

Global Economic Crisis and the Energy Sector – Challenges and Opportunities for Japan

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Background

- “ Global economic crisis has severely impacted Japanese economy, which growth had been led by the export of manufactured goods.
- “ Economic stimulus package was announced in April this year, and this includes the measures for the energy/environment sector.
- “ Japan’s mid-term target to reduce CO2 emissions by 15% by 2020 (2005 as the base year) was announced by Prime Minister Taro Aso in June 2009.
- “ Japan’s general election scheduled on the 30th of August is likely to result in a shift in power from LDP to DPJ, which sets higher CO2 emissions target at 25% reduction by 2020 (1990 as the base year). This represents about two times higher level than the proposed one in June.
- “ The global economic crisis combined with the paths to meet CO2 emissions reduction target poses challenges to Japan.

Outline

- “ Global Financial Crisis and Japan
 - . Impact on the economy
 - . Impact on the energy consumption
- “ Basic Framework of Japan’s Energy and Environmental Policy
- “ Low Carbon Revolution
- “ Japan’s Energy/CO2 Emissions Short-term Outlook
- “ Proposed Mid-term Target for Japan and the Assumptions to Meet the Target
- “ Energy Policy – Achievements and Requirements
- “ Workable Framework for the Low-Carbon Society
 - “ Energy Efficiency
 - “ Renewable Energy
 - “ CCS and CCT
 - “ Resources Development

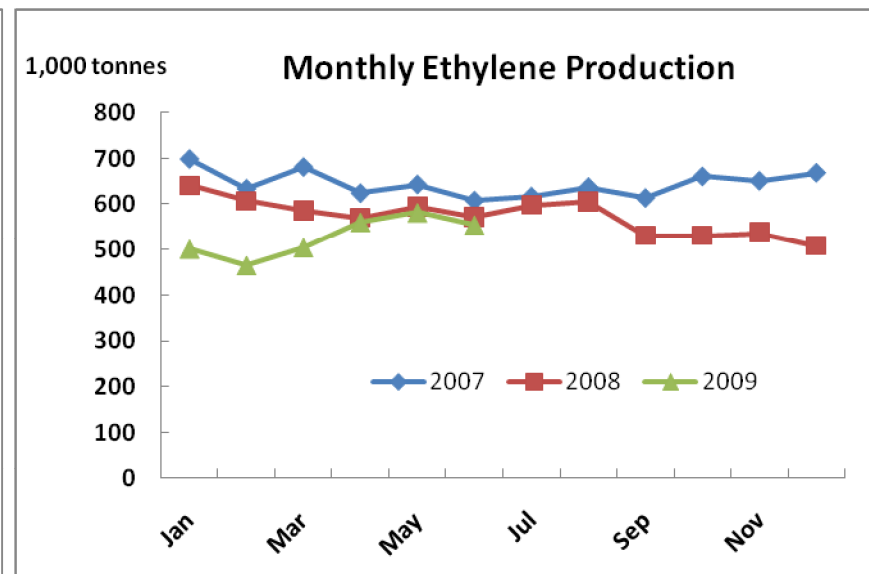
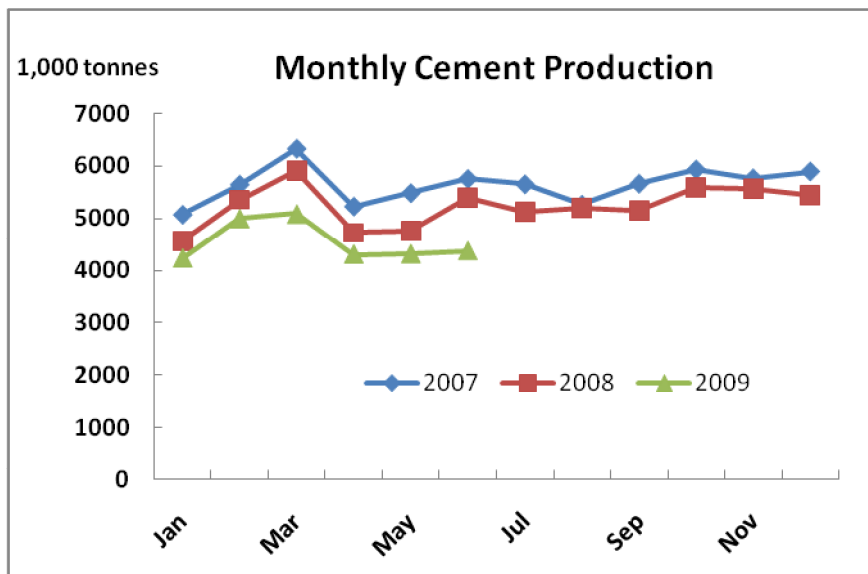
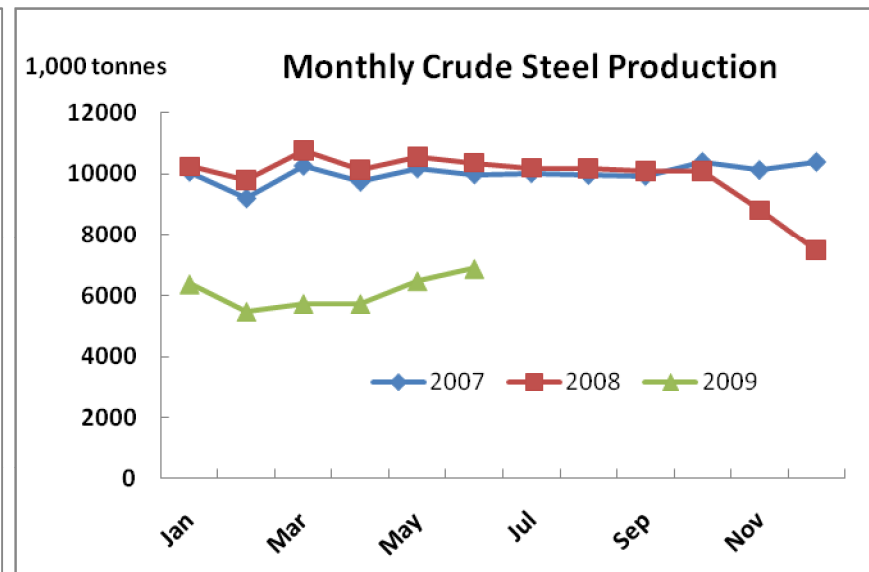
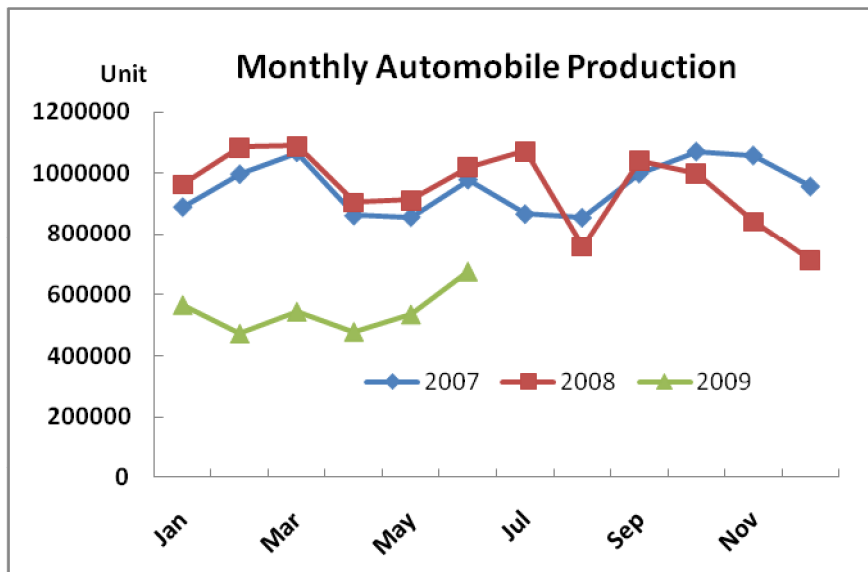
Global Economic Crisis and Japan

GDP is expected to register a negative growth for 2008 and 2009 reflecting the decline in investment and export.

| | Actual | Outlook | | Annual Growth Rate | | |
|--------------------------------|---------|---------|---------|--------------------|--------------|--------------|
| | 2007 FY | 2008 FY | 2009 FY | 2007 FY | 2008 FY | 2009 FY |
| Real GDP (Trillion Yen) | 562.8 | 557.4 | 552.4 | 1.9% | -1.0% | -0.9% |
| Private Consumption | 308.2 | 309.5 | 309 | 0.9% | 0.1% | 0.2% |
| Investment | 89.9 | 85.1 | 80.8 | 2.3% | -5.3% | -5.0% |
| Public Demand | 117.9 | 117.2 | 118.3 | 0.8% | -0.6% | 0.9% |
| Export | 89.8 | 90.4 | 87.9 | 9.3% | 0.7% | -2.7% |

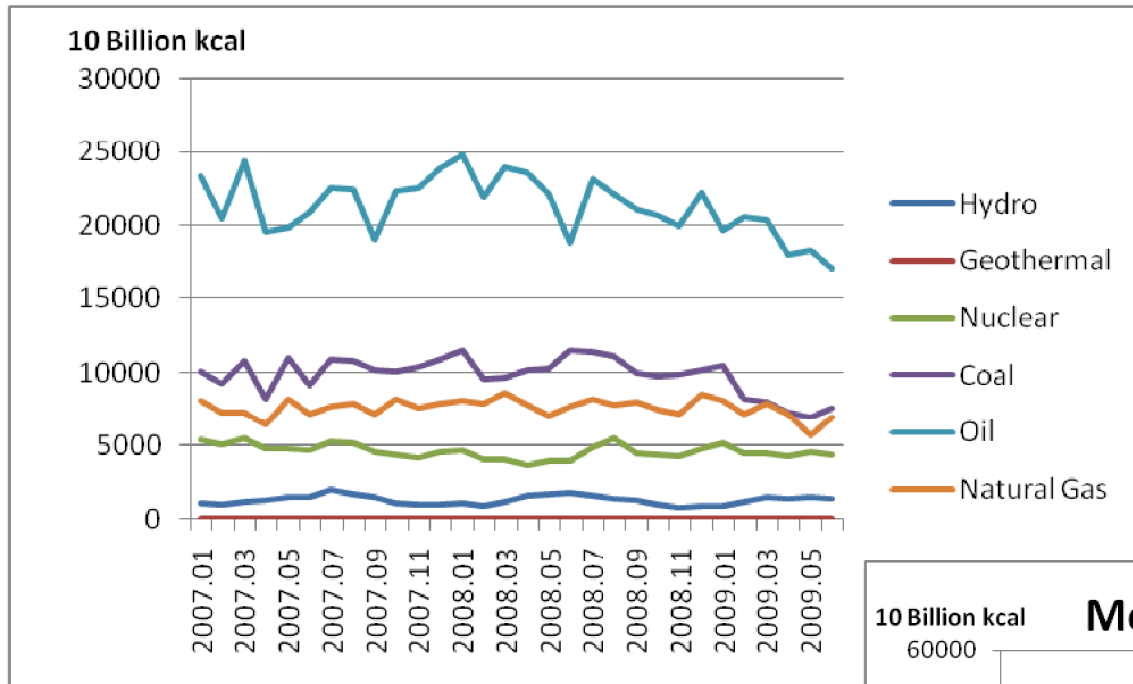
Source: Institute of Energy Economics, Japan. 2009. Short-term Energy Outlook for Japan.

Monthly Trends in the Key Industries



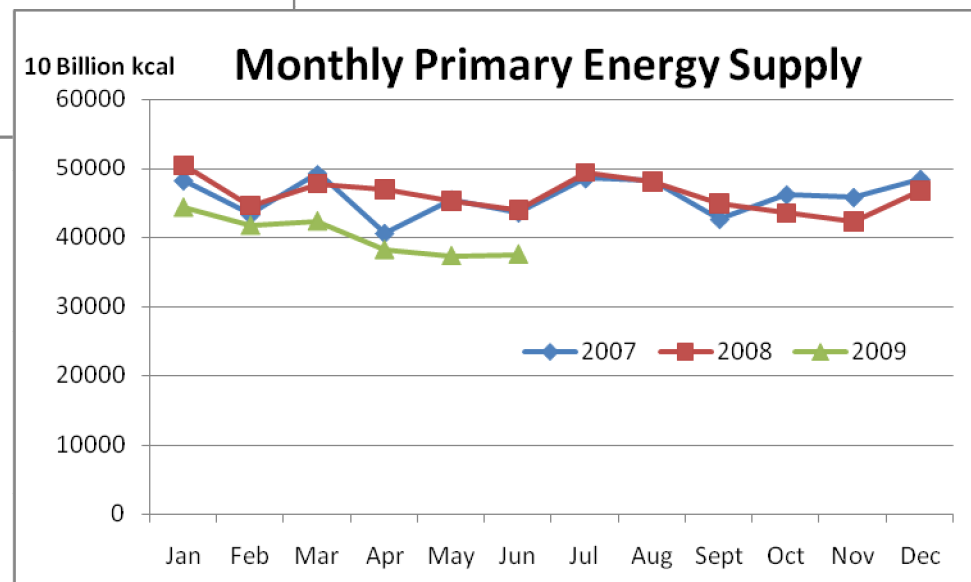
Source: EDMC Database. 2009.

Monthly Primary Energy Trends by Sources



About 14% reduction in energy consumption in June 2009.

Source: EDMC Database. 2009.



Short-term Energy/CO2 Outlook

Japan's energy demand is projected to decline at 2.9% in 2009. Combined with the negative growth in energy, and assumed increased use of nuclear, CO2 emissions is expected to decline substantially at 6.9%.

| | | Actual | Outlook | | Annual Growth Rate | | |
|-------------|----------------|--------|---------|-------|--------------------|-------|-------|
| Unit | | 2007 | 2008 | 2009 | 2007 | 2008 | 2009 |
| Coal | MTOE | 119.3 | 115.8 | 106.8 | 4.8% | -2.9% | -7.8% |
| Oil | MTOE | 243.3 | 230.7 | 216.2 | 0.0% | -5.2% | -6.3% |
| Natural Gas | MTOE | 93 | 92 | 87 | 8.0% | -1.1% | -5.4% |
| Hydro | MTOE | 16.5 | 16.9 | 19.5 | -14.9% | 2.2% | 15.3% |
| Nuclear | MTOE | 55.5 | 54.4 | 65.1 | -13.0% | -2.1% | 19.8% |
| NRE | MTOE | 7.3 | 7.3 | 7.3 | -0.4% | 0.4% | -0.9% |
| Total | MTOE | 534.9 | 517.1 | 501.9 | 0.2% | -3.3% | -2.9% |
| CO2 | Million Tonnes | 1,218 | 1,172 | 1,090 | 2.7% | -3.8% | -6.9% |

Coal may decline substantially both in the industry and power sectors. Nuclear will register a double digit growth to reflect the assumed restart operation of Kashiwazaki nuclear power plant.

Source: The Institute of Energy Economics, Japan. 2009.

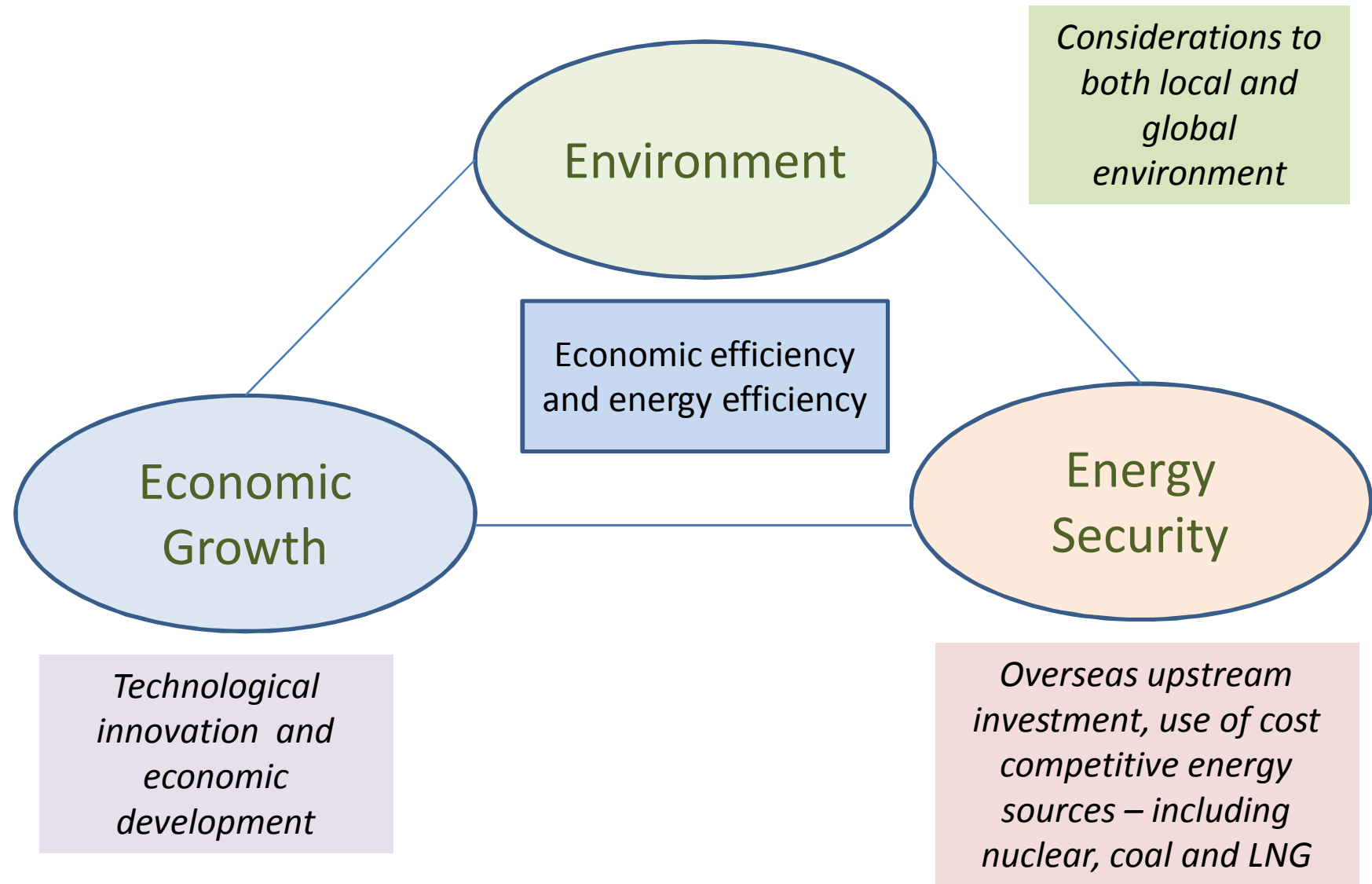
Short-term CO2 Outlook

Projected slow CO2 emissions growth for 2009.

| | 1990 | 2007 | 2010 | 2009 |
|----------------------------------|-----------|--------|----------------|--------------------|
| | Base Year | Actual | Plan | Short-Term Outlook |
| CO2 Emissions from Energy | 1,059 | 1,218 | 1,076-1,089 | 1,090 |
| Growth Rate from 1990 | | 15% | 1.6% - 2.8% | 3.0% |
| Others | 202 | 153 | 163 | |
| Total GHG | 1,261 | 1,371 | 1,239-1,252 | |
| Growth Rate from 1990 | | 8.70% | -.1.8%- -0.8% | |
| Sink | | | -3.8% | |
| Kyoto Mechanism | | | -.0.4% - -1.4% | |
| Kyoto Target | | | -6.0% | |

Source: The Institute of Energy Economics, Japan. 2009.

Basic Framework of Japan's Energy Policy - 3Es (Environment, Economy and Energy Security)



Policies and measures for achieving the 4Es

Economic Growth

- **Economic stimulus package** through developing technologies focusing on (1) solar generation, (2) new generation vehicles, (3) expansion of new technology rail system and (4) resources development.

Environment

- Ratification of the Kyoto Protocol to reduce GHG emissions by 6% in the first commitment period
- Setting **the mid-term target** for 2020
- Keidanren's Voluntary Action Plan

Energy Efficiency

- **Energy conservation law** – continuous amendment to expand the coverage and strengthen regulation
- **Top runner program**
- **Deregulation of the energy sector** to improve the operational efficiency

Low-carbon technology

- Technology development roadmap on 21 technologies are drawn with timeframe for development and deployment. CCS, CCT and nuclear are included in the roadmap.

Resources Development

- Japan aims to increase the self-sufficiency ratio of oil to reach 40% in 2030.

Economic Stimulus Package

Overall about 737 Billion USD of economic stimulus package was announced in April 2009. Through implementing those measures in the package, Japan aims to increase GDP by 2% and create total of 3.9 million new employment.

Urgent measures

- Employment measures (**About 44 Billion USD**)
- Financial measures (**448 Billion USD**)
- Earlier implementation of planned projects

Development strategy – investment in future

- **Low carbon revolution** (About 38 Billion USD)
- Health, long life, and care for children (**48 Billion USD**)
- Agriculture and 21st century infrastructure development (**64 Billion USD**)

Local matters and safety enhancement

- **Local economy development** (About 6 Billion USD)
- Safety measures (**39 Billion USD**)
- Considerations to the local governments (**48 Billion USD**)

Temporary change in tax system

- (**About 2 Billion USD**)

Japan's Measures towards 'the Low Carbon Revolution'

Promotion of new energy and energy efficient technologies through 'School New Deal' and acceleration of introducing the solar power generation (20 times more than the current level by 2020).

Promotion of low emissions vehicles including the next generation vehicles. By 2020, Japan aims to expand the share of next generation vehicles – which will account for 50% of total vehicles sold. **Promotion of sales for energy efficient appliances** – with the effective use of 'Eco Point' system.

Transport system and infrastructure innovation – focusing on completing the linear motor car technology development, expanding the Shinkansen network, and developing the battery engine energy efficient tram system

Resources development – focusing on the urban resource development, investment in the overseas upstream segment and promotion of water treatment technologies in developing/developed countries

Comparisons of Assumed Policies and Measures to Reduce CO2 Emissions by Different Target Level

(Assumptions prepared by the Committee for Japan's Mid-term Target)

| CO2 Emissions | Solar and Power Generation | Transport | Residential/Commercial |
|---|--|--|--|
| Continuous Effort Case -4% from 2005 + 4% from 1990 | Solar – 4 times higher than present RPS | Next gen. vehicles – 10% of new vehicle sold Top-runner approach, subsidy | Heat Insulator – 10% of New Residential Building Energy conservation law, subsidy |
| Maximum Introduction Case -14% from 2005 - 7% from 1990 | Solar – 10 times higher than present Resale to the grid Subsidy | Next gen. vehicles – 50% of new vehicle sold Subsidy | Heat Insulator – 80% of New Residential Building Energy conservation law, subsidy |
| - 15% Case through regulation and Subsidy -21% from 2005 - 15% from 1990 | Solar – 40 times higher than present Mandatory regulation to install solar for new buildings & existing | Next gen. vehicles – 100% of new vehicle sold Regulation for conventional vehicle sales | Heat Insulator – 100% of New and Existing Residential Buildings Energy conservation law |

Mid-term CO2 Emissions Outlook

*Japan could reduce CO2 emissions by 5% in the maximum introduction case. How to reduce CO2 emissions from **the residential and commercial sectors** pose challenges.*

| | 1990 FY | 2005 FY | 2020 FY | | | |
|---|---------|---------|---------|------------------------|---------------------|----------------|
| | | | BAU | Continuous Effort Case | Maximum Intro. Case | Minus 15% Case |
| CO2 Emissions from the Energy Sector (Million CO2 Tonnes) | 1,059 | 1,203 | 1,245 | 1,120 | 994 | 891 |
| Growth rate from 2005 | | | 3.0% | -6.0% | -15.0% | -23.0% |
| Growth rate from 1990 | | | 15.0% | 5.0% | -5.0% | -13.0% |

| Index 1990 = 100 | 1990 | 2005 | 2020 | | | |
|-----------------------|------|------|------|------------------------|---------------------|----------------|
| | | | BAU | Continuous Effort Case | Maximum Intro. Case | Minus 15% Case |
| Industry | 100 | 94 | 92 | 91 | 85 | 80 |
| Res/Com | 100 | 142 | 163 | 131 | 109 | 88 |
| Residential | 100 | 137 | 139 | 120 | 102 | 77 |
| Commercial | 100 | 145 | 182 | 139 | 114 | 96 |
| Transport | 100 | 118 | 111 | 102 | 93 | 88 |
| Energy Transformation | 100 | 116 | 128 | 116 | 96 | 90 |

Source: Kokichi Ito (2009). "Evaluation of Japan's Mid-term CO2 Emissions Target". Institute of Energy Economics, Japan.

Primary Energy Demand Outlook – 3 Cases

| | 2005 | | 2020 | | 2020 | | 2020 | |
|-------------|--------|------|-------------------------|------|---------------------------|------|------------|------|
| | Actual | | Continuous Efforts Case | | Maximum Introduction Case | | .-13% Case | |
| Oil | 273 | 46% | 233 | 39% | 209 | 38% | 200 | 37% |
| Coal | 123 | 21% | 128 | 21% | 116 | 21% | 103 | 19% |
| Natural Gas | 88 | 15% | 95 | 16% | 83 | 15% | 66 | 12% |
| Nuclear | 69 | 12% | 99 | 17% | 99 | 18% | 111 | 21% |
| Hydro | 17 | 3% | 19 | 3% | 18 | 3% | 20 | 4% |
| Geothermal | 1 | 0% | 1 | 0% | 1 | 0% | 1 | 0% |
| New Energy | 17 | 3% | 23 | 4% | 27 | 5% | 40 | 7% |
| Total | 588 | 100% | 598 | 100% | 553 | 100% | 541 | 100% |

Source. Institute of Energy Economics, Japan. 2009

Outstanding Efforts Achieved So Far on Energy Efficiency and Environment

“ **Energy Conservation Law**

- . Continued amendment to expand the coverage and to require higher efficiency improvement

“ **Top-runners Approach**

- . Contributed to produce highly efficient products

“ **Keidanren’s Voluntary Action Plan**

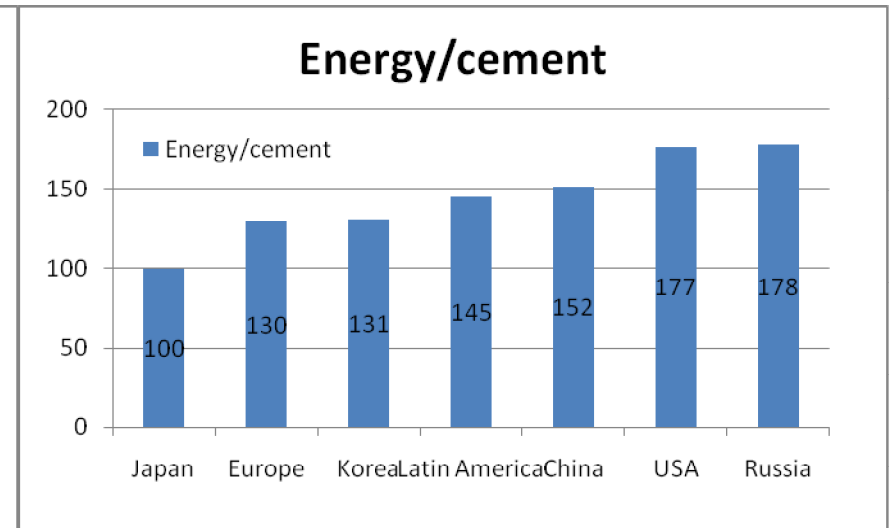
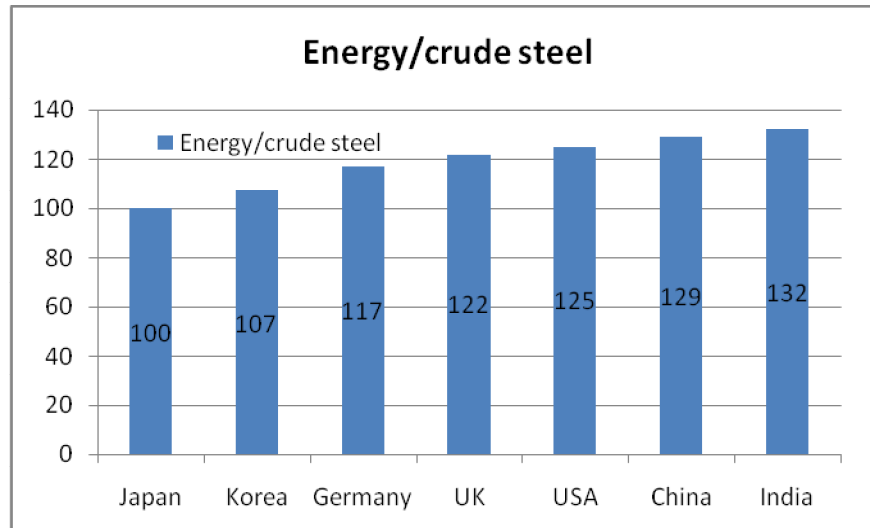
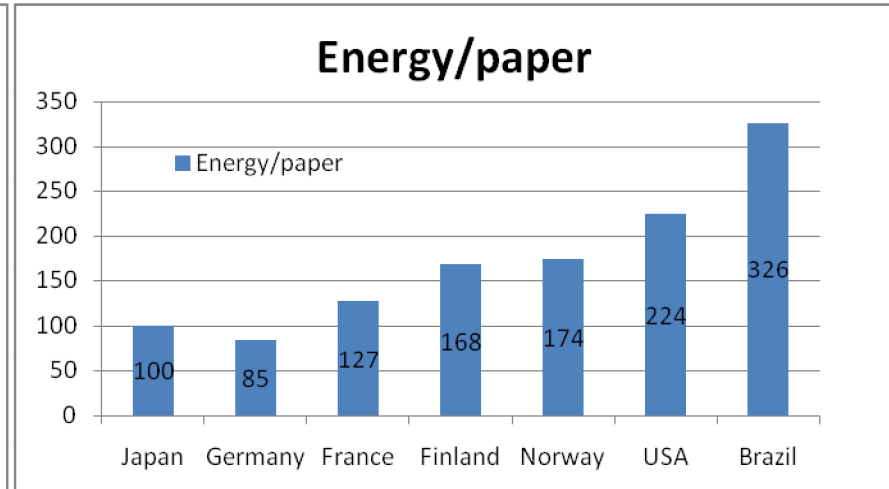
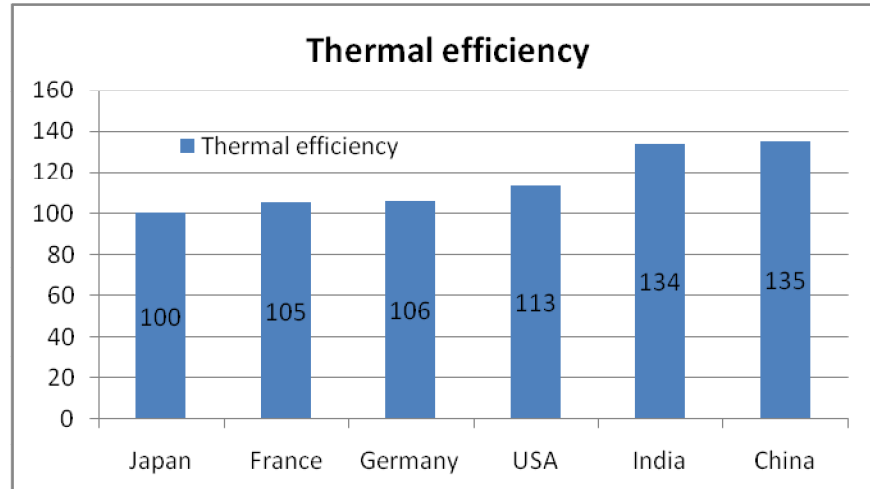
- . The participating industry’s CO2 emissions have been below 1990 level excluding 2007

“ **Urban Transport Infrastructure Development**

- . 90% of the commuters in Tokyo utilize rails/subways for commuting

Energy Efficiency in Japan

– Japan's industry efficiency represents the highest level

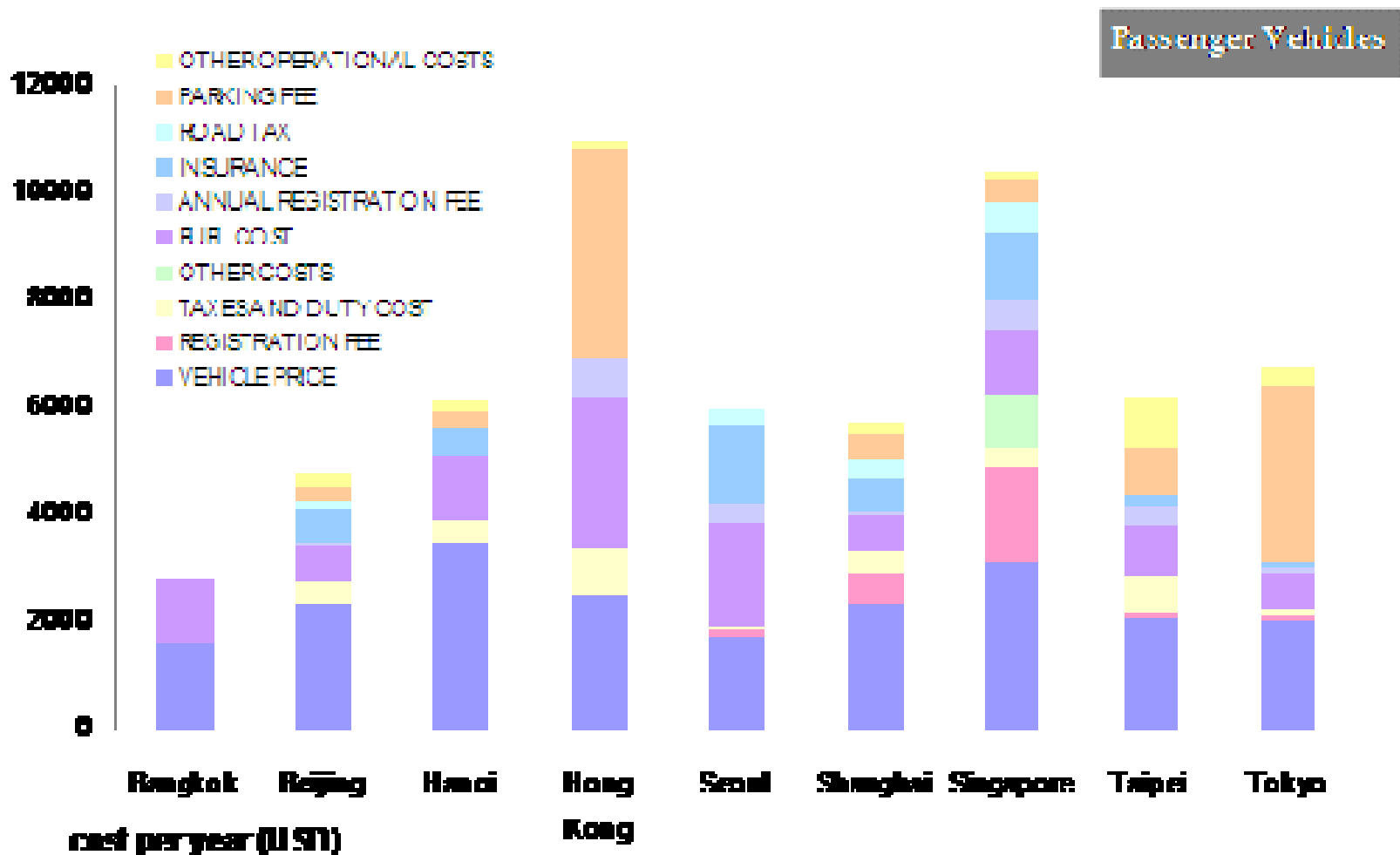


Promoting Energy Efficiency

- “ **Energy conservation law** provides the basic framework for improving energy efficiency. Since it became effective in 1979, the Law has been amended to cope with the change in socio-economic situations.
- “ The latest amendment of energy conservation law was intended to expand the coverage. Originally factories/business entities above 1500 kl of energy consumption per year had a mandatory reporting requirement , while the latest amendment requires those ‘companies’ of which total energy consumption surpasses 1500 kl has to report to the government.
- “ Top runners approach is included in the Law. The approach benchmarks the most efficient technologies, and requires the efficiency level of technologies in the market should be equal to or above.

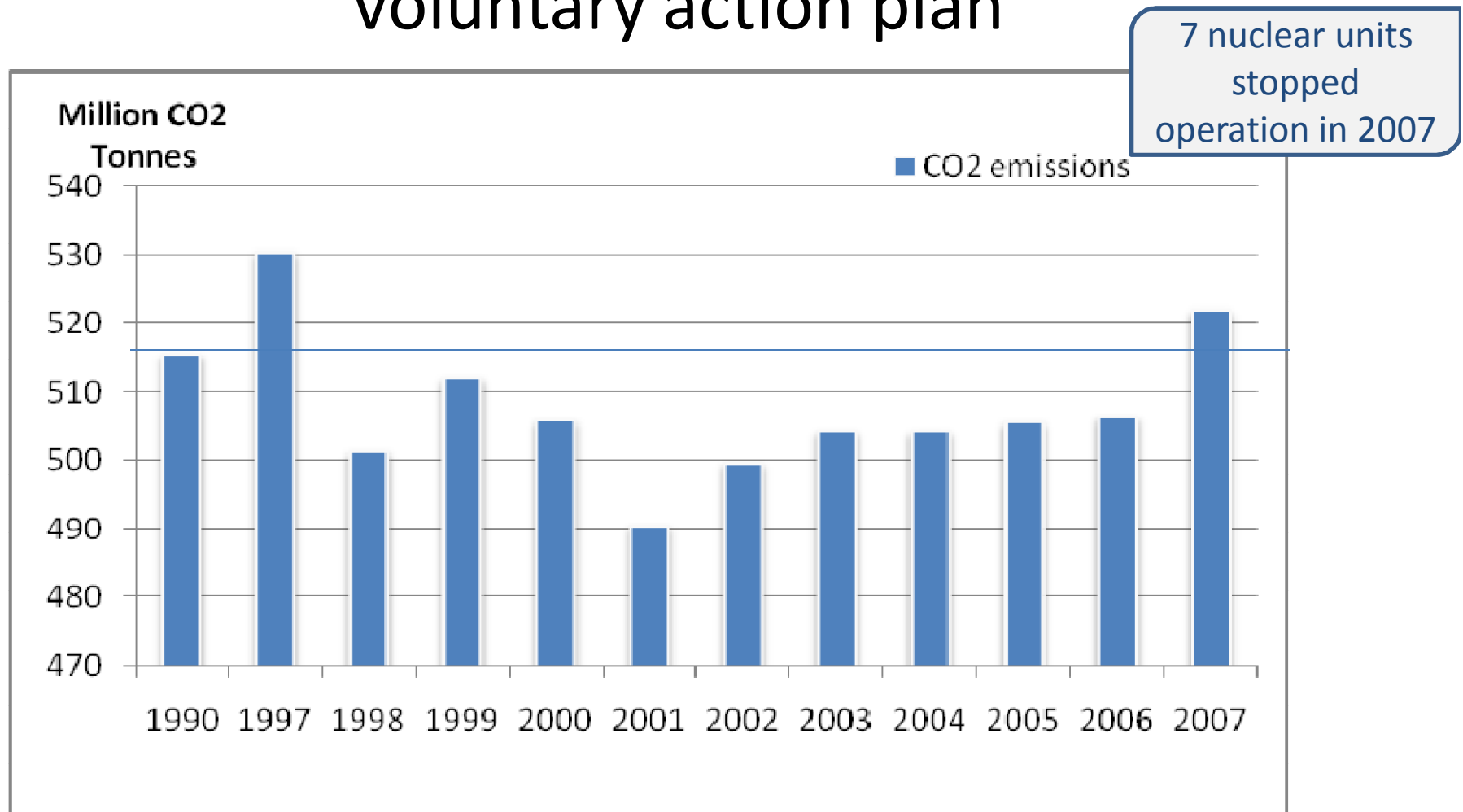
Cost of passenger vehicle ownership

High cost of passenger vehicle ownership reduces the use of vehicles in Tokyo.



Source: Asia Pacific Energy Research Centre. 2008.

CO2 emissions from the participants to the voluntary action plan



CO2 emissions from the participating industries to the Keidanren's action plan recorded the below 1990 level excluding 1997 and 2007.

Source: Keidanren. 2008.

Areas to be Strengthened on Environment and Energy Security

- “ Local level commitment towards meeting the GHG emissions target
 - . An example of industry
- “ Overseas upstream investment
 - . Energy security index

Comparison of Oil Supply Security Index

Lower oil supply security in Japan and Korea due mainly to lower domestic resources availability and higher oil dependence.

| | Equity oil ratio | Self-sufficiency ratio | Independence from oil ratio | Political stability of crude oil import source | Oil Supply Security Index |
|-------|------------------|------------------------|-----------------------------|--|---------------------------|
| China | 6.5% | 53% | 80% | 29% | 42 |
| Japan | 9.4% | 1% | 56% | 44% | 27 |
| Korea | 4.0% | 1% | 54% | 45% | 26 |
| USA | 38.2% | 33% | 60% | 32% | 41 |

Source: Author's Estimate. 2008.

Conclusions

- “ A list of measures are included towards ‘low-carbon revolution’ focusing mainly on the technological innovation.
- “ Priorities are given to solar generation, new generation vehicles, and mandatory installment of insulator.
- “ The pathway towards achieving the low-carbon revolution may need to be supported by development of systems that can shift people away from heavy energy use.
 - . Urban infrastructure development
 - . Incentives and subsidies for technological diffusion
 - . Local level commitment in addition to the central government
 - . Continued efforts to promote energy/environmental education
- “ Resources development may need to be enhanced further to achieve the plan through strengthening cooperation with neighboring countries.
 - . Investment in the upstream segment and technology transfer in host countries

Appendix

Developing Renewable Energy

“ Solar power generation

- . Japan's solar generation capacity stood at 1.9 GW in 2007 or 1% total generation installed capacity.
- . Japan used to be the world's leader in solar cell. Japan represented almost half of the world's total by 2005. As a result of the subsidy elimination in 2005, Japan's share declined substantially accounting for around 24% in 2007.
- . To expand the solar power generation, Japan will introduce feed-in-tariff system from 2010. Surplus electricity generated from solar system can be sold to the market at around 40 yen/kWh for 10 years.
- . Government also plans to restart providing subsidy to households for the installment of solar system (at around 210,000 yen).

Investing in Low-carbon Technology 1

“ **Carbon Capture and Storage**

- . Japan plans to reduce the cost of carbon capture and storage from the current 4000 yen/ton to 2000 yen/ton in 2015, and 1000 yen/ton in 2020.
- . For the commercialization of the large-scale CCS technology, feasibility study has been implemented.
- . Japan CCS Co. Ltd. was established in 2008 – share holder of Japan CCS includes 29 major companies in Japan (including electric utilities, petroleum companies, iron and steel companies. Japan CCS is the first private company specialized on CCS technology development.

Investing in Low-carbon Technology 2

“ Clean Coal Technology

- . Coal continues to be the important energy source for the power generation and industry sector. In combination with the CCS technologies, efficient use of coal has become a policy agenda for the purpose of CO₂ emissions reduction and energy security.
- . Under the energy and mineral resources agency, general energy research committee, clean coal technology sub-committee has been established to discuss the key issues on promoting clean coal technology and to develop road map for promoting clean coal technology.
 - “ Ultra Super Critical Technology
 - “ Advanced U-SCT
 - “ IGCC
 - “ IGFC

Securing Stable Oil/Gas Supply

“ Oil/Gas

- . Japan aims to expand the self-sufficiency ratio of oil to reach 40% by 2030.
- . Japanese government tries to create conditions that can facilitate the private sectors' investment in the overseas oil/gas projects.
 - “ Regular dialogue with oil/gas producers has been promoted through the bilateral/multilateral frameworks.
 - “ To the oil/gas producing countries, assistance has been provided to support the deployment of renewable energy, and improvement of energy efficiency through applying the Japanese technologies.