 1.8 trillion yen in August 2008 to about 0.5 trillion yen in February 2009.

**Figure: Changes in Volume and Value of Crude Oil Imported by Japan and Crude Oil CIF Prices (2008)**

Source: Developed based on Japan Exports & Imports.
Economic relations between Japan and oil producing countries

- The ratio of Japan’s direct investments in oil producing countries such as the Middle East and Russia is relatively small in relation to the economic strength of these resource countries, and the growing force of oil producing countries has not been taken into the economic growth of Japan.

**Figure: Direct Investments in Middle East and Russia**

<table>
<thead>
<tr>
<th>Japan’s share in direct foreign investments (2007)</th>
<th>Middle East</th>
<th>Russia</th>
<th>China</th>
<th>U.S.</th>
<th>Total (real number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3%</td>
<td>0.1%</td>
<td>8.4%</td>
<td>21.4%</td>
<td></td>
<td>8.7 trillion yen</td>
</tr>
</tbody>
</table>

| Japan’s share in the world’s total GDP (2006)     | 3.9%        | 2.1%   | 5.6%  | 27.7%| 47.6 trillion dollars |

Source: “Statistics of the balance of payments” of the Ministry of Finance and “National accounts” of the Cabinet Office

Increase in burdens on household finances in Japan

- In the phase of steep rise in crude oil prices, the prices of petroleum products such as regular gasoline, kerosene and others also steeply rose and a strain on household finances was caused.
- As a result of downfall of crude oil prices since July 2008, household expenses for gasoline and kerosene are estimated to be reduced by about 56,000 yen per year, according to estimations.

<table>
<thead>
<tr>
<th>Highest prices (August 2008)</th>
<th>Most recent prices (April 20, 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline: 185.1 yen/liter</td>
<td>Gasoline: 115.1 yen/liter</td>
</tr>
<tr>
<td>Kerosene: 132.1 yen/liter</td>
<td>Kerosene: 63.2 yen/liter</td>
</tr>
<tr>
<td>Gasoline price declined by 10 yen/liter</td>
<td>burden on family finance declined by about 5,000 yen per year</td>
</tr>
<tr>
<td>Kerosene price declined by 10 yen/liter</td>
<td>burden on family finance declined by about 3,000 yen per year</td>
</tr>
</tbody>
</table>

Note: These figures are estimated based on the volume of gasoline and kerosene purchased per household, according to the survey on household finances (household of two or more persons) by the Ministry of Public Management, Home Affairs, Posts and Telecommunications.

If the most recent prices of gasoline and kerosene remain unchanged, the burden on household finance is reduced by about 56,000 yen a year per household compared with the case where the highest prices thereof remain continued.
Burdens of Japanese businesses

- Japan is exposed to price competition with Asian countries and cannot pass a steep price rise of raw materials on to export prices, whereas the U.S. and Germany can do so.

**Figure: Changes in Terms of Trade in Respective Countries (2000 as the Base Year)**

Note: Export and import prices are presented on a dollar basis.

Effects on earnings of Japanese businesses

- The steep rise in crude oil prices caused deterioration of business earnings.

**Figure: Factors of Earnings of Japanese Businesses**

Source: Developed based on quarterly surveys on statistics of corporations.
Reduction of oil demand in Japan

- The demand for petroleum products continued to increase until 2005, but the demand drastically reduced in and after 2006.

Change in Japan’s energy supply and demand structure

- The demand for petroleum products in respective sectors slackened in and after 2006 and the shift to other types of energy proceeded.

Effects on key industries

- The steep rise in crude oil prices caused various effects on key industries in Japan.
- Though measures were taken, many industries could not avoid deterioration in earnings and other difficulties.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Effects</th>
<th>Measures</th>
</tr>
</thead>
</table>
| Oil refining           | • The steep rise in prices of petroleum products was one of the causes of decrease in demand  
                        | • Earnings deteriorated due to the time-lag to reflect the procurement costs of crude oil in product prices  
                        | (Waiting purchases in the price fall down phase)                           | • Reinforcement of export capacity  
                        | • Reduced production in accordance with decrease in demand                |
| Electricity and gas    | • Earnings deteriorated due to the time-lag to reflect the prices of raw fuels in electricity and gas rates | • Review of the fuel cost adjustment system                              |
| Automobile             | • The steep rise in fuel prices was one of the causes of sales reduction  
                        | • The increased direction to fuel efficient vehicles                      | • The efforts focused on development of fuel efficient vehicles and next-generation vehicles |
| Transportation (land transportation) | • Earnings deteriorated due to a rise in prices of gas oil and others | • Negotiations with shippers for rise in fares  
                        | | • Introduction of a surcharge system                                     |
| Chemical               | • Pressure on earnings because of a delay in passing the steep rise in crude oil prices on to product prices  
                        | (Strong request by customers for price reduction after the downfall in crude oil prices)                  | • Change of price decision systems under review                          |
| Paper                  | • Pressure on earnings because of a delay in passing the steep rise in crude oil prices on to product prices | • Promotion of plans to reduce the usage of fuel oil                      |
| Fishery                | • Financial difficulties in business management due to the steep rise in fuel prices | • Simultaneous suspension of fishery in June and July 2008  
                        | | • Change to short distant fishing grounds  
                        | | • Cruising at economical speed  
                        | | • Change to different types of fishing lamps                             |

Summary of effects on economy

- The steep rise in crude oil prices had large adverse effects on the economy of oil consuming countries such as oppression on household finances, deterioration in business earnings and other difficulties.
- The sharp fall in crude oil prices retarded transfer of incomes to oil producing countries and, on the other hand, brought about positive effects including price down and reduction in burdens on household finances, among others. However, the macro economy is worsening due to the global recession at the present time. So, it is difficult to have a real feeling of such positive effects.
Recognition of realities of crude oil price downfall

- The steep rise in crude oil prices had large adverse effects on the economy of oil consuming countries.
- At present when crude oil prices have fallen down, it is concerned that investments in the upstream businesses, energy conservation, new energy and nuclear energy may remain sluggish, and that the supply and demand balance may tighten after the recovery of the world economy and crude oil prices may jump again.

Measures to be taken from now on

- In preparation for another steep rise in crude oil prices, it is necessary to put more energies into conversion to the economic structure that can hardly be affected by price fluctuations.

  - **Conversion of energy supply and demand structure**
    - Promotion of energy conservation
    - Conversion to nonfossil energy (new energy and nuclear energy) and promotion of effective use of fossil energy
  
  - **Ensuring of earnings from the upstream businesses in the fields of resources, energy and other sources**
    - Encouragement of industries related to resources and energy
    - Expansion of direct investments in resource countries such as Middle East, Russia, etc.