FY 2014 Annual Report on Energy (Energy White Paper 2015) Outline

July 2015
Ministry of Economy, Trade and Industry
Agency for Natural Resources and Energy

◇ 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.

◇ As its main topics, the Energy White Paper 2015 provides analysis on the global environment for energy security, which is drastically changing due to the Shale Revolution in the United States (The Shale Revolution and Changes in the Global Energy Situation (Chapter 1, Part 1)), and also explains the current situation of rising energy costs in Japan and the Government's response to the situation (Chapter 3, Part 1).

◇ In addition, in the same manner as previous white papers, the 2015 White Paper also describes in detail the responses to the accident at Tokyo Electric Power Company's (TEPCO) Fukushima Daiichi Nuclear Power Station (Chapter 2, Part 1), energy trends (Part 2), and measures taken in FY 2014 concerning energy supply and demand (Part 3).

Part 1 Current Energy Situation and Key Measures

Chapter 1 The Shale Revolution and Changes in the Global Energy Situation

Chapter 2 Responses to the Great East Japan Earthquake and the Accident at Tokyo Electric Power Company's (TEPCO) Fukushima Daiichi Nuclear Power Station

Chapter 3 Dealing with Energy Costs

Part 2 Energy Trends

(Collection of basic data outlining energy supply and demand within and outside Japan and primary and secondary energy trends)

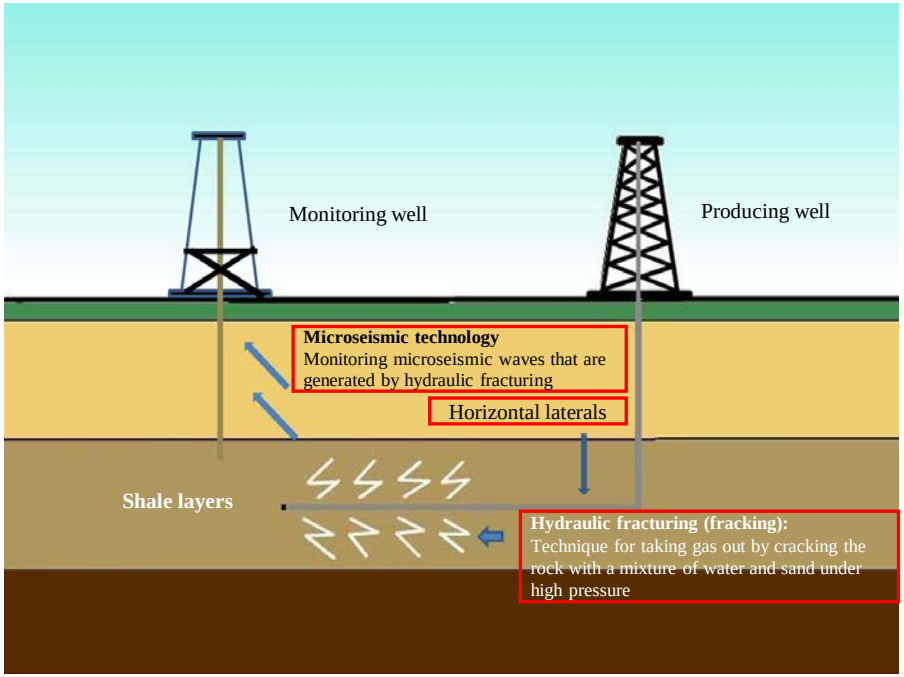
Part 3 Measures Taken in FY 2014 concerning Energy Supply and Demand

(Outline of Individual Measures and Budgets, etc.)

Changes in the United States Brought about by the Shale Revolution (i)

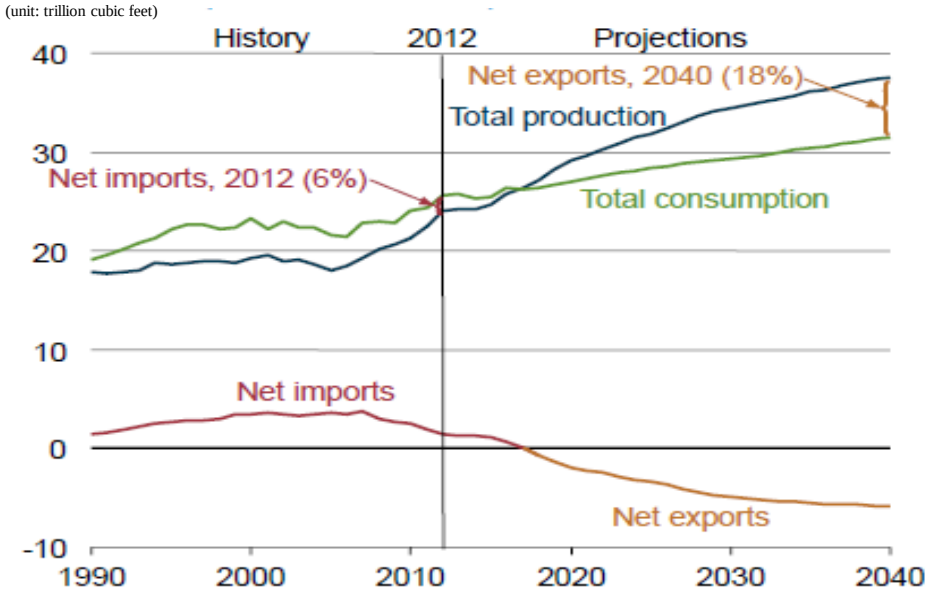
- ○ In the United States, gas from shale layers (or shale gas), which lies more than 2,000 meters underground and used to be unprofitable to drill, has been in full-fledged production since 2006. The development of shale gas has had a huge impact on global energy and even on political situations. This transformation is called the Shale Revolution.
- ○ The Shale Revolution was realized through (i) technological innovation, (ii) a rise in natural gas prices, and (iii) support from the U.S. government.
- ○ The United States has become the largest natural gas producing country in the world since 2009, and it is expected that the United States will become a net exporter of natural gas by 2020. As for the production of crude oil in the United States, its production volume also exceeded its import volume in October 2013 for the first time since 1993 and continues expand.

[Three Technological Innovations that Made Shale Gas Extraction Possible]



Source: Based on data from Japan Oil, Gas and Metals National Corporation (JOGMEC)

[Trends and Outlook for Natural Gas Production, Consumption, Exports, and Imports in the United States]



Source: Based on Statistics from the U.S. Energy Information Association (EIA)

Changes in the United States Brought about by the Shale Revolution (ii)

- Changes in the energy supply and demand structure in the United States are not limited to natural gas.
- The development and increased production of shale oil has decreased U.S. imports of crude oil. Because shale oil is light or medium oil, countries which used to supply these kind of oil to the United States, particularly Nigeria, Angola, and Algeria, have been seriously impacted.
- In addition, as the production of inexpensive natural gas has progressively increased, power generation has likewise increased its dependency on natural gas, resulting in significant changes in the coal supply and demand structure. Coal consumption and production volume have dramatically declined, and most of the coal produced is being exported.
- These changes in the energy supply and demand structure in the United States have also significantly changed that of the world as described in the following pages.

[Changes in Top Ten Countries from which the U.S. Imports Crude Oil]

2005	Thousand barrels per day	Share
Canada	1,633	16%
Mexico	1,556	15%
Saudi Arabia	1,445	14%
Venezuela	1,241	12%
Nigeria	1,077	11%
Iraq	527	5%
Angola	456	5%
Ecuador	276	3%
Algeria	228	2%
Kuwait	227	2%
Total imports	10,126	

2013	Thousand barrels per day	Share
Canada	2,579	33%
Saudi Arabia	1,325	17%
Mexico	850	11%
Venezuela	755	10%
Colombia	367	5%
Iraq	341	4%
Kuwait	326	4%
Nigeria	239	3%
Ecuador	232	3%
Angola	201	3%
Total imports	7,730	

Not in the top ten

Source: Based on Statistics from EIA

[Changes in Coal Consumption in the United States]

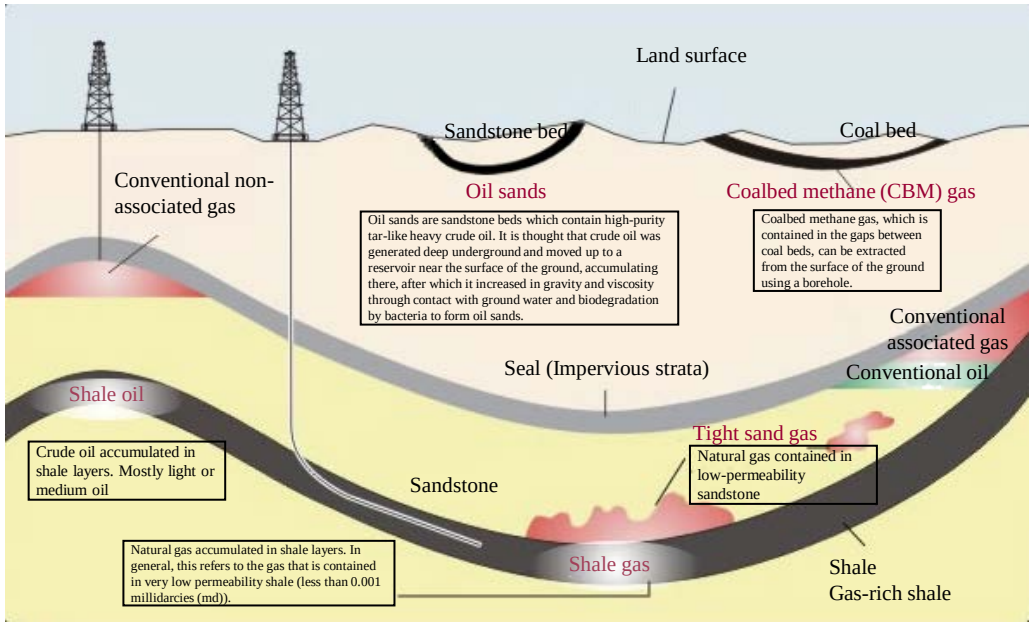
Unit: thousand tons of oil equivalent	2005	2013	Change
Production	565,282	479,200	-86,082
Imports	19,598	5,060	-14,538
Exports	29,460	68,220	38,760
Change in reserves	2,902	19,370	16,468
Primary energy consumption	558,321	435,410	-122,911

Source: Based on *Energy Balances of OECD Countries 2014*, International Energy Agency (IEA)

Changes in International Energy Trends in the Shale Revolution Era (i)

- While the Shale Revolution is taking place in the United States, the development and production of unconventional crude oil and gas other than shale oil and gas are progressed in various countries.
- In Canada, oil production from oil sands accounted for about half of the crude oil production in 2013, and a stable production volume is expected for the next several decades. Therefore, capital has been flowing into the oil sands business from inside and outside the country.
- Extra heavy oil in Venezuela has been included in the estimation of proven reserves since around 2010, making Venezuela the world's top country for crude oil reserves, replacing Saudi Arabia.

[Image of Major Kinds of Unconventional Crude Oil and Gas]



[Major Unconventional Crude Oil and Gas that Are Being Developed in Various Countries]

Name	Summary Description	Major Reservoirs
Heavy oil	This refers to a type of crude oil that has a high gravity (American Petroleum Institute (API) gravity: 10 to 22 degrees) and a high viscosity. Heavy oil cannot be extracted from underground with conventional methods such as letting it gush or pumping. Recovery, therefore, is to be performed by strip mining, using vapor pressure, or other such methods.	Venezuela, Canada, etc.
Extra heavy oil and bitumen	A type of oil that has an API gravity of 10 degrees or less and a viscosity of 10,000 centipoise (cP) or less is called extra heavy oil. If the viscosity is more than 10,000 cP, it is called bitumen. Extra heavy oil with fluidity is distributed throughout Venezuela's Orinoco oil belt, which is a high-temperature oil belt, while bitumen without fluidity is distributed in Canada's oil sands, which are low temperature.	Venezuela, Canada, etc.
Coalbed methane gas (CBM: Coal Bed Methane)	Coal methane gas, which is contained in the gaps between coal beds, can be extracted from the surface of the ground using a borehole.	United States, Canada, China, Australia, etc.

Source: Based on data from EIA

Changes in International Energy Trends in the Shale Revolution Era (ii)

- The global energy supply and demand structure is dramatically changing with the U.S. Shale Revolution.
- Qatar, which had increased its production capacity for liquefied natural gas (LNG) with the prospect of further expansion of its exports to the United States, lost its opportunity to export LNG to the United States due to the Shale Revolution and began with the development of the European and Asian markets. As a result, Europe, which was aiming to free itself from its dependence on Russia, has increased its imports of LNG from Qatar, and Japan was able to respond to the emergency situation and increased demand for thermal power generation after the Great East Japan Earthquake by expanding imports of LNG from.
- While Europe's energy situation has been changing due to the imports of LNG from Qatar and coal from the United States, Russia has moved towards development of its Asian market.

[Changes in Destinations to Which Qatar Exported Natural Gas]

(Unit: million cubic meters)

	2008			2010			2013		
	Exports	Share		Exports	Share		Exports	Share	
Middle East	17,252	30.0		19,480	20.7		23,616	19.4	
Japan	**11,333**	**19.7**	Asia total	**10,809**	**11.5**	Asia total	**22,642**	**18.6**	Asia total
Republic of Korea	11,579	20.1	56.0	9,933	10.5	38.8	17,767	14.6	60.0
India	8,336	14.5		10,670	11.3		14,156	11.6	
Other Asia	996	1.7		5,206	5.5		18,500	15.2	
Europe	7,900	13.7		34,636	36.8		21,128	17.4	
United States	88	0.2		1,291	1.4		207	0.2	
Other	69	0.1		2,164	2.3		3,506	2.9	
Total	57,553	100		94,189	100		121,522	100	

・Other Asia: Taiwan (in 2008), Taiwan and China (in 2010), Taiwan, China, and Thailand (in 2013)
・Other: Canada, Mexico, Brazil, etc.

Source: Based on *Natural Gas Information*, IEA

[Changes in Destinations to Which Russia Exported Natural Gas]

(Unit: million cubic meters)

	2008			2010			2013		
	Exports	Share		Exports	Share		Exports	Share	
Japan	0	0.0	Asia total	8,369	4.0	Asia total	12,018	5.3	Asia total
Other Asia	0	0.0	0.0	4,967	2.4	6.4	2,657	1.2	6.5
Europe	157,594	82.1		127,574	60.8		154,713	68.5	
Former Soviet Union	34,256	17.9		68,722	32.8		56,544	25.0	
Other	0	0.0		90	0.0		0	0.0	
Total	191,850	100		209,722	100		225,932	100	

Source: Based on *Natural Gas Information*, IEA

Changes in Energy Security in Major Countries

○ In order to understand how the energy situations changed in major countries, including the United States, through the Shale Revolution, based on the "indices for quantitative evaluation of energy security" used in the *2010 Annual Report on Energy (Japan's "Energy White Paper 2010")* a comparison of figures between the latest evaluation and that for the 2000s (as described in the *"Energy White Paper 2010"*) will be made and discussed in the following section with focused paid to changes in each country's energy security during that time period.

Indices for Quantitative Evaluation of Energy Security

Regarding the underlined portion in each item, scores are assigned based on relative evaluations. (Ten points is the highest score.)

(1) Development and utilization of domestic and semi-domestic energy resources
- Primary energy self-sufficiency

(2) Diversification of countries from which energy is imported
- Degree of distribution of partner countries from which each resource (crude oil / natural gas / coal) is imported

(3) Risk management in terms of resource transportation
- Reduction of risks at choke points

* Choke points: Narrow channels that are widely used for transporting goods, for example, the Strait of Hormuz, the Strait of Malacca, etc.

(4) Diversification of energy sources
- Degree of distribution of primary energy supply sources
- Degree of distribution in makeup of power generation by source

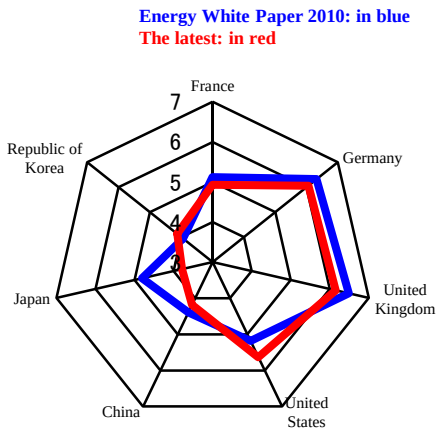
(5) Domestic risk management
- Reliability in electric power supply (power failure time)

(6) Demand restraint
- Specific energy consumption per unit of GDP

(7) Response to supply disruption
- Days of stockpiles

Average Score for All Items in Each Country's Quantitative Evaluation

	2000s	The latest	Changes in scores
France	5.1	4.9	-0.2
Germany	6.4	6.2	-0.2
United Kingdom	6.5	6.2	-0.3
United States	5.2	5.6	0.4
China	4.4	4.2	-0.2
Japan	4.8	4.0	-0.8
Republic of Korea	3.9	4.1	0.2

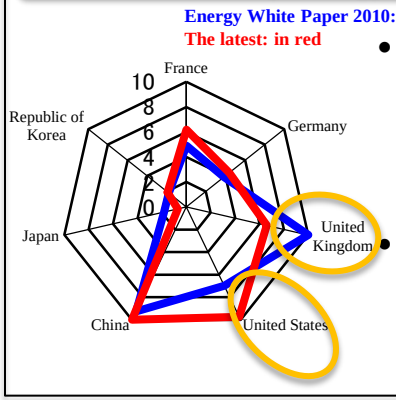


- The highest scores in the evaluations for the 2000s and the latest figures were both given to the United Kingdom, but the United States improved its evaluation scores the most due to an increase in its primary energy self-sufficiency rate thanks to the Shale Revolution.
- As for Japan, its evaluation dropped the most to the lowest score among the subject countries.

* Higher scores (farther from the center point) indicate higher evaluations.

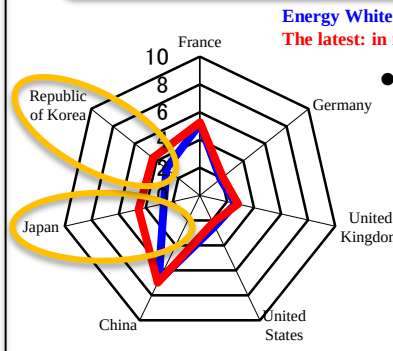
Changes in Energy Security in Major Countries

(1) Primary energy self-sufficiency



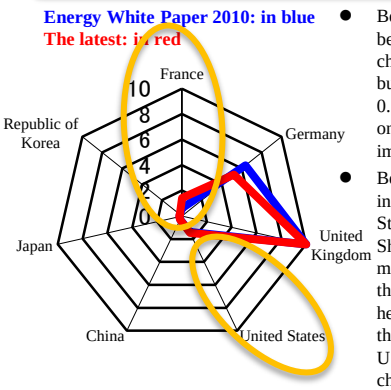
- The United States has continued to increase its production of natural gas since 2006, as well as that of crude oil since 2009, which indicates that the Shale Revolution has greatly contributed to the increase in the U.S.'s primary energy self-sufficiency.
- As for the United Kingdom, production in the North Sea oil fields has declined, and the U.K.'s primary energy self-sufficiency rate thus fell to less than 100% in 2005 and is still continuing a downward trend.

(2) Diversification of countries from which energy is imported



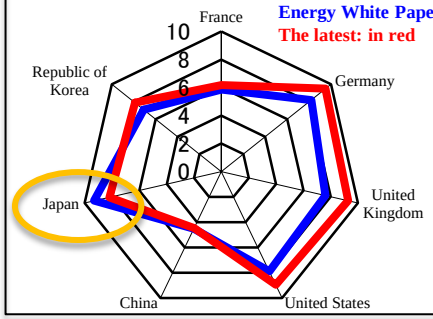
- The countries from which energy is imported to Japan and the Republic of Korea have diversified due to the decline of imports of natural gas from Indonesia.

(3) Reduction of risks at choke points



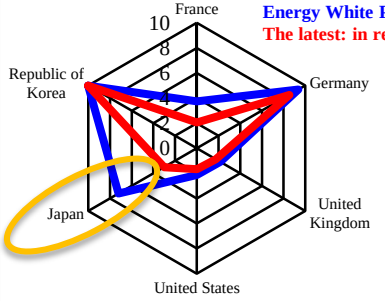
- Because the United Kingdom has been at extremely low risk from choke points, it may not be noticed, but France improved its score (from 0.6 to 1.4) due to the effect of a ban on crude oil imports from Iran imposed by the EU in 2012.
- Because the shale oil which has been increasingly produced in the United States since the beginning of the Shale Revolution is light and medium gravity oil, crude oil from the Middle East, which is mainly heavy oil, has not been affected by the Shale Revolution. Therefore, the U.S's score concerning risks at choke points has not changed.

(4) Diversification of energy sources



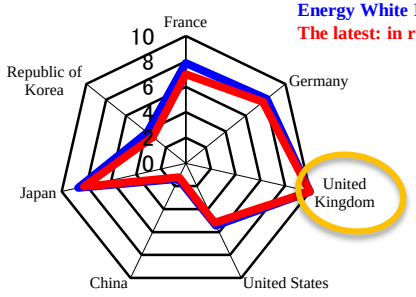
- Japan was ranked first for the 2000s' evaluation but then went down to fourth for the latest evaluation because the number of energy sources has been reduced due to the shutdown of nuclear power plants.
- All of the five countries other than Japan and China have increased their scores, which promoted the reduction of the risk of threats to their energy security.

(5) Power failure time



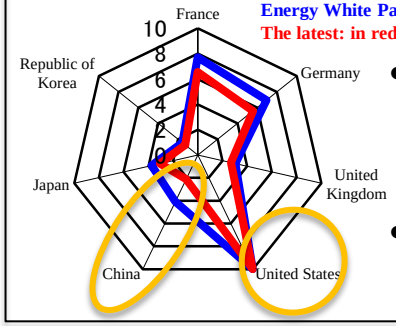
- It is difficult to analyze these changes because power failure largely depends on natural conditions such as lightning.
- Japan's score for the latest evaluation (FY 2011–FY 2013) excluded rolling blackouts but included power failures caused by aftershocks of the Great East Japan Earthquake (an example: April 8, 2011: power failure affected four million households).

(6) Specific energy consumption per unit of GDP



- Although all the countries achieved improvements in their energy consumption efficiency, the six countries other than the United Kingdom had scores that worsened relatively because the United Kingdom, which obtained the best score (the lowest consumption), has raised its score the most.

(7) Response to supply disruption



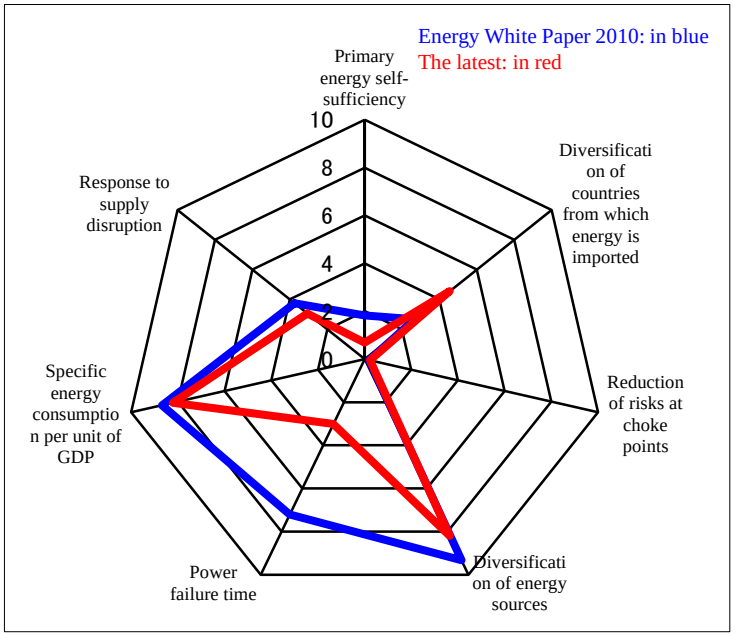
- The United States continuously obtained the best evaluation for the latest figures as well as the 2000s (the highest number of days capable of response to supply disruption). U.S. stockpiles have almost remained flat, which indicates that a decrease in crude oil imports due to the Shale Revolution greatly contributed to the results.
- Although China has doubled its stockpiles, its crude oil imports have dramatically increased, resulting in a worsening of its score.

Changes in Japan's Energy Security

- ○ The latest scores and evaluation values for Japan's primary energy self-sufficiency and diversification of energy sources worsened compared to those from the 2000s, due to the Great East Japan Earthquake and the later accident at Tokyo Electric Power Company's (TEPCO) Fukushima Daiichi Nuclear Power Station.
- ○ Evaluation results for all items except the diversification of energy sources worsened, and Japan obtained the lowest scores among the countries involved in this analysis.
- ○ Regarding LNG from the United States, Japanese enterprises have already concluded a contract for the purchase of LNG equivalent to 20% of Japan's LNG imports. These Japanese enterprises are slated to gradually start to supply LNG to Japan after 2016. In the future, Japan's energy security is to be strengthened through the diversification of supply sources as Japan increases its natural gas imports from North America.

[Changes in Scores and Evaluation Values for Japan by Item]

Items	Scores			Evaluation Values		
	2000s	The latest	Changes in Scores (○: up / ×: down)	2000s	The lates	Changes in Evaluation Values (○: improved / ×: worsened)
Primary energy self-sufficiency	1.8	0.7	×	19	6	×
Diversification of countries from which energy is imported	2.7	4.5	○	944/479/705 (crude oil / gas / coal) *1	717/326/886	○ /○ / ×
Reduction of risks at choke points	0.2	0.2	—	171.4	160.2	○
Diversification of energy sources	9.3	8.2	×	2,886/2,228 (primary energy / electric power)*2	3,179/2,836	× / ×
Power failure time	7.2	3.0	×	26.50	44.00	×
Specific energy consumption per unit of GDP	8.7	8.2	×	0.115	0.095	○
Response to supply disruption	3.7	3.1	×	175	204	○
Average	4.8	4.0	×			



Evaluation Values – Numerical values used as a basis in assigning a score to each item

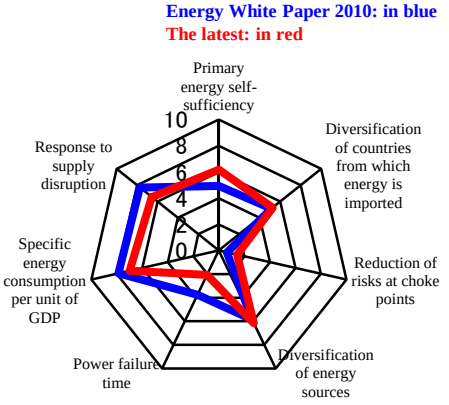
*1 The Herfindahl-Hirschman Indexes (HHI) of crude oil, natural gas, and coal (sum of squares of import shares, with some adjustment so that the higher the risk from the country from which these natural resources are imported is, the higher its share becomes) were respectively defined as the evaluation values for this item.

*2 The market concentrations of primary energy and electric power (sum of squares of values of shares of each kind of energy) were respectively defined as the evaluation values for this item.

[References] Changes in the Energy Situation by Country

(1) France

Items	2000s	The latest
Primary energy self-sufficiency	4.9	6.2
Diversification of countries from which energy is imported	5.1	5.3
Reduction of risks at choke points	0.6	1.4
Diversification of energy sources	5.9	6.2
Power failure time	3.7	1.9
Specific energy consumption per unit of GDP	7.9	7.0
Response to supply disruption	7.7	6.6
Average	5.1	4.9

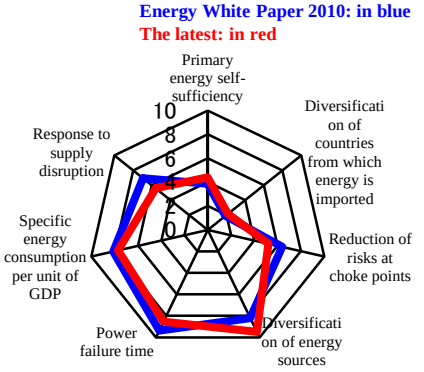


(i) Shale-related change: Although a potentially large volume of shale gas is expected to exist in northern France, France currently bans hydraulic fracturing. Therefore, it would be difficult to start the production of shale gas in the near-term.

(ii) Other change: The Law on Energy Transition, which incorporates the expansion of the introduction of renewable energy in addition to nuclear power generation, is expected to be enacted in the summer of 2015.

(2) Germany

Items	2000s	The latest
Primary energy self-sufficiency	3.9	4.4
Diversification of countries from which energy is imported	1.9	2.1
Reduction of risks at choke points	6.4	5.2
Diversification of energy sources	8.2	9.5
Power failure time	9.4	8.5
Specific energy consumption per unit of GDP	8.1	7.7
Response to supply disruption	6.9	5.6
Average	6.4	6.2

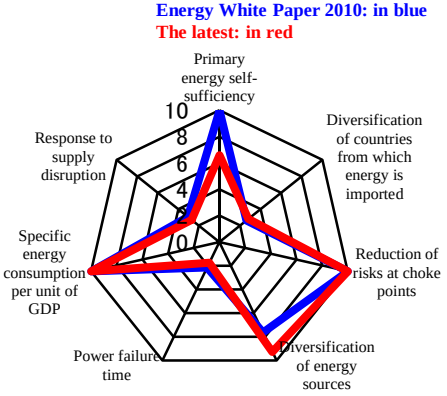


(i) Shale-related change: If Germany is able to import natural gas from North America, which has been increasing its production due to the Shale Revolution, Germany will improve the diversification of the countries from which energy is imported, which was its lowest score among all the items in the evaluation. For this purpose, LNG terminals will be necessary. In 2005, Germany publicized a plan to construct LNG terminals necessary for LNG imports, but then withdrew it in 2008.

(ii) Other change: Because some nuclear power plants were shut down in 2011, recently coal consumption has increased. Meanwhile, Germany is trying to promote the diversification of energy sources by further encouraging the introduction of renewable energy.

(3) United Kingdom

Items	2000s	The latest
Primary energy self-sufficiency	10.0	6.6
Diversification of countries from which energy is imported	2.6	2.8
Reduction of risks at choke points	10.0	10.0
Diversification of energy sources	7.6	9.3
Power failure time	2.2	1.7
Specific energy consumption per unit of GDP	10.0	10.0
Response to supply disruption	3.1	2.7
Average	6.5	6.2

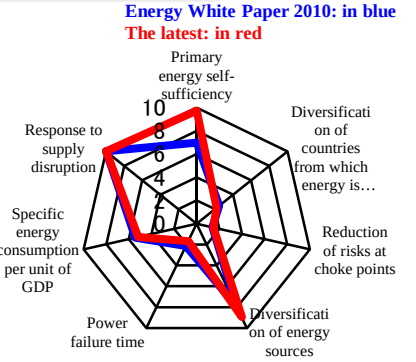


(i) Shale-related change: While its energy self-sufficiency rate is falling, the United Kingdom is attempting to promote the development of shale oil and shale gas on land, but local residents are strongly resisting it.

(ii) Other change: As its latest measures for improvement in energy self-sufficiency, the United Kingdom is also working on expanding the introduction of renewable energy while promoting the re-development of the North Sea oil fields.

(4) United States

Items	2000s	The latest
Primary energy self-sufficiency	7.0	9.7
Diversification of countries from which energy is imported	2.5	2.2
Reduction of risks at choke points	1.4	1.5
Diversification of energy sources	7.9	9.0
Power failure time	2.1	1.7
Specific energy consumption per unit of GDP	5.4	5.2
Response to supply disruption	10.0	10.0
Average	5.2	5.6



(i) Shale-related change: If the development of shale oil and shale gas continues to proceed as it is now, U.S. energy self-sufficiency will further improve, and its power generation from coal will decline, leading to the further diversification of energy sources. Complete self-sufficiency in energy is thought to be difficult because of huge domestic demand, but imports of crude oil are still expected to continue to decrease.

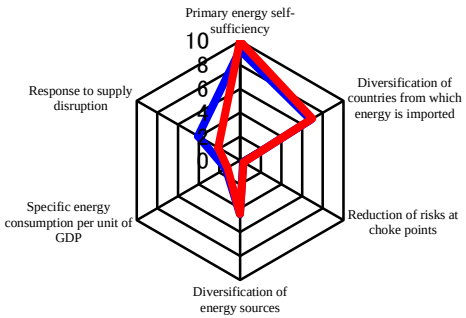
(ii) Other change: As for the diversification of energy sources, the United States promotes policies which encourage shifting not only from coal to natural gas, but also from coal to renewable energy. According to the President's Climate Action Plan, announced by President Barack Obama in 2013, the United States will enhance the regulation of emissions from thermal power plants and double the share of power generation from renewable energy by 2020 (12 percentage points higher than in 2012).

[References] Changes in the Energy Situation by Country (Continued)

(5) China

Items	2000s	The latest
Primary energy self-sufficiency	9.2	10.0
Diversification of countries from which energy is imported	6.8	7.0
Reduction of risks at choke points	0.3	0.3
Diversification of energy sources	4.5	4.5
Specific energy consumption per unit of GDP	1.4	1.2
Response to supply disruption	4.1	2.1
Average	4.4	4.2

Energy White Paper 2010: in blue
The latest: in red



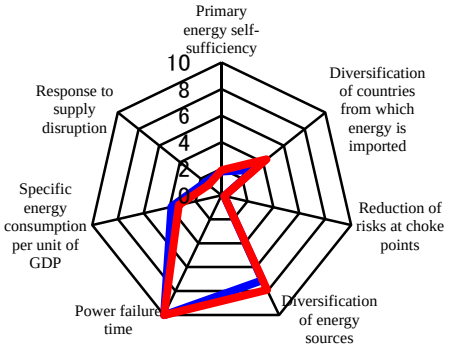
(i) Shale-related change: While the production of shale gas is already proceeding in China, the production volume has not increased, due to a lack of technology, and it remains at just about 1% of the domestic production volume for natural gas. As for shale oil, reserves have been proven, but development is expected to need more time because of geographical conditions and other matters.

(ii) Other change: China is planning to promote the diversification of countries from which energy is imported through the construction of a natural gas pipeline between China and Russia and other measures. In addition, China is trying to respond to supply disruptions by building more national crude oil terminals and by acquiring and maintaining stockpiles that are to be double the size of its latest stockpiles.

(6) Republic of Korea

Items	2000s	The latest
Primary energy self-sufficiency	1.8	1.9
Diversification of countries from which energy is imported	3.1	4.3
Reduction of risks at choke points	0.2	0.2
Diversification of energy sources	7.1	7.9
Power failure time	10.0	10.0
Specific energy consumption per unit of GDP	3.9	3.3
Response to supply disruption	1.6	1.3
Average	3.9	4.1

Energy White Paper 2010: in blue
The latest: in red



(i) Shale-related change: If natural gas is imported to the Republic of Korea from North America, it will contribute to reducing its dependence on the Middle East as well as risks at choke points.

(ii) Other change: The Republic of Korea has already agreed with Russia to import LNG from Sakhalin, which is expected to accelerate the diversification of countries from which energy is imported.

Efforts towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4

- As for the decommissioning, fuel removal from the spent fuel pool of Unit 4 was completed in December 2014.
- As for the contaminated water management, under the three basic principles of "Removing the contamination source," "Isolating groundwater from the contamination source," and "Preventing leakage of contaminated water," multi-layered measures are being taken. Among such measures, the construction of land-side impermeable walls utilizing the frozen-soil method began in earnest in June 2014, and a test freeze trial began April 30, 2015.
- In response to the fact that contaminated water containing radioactive materials with a relatively low concentration had been flowing out into the open sea from Drainage K, additional measures (such as the placement of purification materials) have been taken since the end of February 2015. Also, a comprehensive risk review was conducted, the government being proactively involved in the process, and the overall results of the review were publicized on April 28, 2015.
- In order to steadily proceed with these efforts, measures concerning decommissioning and contaminated water are being taken in line with the Mid-and-Long-Term Roadmap, which was revised in June 2015, placing particular emphasis on "giving priority to risk reduction" and "strengthening trusting relationships with local communities with thorough disclosure of information".

Main Points of Revision of the Mid-and-Long-Term Roadmap

1. Give priority to risk reduction

Focus on speed ⇒ Focus on risk reduction

Prioritize actions in order to consistently reduce risks in the long term, not just to focus on speed

- Contaminated water management, fuel removal from spent fuel pools (SFPs) ⇒ Should be tackled as soon as possible
- Fuel debris removal ⇒ Should be tackled safely, securely, and carefully with adequate preparation
- Solid radioactive wastes, secondary waste generated by contaminated water treatment ⇒ Should be tackled for the long-term

2. Clarifying milestones

⇒ Clarifying milestones for the next few years, taking stakeholder's opinions into account

3. Strengthen trusting relationships with the local stakeholders with thorough disclosure of information, etc.

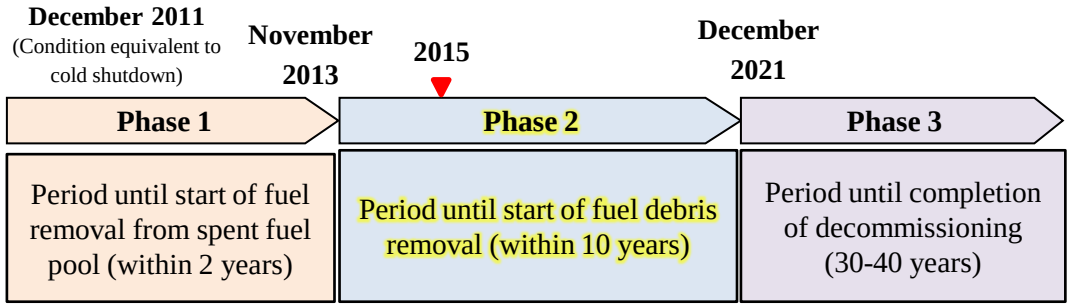
Establishment of Fukushima Council for communication with stakeholders (February 2014) ⇒ Further enhancement of communication (International Forum on Strategy for Decommissioning, etc.)

4. Further reduction in workers' radiation doses, strengthening of organizations for industrial safety and health management systems

5. Reinforcement of Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF), as the control tower for technical strategies for decommissioning

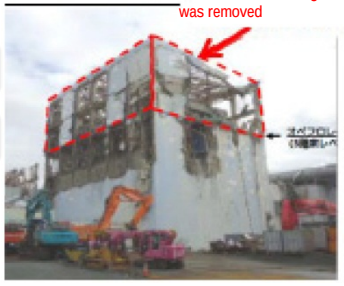
Foundation of NDF (August 2014) ⇒ Total management of R&D, integration of wisdom from all over the world

Main Schedule for Decommissioning



Status of Unit 4

September 22, 2011



2015

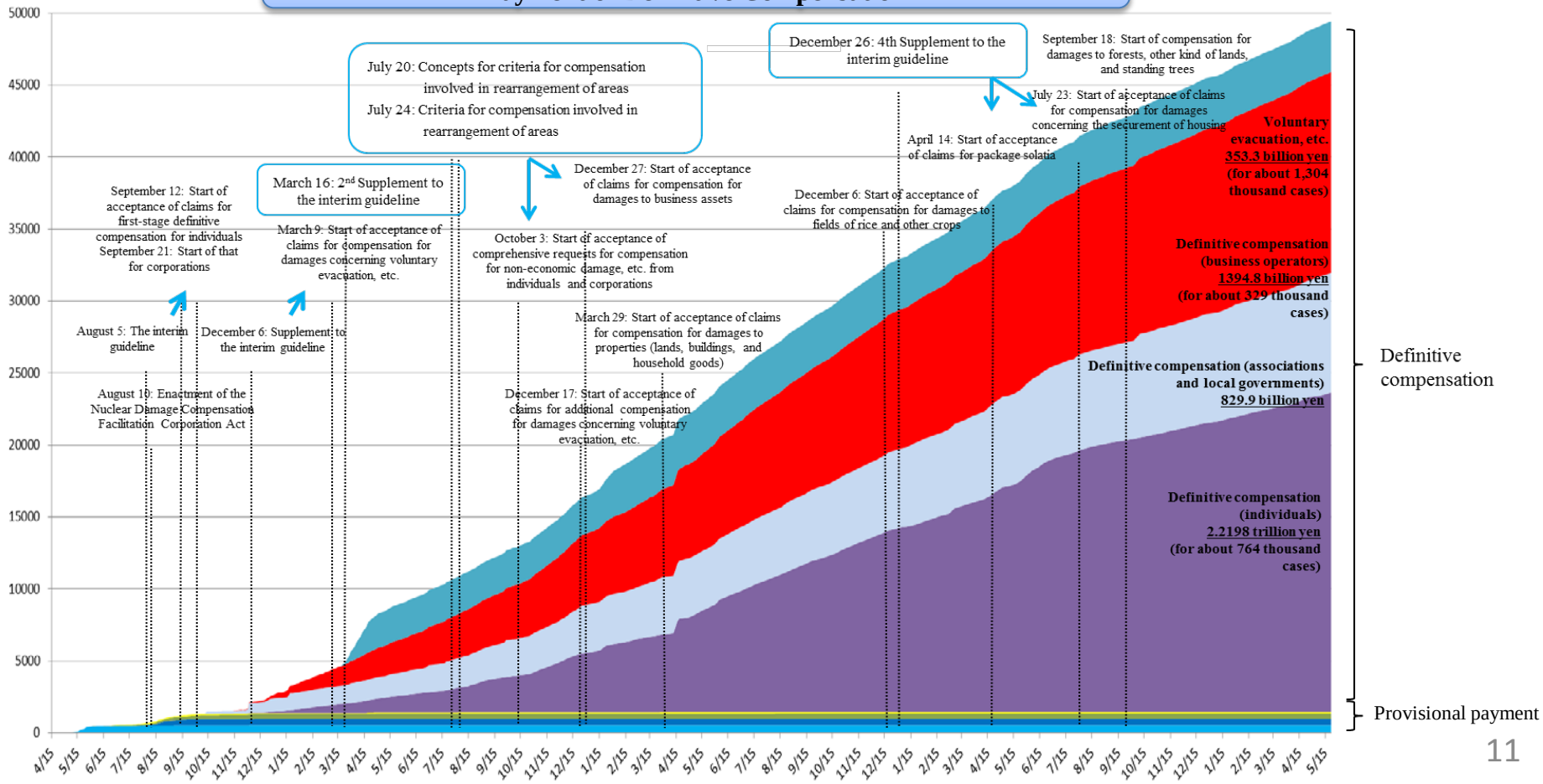
Removal of all spent fuel from Unit 4 was completed on December 22, 2014.

Nuclear Damage Compensation

- As for nuclear damage resulting from the accident, TEPCO provided compensation for damages to properties, non-economic damages, and the like in accordance with the interim guideline from the Dispute Reconciliation Committee for Nuclear Damage Compensation. TEPCO has already paid 4.9499 trillion yen (as of May 22, 2015).
- Based on the fourth supplement to the interim guideline, compensation as a package solatium (April 2014) and compensation concerning the securement of housing for rebuilding lives (July 2014) has begun.

State of Provisional Payment of Compensation for Nuclear Damage and Payment of Definitive Compensation

(as of May 22, 2015)



Support for Nuclear Power Accident Victims (i)

○ Guidelines titled, For Accelerating the Reconstruction of Fukushima from the Nuclear Disaster, were revised (Cabinet decision in June 2015) to enhance measures for prompt returns and for starting new lives as well as expanding and enriching efforts for rebuilding the businesses and occupations of disaster victims and for supporting their self-reliance. To this end, a joint team through public-private collaboration was established.

○ Evacuation orders were lifted for Tamura City (April 2014) and some areas of Kawauchi Village (October 2014), and the designation of specified spots where evacuation had been recommended was lifted for Minamisoma City (December 2015). The number of evacuees from the areas where evacuation orders were issued is about 79 thousand (as of March 3, 2015).

Main Points of Revision (i) Enhancement of Efforts in Terms of Support Both for Prompt Returns and New Lives

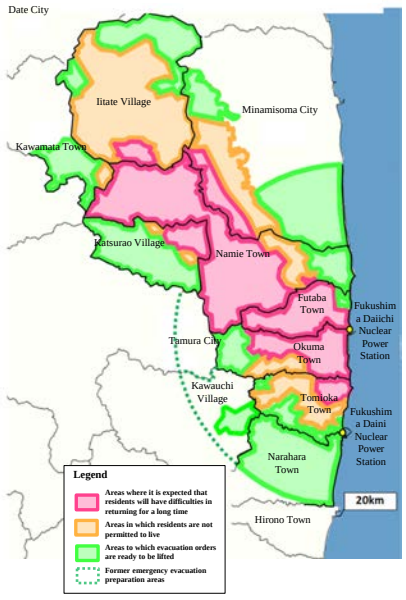
(1) Support for prompt returns

- Acceleration of enhancement of environment so that evacuation orders for areas for which evacuation orders are ready to be lifted and areas in which residents are not permitted to live will be able to be lifted within six years after the accident (March 2018) at the latest
- Regardless of the time of the lifting of evacuation orders, payment of amounts of compensation for mental suffering equivalent to those paid in cases where evacuation orders are lifted six years after the accident
- Development of reconstruction measures in places such as former emergency evacuation preparation areas
- Further precise measures for radiation protection (follow-up on and strengthening of measures for risk communication)
- Efforts for further acceleration of decontamination, disposal of contaminated waste, and rapid transportation of such waste to interim storage facilities (thorough and thoughtful explanations to persons who hold certain rights on the sites for such disposal and transportation and securement of personnel systems)

(2) Support for new lives

- Flexible utilization of and one-stop support for support measures for rapid enhancement of reconstruction bases
- Immediate consideration of rearrangement of areas and the like regarding zones to be designated as reconstruction bases in areas where it is expected that residents will have difficulties in returning for a long time
- Taking concrete measures for the Fukushima Innovation Coast Scheme
- Accelerated efforts for the formulation, achievement, and realization of the Future Visions for 12 Municipalities in Fukushima Prefecture in the summer of 2015
- Full opening of the JR Joban Line for traffic as soon as possible
- Smooth payment of compensation necessary and sufficient for new lives

Conceptual diagram of areas to which evacuation orders have been issued



Main Points of Revision (ii) Drastic Expansion and Enrichment of Efforts for Rebuilding Businesses and Occupations of Disaster Victims and for Supporting Their Self-reliance

Development of particularly intensive support for the two years FY 2015 and FY 2016, in order to eliminate damages that have arisen due to the nuclear power disaster

(1) Establishment of new entities to take measures for supporting self-reliance

- New supporting entities (joint teams through public-private collaboration) are to be established, and at first, individual visits and support through counseling are to be provided for business operators that have been evacuated (about 8,000 operators).
- Efforts are to be reviewed around the end of 2015, and the ideal state of the supporting entities mentioned above and the expansion and enrichment of measures for supporting self-reliance are to be discussed.

(2) Enrichment of various support measures

- Support measures in FY 2015 for the measures listed below are to be utilized to the maximum extent possible.
  1) Rebuilding of businesses and occupations of disaster victims, support for their self-reliance, and securement of their workplaces
  2) Securement of human resources
  3) Recovery of agriculture, forestry, and fishery
  4) Measures against harm caused by rumors, elimination or relaxation of import restrictions on agricultural and marine products and foods and restrictions on travel
  5) Development of sales channels
  6) Enhancement of environment for shopping at commercial facilities and retail shops
  7) Restart of facilities for medical care, nursing care, and welfare
- Support measures are to be enriched so that businesses and occupations can be rebuilt in 12 municipalities for FY 2016 and the following years also.

(3) Responses regarding compensation for damages concerning operation of businesses and harm caused by rumors, etc.

- During the two years when measures for supporting self-reliance are to be particularly intensively developed, the national government is to direct TEPCO to appropriately respond to claims for compensation for damages concerning the operation of businesses and the harm caused by rumors and to cooperate in the development of support from the national government, thereafter appropriately providing responses in light of individual circumstances.

Support for Nuclear Power Accident Victims (ii)

○ Efforts towards realization of the Fukushima Innovation Coast Scheme, which aims to build new foundations for industries in the Hama-Dori area in Fukushima, are to be made.

Innovation Coast Scheme Promotion Meeting

○ A general assembly composed of members from entities such as relevant ministries and agencies, the Fukushima prefectural government, and each municipality, as well as topic experts (meetings held in Fukushima Prefecture)

○ Along with reports on discussions at individual study groups and the sharing of other kinds of progress toward the fleshing out of the Scheme, opinion exchanges and the like on measures for the realization of the Scheme are conducted.

Individual study groups

○ Technical issues and the like in three projects (enhancement of bases for the development of robot technologies, realization of bases for industry-academia collaboration, and realization of smart eco-parks) are organized.

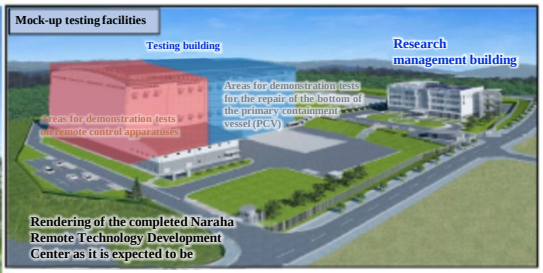
○ These study groups are composed of members from entities such as relevant ministries and agencies and relevant companies and experts. The Fukushima prefectural government also participates in these study groups.

○ Meetings for discussing individual issues are to be held starting in November 2015.

Progress by entities, etc. other than the study groups

○ Efforts by entities including the Fukushima prefectural government and each municipality

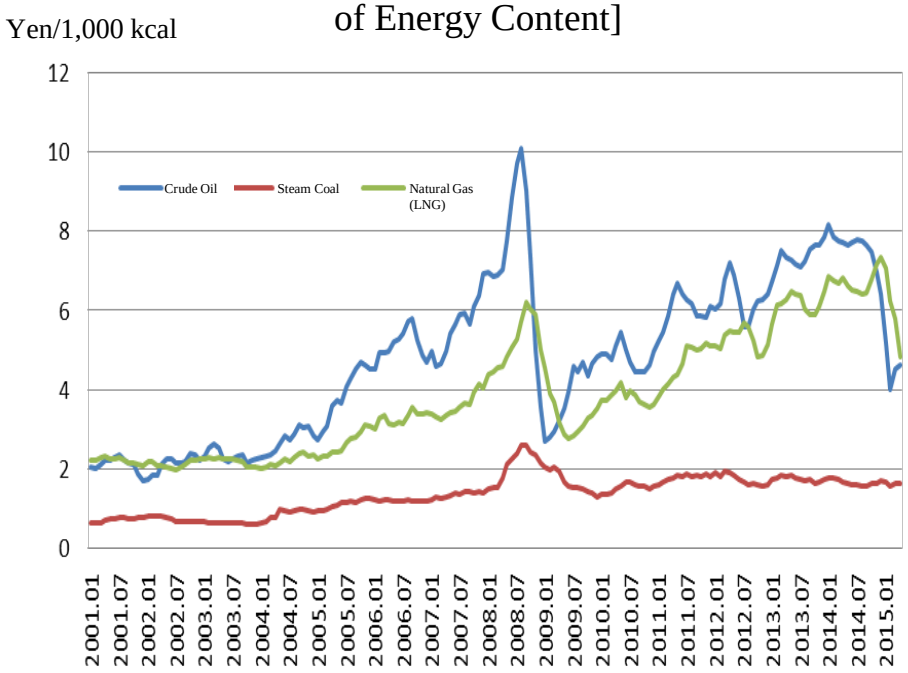
○ Progress on projects already started, etc.



Situation of Energy Costs [i]

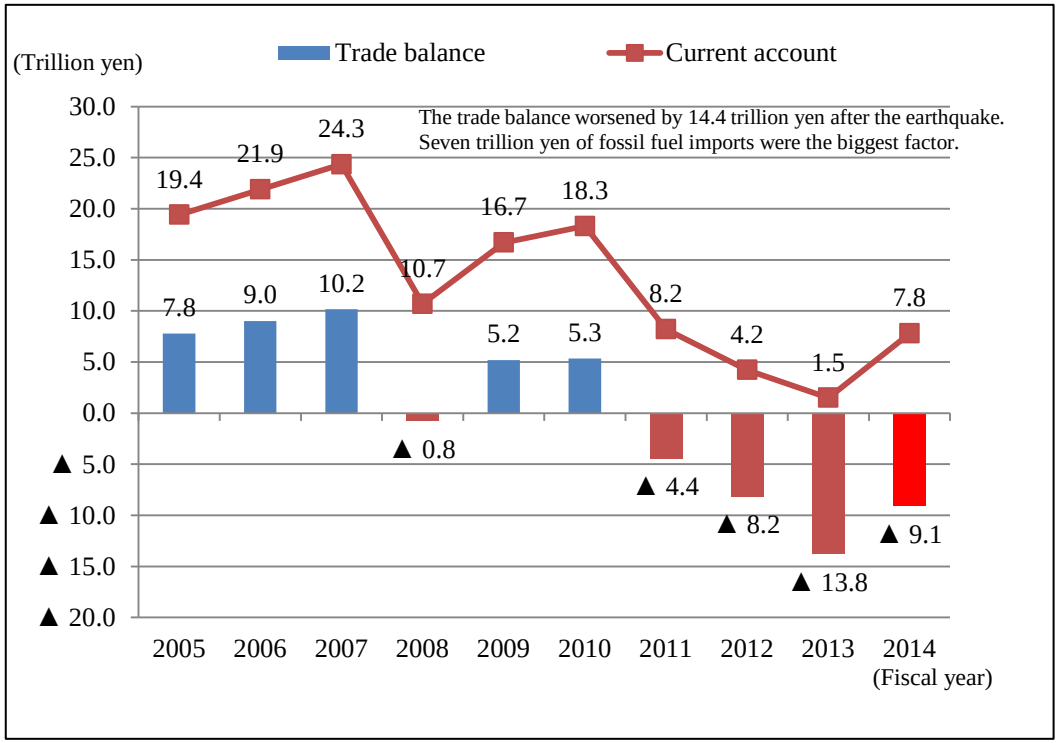
- ○ Because of a higher dependency on overseas fossil fuels due to the nuclear power plant shutdown after the Great East Japan Earthquake, Japan is affected to a relatively increased and large extent by international trends in fuel prices.
- ○ Based on brisk global demand and changes in international circumstances, fossil fuel prices increased until the summer of 2014.
- ○ Japan faces issues such as an outflow of national wealth and high domestic energy costs due to increases in imports of fossil fuels.

[Changes in Import Prices of Fossil Fuels per Unit of Energy Content]



Source: Based on Trade Statistics of Japan, Ministry of Finance

[Changes in Trade Balance and Current Account (on a fiscal year basis)]

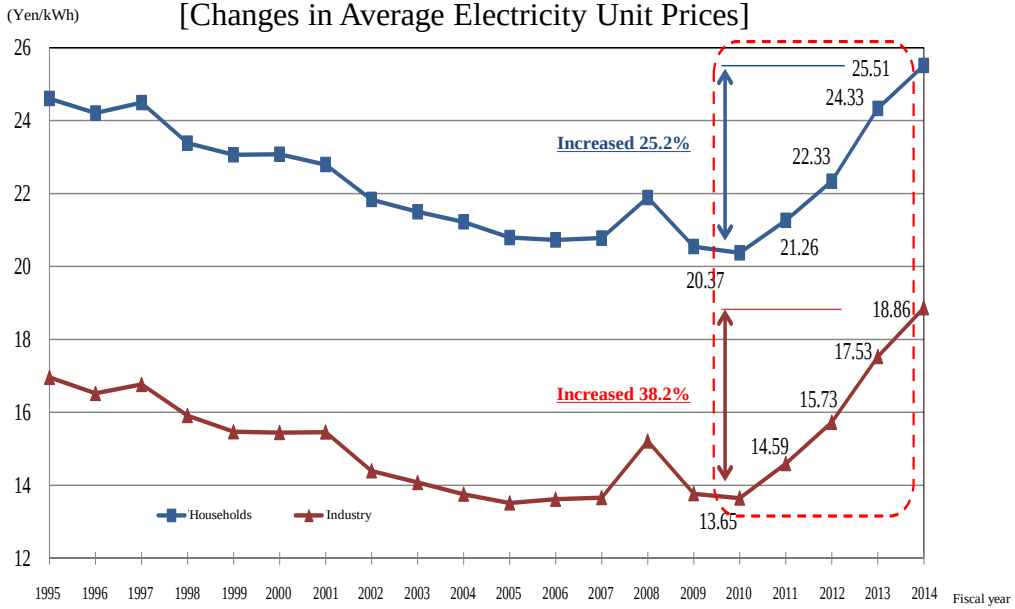


Source: Based on *Trade Statistics of Japan*, Ministry of Finance and *Balance of Payments*, Bank of Japan, etc.

Situation of Energy Costs [ii]

- ○ After the Great East Japan Earthquake, the electricity price increased by about 25% for households, and by 40% for industry, due to the increase in fuel costs for thermal power generation caused by the increase in the operating rate of thermal power plants and other factors.
- ○ The Consumer Price Indices related to energy largely increased after the Great East Japan Earthquake.

[Changes in Average Electricity Unit Prices]



Source: Based on *Electricity Demand Report*, Federation of Electric Power Companies in Japan and the materials concerning the power companies' final settlement reports

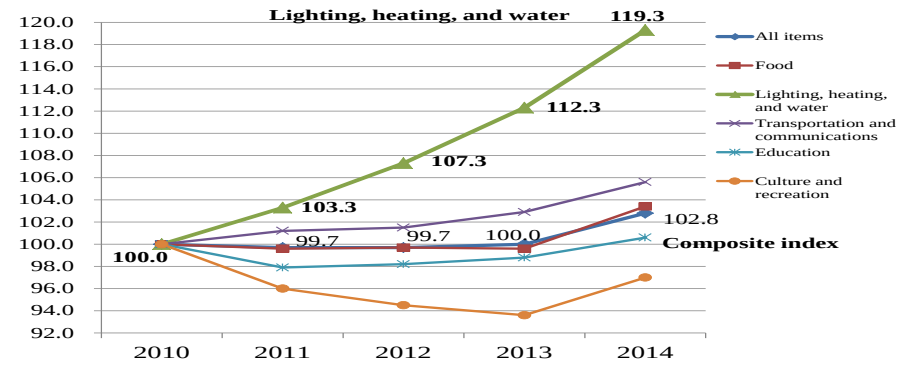
[Breakdown of Electricity Price (a model case for the standard household (TEPCO))]

Electricity Price	=	Minimum charge + Energy charge	±	Fuel cost adjustment price	+	Renewable energy power promotion surcharge
8,240 yen/month (June 2015)		Minimum charge: 842 yen (30 amperes) Energy charge: 6,736 yen (About 23 yen/kWh × 290 kWh/month)		258 yen (About 0.9 yen/kWh × 290 kWh/month)		458 yen (*Added nationwide unit price)

*The values in the formula above don't match as the discount due to account transfer (54 yen) is included in the total price on the left.

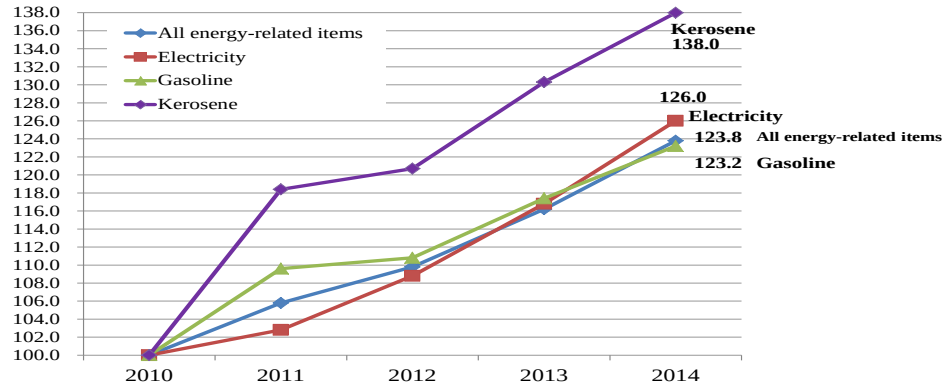
Source: Based on published data from TEPCO

[Recent Changes in the Consumer Price Index for Major Expense Items]



Source: Based on *Annual Report on the Consumer Price Index, Japan 2014*, Ministry of Internal Affairs and Communications

[Recent Changes in the Consumer Price Index for Items Related to Energy]

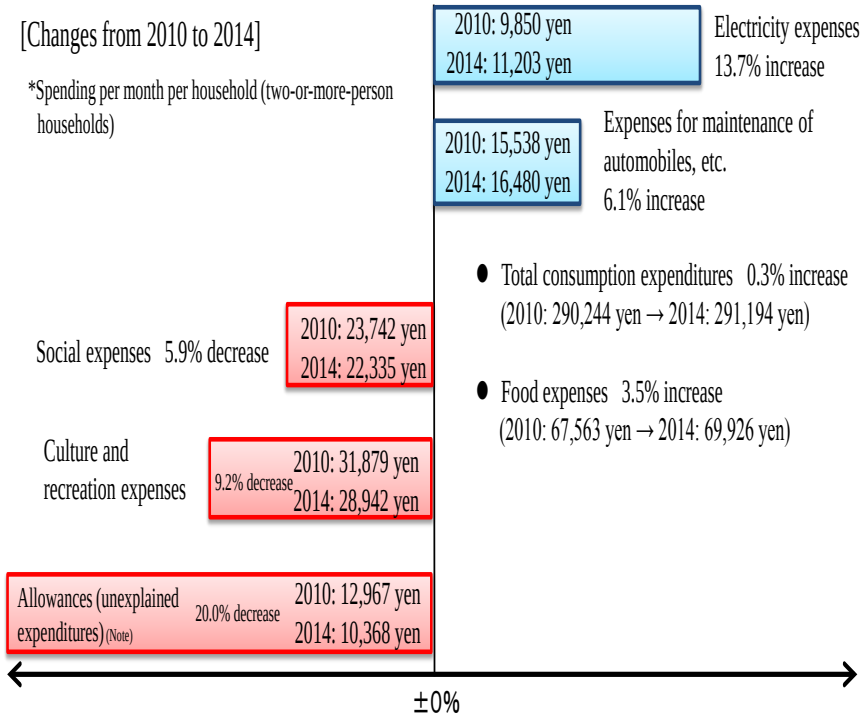


Source: Based on *Annual Report on the Consumer Price Index, Japan 2014*, Ministry of Internal Affairs and Communications

Influence of Energy Costs [i]

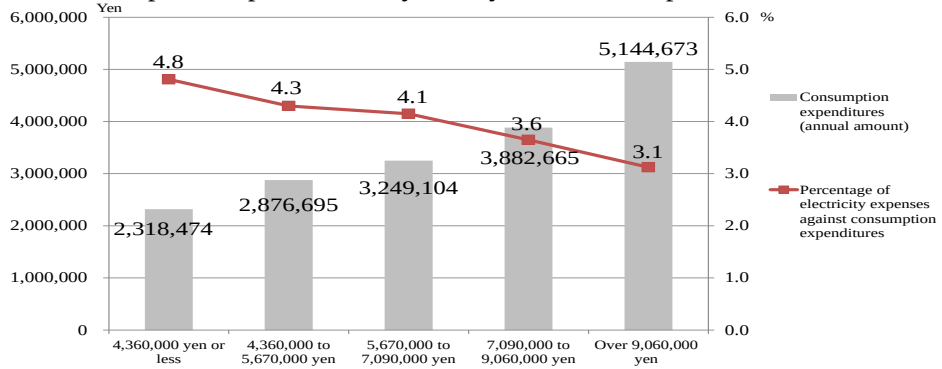
- ○ Expenditures such as electricity bills among household expenses significantly increased due to the increase in the Consumer Price Index for items related to energy. This also affected spending patterns for household expenses more broadly, such as decreasing culture and recreation expenditures.
- ○ Spending situations for household expenses show that the lower annual incomes are and the older the household heads are, the greater the burdens they need to bear.

[Change in Expenditures such as Electricity Bills]
(Spending per month per household (two-or-more-person households))



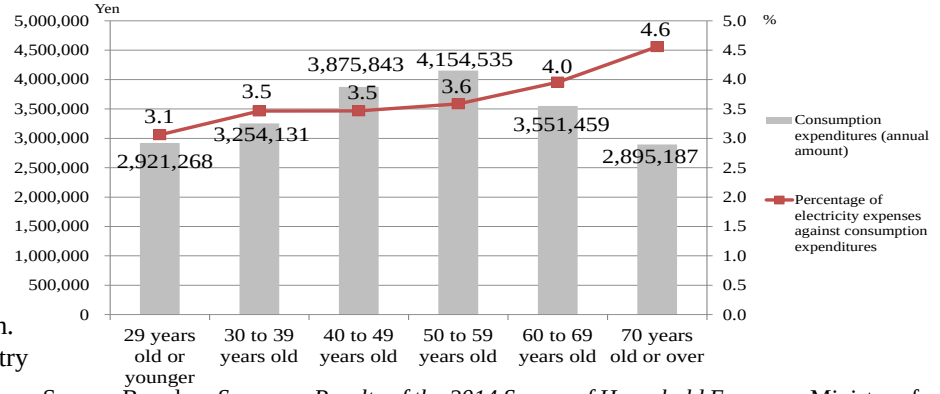
Note: Allowances (unexplained expenditures): Allowances for which use is unknown.
Source: Based on *Summary Results of the 2014 Survey of Household Economy*, Ministry of Internal Affairs and Communications

[Consumption Expenditures (Annual Amount) and Percentages of Electricity Expenses against Consumption Expenditures [by Yearly Income Group]]



Source: Based on *Summary Results of the 2014 Survey of Household Economy*, Ministry of Internal Affairs and Communications

[Consumption Expenditures (Annual Amount) and Percentage of Electricity Expenses against Consumption Expenditures [by Age Group]] (Two-or-more-person households)

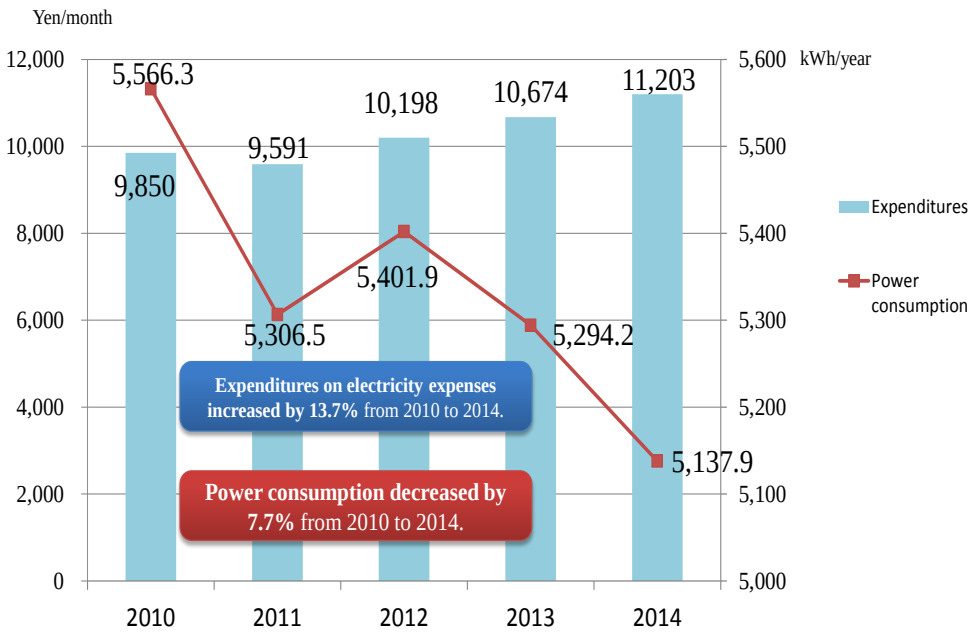


Source: Based on *Summary Results of the 2014 Survey of Household Economy*, Ministry of Internal Affairs and Communications

Influence of Energy Costs [ii]

- ○ Against an increase in energy costs, households are trying to save on electricity. However, energy costs remain a burden because, for example, power savings cannot adequately offset increases in electricity prices.
- ○ A survey shows that in the industrial sector, about 60% of respondents were of the opinion that the greatest additional increase in electricity prices that they could handle was less than 1 yen/kWh.

[Changes in Expenditures on Electricity Expenses and Power Consumption]
(Monthly expenditures per household (two-or-more-person households) for expenditures on electricity bills)

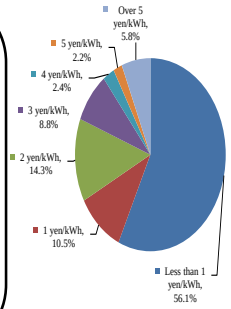


Source: Based on *Summary Results of the 2014 Survey of Household Economy*, Ministry of Internal Affairs and Communications

[Limitations on Burden of Increases of Electricity Prices]

Results of the survey

- ♦ 56.1% companies answered that their allowance for increases in electric power prices was less than 1 yen/kWh.
- ♦ 90.8% of companies answered that increases in electric power prices affected their business activities.
- ◆ As measures against increases in electric power prices,
  1. 56.1% of companies answered that they considered reduction of personnel and labor costs.
  2. 35.0% of companies answered that they conducted reduction and suppression of business investment and R&D activities.



Comments from business operators

- ➢ An increase in electricity prices of 1 yen corresponds to cost increases of about 9% of the value of our ordinary profits in FY 2014. (a retailer)
- ➢ Although we are considering more energy conservation, the impact on production activities would be unavoidable. We have to reconsider our improvement plan to introduce equipment and streamline our business. (a manufacturer)
- ➢ We would like to ask to pass on our costs to users. If it's impossible, we will dismiss some of our employees. (a manufacturer)

Source: Based on results of *Emergency Survey on Limitations for Burden of Increases in Electric Power Costs (from November to December, 2014)*, Japan Chamber of Commerce and Industry

Measures for Energy Costs

○ In the FY 2014 Supplementary Budget, 360.1 billion yen was appropriated for energy-related measures, primarily to counter high energy costs, such as the strengthening of means and methods for energy conservation, measures for fuel, and the promotion of renewable energy including locally produced energy for local consumption.

FY 2014 Supplementary Budget (main measures for energy-related matters): 360.1 billion yen

1. Subsidies for introduction of equipment for energy conservation into local factories and small and medium enterprises, etc. [93.0 billion yen]
   - Supporting introduction of newest models of energy-conserving devices
   - Supporting updates and repairs for energy conservation and measures to handle peak electricity demand in local factory offices, shops, etc.
2. Support for introduction of home fuel cells (ENE-FARM) and stationary lithium-ion batteries [35.2 billion yen]
   - Supporting introduction of home fuel cells (ENE-FARM), peak shifting in households, etc. and stationary lithium-ion storage batteries for reduction of costs
3. Development of hydrogen refueling stations for fuel cell vehicles and charging stations for electric vehicles [39.6 billion yen]
   - Supporting acceleration of development of charging stations and hydrogen refueling stations for the spread of fuel cell vehicles
4. Promotion of introduction of renewable energy such as locally produced energy for local consumption [23.8 billion yen]
   - Supporting construction of leading systems for locally produced energy for local consumption to use distributed energy regionally
   - Supporting installation of renewable energy electric generation systems for individual household consumption and storage batteries
5. Projects such as establishment of safety nets for fishery management [22.0 billion yen]
   - Giving compensation money(*) when prices of crude oil or mixed feed for aquaculture increase beyond a certain threshold

   (*) Fishermen and the national government and farmers and the national government accumulate funds.
6. Expenses for measures for fuel for small and medium trucking companies [3.5 billion yen]
   - Supporting introduction of fuel storage equipment to secure fuel-efficient environmentally-friendly vehicles and low-cost and stable fuel for truck companies, many of which are small and medium enterprises whose investment capacity is small

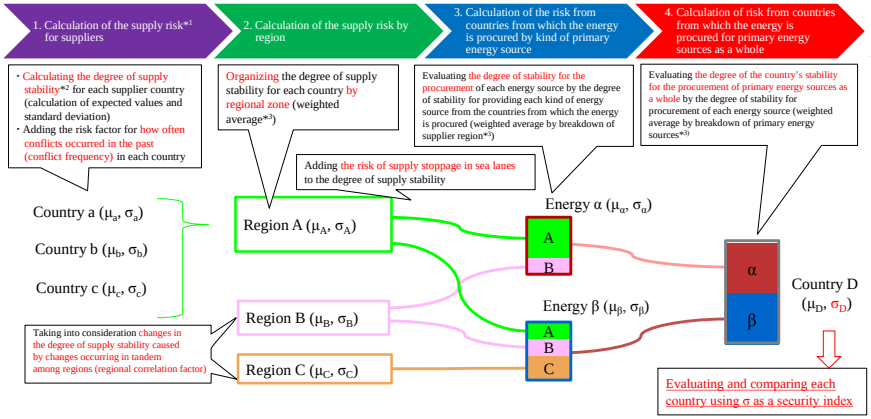
[ENE-FARM (for detached houses)]

Formulation of Energy Security Index

Regarding energy security, efforts for numerically expressing and ranking qualitative information from various viewpoints have been made. However, it had not been quantitatively evaluated except in scoring for self-sufficiency. In FY 2014, the formula for calculating the energy security index was formulated and evaluated.

○ Analytical process for energy security index

The energy security index is calculated through the following processes.

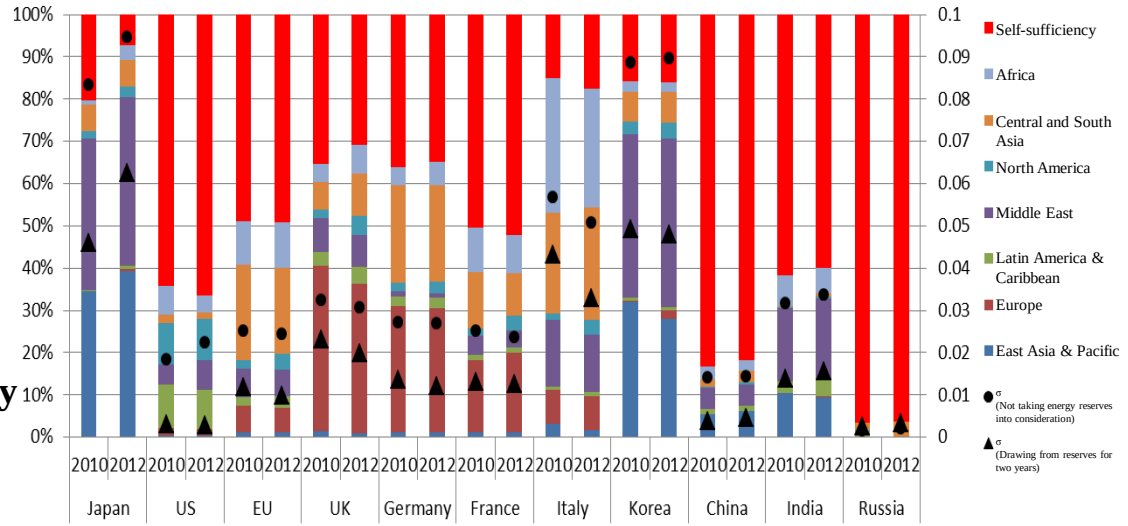


○ Sensitivity analysis of effects when changing primary energy mix and breakdown of countries from which energy is procured

By changing the primary energy mix and the breakdown of countries from which energy is procured in calculating the security index, we can predict what kind of effects change will have on energy security when such measures are taken so as to bring about changes.

○ Evaluation results of energy security index in 2010 and 2012

The security index scores of each country were compared based on their primary energy supply as follows. When comparing between the marks in 2010 and those in 2012 for each country (● indicates cases where countries' energy reserves were not taken into consideration, ▲ indicates cases where countries' energy reserves would be drawn from for two years), if the marks shift toward the upper right, they indicate rising risks, while if the marks shift toward the lower right, they indicate decreasing risks.



Change in the security index due to the shift in the fuel mix in supplying primary energy sources (in 2012)	
Replacement of Oil with Natural Gas (5%)	▲3.2%
Replacement of Coal with Natural Gas (5%)	+2.2%

Change in the security index in cases where crude oil suppliers were switched from the Middle East to North America (in 2012)	
Primary energy supply as a whole	▲4.3%
Crude oil only	▲6.5%

Promotion of comprehensive policy for securing stable supply of resources

Methane hydrate

Methane hydrate, which is an ice-like substance formed when methane and water combine in a low-temperature/high-pressure state, also known as “burning ice”, has attracted attention as a next-generation energy resource. Because it emits less carbon dioxide in combustion than oil or coal, it is being considered as a future clean energy source. However, since it exists in a solid state, it is different from conventional oil and natural gas, which are confined under high pressure, and will not gush from a well. Accordingly, development of new production technology is necessary.

○ Sand-layer methane hydrate

Regarding sand-layer methane hydrate, the world's first gas-production experiment in open water was conducted in March 2013. Technological development is currently being conducted so that stable production over the long term will be possible.

A scene from the gas production experiment

○ Near-surface methane hydrate

Regarding near-surface methane hydrate, the Government of Japan started surveys to evaluate the quantity of resources in FY 2013, and Japan succeeded in being the first country in the world to glean full-scale samples in FY 2014.

Geological samples that contain near-surface methane hydrate

Acquisition of a participating interest in the ADCO Onshore Concession in Abu Dhabi

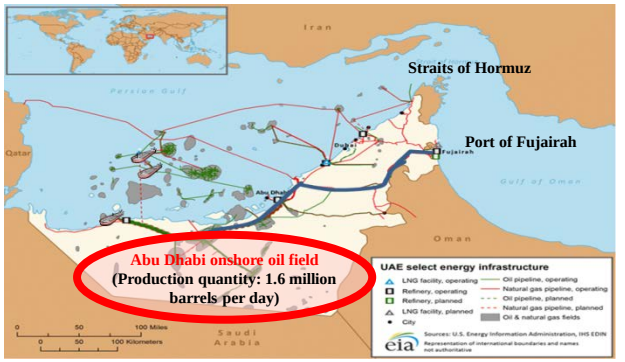
On April 27, 2015, INPEX CORPORATION (INPEX) signed a contract for the acquisition of a 5% participating interest in the ADCO Onshore Concession in Abu Dhabi, a 40-year agreement with the Supreme Petroleum Council of the Emirate of Abu Dhabi and the Abu Dhabi National Oil Company (ADNOC) of the United Arab Emirates (UAE).

○ First company in Asia that was successful in the acquisition of a participating interest

The Abu Dhabi onshore oil field is one of the world's leading giant oil fields, currently producing 1.6 million barrels per day, and it is estimated that it will produce 1.8 million barrels per day in 2017. Regarding foreign capital, only the so-called European and U.S. oil majors had owned participating interests, however, INPEX has succeeded in being the first company in Asia to acquire such rights.

○ Results of close relationship and resource diplomacy between Japan and the Emirate of Abu Dhabi

The Government of Japan has enhanced efforts to cooperate with the Emirate of Abu Dhabi in a wide range of areas such as education and medical services, in addition to diplomatic efforts aimed at Japan’s acquisition of a participating interest in the onshore oil field, including visits to the country by Prime Minister Shinzo Abe in May 2013 and by METI Minister Yoichi Miyazawa in January 2015. This acquisition of a participating interest in the onshore oil field has come as a result of INPEX’s past achievements and a high appreciation of the close relationship between Japan and the Emirate of Abu Dhabi.



Map of the Abu Dhabi onshore oil field

Regional Revitalization and Renewable Energy

The promotion of the utilization of renewable energy derived from regional resources is conducive to regional revitalization and the securement of a certain amount of supplied energy, including during emergencies when they would have difficulty accessing supply from large-scale power sources.

Recycling energy within regions by utilizing lumber in local areas

Regarding woody biomass, it is possible to design a self-sustaining recycling system by utilizing lumber that exists in abundance in certain regions. In order to achieve this, it is essential to secure a mechanism that can stably supply wood as an energy resource.

○ Efforts in Mogami Town, Yamagata Prefecture

In Mogami Town, Yamagata Prefecture, periodic tree thinning is necessary to maintain the mountains and forests, which account for 84% of the town's total area. However, cost problem prevented progress in thinning. In order to solve this, a mechanism for utilizing thinned wood whose value had been low in the past was considered and established.

Efforts for the establishment of a regional energy recycling system are being made. For example, the stable use of thinned wood as a fuel enables the payment of allowances for thinning expenses, leading to continuous thinning, which enables the maintenance of mountains and forests, a stable supply of raw materials, and the securement of an energy supply-demand balance.

Case of Mogami Town, Yamagata Prefecture

Efforts for regional revitalization using heat

In geothermal power generation, steam heated by magma and enclosed deep in the ground is extracted through wells two kilometers deep to generate electricity. Such geothermal power generation, which enables the reduction of power costs and power generation that does not depend on the weather, is regarded as a base load power resource with a high capacity factor of about 80%. In addition, since Japan, a volcanic country, possesses the third most potential geothermal resources behind the U.S. and Indonesia (about 23 million kW), Japan should proactively introduce geothermal power generation in the future.

○ Utilization of heat produced through geothermal power generation

Geothermal power generation not only serves the important role of being a power resource but is also actively used in agriculture, tourism, and other businesses, including, hothouse cultivation, fish farming, and the snow melting business, by providing regions with hot water left over after power generation.
For instance, in Toyako Town, Hokkaido Prefecture, the Utility Cooperative Association of Toyako Onsen is conducting geothermal power generation using a newly excavated hot spring source. In the town, electric power derived from geothermal energy is used for street lights, as a resource for charging electric vehicles, and for other purposes. Furthermore, *Onsen-tamago*,(*) called Geo-Tamago, boiled in hot water left over after power generation, are produced and provided to hotels and restaurants. In this way, geothermal power generation enables the development of new local products for tourists and regional revitalization.
**Onsen-tamago*: eggs boiled in hot springs

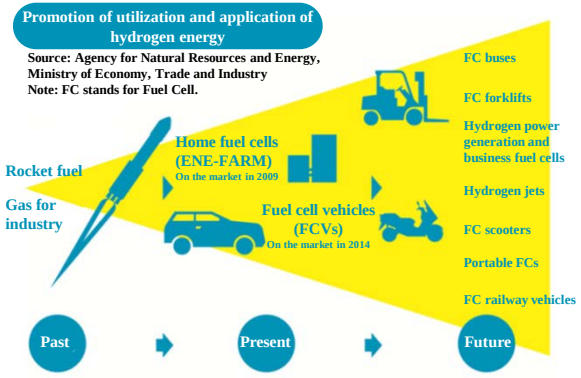
Mori Geothermal Power Plant in Hokkaido Prefecture

Production of Geo-Tamago

Realization of a hydrogen society

Promotion of utilization and application of hydrogen energy

Hydrogen does not emit carbon dioxide when utilized, and it can be produced from various resources. Therefore, hydrogen is expected to serve as an important secondary energy source that will contribute to the reduction of environmental burdens and the advancement of energy security.



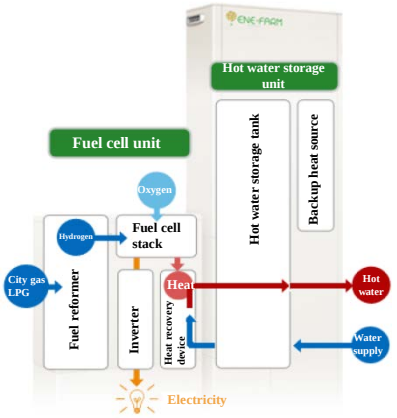
○ Advent of fuel cell vehicles

Fuel cell vehicles (FCVs) are cars that run by driving a motor using electrical energy generated through chemical reactions between hydrogen supplied as fuel and oxygen in the air. In December 2014, the MIRAI, a fuel cell vehicle, was launched as the earliest in the world by Toyota Motor Corporation. This represents the beginning of the dissemination of fuel cell vehicles, which utilize hydrogen as fuel, in Japan. The memorable first vehicle was delivered to the prime minister's official residence, and Prime Minister Abe took a test ride in it.

Scene of the delivery ceremony (January 2015)

○ Dissemination of home fuel cells (ENE-FARM)

Fuel cells generate electricity through chemical reactions between hydrogen and oxygen. Home fuel cells (ENE-FARM), in which the technology of fuel cells is applied, generate electricity through chemical reactions between hydrogen extracted from city gas or LPG and oxygen in the air and achieve in excess of 90% energy efficiency by effectively utilizing heat generated in the process of power generation for hot-water supply. At the end of FY 2014, over 110,000 ENE-FARMs had been sold.



Home fuel cell (ENE-FARM)

○ Toward the realization of a hydrogen society

The utilization of hydrogen as fuel not only for home fuel cells (ENE-FARM) and fuel cell vehicles but also for vehicles other than passenger cars, such as buses and forklifts, is being considered. Toward the prompt market introduction of such vehicles, various demonstrations are in progress. In addition, efforts for hydrogen power generation, which effectively utilizes hydrogen as fuel for power generation, are also being considered.

Fuel cell forklift

Fuel cell bus

Mixed hydrogen combustion turbine