Provisional Translation

Options for Energy and the Environment

June 29, 2012

The Energy and Environment Council

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Introduction

(Meaning of the Choice of Energy Options in Light of the TEPCO Fukushima Nuclear Power Plant Accident)

It is impossible to live a comfortable life without energy. Neither it is possible to maintain industrial activities. Japan depends on other countries for most energy sources, and imports fossil fuels amounting to approximately 17 trillion yen annually as of 2010. Households consume energy amounting to approximately nine trillion yen annually. The energy costs of the manufacturing industry are estimated to amount to approximately eight trillion yen annually. CO2 emissions from energy use amount to approximately 1.1 billion t-CO2, accounting for approximately 90% of greenhouse gas emissions by Japan. Choosing energy options is therefore making a national choice.

This recognition was sufficient before the Great East Japan Earthquake occurred, but not anymore.

Due to the Great East Japan Earthquake on March 11 last year and the accident at the TEPCO Fukushima Daiichi Nuclear Power Plant (hereinafter referred to as the "TEPCO Fukushima Nuclear Power Plant Accident"), a number of citizens have been forced to bear a severe burden. Even now after more than one year has passed since the accident, many people are forced to live in shelters away from their hometowns (population in the evacuation zones: approximately 86,000 persons (as of the end of March 2012)). Residents in Fukushima Prefecture and children who will play a leading role in the next generation are suffering continuously. Many communities and people are suffering from reputational damages. Although compensation and decontamination are being carried out, measures therefor have already imposed a heavy burden on the citizens, and such burden will increase in the future.

Japan must recognize anew that the choice of energy options is a national choice to decide on the affluence and shape of the country in an extremely broad sense and is a choice on an issue that influences future generations. In addition, the TEPCO Fukushima Nuclear Power Plant Accident has greatly affected other country's choice of energy options, and Japan's choice of this time is drawing the world’s attention. The choice of energy options which we are going to make now is an international issue that will have a great impact on the choice of energy options of the world.

(Before the Disaster: Energy Option with Nuclear Energy as the Major Power Source)

In discussing the new choice of energy options, it is necessary to review again the choice before the Great East Japan Earthquake and the idea on which the choice was based.

Energy sources which we can use now include nuclear energy, fossil fuels, including oil, natural gas, and coal, and renewable energy, such as water power, solar power, wind power, geothermal power, and biomass. In choosing energy options, it is desirable to give priority to low-cost energy that does not depend on import from specific countries and regions, environmentally-friendly energy, and above all, safe and secure energy. It is however quite difficult to do so.

Oil is very easy to use and accounts for over 30% of the energy sources used in Japan. However, approximately 90% of oil used in Japan is imported from the Middle East, and CO2 emissions are large. Regarding natural gas, CO2 emissions are less than those for oil and coal; however, Japan is the largest importing country, accounting for approximately over 30% of the amount of LNG imported in the world. The price of natural gas is also high. Coal is less expensive than oil and natural gas, and its procurement is stable. However, CO2 emissions from the use of coal are highest among fossil fuels. Water power is domestically produced, inexpensive, and CO2 emission-free; however, it is difficult to further develop large-scale water power. Solar power and wind power are domestically produced and CO2 emission-free; however, they are expensive in the existing circumstances. Geothermal power is domestically produced, CO2 emission-free, and inexpensive; however, there is limited room for its development.

It was nuclear power that was given importance under such circumstances. Uranium as a fuel for nuclear power was purchasable at a low price without depending on specific countries and regions, had a high stockpiling effect, and was CO2 emission-free at the time of power generation. The superiority of nuclear power generation as a quasi-domestically produced power source was further increased through combination with the nuclear fuel cycle policy in which plutonium, uranium, etc. recovered through reprocessing of spent nuclear fuel were effectively used. Based on such recognition, Japan revised the Strategic Energy Plan of Japan in 2010 and made a choice of energy options, specifically, expanding the share of nuclear power generation up to 50% by 2030, for the reasons that it takes the lead in the international efforts to solve the global warming issue and that nuclear power generation is inexpensive and contributes to ensuring energy security.

(Choice after the Disaster: Conversion of Energy/Environmental Structures towards the Reduction in Dependence on Nuclear Energy Reflecting the Examination of the Nuclear Power Plant Accident)

On March 11, 2011, the Great East Japan Earthquake and the TEPCO Fukushima Nuclear Power Plant Accident occurred. The major premise that nuclear power is safe was significantly undermined, and it became necessary to thoroughly and fundamentally review the energy option

depending on nuclear power generation from scratch. In June of that year, the government established the Energy and Environment Council consisting of the Minister for National Policy and other related ministers and started discussions. On July 29 of that year, the government decided on the basic philosophy of reducing dependence on nuclear energy.

Since then, for about one year, related councils, etc. have held repeated discussions on options for energy mix, global warming countermeasures, etc. under the policy of "reducing dependence on nuclear energy to the extent possible in the medium-to-long terms." Last December, the Cost Review Committee of the Energy and Environment Council made a report to the following effect: Nuclear power generation involves considerable social costs, and price differences among nuclear power generation, thermal power generation, and renewable energy power generation would be fairly smaller in the medium-to-long term than the differences according to the past conventional understanding. The general direction toward reducing dependence on nuclear energy has been basically shared in discussions at related meetings or in various opinion polls, etc. However, opinions are divided with regard to the duration needed for the reduction, the level of the reduction, and alternative energy sources for nuclear power generation.

Amid lively discussions on the choice of energy options, the Energy and Environment Council prepared herewith three scenarios concerning energy and the environment: reducing the share of nuclear energy from approximately 26% in real terms in 2010 before the Great East Japan Earthquake to around 0%, 15%, or 20-25% by 2030.

All of these options reduce dependence on both nuclear energy and fossil fuels, improve energy security, and reduce greenhouse gas emissions through promotion of renewable energy and energy conservation to the maximum extent.

As a premise common to all of these scenarios, it is necessary to work on drastic energy structure reforms. They are aimed at converting the structure of the lifestyles of people and industrial activities, shifting the priority area to clean energy, and establishing a distributed energy system while thoroughly strengthening the risk management of nuclear energy. Growth, creation of employment, and regional revitalization will be realized through all-out mobilization of policy resources and enhancement of investment and consumption for energy structure reforms, using energy and environment constraints as an opportunity. The rebirth of Japan will be pursued based on a green growth strategy.

Significant differences among the scenarios are the duration needed for the reduction of dependence on nuclear energy, the degree of the reduction, and the costs spent for converting the structures. In addition, regarding methods of securing safety, that is, methods of managing the accident risks of nuclear power generation, there are two approaches, specifically, (1) not using nuclear power generation and (2) controlling accident risks through safety technology and safety

regulations. The scenarios differ in terms of the combination of these approaches. They also differ in terms of the priority policies and influence on the lifestyles of people and industrial activities.

The Energy and Environment Council will start national discussions on these three scenarios and then take responsibility for drawing a conclusion regarding the choice of energy options as well as domestic global warming countermeasures that are inextricably linked with each other.

1. Viewpoints which Should Be Considered in Verifying the Scenarios

The Advisory Committee on Energy and Natural Resources and the Central Environment Council have examined the draft proposal of the Options for Energy and the Environment since last fall, and have discussed the points at issue, such as simultaneous pursuit of both reduction of dependence on nuclear energy, and energy security, global warming countermeasures as well as stable and inexpensive supply of energy. In light of these discussions, the Energy and Environment Council intends to emphasize the following three viewpoints concerning energy structure reforms as well as the four perspectives in choosing energy options as extremely important: as for energy structure reforms, (1) shifting the priority area to clean energy sources and securing green growth, (2) reforming the energy system, and (3) multifaceted international contribution for energy and the environmental field; as regards the choice of energy options, (1) securing nuclear safety, (2) strengthening energy security, (3) contributing to the solution of the global warming issue, and (4) restraining costs and preventing hollowing-out of industry.

(1) Three Viewpoints Concerning Drastic Energy Structure Reforms

Whatever option Japan chooses in reducing dependence on nuclear energy, it is necessary to work on the three viewpoints, securing growth, energy system reform, and multifaceted international contribution, while recognizing them as the basic requirements for restructuring the policy framework on energy and the environment to a significant extent for the future and making a major shift of the energy structure.

1) Shifting the priority area to clean energy sources and securing green growth

In order to reduce dependence on nuclear energy as well as dependence on fossil fuels, it is necessary to significantly shift the priority area of the energy structure to renewable energy, clean energy such as hydrogen and storage systems, and energy conservation.

For this purpose, ambitious goals are set, namely, significantly expanding the share of renewable energy in 2030 to approximately over 25-30%, and, for energy conservation, reducing electricity consumption by 10% from the current level by 2030 despite the estimate (*) for increase in GDP by over 20%. In order to accomplish these goals, consumption and investment concerning clean energy, energy conservation, and distributed energy, which are necessary to convert the industrial structure and structure of living, will be promoted. In addition, research and development for green innovation and investments in next-generation energy networks will be accelerated.

A Framework for Green Development Policy will be drawn up, and such systems reform and development support will be promoted in an integrated manner, which is to form a basis for the rebirth of Japan.

*This estimate is based on the scenario set by the Secretariat of the Energy and Environment Council.

2) Reforming the energy system led by demand side actors

The use of renewable energy, energy conservation, and use of distributed energy by demand side actors themselves are very important in reducing dependence on nuclear energy. Each citizen needs to take the initiative in choosing energy as a consumer or producer of energy. The energy system will be converted to a new demand-side-led, distributed energy system in which various actors can participate. The energy/electric power systems reform will be implemented as a priority issue to this end.

3) Multifaceted international contribution for energy and the environmental field

Converting structures toward clean energy development and further innovation in energy efficiency will serve as the basis for Japan to share its challenges with emerging countries and to promote multifaceted international contribution in the fields of energy/the environment. This will also offer a model for solving global warming.

In light of international contribution in the fields of nuclear disarmament/nonproliferation in the past as well as the international status built thereby, Japan, which experienced the TEPCO Fukushima Nuclear Power Plant Accident, will fulfill its responsibility as a country using nuclear power for peaceful purposes, by controlling nuclear power risks, improving nuclear safety, undertaking decontamination, and managing decommissioned reactors through securing of human resources and technological basis. For this purpose, Japan will share its experiences in and lessons learned from the accident with other countries.

(2) Four Important Perspectives in Choosing Energy Options

Considerable efforts are required to fulfill all of the four perspectives—securing nuclear safety and reducing future risks, strengthening energy security, contributing to the solution of global warming, and restraining costs and preventing hollowing-out of industry—in the real world where there is no self-sufficient energy source that is inexpensive and safe and does not emit CO2. However, these perspectives are unignorable in choosing energy options. In particular, it is necessary to respond to the following challenges in reducing dependence on nuclear energy.

1) Securing nuclear safety and reducing future risks

The current prime challenge is to secure social safety and security in a sustainable manner.

Facing squarely the devastating damages caused by the nuclear power plant accident and the reality of Japan as an earthquake-prone country, it is critical to reduce the burden on future generations by minimizing risks through the thorough implementation of strengthened safety measures as well as by reducing the amounts of spent nuclear fuel and radioactive waste. At the same time, it is important to secure and develop technologies and human resources for ensuring nuclear safety. Based on the above, a roadmap to reduce dependence on nuclear energy needs to be framed.

2) Strengthening energy security

Amidst the uncertainty in the global energy situation and the prospects for securing alternative energy, strong demand for energy security remains unchanged. In light of such reality, the roadmap to reduce dependence on nuclear energy needs to be framed in a form that is compatible with both energy security and the diversification of energy sources.

3) Contributing to the solution of global warming

Efforts to reduce domestic CO2 emissions must be continued in the course of carrying out measures to reduce dependence on nuclear energy.

The currently goal for the reduction of greenhouse gas emissions includes sinks and those gained through international contributions in addition to reduction of domestic emissions. How should the balance between them be considered? Japan needs to contribute to solution of the global warming issue, including reducing CO2 emissions overseas by utilizing Japan’s advanced technology.

4) Restraining costs and preventing hollowing-out of industry

The roadmap to reduce dependence on nuclear energy should be shaped from the perspective of avoiding the hollowing-out of industry and employment as a result of the energy mix conversion, by looking closely into the impact of the increase in energy costs on industry and economy as well as on social changes.

2. Three Scenarios

(1) Preparing Scenarios that Can Reduce Dependence on Nuclear Energy and Fossil Fuels as well as Reduce CO2 Emissions

In light of the four perspectives—securing nuclear safety, strengthening energy security, contributing to the solution of global warming, and restraining costs and preventing hollowing-out of industry—, it is necessary to prepare scenarios for reducing dependence on nuclear energy as well as on fossil fuels and reducing CO2 emissions and to choose an energy option taking the element of economic efficiency into consideration.

The choice of energy options as of 2010 included the following.

- 1.1 trillion kWh was generated and energy equivalent to 390 million kl of crude oil was consumed.
- The share of nuclear energy was 26% on the basis of the electric energy generated.
- The share of fossil fuels was 63% on the basis of the electric energy generated.
- The share of non-fossil energy resources (i.e. nuclear energy and renewable energy) was 37% on the basis of the electric energy generated.
- Energy-related CO2 emissions amounted to 1.06 billion t-CO2 and the total greenhouse gas emissions amounted to 1.26 billion t-CO2.

In presenting scenarios, the Energy and Environment Council set the followings as the major premises.

- Promote energy conservation and reduce energy consumption and electric consumption
- Reduce dependence on nuclear energy
- Reduce dependence on fossil fuels
- Maximize the usage of renewable energy
- Thereby increase the share of non-fossil energy resources and reduce CO2 emissions

Based on these premises, the Council prepares three options for energy and the environment as of 2030 ((1) 0% scenario, (2) 15% scenario, and (3) 20-25% scenario on the basis of dependence on nuclear energy).

Through comparative verification of these three scenarios, the Energy and Environment Council intends to question the combination of alternative energy sources to nuclear energy, the duration needed for the reduction of dependence on nuclear energy, and the duration and costs to be spent for promoting measures concerning renewable energy, energy conservation, and use of clean technologies for fossil fuels in response to the demand for global warming countermeasures.

Table 1　Three Scenarios for 2030 (compared to 2010)

* The shares mean those in the electric energy generated.
Figures in parentheses indicate changes from 2010 before the Great East Japan Earthquake.

	2010	0% scenario		15% scenario	20-25% scenario
		Before additional measures	After additional measures		
Share of nuclear energy	26% Note1	0% (-25%)	0% (-25%)	15% (-10%)	20 to 25% (-5 to -1%)
Share of renewable energy	10%	30% (+20%)	35% (+25%)	30% (+20%)	25 to 30% (+15 to 20%)
Share of fossil fuels	63%	70% (+5%)	65% (Current level)	55% (-10%)	50% (-15%)
Share of non-fossil energy resources	37%	30% (-5%)	35% (Current level)	45% (+10%)	50% (+15%)
Electric energy generated	1.1 trillion kWh	Approx. 1 trillion kWh (-10%)	Approx. 1 trillion kWh (-10%)	Approx. 1 trillion kWh (-10%)	Approx. 1 trillion kWh (-10%)
Final energy consumption	390 million kl	310 million kl (-72 million kl)	300 million kl (-85 million kl)	310 million kl (-72 million kl)	310 million kl (-72 million kl)
Greenhouse gas emissions Note2 **(compared to 1990)**	-0.3%	-16%	-23%	-23%	-25%

Note1: The share of nuclear energy under the Current Strategic Energy Plan of Japan (53%) is the share of large-scale power sources (excluding cogeneration and private power generation)

Note2:Figures in parentheses indicate only energy-related CO2 emissions

(2) Key Points of the Three Scenarios

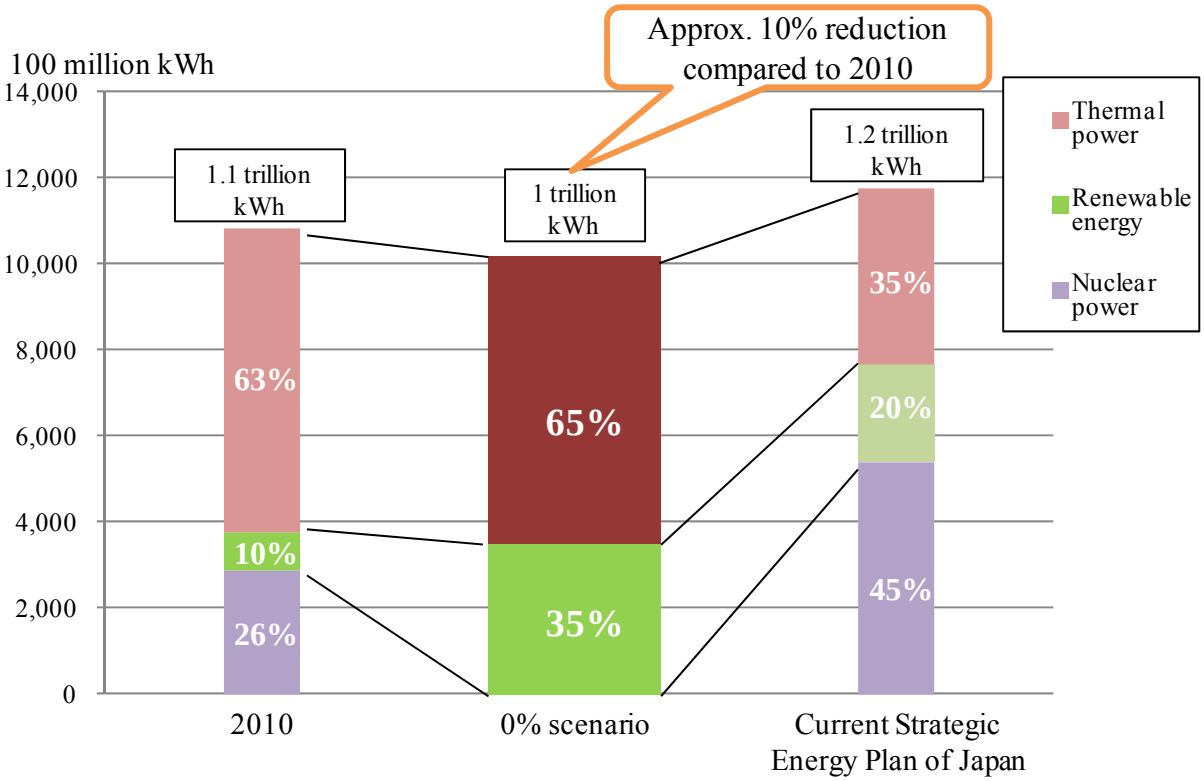
0% Scenario

The share of nuclear energy will be reduced to 0% at the earliest possible time before 2030. The energy structure will be converted to one consisting of energy from renewable energy and fossil fuels in the end. A considerably drastic shift of energy sources to renewable energy, energy conservation, and shift to gas will be implemented through strict regulations and with economic burden in order to reduce dependence on fossil fuels to the minimum and reduce CO2 emissions to a level comparable to other scenarios.

○Specifics in 2030

- Nuclear energy will be reduced to zero. The nuclear fuel cycle policy of direct disposal of spent nuclear fuel will be adopted.
- Even if the share of renewable energy is expanded from around 10% at present to approximately 30%, dependence on fossil fuels will increase to approximately 70% from around 65% at present as the share of nuclear energy is to be zero. The share of non-fossil energy resources will also decline to approximately 30% from around 37% at present.
- Greenhouse gas emissions will be reduced by approximately 16% compared to 1990 level. The reduction will be smaller compared to approximately 23% reduction under the 15% scenario and approximately 25% reduction under the 20-25% scenario. The import of fossil fuels will be 17 trillion yen, remaining at the same level as now. It is more than the cases in other scenarios; 16 trillion yen under the 15% scenario and 15 trillion yen under the 20-25% scenario.
- Therefore, in the case of the 0% scenario, further in-depth systems reform, etc. should be pursued to increase the share of renewable energy to approximately 35%.

  Nevertheless, the share of fossil fuels will be approximately 65% and the share of non-fossil energy resources will be approximately 35%, both remaining at the same level as now. Therefore, in order to reduce dependence on fossil fuels and improve the situation on CO2 emissions, stricter regulations than those imposed under the 15% and 20-25% scenarios, including restrictions on/prohibition of sales of products with poor energy conservation performance, will be imposed in broader fields, and energy conservation and CO2 emission reduction measures will be implemented even with a heavier economic burden. In addition, further shift to natural gas will be carried out. Thereby, the import of fossil fuels will be reduced to approximately 16 trillion yen, and greenhouse gas emissions will be reduced by 23%, on par with the reduction under the 15% scenario.



(Note) The share of nuclear energy under the current Strategic Energy Plan of Japan (53%) is the share of large-scale power sources (excluding cogeneration).

15% Scenario

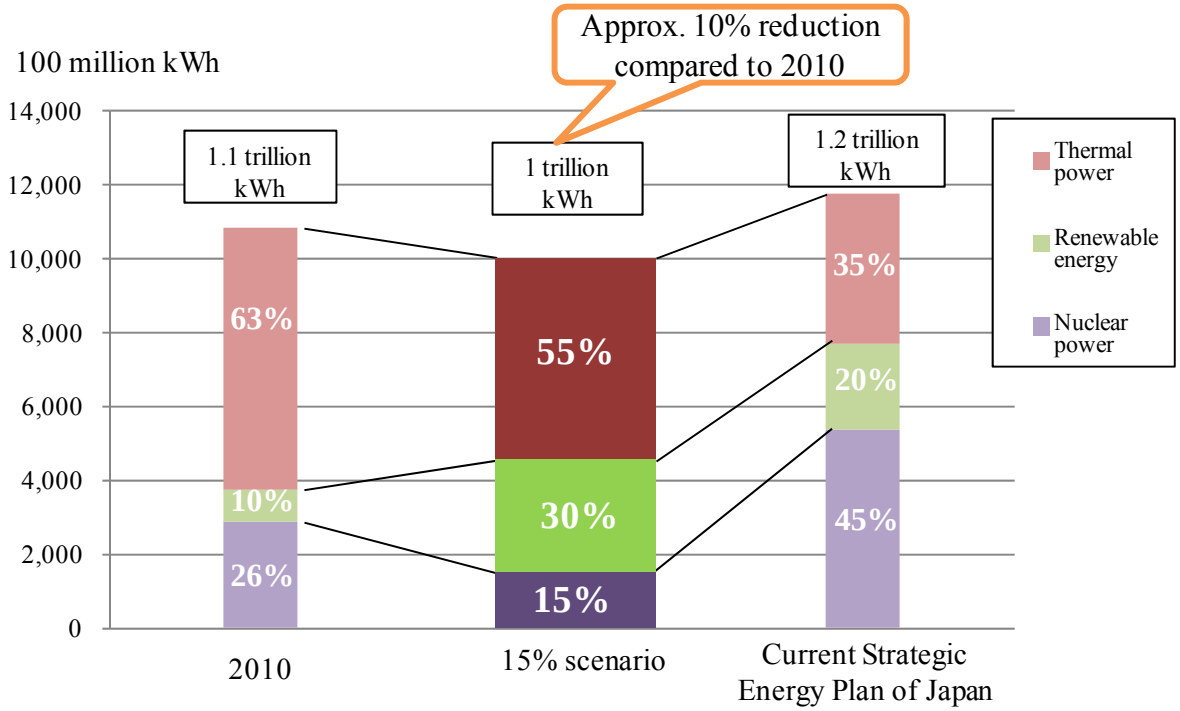
While steadily reducing dependence on nuclear energy to around 15% in 2030, reduction of dependence on fossil fuels and CO2 emission reduction will be smoothly realized. Nuclear power, renewable energy, and fossil fuels will be utilized through their combination, and flexible responses will be made to various environmental changes, including changes in the energy situation, in the international situation concerning the global environment, and in technological innovation.

○Specifics in 2030

- The share of nuclear energy will be reduced to around 15%. Reprocessing and/or direct disposition will be possible options in relation to the nuclear fuel cycle policy.
- It will be aimed at expanding the share of renewable energy to approximately 30%. The share will increase by approximately 20% points compared to now.
- The share of fossil fuels will be approximately 55%. The share will be reduced by approximately 10% points compared to now.

  The import of fossil fuels will be reduced to approximately 16 trillion yen in 2030 from 17 trillion yen at present.
- The share of non-fossil energy resources will be approximately 45%. The share will increase by approximately 10% points compared to the current share of around 35%.

  Greenhouse gas emissions will be reduced by approximately 23% compared to 1990 level in 2030.



(Note) The share of nuclear energy under the current Strategic Energy Plan of Japan (53%) is the share of large-scale power sources (excluding cogeneration).

20-25% Scenario

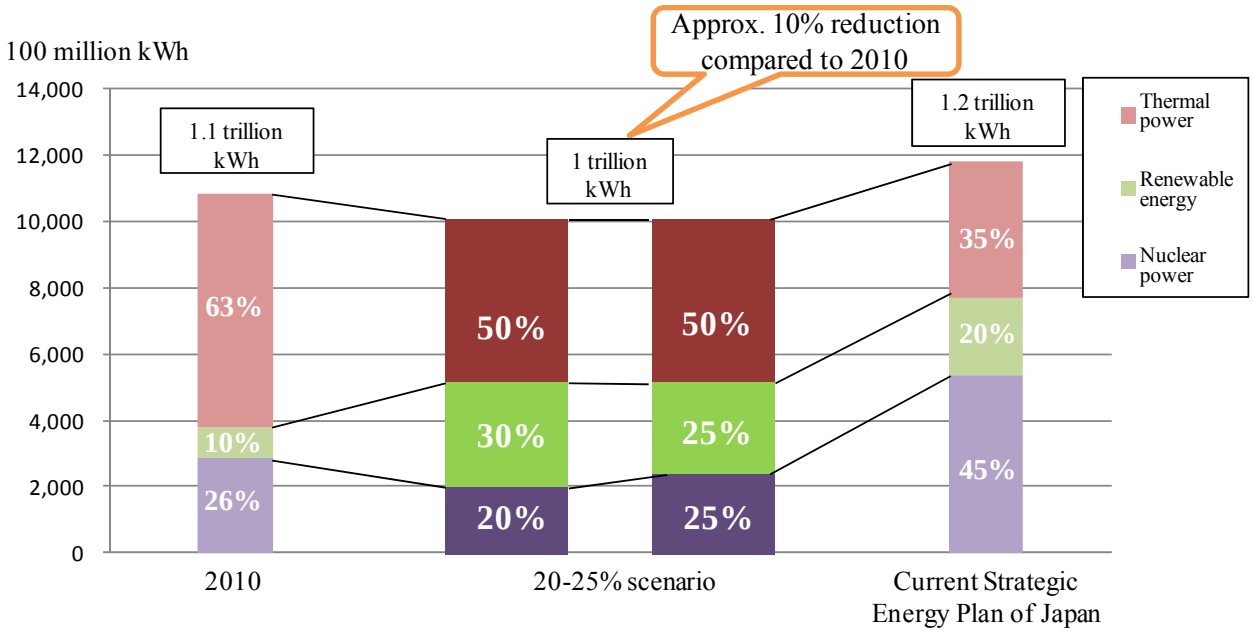
Keeping a certain level of dependence on nuclear energy, the share of nuclear energy in 2030 will be made around 20-25% while slowly reducing dependence on it. Reduction of dependence on fossil fuels and CO2 emission reduction will be promoted from a more economic aspect. Strong public confidence in nuclear energy and administration thereof is the prerequisite.

○Specifics in 2030

- The share of nuclear energy will be reduced to 20-25%. Establishment of new nuclear power plants and replace of existing plants are required. Reprocessing and/or direct disposition will be possible options in relation to the nuclear fuel cycle policy.
- It will be aimed at increasing the share of renewable energy to approximately 25-30%.
- The share of fossil fuels will be approximately 50%, and the share will be reduced by approximately15% points compared to now.

  The import of fossil fuels will be reduced to approximately 15 trillion yen in 2030 from 17 trillion yen at present.
- The share of non-fossil energy resources will be approximately 50%. The share will be increased by approximately 15% points compared to now.

  Greenhouse gas emissions will be reduced by approximately 25% compared to 1990 level in 2030.



(Note) The share of nuclear energy under the current Strategic Energy Plan of Japan (53%) is the share of large-scale power sources (excluding cogeneration).

(3) Comparison of the proposed scenarios from each of the four perspectives

The main points of the 0% scenario, 15% scenario, and 20-25% scenario are explained in the above.

In the course of studying the scenarios, it is important to compare and verify them from each of the following perspectives:

- Securing nuclear safety
- Strengthening energy security
- Contributing to the solution of global warming
- Restraining costs and preventing hollowing-out of industry.

The particulars of the scenarios are shown in Table 2, which is expected to help gain better understanding of the features of each scenario and grasp the differences among the scenarios in terms of the assessment items.

Table 2 Overview of the energy situation in Japan in 2030 based on the proposed scenarios

(Figures in parentheses are changes from the 2010 level.)

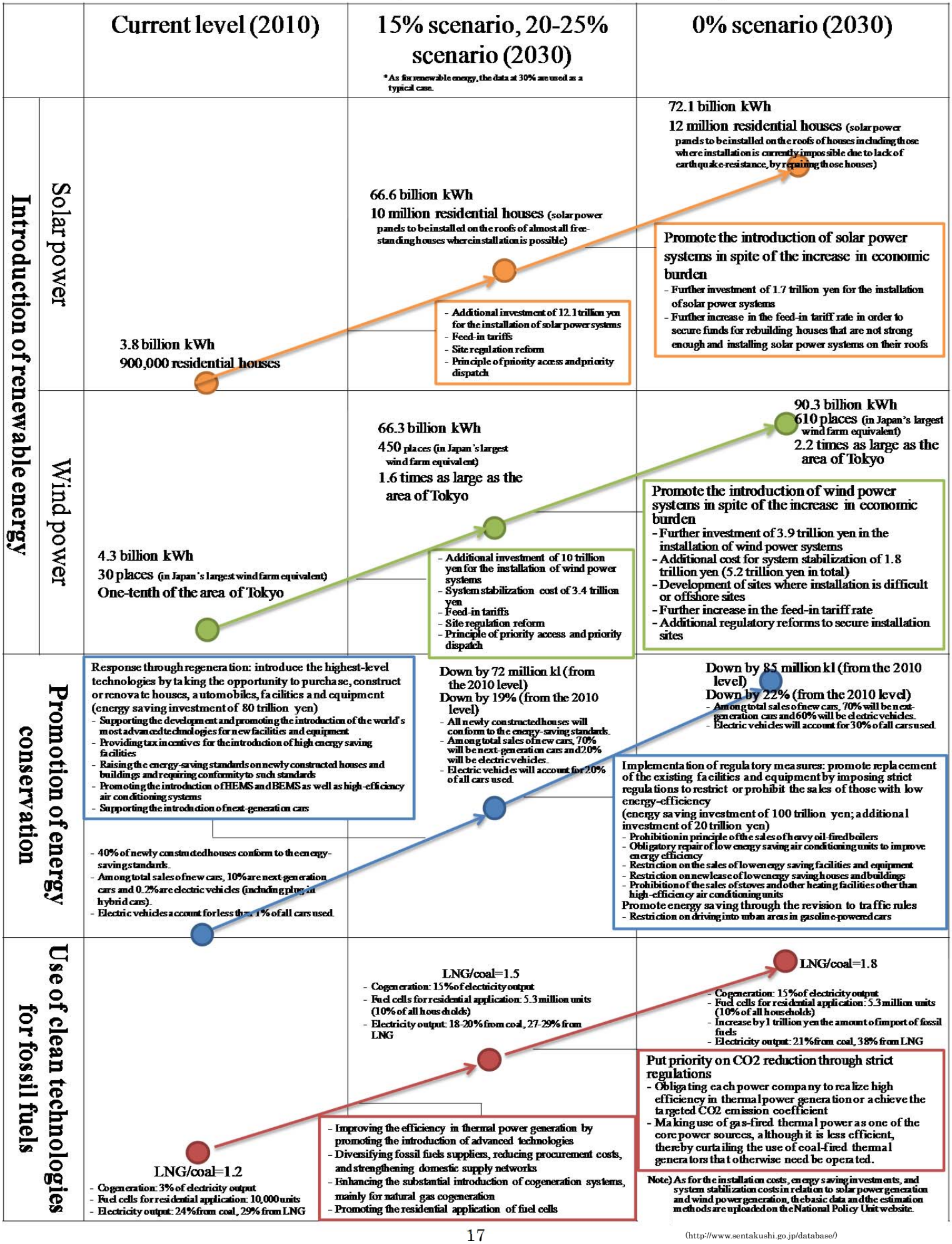
	Assessment items		2010	0% scenario		15% scenario	20-25% scenario
				Before additional measures	After additional measures		
Composition of power sources	Dependence on nuclear energy		Approx. 26%	0% (-25%)	0% (-25%)	15% (-10%)	20-25% (-5%- -1%)
	Renewable energy		Approx. 10%	30% (+20%)	35% (+25%)	30% (+20%)	30%-25% (+20%- +15%)
	Thermal power		Approx. 63%	70% (+5)	65% (current level)	55% (-10%)	50% (-15%)
		Coal	Approx. 24%	28% (+4%)	21% (-3%)	20% (-4%)	18% (-6%)
		LNG	Approx. 29%	36% (+7%)	38% (+9%)	29% (±0%)	27% (-2%)
		Oil	Approx. 10%	6% (-4%)	6% (-4%)	5% (-5%)	5% (-5%)
Amount of energy saved	Electricity output *2		Approx. 1.1 trillion kWh	Approx. 1 trillion kWh (-10%)	Approx. 1 trillion kWh (-10%)	Approx. 1 trillion kWh (-10%)	Approx. 1 trillion kWh (-10%)
	Final energy consumption		Approx. 390 million kl	Approx. 310 million kl (-19%) (-72 million kl)	Approx. 300 million kl (-22%) (-85 million kl)	Approx. 310 million kl (-19%) (-72 million kl)	Approx. 310 million kl (-19%) (-72 million kl)
Reducing dependence on nuclear energy and securing nuclear safety	Dependence on nuclear energy		Approx. 26%	0% (-25%)	0% (-25%)	15% (-10%)	20-25% (-5%- -1%)
Strengthening energy security	Dependence on fossil fuels		Approx. 63%	70% (+5%)	65% (current level)	55% (-10%)	50% (-15%)
	Amount of import of fossil fuels from overseas (primary energy supply basis)		17 trillion yen	17 trillion yen	16 trillion yen	15 trillion yen	14-15 trillion yen
				(Note) Implement strong measures that involve regulations and burden sharing, thereby promoting the shift to natural gas further than other scenarios. Stable and low-cost procurement of natural gas will be a major issue.			
Contributing to the solution of global warming	Share of renewable energy		Approx. 10%	30% (+20%)	35% (+25%)	30% (+20%)	30%-25% (+20%- +15%)
	Share of non-fossil energy resources		Approx. 37%	30% (-5%)	35% (current level)	45% (+10%)	50% (+15%)
	Coal/gas ratio in thermal power generation (including cogeneration)		1:1.2	1:1.3	1:1.8	1:1.5	1:1.5
	Greenhouse gas emission (1990-level basis)	2030	—	-16%	-23%	-23%	-25%
		2020	*3 —	+0% (nuclear energy: 0%) / -5% (nuclear energy: 14%)	-0% (nuclear energy: 0%) / -7% (nuclear energy: 14%)	-9% (nuclear energy: 21%)	-10-11% (nuclear energy: 23-26%)
				(Note) In order to promote the use of renewable energy, energy saving, and shift to natural gas more vigorously, it will be necessary to impose strict regulations in broad fields, including restriction and prohibition of the sale of low energy saving products (for details of these measures, see Table 3).			
Curtailing costs and preventing hollowing-out of industry	Power generation costs *1		8.6 yen/kWh	-	15.1 yen/kWh (+6.5 yen)	14.1 yen/kWh (+5.5 yen)	14.1 yen/kWh (+5.5 yen)
	System stabilization costs (accumulated until 2030) *1		—	3.4 trillion yen	5.2 trillion yen	3.4 trillion yen	3.4-2.7 trillion yen
	Energy saving investment (accumulated until 2030) *1		—	Approx. 80 trillion yen (Saved cost: approx. 60 trillion yen)	Approx. 100 trillion yen (Saved cost: approx. 70 trillion yen)	Approx. 80 trillion yen (Saved cost: approx. 60 trillion yen)	Approx. 80 trillion yen (Saved cost: approx. 60 trillion yen)
	Household electricity charges (Average for a household with two or more persons) *1, 4, 5						
	NIES		10,000 yen/month	-	+4,000 yen/month between 2011 and 2030 (14,000 yen/month in 2030)	+4,000 yen/month between 2011 and 2030 (14,000 yen/month in 2030)	+4,000 yen/month between 2011 and 2030 (14,000 yen/month in 2030)
	Professor Ban, Osaka University			-	+5,000 yen/month between 2011 and 2030 (15,000 yen/month in 2030)	+4,000 yen/month between 2011 and 2030 (14,000 yen/month in 2030)	+2,000 yen/month between 2011 and 2030 (12,000 yen/month in 2030)
	Associate Professor Nomura, Keio University			-	+11,000 yen/month between 2011 and 2030 (21,000 yen/month in 2030)	+8,000 yen/month between 2011 and 2030 (18,000 yen/month in 2030)	+8,000 yen/month between 2011 and 2030 (18,000 yen/month in 2030)
	RITE			-	+10,000 yen/month between 2011 and 2030 (20,000 yen/month in 2030)	+8,000 yen/month between 2011 and 2030 (18,000 yen/month in 2030)	+8,000 yen/month between 2011 and 2030 (18,000 yen/month in 2030)
	Real GDP *5						
	NIES		2010 511 trillion yen	Normal case in 2030 *2 636 trillion yen	628 trillion yen (+97 trillion yen from the 2010 level) (-8 trillion yen in the normal case)	634 trillion yen (+123 trillion yen from the 2010 level) (-2 trillion yen in the normal case)	634 trillion yen (+123 trillion yen from the 2010 level) (-2 trillion yen in the normal case)
	Professor Ban, Osaka University			624 trillion yen	608 trillion yen (+117 trillion yen from the 2010 level) (-15 trillion yen in the normal case)	611 trillion yen (+100 trillion yen from the 2010 level) (-13 trillion yen in the normal case)	614 trillion yen (+103 trillion yen from the 2010 level) (-10 trillion yen in the normal case)
	Associate Professor Nomura, Keio University			625 trillion yen	609 trillion yen (+98 trillion yen from the 2010 level) (-17 trillion yen in the normal case)	616 trillion yen (+105 trillion yen from the 2010 level) (-10 trillion yen in the normal case)	617 trillion yen (+106 trillion yen from the 2010 level) (-9 trillion yen in the normal case)
	RITE			609 trillion yen	564 trillion yen (+53 trillion yen from the 2010 level) (-45 trillion yen in the normal case)	579 trillion yen (+68 trillion yen from the 2010 level) (-30 trillion yen in the normal case)	581 trillion yen (+70 trillion yen from the 2010 level) (-28 trillion yen in the normal case)

*1 The power generation costs for new plants are estimates indicated in the report of the Cost Review Committee. Those for existing plants are estimated based on the operating costs, etc. indicated in the same report. The details of power generation costs, system stabilization costs, and energy saving investment are uploaded on the National Policy Unit website, accompanied by the primary data.
*2 The normal (intact) case is based on the assumption that the economic growth and other macroeconomic conditions are in line with the prudent scenario (the real GDP growth will be 1.1% between 2010 and 2019 and 0.8% between 2020 and 2029).
*3 The level of dependence on nuclear energy in 2020 is projected as a middle point on a line that runs between the 2010 point and the 2030 point.
*4 The data takes into account both the effect on the price hike and the effect of power saving.
*5 The features of the model used by each institute for the analysis of economic impact are summarized as follows. For details of each model, see the reference documents issued by the Basic Issue Subcommittee of the Advisory Committee on Energy and Natural Resources (http://www.enecho.meti.go.jp/info/committee/kihonmondai/) and the Global Environmental Division of the Central Environment Council (http://www.env.go.jp/council/06earth/yoshi06.html).

(1) Price elasticity
• The degree of progress in energy saving in the case of raising the energy price (price elasticity) differs greatly depending on the model (the price elasticity of electricity is the highest in Osaka University's model, followed by NIES, RITE, and Keio University, in this order, whereas the marginal cost for CO2 reduction is the highest in RITE's model, followed by Keio University, NIES, and Osaka University, in this order). When the elasticity is higher, further progress will be made in taking measures even in response to a small price hike (because the measures cost less), the price hike in the scenario will become smaller, and the impact on economy will become smaller accordingly.

(2) The economic impact estimated by RITE is larger than those estimated by other institutes because the model applied by RITE estimates lower price elasticity and higher cost for CO2 reduction as compared to other models, and also because that model is an international model which expressly deals with an increase in overseas production arising due to an energy price hike in Japan (leakage). NIES estimates a smaller economic impact because it assumes that progress will be made in energy saving and CO2 reduction at low costs, giving higher evaluation to the effect of energy saving investment (by taking into account the future effect of energy saving).

Table 3 Image of Clean Energy Policy



3. Development of National Discussions and Decision on Strategy

(1) Roadmap toward the development of national discussions and decision on strategy

The Energy and Environment Council will make a responsible choice around end of August and specify the policy details, through the following process which is aimed at encouraging citizens to discuss the energy issues based on the three proposed scenarios.

July: National discussions

In order to carefully understand the views of all levels of citizens, the government will provide objective and concrete information as well as the opportunity for citizens to exchange opinions and further the discussion on the energy issues among them as follows.

At the same time, the government will cooperate with local authorities and private organizations in holding explanatory meetings for citizens and closely examine the opinion polls arranged by the mass media, thereby grasping citizens' thoughts comprehensively.

(i) Development of the information database relating to the energy and environmental options

- Build an easily accessible and serviceable database on the National Policy Unit website by early July. (http://www.sentakushi.go.jp)
- Provide objective data and facts as well as background information which will facilitate the discussions on the energy issue among the citizens.

(ii) Holding of public hearing sessions relating to the energy and environmental options

- Hold public hearing sessions to hear citizens' opinions concerning the three proposed scenarios at 11 places nationwide.
- Hold these sessions intensively, every weekend from July 14 (Sat.) to early August.

(iii) Solicitation of public comments relating to the energy and environmental strategy

- Receive public comments during the period from July 2 (Mon.) until August 12 (Sun.).
- Solicit comments and proposals based on the three scenarios from a wide range of the public, by encouraging them to express their opinions freely.

(iv) Conducting of a Deliberative Polling relating to the energy and environmental options

- When tackling the energy and environmental issues, it is necessary to closely examine and identify citizens' opinions through their discussions. Accordingly, the government will conduct a Deliberative Polling to grasp how citizens see these issues.
- Small groups consisting of a small number of citizens with diverse opinions, who will accept to attend deliberative forum after randomly polled from across the nation will be formed. After learning the necessary information based on the reference materials

concerning the three scenarios, prepared by a neutral committee, the participants will hold small group discussions and pose questions to experts in plenary sessions. Through three questionaires among the process, the committee will comprehend in detail their considered opinions on the three scenarios.

- This Deliberative Polling will be conducted in early August.

Around August: Decide on Innovative Strategy for Energy and the Environment

Following the national discussions on the three scenarios, the government will decide on an Innovative Strategy for Energy and the Environment which will set the general course for Japan's energy and environmental policy around August, thereby presenting an outline of the future energy mix, domestic greenhouse gas emissions in 2020 and 2030, and other relevant matters. The government will also decide on the nuclear fuel cycle policy, based on the options proposed by the Japan Atomic Energy Commission and in line with the energy mix outline.

Promptly: Formulate a New Strategic Energy Plan of Japan
By the end of 2012: Formulate Framework for Nuclear Energy Policy, etc.

In accordance with the Strategy for Energy and the Environment to be decided on around August, the government will formulate a new Strategic Energy Plan of Japan promptly and then formulate a Framework for Nuclear Energy Policy, Countermeasures for Global Warming, and a Framework for Green Development Policy by the end of 2012.

(2) Continuous review and verification to be made by 2030

There is no end in national discussions relating to energy and environmental strategy. All levels of citizens must continue discussing this issue with great interest and accurate knowledge, and urge the government to make a rational choice of policy in the field of energy and the environment. Continuous review, as well as verification to be made by 2030, will be the basis for making a flexible choice of energy and environmental options as a national challenge.

In order to respond to changes in the situation flexibly, the Energy and Environment Council will supervise the government's implementation of the policy measures. The council will provide the relevant information to the public, while constantly paying attention to and grasping international energy situations and other international circumstances relating to the global environment, trends in technological innovation, and public confidence in the government's energy policy.

Whichever scenario is chosen, the choice of energy and environmental options will depend on international energy situations and other international circumstances relating to the global environment, trends in technological innovation, and public confidence in the government's nuclear energy policy. With this in mind, the council will verify the general direction of the policy by 2030.

Conclusion

The lives of citizens and industrial activities cannot stand without the use of energy. There is no country which does not have to worry about the choice on energy sources. The energy issue has been one of the most critical and challenging tasks in any age and in any country, and it is still so today.

Japan has been constantly tackling this task and taking various measures such as shifting from hydroelectric power to coal-fired thermal power, shifting from coal to oil, promoting energy saving, accelerating nuclear energy development, and introducing renewable energy, thus choosing different energy options along with the economic development and in response to the needs of the times.

The major factors that caused Japan to change its energy options so far were drastically changing international energy situations and other international circumstances relating to the global environment, combined with the innovation in energy technologies. Japan has a history of choosing energy options flexibly in response to such changes in international situations and technological innovation.

On the occasion of facing the first and second oil crises, Japan pursued the diversification of energy sources, ranging from nuclear energy to coal, natural gas and renewable energy, with the development and introduction of alternatives to oil as a priority agenda. As a result, Japan has shifted its energy structure in the past 30 years from one in which oil-fired thermal power accounted for over half of the total output to one in which nuclear energy, coal and natural gas serve as the major energy sources. Since the beginning of the 1990s, when global warming became one of the world's top priority issues, Japan started to place more weight on nuclear energy and renewable energy, and immediately before the disaster occurred, it shifted its focus on the development and introduction of energy technologies to non-fossil energy resources.

Thus, the progress in technology and changes in international situations in relation to energy and the environment could sometimes take place at a higher speed and on a greater scale than we expect. Therefore, while paying attention to such trends, we should combine all available technologies and various supply sources together, with a view to stabilizing the lives of people and industrial activities, thereby creating an energy structure that can be more flexible and adaptable than before in response to changes in the circumstances.

At the same time, global warming remains a critical challenge that the whole world is facing, and there is a call for long-term and drastic reduction of CO2 emissions. Japan should take the initiative in building a framework that can deal with this issue more flexibly and from a broader perspective, covering not only the reduction of domestic greenhouse gas emissions but also the measures to secure forests and other sinks, promote emission reduction on abroad and construct an international

framework.

Unlike the past cases, a change in choosing energy and environmental options this time was triggered by its own experience of the Great East Japan Earthquake and the TEPCO Fukushima Nuclear Power Plant Accident. This accident has reminded us anew of the importance of the matter-of-course principle for choosing any energy option, i.e. safety and security, and posed us a fundamental question on the validity of our choice of nuclear energy, which has previously been considered low-cost, safe, and environmentally-friendly energy option.

The TEPCO Fukushima Nuclear Power Plant Accident has invoked national debates overseas as well, with regard to nuclear energy and other energy options and issues on the global environment. The choice we make now will, in some aspects, determine the benefit that the future generation can enjoy. All of the present generation in Japan, having experienced the great earthquake and the nuclear power plant accident, assume an important responsibility for turning the current crisis into a chance to change.

In this respect, the choice that Japan will make in relation to energy and the environment after experiencing the TEPCO Fukushima Nuclear Power Plant Accident will be a choice that concerns all citizens, a choice that affects future generations, and a choice that draws attention from the international community.

Against this background, Japan’s choice will be of grave significance and meaning. It is expected that all citizens will take part in the national discussions on the choice of energy and environmental options. The government will make the best choice based on the voices expressed in such discussions.