Part 1 Current Energy Situation and Key Measures

Chapter 1 Energy Security into the Future against the Backdrop of Low Crude Oil Prices

- Promotion of investment in upstream development
- Responses to oil price fluctuation risks (LNG-related measures)
- Reduction of dependence on crude oil on the demand side

Chapter 2 Responses to the Great East Japan Earthquake and the Accident at Tokyo Electric Power Company’s (TEPCO) Fukushima Daiichi Nuclear Power Station and the Nuclear Energy Policy Based on Such Experience

- Efforts towards the Decommissioning of TEPCO’s Fukushima Daiichi Nuclear Power Station Units 1-4
- Support for Nuclear Disaster Victims and the Fukushima New Energy-Oriented Society Scheme
- Efforts to Improve Public Trust in Nuclear Power Policy

Chapter 3 Changes in Energy Policy Based on the Paris Agreement

- Influence of the Paris Agreement on Energy Policy
- Energy Policy to Balance Environmental Restrictions and Growth - Innovative Energy Strategy -
- New Mechanism in the Electricity Sector - Innovation in the Electricity Sector -

Chapter 2 Energy Trends

(Basic energy-related data within and outside Japan)

Chapter 3 Measures Taken in FY2015 concerning Energy Supply and Demand

* The Energy White Paper is a report submitted to the Diet annually based on Article 11 of the Basic Act on Energy Policy outlining energy measures taken during the previous fiscal year.
Energy Security into the Future against the Backdrop of Low Crude Oil Prices
After experiencing several oil shocks, the world faced significant crude oil price declines in the 1980s, 1990s and 2000s.

- The middle of the 1980s: **An oversupply occurred** as Saudi Arabia tried to maintain its market share against production increases in non-OPEC oil producers (Mexico, United Kingdom, etc.).
- The end of the 1990s: **Worries over the possibility of oversupply** prevailed as OPEC decided to increase production while a decrease in oil demand was expected due to an economic slump caused by the Asian Financial Crisis.
- The end of the 2000s: **Major causes of the decline were financial factors.** Speculative funds, which had been invested in the crude oil market under monetary easing policies and had excessively inflated crude oil prices, were suddenly withdrawn due to the Lehman Shock.

Currently, crude oil prices are declining mainly due to oversupply (production increase by the United States (shale oil), Saudi Arabia, Iraq, etc.).
The growth of demand has been slower than supply increases, resulting in a current oversupply of approximately 2 million barrels per day. However, in the medium term, stocks are expected to decrease due to supply shortages caused by demand increases in emerging countries and the investment slump.

According to forecasts by various organizations, it is estimated that oil demand will increase continuously and oil prices will maintain an upward trend in the longer term.

In addition to price fluctuations due to the supply and demand balance, risks of significant price fluctuations caused by finance and geopolitics have increased from the 2000s onward.

**Forecast of Crude Oil Prices**

- The growth of demand has been slower than supply increases, resulting in a current oversupply of approximately 2 million barrels per day. However, in the medium term, stocks are expected to decrease due to supply shortages caused by demand increases in emerging countries and the investment slump.

- According to forecasts by various organizations, it is estimated that oil demand will increase continuously and oil prices will maintain an upward trend in the longer term.

- In addition to price fluctuations due to the supply and demand balance, risks of significant price fluctuations caused by finance and geopolitics have increased from the 2000s onward.

**[Crude oil stocks and expected supply and demand]**

- IEA forecasts that crude oil demand will exceed the supply in 2018 -

**[Expected crude oil prices (forecasts by major organizations)]**

- EIA and IEA forecast crude oil price increases in the long term -

**[Expected changes in demand by region]**

- Demand will increase mainly in China and other emerging countries -

**Estimated demand (consumption)**

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIA (Reference case)</td>
<td>98.4</td>
<td>108.8</td>
<td>121.0</td>
</tr>
<tr>
<td>IEA (New Policies Scenario)</td>
<td>98.0</td>
<td>103.0</td>
<td>107.7</td>
</tr>
</tbody>
</table>

* U.S. Energy Information Administration (EIA)
< Energy Security against the Backdrop of Low Crude Oil Prices >

The world

- Slump in energy development investment to cause tight supply in the future
  - Global investment decreased by 20% in one year (down by 15 trillion yen)

(i) Promotion of investment in upstream development

- Lead global supply of risk money

(ii) Responses to oil price fluctuation risks (LNG-related measures)

- Develop a transparent LNG market with high mobility
  - Create and enhance international emergency response frameworks

(iii) Reduction of dependence on crude oil on the demand side

- Export energy conservation systems to emerging countries and oil producers
  - Diversify energy sources (high quality infrastructure)

Japan

- Japan depends on exports for most of its energy resources
  - Need to secure stable supply

- Development of resources and acquisition of rights by Japanese companies/Creation of core companies

- Lead international cooperation as the host country of the G7 Summit

- Promotion of infrastructure development such as pipelines in Japan

- Further energy conservation and diversification of energy sources to strengthen Japan’s bargaining power

- Ratio of self-development to be achieved: 40% (2030)

- The world’s largest LNG consumer

- The most advanced energy conservation technology in the world

Crude oil prices remaining at low levels

- From over 100 dollars in 2014 to a sharp decrease to the 40-dollar range

- Japan depends on exports for most of its energy resources
  - Need to secure stable supply
Due to low crude oil prices, global investment in oil/gas development projects decreased by 20% (an annual decrease of 15 trillion yen). This may delay the commencement of new exploration and development projects.

It is necessary to make the most of such opportunities at the G7 Summit meeting and make efforts to stabilize the world economy and supply of resources through harmonized investment.

Global investment in oil/gas development

<table>
<thead>
<tr>
<th>Year</th>
<th>Approx.</th>
<th>Down by</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>80 trillion yen</td>
<td>15 trillion yen</td>
<td>WEO2015, IEA</td>
</tr>
<tr>
<td>2015</td>
<td>65 trillion yen</td>
<td>0.7 trillion yen</td>
<td></td>
</tr>
<tr>
<td>2016 (planned)</td>
<td>1.2 trillion yen</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Approximately 70 trillion-yen investment is required annually in order to maintain the current production level.

Japan’s investment in oil/gas development

<table>
<thead>
<tr>
<th>Year</th>
<th>Approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>2.1 trillion yen</td>
</tr>
<tr>
<td>2015</td>
<td>1.9 trillion yen</td>
</tr>
<tr>
<td>2016 (planned)</td>
<td>1.2 trillion yen</td>
</tr>
</tbody>
</table>

* The possibility of an investment decrease for two years in a row for the first time since the 1980s

Estimated closing of accounts for FY2015 of major companies engaging in upstream development:

<table>
<thead>
<tr>
<th>Company</th>
<th>Net profit (entirety of group companies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JX Nippon Oil &amp; Gas Exploration Corporation</td>
<td>-196 billion yen (down by 198.4 billion yen)</td>
</tr>
<tr>
<td>INPEX Corporation</td>
<td>26 billion yen (down by 51.8 billion yen)</td>
</tr>
<tr>
<td>Japan Petroleum Exploration Co., Ltd.</td>
<td>5.2 billion yen (down by 24.3 billion yen)</td>
</tr>
</tbody>
</table>

Trading companies with energy departments also saw decreases in their earnings. In particular, Mitsubishi Corporation recorded a consolidated deficit of 150 billion yen and Mitsui & Co., Ltd. recorded a deficit of 70 billion yen, the first final deficit since its foundation.

Estimated closing of accounts for FY2015

- Rapidly shrinking investment against the backdrop of low crude oil prices

[Significant decrease in Japanese companies’ investment in oil/gas development]

* Calculated by METI based on reports by respective companies
Japan has set a goal to achieve a ratio of 40% or more for self-development of oil and natural gas by 2030.

The ratio for FY2014 was approximately 24.7%, the highest level since the measurement was commenced. Major causes for the high ratio in FY2014 include the addition of points thanks to the Garraf project in Iraq and commencement of imports from Papua New Guinea.

It is necessary to further increase the ratio of self-development by promoting acquisition of rights and purchase of overseas assets and facilitating domestic oil and gas development, thereby strengthening Japan’s energy security.

* From FY1973 to FY2008, ratios of self-development were calculated only for oil. However, the Strategic Energy Plan (Cabinet Decision in March 2007) reviewed the definition of the term, and since FY2009, the ratios have been calculated by totaling data for oil and natural gas.
Currently, Japan’s upstream development is carried out under a system wherein three axes ((i) strategic supply of risk money by JOGMEC, (ii) creation of core companies, and (iii) active resource diplomacy) function integrally.

Japanese companies engaging in upstream development generally have weaker funding bases compared with international resource majors. As fluctuations in crude oil prices have been expanding in recent years, the supply of risk money, which is indispensable for ensuring stable resource exploration and purchase of assets, needs to be strengthened by the use of public funds.

Additionally, acquisition of overseas resource rights should be facilitated efficiently to secure a stable supply of oil and natural gas in Japan. It is also necessary to create core Japanese companies that have capabilities equal to that of overseas national flag companies in terms of funds, technologies and human resources.

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[Fluctuations in crude oil prices have been expanding]

[Investment by Japanese companies and international resource majors (2015)]

[Production scales of Japanese companies and international resource majors, etc.]

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* The medium-to-long-term vision (2012) of INPEX sets the production goal of 1 million barrels/day by the middle of the 2020s.
Due to the suspension of operation of nuclear power stations after the Great East Japan Earthquake, LNG-fired power stations expanded operation and a large amount of LNG was imported from a spot market to make up for the shortage that could not be covered with the amount of LNG purchased under existing long-term contracts.

However, at that time, (i) it was a customary practice to trade LNG at prices linked to crude oil prices, and (ii) LNG transactions were mostly based on long-term contracts and a sufficient amount of LNG was not available on a spot market. As a result, Japan was forced to import natural gas at higher prices than Western countries, which created a trade deficit and significantly deteriorated Japan’s current balance.

While crude oil prices are expected to increase in the medium to long term, it is necessary to develop an environment to enable stable procurement of LNG at reasonable prices. Specifically, Japan needs to collaborate with natural gas producers and other LNG consumers to develop an environment where spot and futures transactions of LNG are carried out based on price indicators, properly reflecting supply and demand of LNG, not on those linked to crude oil prices.

(ii) Responses to Crude Oil Price Fluctuation Risks
- Trade balance deteriorated due to a significant increase in imports of LNG after the earthquake -

<table>
<thead>
<tr>
<th>Calendar year</th>
<th>Trade balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>6.6</td>
</tr>
<tr>
<td>2011</td>
<td>-2.6</td>
</tr>
<tr>
<td>2012</td>
<td>-6.9</td>
</tr>
<tr>
<td>2013</td>
<td>-11.5</td>
</tr>
<tr>
<td>2014</td>
<td>-12.8</td>
</tr>
<tr>
<td>2015</td>
<td>-2.8</td>
</tr>
</tbody>
</table>

Source: Trade Statistics, Ministry of Finance; EIA; Bloomberg, etc.
Demand for LNG has been increasing, led by Asian and European countries. An increase of approximately 45% (from the 2014 level) is expected by 2020. Some new LNG suppliers such as the United States do not impose destination clauses, and market shares of LNG suppliers other than those in the Middle East will continue to increase until 2040.

Considering these changes in the supply-demand environment in and outside Japan to be a significant opportunity, Japan should address the following challenges to establishing a favorable LNG market, while taking advantage of its status as the world’s largest LNG consumer (consuming over 30% of the world’s LNG production).

1. Destination clauses: **Destination clauses** are included in many contracts, which makes it difficult to flexibly buy or sell LNG depending on supply-demand relationships.
   - Destination clauses: Clauses included in LNG transaction contracts that limit the landing place (destination) and prohibit resale to a third party
2. Oil-linked prices: LNG prices are tied to crude oil prices under long-term contracts and **do not reflect the supply-demand relationship of LNG**.
3. Domestic natural gas infrastructure: The amended Gas Business Act, which was enacted last year, introduced a system of third party access to LNG facilities. While ensuring the effectiveness of this system, efforts should be made for the future development of domestic pipelines, etc.

Operators of electric utilities and gas suppliers will face severer competition amid progress in the reform of the electricity and gas systems. Therefore, it has become increasingly important to procure LNG flexibly at reasonable prices.

(ii) Responses to Crude Oil Price Fluctuation Risks - Problems concerning LNG market -

- Relaxation of destination clauses
- Establishment of LNG price indices
- Development of domestic gas infrastructure

**LNG supply is expected to increase globally**

<table>
<thead>
<tr>
<th>Year</th>
<th>Rest of world</th>
<th>Southeast Asia</th>
<th>Russia</th>
<th>North America</th>
<th>Middle East</th>
<th>Australia</th>
<th>Africa</th>
<th>LNG share of inter-regional trade (right axis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2013</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>2025</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>2040</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
</tbody>
</table>

Source: IEA, World Energy Outlook 2015
On May 1 and 2, 2016, Japan hosted the G7 Energy Ministerial Meeting in Kitakyushu. Previously, it held the Toyako Summit in Aomori in 2008.

The Energy Ministerial Meeting was held in Italy in 2014 for the first time in five years, in consideration of the circumstances surrounding Russia and the Ukraine at that time. Member countries discussed means to strengthen energy security, focusing on natural gas. At the meeting held in Germany in 2015, member countries discussed sustainable energy, in addition to energy security, ahead of COP21.

At the meeting this year, under the grand theme of “Energy Security for Global Growth,” a joint statement “Kitakyushu Initiative” was compiled with the aim of contributing to the sustainable growth of the world economy from the perspective of energy, which is the very base of economic activities.

[Developments of the G7 Energy Ministerial Meeting]

[Theme of the G7 Energy Ministerial Meeting in 2016]

(i) Promotion of energy investment for global growth
(ii) Strengthening of energy security in consideration of global energy markets and geopolitical changes
(iii) Energy technology innovation for balancing the environment and economy in light of the outcomes of COP21
(ii) Responses to Crude Oil Price Fluctuation Risks - Building and enhancing emergency response frameworks -

- IEA countries share cooperative frameworks for oil stockpiling obligations and for emergency responses.
- Energy consumption by IEA countries as a share of the world total decreased from 60% in 1973 to 40% (and will become less than 30% in 2040). In order to ensure the effectiveness of cooperative actions, IEA countries commenced efforts to collaborate with emerging countries (making China, Indonesia and Thailand association countries).
- Japan will endeavor to ensure energy security domestically and internationally by facilitating deeper cooperation between IEA and association countries and supporting the development of oil stockpiling systems and emergency response frameworks in Asia.
- As the need to strengthen international emergency responses regarding natural gas has been recognized, the issue was discussed at the G7 Energy Ministerial Meeting this year.

[IEA primary energy consumption as a share of world total is decreasing]

[Enhancement of emergency response frameworks]

Oil

IEA countries (29 industrialized countries)

- Obligation to stockpile oil (for 90 days)
- Cooperative release of stockpiles to the market in an emergency such as a supply disruption

Emerging countries in Asia (China, Indonesia, Thailand, etc.)

- Development of oil stockpiling systems
- Contribution to cooperative release of stockpiles

Japan supports the development of oil stockpiling systems, etc. in Asia under the frameworks of ASEAN and APEC.

Natural gas

At the G7 Energy Ministerial Meeting in May 2015, member countries agreed to discuss means for international emergency responses in the field of natural gas.

At the G7 Kitakyushu Energy Ministerial Meeting in May 2016, member countries agreed to take concrete actions, such as conducting resiliency assessments.

Emerging countries in Southeast Asia and elsewhere will become increasingly dependent on the import of energy and will thus need to plan accordingly. In these countries, it is necessary to expand investment in high quality energy infrastructure in such fields as electricity, and to diversify energy sources.

METI newly commenced the Enevolution initiative last year, aiming to achieve diversification of energy sources and a stable energy supply in Asia by utilizing Japan’s experience in energy policy planning and advanced technological capabilities.

For example, Japan promotes cooperation with the Indonesian government on energy systems development towards achieving its 35GW Power Development Plan goal. Similarly in India, which plans to introduce renewable energy on a large scale, Japan will offer cooperation on stabilizing the system, critical for the introduction of alternative energies.

Source: “WEO2013,” IEA
- Export of energy conservation systems to emerging countries and oil producers -

Energy demand is expected to increase significantly in ASEAN countries and oil producers in the Middle East, not only in China and India.

China, India and ASEAN countries are now endeavoring to build an energy conservation system, while oil producers in the Middle East are falling behind in their efforts for energy conservation as a result of subsidies working to reduce energy prices.

Japan will export its energy conservation systems, which have achieved the world’s top energy efficiency, in accordance with the maturity of the systems and characteristics of energy supply and demand in respective countries and regions. Through these activities, Japan will contribute to the improvement of the energy intensity (energy consumption per unit) in these countries in order to mitigate the tightness in global energy demand and supply.

[Energy demand increases are mostly observed in emerging countries]
(Estimated changes in energy demand in respective countries and regions in 2040 (from the 2014 level))

[Comparison and problems of energy conservation-related systems of respective countries]
(iii) Enhancement of Energy Efficiency and Diversification of Energy Sources
- Development of energy conservation technologies together with export of systems -

- In order to enhance energy efficiency, it is important to disseminate excellent energy conservation technologies broadly in society, in addition to establishing proper legislation for exporting energy conservation systems.
- Japan will implement projects to mitigate tightness in the global energy demand and supply balance through expanding energy efficiency policy and related technologies for both the supply side and demand side.

**[Establish energy conservation systems]**

Primarily with government officials of partner countries, provide training in Japan, along with the dispatch of experts, to improve knowledge and know-how concerning the establishment and operation of an energy conservation system.

- **[China and India]**
  Training on measures for the Commercial/Building sector, etc. in China

- **[ASEAN countries]**
  Training on measures for the industrial sector in Indonesia

- **[Oil producers in the Middle East]**
  Seminar on measures for the Commercial/Building sector in Saudi Arabia

**[Expand energy conservation technologies]**

Conduct demonstration projects overseas and dispatch public-private missions to build recognition of the excellence of Japan’s energy conservation technologies while achieving goals of partner countries.

- **[Commercial/Building sector]**
  Building Energy Management System (BEMS)

- **[Industrial sector]**
  Exhaust heat recovery boiler in the manufacturing process of cement

- **[Commercial/Building sector]**
  Highly efficient freezer
Responses to the Great East Japan Earthquake and the Accident at Tokyo Electric Power Company’s (TEPCO): Fukushima Daiichi Nuclear Power Station and Nuclear Energy Policy
The “Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO’s Fukushima Daiichi Nuclear Power Station” was revised in June 2015.

The national government continues to take the initiative in promoting measures concerning decommissioning and contaminated water while placing top priority on safety, and providing related information accurately inside and outside Japan.

The Landside Impermeable Wall (Ice Wall) to prevent the inflow of groundwater into reactor buildings was constructed and freezing began on March 31, 2016, leading to a significant progress of measures against contaminated water.

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### Milestones in the Mid-and-Long-Term Roadmap (major targets)

Clarify the most immediate targets (in green) with higher priority while maintaining the general framework of targets (in blue).

<table>
<thead>
<tr>
<th>Overall measures</th>
<th>Completion of decommissioning measures</th>
<th>In 30 to 40 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures against contaminated water</td>
<td>Completion of disposal of the stagnant water in reactor buildings</td>
<td>Within 2020</td>
</tr>
<tr>
<td>Remove</td>
<td>Reduce additional effective doses at the border of the premises to less than 1mSv/year</td>
<td>FY2015</td>
</tr>
<tr>
<td></td>
<td>Commence preparation for deciding matters concerning long-term treatment of sewage from the Advanced Liquid Processing System (ALPS)</td>
<td>First half of FY2016</td>
</tr>
<tr>
<td>Isolate</td>
<td>Reduce the inflow of groundwater into reactor buildings to less than 100m³/day</td>
<td>FY2016</td>
</tr>
<tr>
<td>Prevent leakage</td>
<td>Store in welded tanks all water used for the treatment of high concentration contaminated water</td>
<td>Early date in FY2016</td>
</tr>
<tr>
<td>Treatment of the stagnant water</td>
<td>Halve the amount of radioactive materials in the water stagnant in reactor buildings</td>
<td>FY2018</td>
</tr>
<tr>
<td>Fuel removal</td>
<td>Decide treatment and storage methods of spent fuel</td>
<td>Around FY2020</td>
</tr>
<tr>
<td></td>
<td>Start fuel removal for Unit 1</td>
<td>FY2020</td>
</tr>
<tr>
<td></td>
<td>Start fuel removal for Unit 2</td>
<td>FY2020</td>
</tr>
<tr>
<td></td>
<td>Start fuel removal for Unit 3</td>
<td>FY2017</td>
</tr>
<tr>
<td>Fuel debris removal</td>
<td>Decide policies for fuel debris removal for each unit</td>
<td>Around the summer of 2017</td>
</tr>
<tr>
<td></td>
<td>Finally decide methods of fuel debris removal for the first unit</td>
<td>First half of FY2018</td>
</tr>
<tr>
<td></td>
<td>Start fuel debris removal for the first unit</td>
<td>Within 2021</td>
</tr>
<tr>
<td>Measures against waste</td>
<td>Compile basic ideas concerning treatment and disposal</td>
<td>FY2017</td>
</tr>
</tbody>
</table>

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**Land-side impermeable walls utilizing the frozen-soil method**

- **South side of Unit 4 building:** Construction completed

- **Construction of the Ice Wall completed**
  - Mountain side: September 15, 2015
  - Sea side: February 9, 2016

- **Freezing started:** March 31, 2016
As of the end of March 2016, the number of evacuees in Fukushima as a whole was approximately 100,000, of which approximately 70,000 were from the areas where evacuation orders were issued. The national government will accelerate enhancement of an environment conducive to the lifting of such evacuation orders as early as possible and promote the Innovation Coast Scheme to create new industry in Hamadori, centered on cutting-edge technologies for decommissioning and robotics, to facilitate efforts for revitalization of local communities.

**Enhancement of environment to achieve the lifting of evacuation orders**

1. **Support for prompt returns**
   - Accelerating the enhancement of the environment so that evacuation orders may be lifted within six years of the accident (March 2017) in areas ready for such measures to be adopted
   - Regardless of the time period of the lifting of evacuation orders, payment of compensation for mental suffering will be equivalent to those paid in cases where evacuation orders are lifted six years after the accident

2. **Support for new lives**
   - Flexible utilization of and one-stop support for measures for rapid enhancement of reconstruction bases
   - Taking concrete measures for the Fukushima Innovation Coast Scheme
   - Full opening of the JR Joban Line as soon as possible

3. **Support for self-reliance efforts**
   - Through intensive support measures for the two years of FY2015 and FY2016, strive to substantially reduce the damage caused by the nuclear disaster.
   - Establishment of new supporting entities that carry out measures to support self-reliance efforts
   - Enhancement of efforts for rebuilding businesses and occupations of disaster victims, supporting their self-reliance efforts and helping them rebuild their lives and livelihoods
   - Measures concerning compensation for business damage and harm caused by rumors

**Innovation Coast Scheme**

- Take concrete measures for the prefectural wind power generation scheme targeting the Abukuma Mountains and Hamadori area
- Develop technologies for the treatment and disposal of fuel debris and radioactive waste, etc. The facility in Okuma Town is scheduled to commence operation in FY2017.
- Gather Japanese and foreign universities, research institutes, companies, etc. in diverse fields and strengthen research on decommissioning. The facilities are scheduled to be developed in Tomioka Town within FY2016.
- Commence operation of a 5MW floating offshore wind farm in FY2016 and conduct a full-fledged demonstration project using multiple units for the first time in the world.

**Other major projects**

- [Agriculture, forestry and fisheries industry] Various projects are to be carried out and Fukushima Prefecture considers concrete measures therefor.
- [Smart Eco Park] A project aiming to accumulate recycling-related industries is to be carried out and a panel to study relevant issues is being held in Fukushima Prefecture.
- Support companies’ efforts for commercialization in collaboration with local companies in relation to robotics or other priority fields in the Innovation Coast Scheme.
Fukushima Prefecture has been endeavoring to be a pioneer in introducing renewable energy as the core initiative for achieving reconstruction.

The Fukushima New Energy-Oriented Society Scheme is to be established by around the summer of 2016, with the aim of expanding the introduction of renewable energy to the extent possible and creating a new social model in Fukushima for realizing a cycle of generating hydrogen from renewable energy and storing, transporting and using it.

For that purpose, the first meeting of the Council for Realizing the Fukushima New Energy-Oriented Society Scheme was held in Fukushima City in March 2016.

Creation of a model for a future new energy-oriented society

Expand the introduction of renewable energy

- Utmost support for the people of Fukushima -

- Fukushima Renewable Energy Institute, AIST (FREA) -
  ○ Japan’s only research institute specialized in new energy

- Fukushima Floating Offshore Wind Farm -
  ○ The world’s largest offshore wind power facility (7000KW) off the coast of Fukushima

- Support only for Fukushima -
  ○ Development of electric transmitting facilities and improvement of substations

- Support for improving major power lines -
  ○ Construction of power lines from the Abukuma and Futaba areas, which are suited for wind power generation, to TEPCO is supported under a new framework with the participation of electric power companies.

Create a model for realizing a hydrogen energy-oriented society

- Lead the world in developing a system to generate hydrogen from renewable energy and store and use it -

- Generate hydrogen -
  ○ Large-scale generation of hydrogen with wind power, etc.
    (Demonstration at the world’s largest scale of 10,000KW)

- Store and transport hydrogen -
  ○ Field demonstration of next-generation technologies for transportation and storage of hydrogen
  ○ Evaluate the feasibility of converting renewable energy to hydrogen and using it inside and outside Japan
    (Conduct a feasibility study, etc.)

- Use hydrogen -
  ○ Hydrogeneration
    (Through the use of IGCC, etc.)
  ○ Development of hydrogen stations using renewable energy

Build smart communities

- Support reconstruction of local communities through the use of renewable energy and hydrogen -

- Demonstrations in Naraha Town, Shinchi Town, Soma City and Namie Town
- Creation of a model hydrogen energy-oriented town free of CO₂
- Prefecture-wide expansion of the initiative
  (Conduct a feasibility study)

To be a pioneer in introducing renewable energy

Accumulate new energy-related industries

- Build a scheme to intensively support R&D by companies in Fukushima

Communicate a model of a future new energy-oriented society to the world
Based on lessons learned from the nuclear disaster in Fukushima, comprehensive policy measures for improving public trust in nuclear power policy will be taken by actively utilizing nuclear-related ministerial meetings or other opportunities in order to sufficiently cope with issues concerning (i) the reduction of dependence on nuclear power, (ii) safety measures and countermeasures against disasters, (iii) spent fuel, and (iv) reconstruction of Fukushima.

### Safety measures

- Safety measures under the Former Nuclear Reactor, etc. Regulation Act were insufficient.
  - Occurrence of the severe accident

### Countermeasures against severe accidents

- Severe accidents were not covered by the Former Nuclear Reactor, etc. Regulation Act.
  - Discharge of approx. 10,000TBq of radioactive materials

### Nuclear disaster prevention measures

- Establishment of evacuation plans was completely left to each local government. / Established plans only covered zones within 10km radius. / Evacuation was required for zones over 30km from the NPS.
  - Chaos at the scene / Burden on residents

### Before the nuclear accident

### After the nuclear accident

- Enactment of the New Nuclear Reactor, etc. Regulation Act (June 2012)
- Establishment of the Nuclear Regulation Authority (September 2012)
  - The scale of assumed earthquakes and tsunamis was reviewed and safety measures were fundamentally strengthened.

- Enactment of the New Nuclear Reactor, etc. Regulation Act (June 2012)
- Countermeasures against severe accidents were included in the coverage of regulations.
  - Nuclear operators were required to limit the discharge of radioactive materials to less than 100TBq even in the event of a severe accident.

- Amendment of the Act on Special Measures Concerning Nuclear Emergency Preparedness (June 2012) and establishment of the Nuclear Emergency Response Guidelines (October 2012)
- Drastic revision of the Master Plan for Disaster Prevention based on the Basic Act on Disaster Control Measures (September 2012)
  - Establishment of evacuation plans for PAZ (zones within 5km) and UPZ (zones within 30km)
  - The national government confirms local governments’ disaster prevention measures. (March 2015) / Regional disaster prevention measures are to be regularly updated through drills.
Based on lessons from the accident at the Fukushima Daiichi NPS, the national government set up the Nuclear Regulation Authority and established new regulatory standards. Additionally, nuclear operators are expected to make voluntary efforts.

In preparation for any accident, the national government has supported local governments in establishing evacuation plans and has confirmed the details thereof. Through disaster drills, etc., efforts should be made to enhance the effectiveness of such plans.

**Safety measures**

*Strengthening of protective measures under new regulatory standards*
(e.g.) At the Sendai NPS, countermeasures against tsunamis were strengthened, including construction of the tsunami protection levee to prevent sea water from flowing into the premises.

*Voluntary efforts by nuclear operators*
(Example 1) Nuclear operators improved a jointly organized nuclear rescue team in order to enhance their capabilities for restoration following an accident.
(Example 2) The electric utility industry as a whole promotes efforts, centered on the Nuclear Risk Research Center established in 2014, for the development of a means to quantify the effectiveness of safety measures at each power station.

**Efforts for further enhancing safety**

Nuclear Emergency Preparedness Commission
September 12, 2014: Sendai area
October 6, 2015: Ikata area
December 18, 2015: Takahama area

*Support for the establishment of evacuation plans and confirmation of the details*
The national government supports local governments in establishing evaluation plans, and the Nuclear Emergency Preparedness Commission chaired by the Prime Minister grants approval for plans thus established.

**Implementation of disaster drills**
Evacuation plans are verified through the implementation of drills, etc. and are improved and enhanced on an ongoing basis.
Increasing Sense of Crisis Regarding Climate Change Issues and the Need to Change Energy Policy
The Paris Agreement was adopted with the participation of all major countries. Countries have submitted their targets. Japan set a target of a 26% reduction in greenhouse gas emissions, which is ambitious compared with targets set by US, EU. Japan aims to achieve the world’s lowest level of “emissions per GDP” (0.16kg/US$).

### Coverage rates of reduction targets

- **Paris Agreement**
  - All countries including major emitters set their targets.
- **Kyoto Protocol**
  - Only some industrialized countries (around 20%) set their targets.

### Comparison of reduction targets

<table>
<thead>
<tr>
<th>Country</th>
<th>From the 1990 level</th>
<th>From the 2005 level</th>
<th>From the 2013 level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>-18.0% (2030)</td>
<td>-25.4% (2030)</td>
<td>-26.0% (2030)</td>
</tr>
<tr>
<td>U.S.</td>
<td>-14 to 16% (2025)</td>
<td>-26 to 28% (2025)</td>
<td>-18 to 21% (2025)</td>
</tr>
<tr>
<td>EU</td>
<td>-40% (2030)</td>
<td>-35% (2030)</td>
<td>-24% (2030)</td>
</tr>
</tbody>
</table>

### Emissions per dollar of GDP

<table>
<thead>
<tr>
<th>Country</th>
<th>2013</th>
<th>2030 / 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>0.29kg-CO2</td>
<td>0.16kg-CO2 (2030)</td>
</tr>
<tr>
<td>U.S.</td>
<td>0.47kg-CO2</td>
<td>0.28-0.29kg-CO2 (2025)</td>
</tr>
<tr>
<td>EU</td>
<td>0.29kg-CO2</td>
<td>0.17kg-CO2 (2030)</td>
</tr>
</tbody>
</table>

Approximately 90% of greenhouse gas emissions originate from CO2. The key is to realize the prerequisite for the 26% reduction target.
The national government established the Innovative Energy Strategy, which integrally develops relevant systems in the fields of energy conservation and renewable energy, etc.

- **Thorough energy efficiency**
  - Industry Benchmark System
  - Transport Next-generation vehicles
  - Household Housing and home appliances

- **Expansion of the use of renewable energy**
  - Review of the Feed-in Tariff System

- **Building of a new energy system**
  - Integration of renewable energy and energy conservation initiatives through the use of IoT
  - Establishment of a strategy concerning a hydrogen energy-oriented society from 2030 onward

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**Changes in final energy consumption per GDP**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>1.4</td>
<td>1.2</td>
<td>1.0</td>
<td>0.8</td>
<td>0.6</td>
<td>0.4</td>
<td>0.3</td>
</tr>
</tbody>
</table>

- **Energy efficiency**
  - Improve energy efficiency by the same percentage as after the oil crises in the 1970’s (35%) (35% improvement)

- **Renewable energy**
  - Double the current level (from 12% to 22-24%)
  - Renewable energy: Around 22-24%
  - Renewable energy (excl. Hydro power): Around 8.8-9.2%
  - Hydro power: Around 8.8-9.2%
  - Wind power: Around 1.7%
  - Solar power: Around 7.0%
  - Geothermal power: Around 0.5%
  - Biomass: Around 3.7-4.6%
  - Hydro power (excl. Hydro power): Around 12%

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- **Innovative Energy Strategy to Overcome Environmental Restrictions and Achieve Economic Growth**
  - Sustainable efforts are required to find real solutions to climate change issues; it is essential that a balance be achieved with economic growth.
  - The key to ensuring a good balance is to (i) achieve thorough energy efficiency, (ii) expand the use of renewable energy, and (iii) expand energy investment for improving efficiency and building a new energy system. In order to achieve these goals, the Innovative Energy Strategy was established and is being carried out.

- **Creation of a negawatt market**
  - Target for disseminating fuel cell vehicles
    - (Around 800,000 cars in 2030)
  - Target for building hydrogen stations
    - (A four-fold increase from the current level to 320 stations in FY2025)
In order to encourage newcomers and further investment amid electricity deregulation and achieve the CO₂ emission reduction target at the same time, the national government has developed systems to support the framework of voluntary efforts by the electric utility industry (the Act on the Rational Use of Energy, the Act on the Promotion of Use of Non-fossil Energy Sources and Effective Use of Fossil Energy Materials by Energy Suppliers, etc.).

Additionally, the national government will promote further improvement of the efficiency of thermal power generation (development of further advanced technologies), and will endeavor to develop an environment under which the value of the types of renewable energy sources that emit less CO₂ is properly appreciated and traded in the market.

Through these comprehensive efforts, Japan aims to achieve a GDP of 600 trillion yen and CO₂ emission reduction at the same time.

Achieve a GDP of 600 trillion yen and CO₂ emission reduction at the same time
Promote Expansion of Well-balanced Introduction of Renewable Energy

○ The FIT System increased the introduction of renewable energy but in an unbalanced manner, centered on solar power. The required cost for this system amounted to 2.3 trillion yen throughout FY2016 with the monthly burden on an average household reaching 675 yen.

○ Regarding solar power that has been broadly introduced, it is important to make efforts to reduce costs and secure solar power as a sustainable independent power source through guaranteeing its appropriateness by reviewing safety regulations.

○ Regarding other types of renewable energy such as wind power and geothermal power, predictability of purchase prices should be enhanced and their introduction needs to be expanded together with relevant research and development. Development of community-based distributed power sources will also be supported.

| [Promotion of introduction of power sources requiring a long lead time (geothermal power, wind power, etc.)] |
|---|---|
| (i) Decide purchase prices in approved projects several years later |
| Purchase prices in an approved project after environmental assessment are decided in advance upon making a judgment on the commercialization, and this will increase the predictability of relevant business (a bill to amend the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities was submitted to the Diet). |

| (ii) Speed up procedures for environmental assessment |
| Aim to halve the period required for the procedures for environmental assessment |

[Promotion of offshore wind generation]

Demonstration projects on bottom-mounted offshore wind farms are carried out off the coast of Choshi and the coast of Kitakyushu, etc. with the aim of developing the wind power generation facilities most suited to Japan’s natural environment.

The national government has submitted a bill to amend the Port and Harbor Act to develop proprietary use rules within ports and harbors with the aim of facilitating long-term maintenance of wind power facilities.

[Creation of a local self-sustaining system using biomass energy]

A demonstration project is carried out with the aim of creating a local system using biomass energy that is economically self-sustaining.
On April 1, 2016, the power retailing business was fully liberalized, and all consumers including ordinary households and stores are now able to freely select power suppliers and electric rate systems.

The size of the newly liberalized electricity market is worth approximately 8 trillion yen annually. Competition caused by new entries from other business sectors is bringing about benefits to consumers such as a restraining effect on price increases and provision of new services.

As of April 1, 280 retailers were registered and approximately 530,000 applications for switching power suppliers were filed. As of March, approximately 80% of consumers were considering changes of power suppliers. Consumers’ selections are expected to vitalize the market.

Innovation based on diverse consumer needs will create dynamic power-related markets and general energy companies targeting overseas markets may emerge in the future.

### Liberalization of power retailing business was carried out in a phased manner

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<th>(Column) Full Liberalization of Power Retailing Business</th>
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### [Liberalization of power retailing business was carried out in a phased manner]

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</thead>
<tbody>
<tr>
<td>2,000 kW</td>
<td>Large-sized plants</td>
<td>Liberalized sector (26% of the total amount)</td>
<td>Liberalized sector (40% of the total amount)</td>
<td>* The amount of power for FY2013</td>
<td>Full liberalization</td>
</tr>
<tr>
<td></td>
<td>Medium-sized plants</td>
<td>Regulated sector (74%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 kW</td>
<td>Small-sized plants</td>
<td>[Supermarkets</td>
<td>Medium to small-sized buildings</td>
<td>Regulated sector (60%)</td>
<td>* The amount of power for FY2013</td>
</tr>
<tr>
<td></td>
<td>Convenience stores</td>
<td>Small factories</td>
<td>Households</td>
<td>Regulated sector (38%)</td>
<td></td>
</tr>
</tbody>
</table>

(Note) As transitional measures to protect demanders, regulations on charges remain applicable at least until 2020 (demanders can select regulated charges).

### [Competing power retailers]

- Retailers offering new charge plans (existing power companies)
- Retailers offering discounted rates to large-scale users (companies in the energy industry)
- Retailers offering discounts for a set of contracts with other types of services (companies in the life infrastructure industry such as telecommunications carriers)
- Retailers procuring power from FIT power sources or other renewable energy sources (companies in the renewable energy industry)
- Retailers selling locally-generated power based on the locally-grown and locally-consumed principle (companies based on the locally-grown and locally-consumed principle)
- Retailers aiming to reduce power consumption through energy management (companies in the energy control or energy conservation industry), etc.
### (Column) Responses for Recovery from a Disaster (Kumamoto Earthquake)  
[as of April 28, 2016]

- Based on opinions of persons in the disaster-affected areas, the utmost efforts are being made to support recovery and assist victims. The national government actively ascertained the energy needs of hospitals, welfare facilities and other vital facilities to provide them with necessary electricity and fuel.
- Response measures are being taken while utilizing various mechanisms that were developed after the Great East Japan Earthquake, such as developed core SSs, increased storage capacity of gas supplying vehicles, and an enhanced power accommodation system.

### Electricity
- Efforts were made to ensure prompt resumption of power supply and Kyushu Electric Company and other electric companies nationwide dispatched a total of 110 power source cars to secure power mainly at vital facilities, such as government offices, shelters, hospitals and welfare facilities.
- Preferential supply of fuel was requested to the Petroleum Association of Japan and the All Japan Petroleum Association.

### Gas
- Saibu Gas, which sustained damage due to the earthquake, accepted a support team consisting of approximately 2,600 personnel from other gas suppliers (mainly from Tokyo Gas, Toho Gas, and Osaka Gas) and carried out emergency measures such as shutting off gas valves, checking damage and repairing gas pipes under a structure consisting of approximately 4,600 personnel.
- Temporary service was conducted using gas supplying vehicles directly to hospitals and welfare facilities, etc. Approximately 130 gas supplying vehicles were secured including those dispatched from nationwide.

### Fuel
- The Emergency Oil Supply Collaboration Plan was initiated and a cooperation system among oil distributors was formed. Under said cooperation system, stable oil supply to SSs was continued by increasing tanker trucks.
- Core SSs (34 stations in Kumamoto Prefecture) supplied fuel preferentially to emergency vehicles.
- Fuel was delivered to hospitals, welfare facilities and other important facilities, as well as to shelters and power source cars from small-sized delivery points.
- Information concerning operating SSs was provided.

### Efforts having been made after the Great East Japan Earthquake
- **Fuel**: The Oil Stockpiling Act was amended and the Emergency Oil Supply Collaboration Plan, under which oil companies collaboratively supply fuel in the event of a disaster, was established. Furthermore, core SSs have been developed to ensure preferential fuel supply to emergency vehicles of local governments and Self Defense Forces, etc. in an emergency.
- **Electricity**: Each power company has developed disaster response systems, such as securing power source cars and other equipments, building emergency cooperation systems with construction contractors and carrying out joint drills. Based on a request from the Organization for Cross-regional Coordination of Transmission Operators, Japan, power companies have developed a mechanism of accommodating equipment and personnel for recovery and offering support among themselves, and have been conducting drills, etc. to ensure a smooth support system.
- **Gas**: All major gas pipes (high-pressure pipes and medium-pressure pipes) have been reinforced against earthquakes. Reinforcement is scheduled to be conducted for 90% of branch pipes (low-pressure pipes) by the end of FY2025. Relevant Ministerial Ordinances, etc. were amended to increase the storage capacity of gas supplying vehicles with the aim of enabling continuation of temporary supply to hospitals and other facilities that consume large amounts of gas.