

**White Paper
On
Nuclear Energy 2003
(Summary)**

Atomic Energy Commission of Japan

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Since the publication of its last White Paper on Nuclear Energy for 1998 (released June 19, 1998), the Atomic Energy Commission of Japan (AEC) has continued to monitor trends covering all aspects of nuclear energy over the period up to September 2003 and summarized its findings in a *White Paper on Nuclear Energy* concentrating especially on recent trends and released on December 19, 2003 by cabinet decision.

This paper is comprised of a main document and supplementary materials.

The first chapter of the main document summarizes the current state of nuclear energy divided along the topics of 'Nuclear power generation,' 'The nuclear fuel cycle,' 'Restoring trust,' 'Research and development,' 'International trends,' and 'An evaluation of policy,' describing the thinking of the AEC in regards to nuclear energy policies in this new age.

Following the outlines of 'the Long-Term Program for Research, Development and Utilization of Nuclear Energy (Long-Term Program)' created in November 2000, we cover the topics 'Nuclear Energy Policy in Japan', 'Harmony between People, Society and Nuclear Energy', 'Nuclear Power Generation and the Nuclear Fuel Cycle', 'Diversified Development of Nuclear Science and Technology', 'Utilization of Radiation Contributing to People's Lives', 'Harmony between International Society and Nuclear Energy', and 'Foundation to Promote Research, Development and Utilization of Nuclear Energy', describing issues related to each topic and concentrating especially on recent trends in each field.

The supplementary materials include lists of AEC decisions, nuclear energy budgets, year-by-year data tables, and other such similar materials.

In the following section, we briefly summarize the contents of Chapter 1. The second chapter of the main document and supplementary materials have not been translated into English.

Note that a summary version of this White Paper may be found at the AEC's website at <http://aec.jst.go.jp>.

Part I: Main document

Chapter 1: Nuclear energy policy for a new age

It is now some fifty years since after the end of the second world war when nuclear power first began to be used for civilian purposes throughout the world. In that time, the use of nuclear power in Japan has grown steadily, and today nuclear power generation makes up one of the main sources of electricity.

At the same time, however, the problems at the Tokyo Electric Power Company (TEPCO) and other issues have resulted in a heavy loss of trust in nuclear power, and questions have come to be raised about the need for the establishment of the nuclear fuel cycle for which plans are now underway.

The demand for greater transparency on the part of government which has arisen as a result of distrust of nuclear energy policy and the demand that the concerns of local residents and other citizens be taken more fully into account has made it necessary to adopt a different approach from that taken in the past towards nuclear energy policy, and steps towards the actual formulation of such a policy are now underway.

Taking the circumstances described above into consideration, in this paper we will describe the current state of nuclear power together with our own thinking about what nuclear power policies ought to be adopted in this new age.

1. Nuclear power generation

(1) Energy and nuclear power generation in Japan

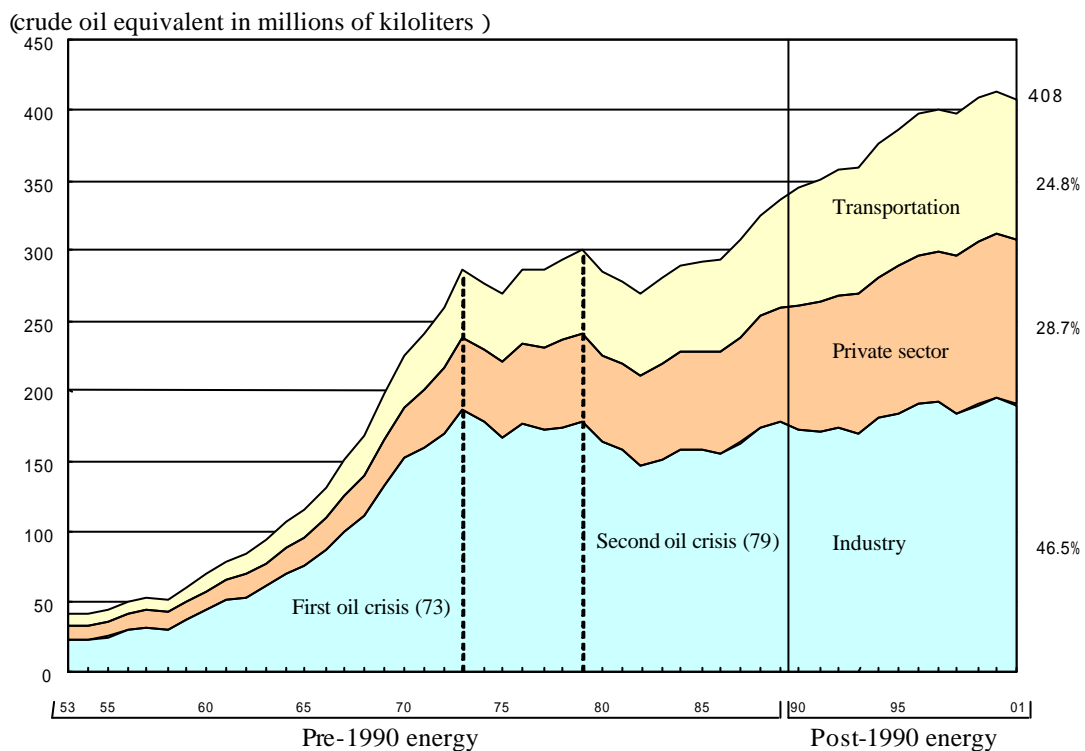
(The state of energy in Japan and around the world)

Driven in part by changes in lifestyle, the demand for energy has risen, with much of the increase coming from transportation and the private sector. The overall demand for energy in 2001 came to 408 million kiloliters (crude oil equivalent), an increase of some 42% when compared to the same figure for 1973, the time of the first oil crisis. Of this total, in contrast to the industrial sector which accounted for 190 million kiloliters (crude oil equivalent) in demand for an increase of just 1 percent, in the private sector home use accounted for 53 million kiloliters (crude oil equivalent) for an increase of 108 percent, office, store, and other commercial use accounted for 64 million kiloliters (crude oil equivalent) for an increase of 141 percent, and transportation use accounted for 101 million kiloliters (crude oil equivalent) for an increase of 116 percent.

A comparison of 1997 and 2001 shows an overall increase in demand of 1.9 percent, with demand in the industrial sector decreasing by 1.3 percent, and with figures for demand in the private sector showing an increase of 3.9 percent in home use, an increase of 14.8 percent in use in offices, stores, and other businesses, and a decrease of 0.2 percent in demand in the transportation sector.

A look at the rise in the demand for energy throughout the world shows that demand has risen rapidly, with much of this demand coming from those countries in Asia experiencing particularly rapid economic growth. A look at the demand for primary energy in 2000 versus forecasted demand in 2030 shows that in contrast to the OECD nations which are expected to see an increase in demand of 34 percent, the demand in developing nations is expected to increase far more by a level of 110 percent, thus resulting in an expected increase of 66 percent for the world as a whole.

From this it can be seen that the demand for energy may be expected to come to outstrip available supplies, thus increasing the severity of energy conditions in Japan, which obtains only 4 percent of its own energy from hydroelectric, geothermal, and other similar sources and only 20 percent of its own energy even when nuclear power—an extremely stable energy supply—is added, a country which is poor in domestic energy resources and which is forced to rely on overseas sources for virtually all of its energy demand.



Note: Because figures for 1991 and later are taken from figures from the Post-1990 Energy Balance Table¹ (compiled according to a different method), not all figures shown are necessarily consecutive.

Source: Created from General Energy Statistics: Energy Supply and Demand Balance Table¹

Figure 1: Past and projected end energy consumption in Japan (by sector)

(Energy policy in Japan)

In the past, ensuring a stable supply of energy has always been the main objective of Japanese energy policy, but today in addition to working to ensure stable energy supplies it is also necessary to work at the same time to protect the environment and improve energy efficiencies.

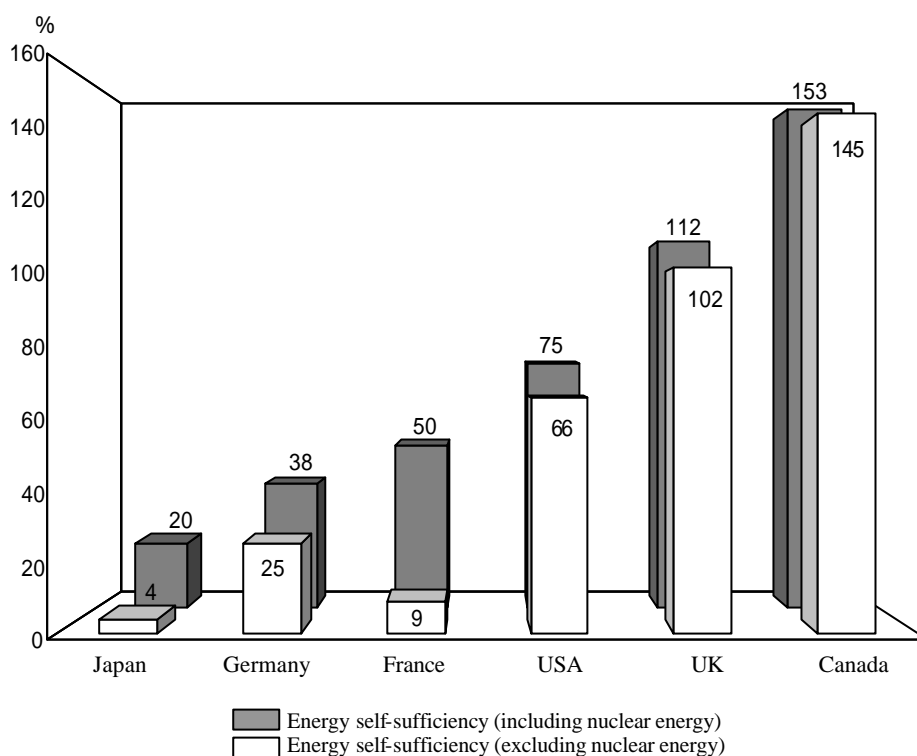
The Basic Law on Energy Policy which took force in June 2002 sets forth three basic goals as the basis for policy on energy supply and demand: ensuring a stable supply, environmental compatibility, and market principles which take the two former goals properly into account.

(The role of nuclear power generation)

With a total production of 294.9 billion kilowatt-hours, nuclear power accounted for 31.2% of the total amount (944.7 billion kilowatt-hours) of all electricity generated domestically over the 2002 fiscal year, thus making it one of the main sources of electricity as well as a source of 12.6% (FY2001) of total primary energy resources. In the 1997 fiscal year, with a total production of 319.1 billion kilowatt-hours, nuclear power accounted for 35.6% of the total amount (895.0 billion kilowatt-hours) of all domestic electricity, thus making it the source of 12.9% of total primary energy resources.

For reasons which include (i) the political stability of Canada, Australia, and other nations which supply the resources and (ii) the ease of storage and high concentration of energy in nuclear fuel and the fact that such fuel can act as a reserve during electric power generation or during fuel processing, nuclear power has several advantages over other forms of energy in that unforeseen drops or cutoffs of supply are unlikely to occur and even if they were to occur it would be relatively easy to reduce the severity of the effects of any such reduction or cutoff in supply. The use of nuclear power also reduces dependence on oil and other energy resources, and it is recognized that the use of nuclear power in Japan has reduced amounts of oil imports by some thirty percent. With advantages such as these in terms of the energy security it provides, we believe that nuclear energy has a very significant role to play in Japan, with its high degree of susceptibility to fluctuations in energy supply.

As a result of the failures to follow prescribed testing and inspection procedures and other problems discovered at TEPCO nuclear power plants, in April of 2003 all of TEPCO's reactors were shut down for inspection. TEPCO's nuclear power plants provide over 40 percent of the electricity for the Kanto area, and because it was feared that it would be impossible to ensure a sufficient supply of electricity if the shutdowns were to continue even if it were possible to resume operation of the No. 6 reactor at the Kashiwazaki-Kariwa nuclear power plant which was expected to be able to go back online fairly early, to restart operations at previously mothballed thermal-fired power plants, and obtain excess power from other electric utilities, government and private sector forces worked together to promote energy conservation measures and similar measures.



Source: ENERGY BALANCES OF OECD COUNTRIES, 2003 IEA/OECD

Figure 2: Energy self-sufficiency of major industrialized nations

In the end, with the help provided by a record-breaking summer which was the coolest in ten years and the understanding of the local governments in the areas where the plants are located, it was possible to resume operations at six reactors with a capacity of approximately 6.80 million kilowatts (including the No. 6 reactor at the Kashiwazaki-Kariwa plant), thus making it possible to get through the summer season without any power outages or any other serious repercussions occurring.

(The deregulation of electric power utilities and nuclear power generation)

One step towards the deregulation of electric power utilities was taken in June 2003 with the passing of the Revised Electric Utilities Law, a law which has been designed to ensure stable supplies of energy and environmental compatibility through the reform of the supply system and to provide an increased range of choice of suppliers under these reforms.

These structural reforms are designed to provide a forum in which to analyze and evaluate the nuclear power industry in terms of its cost structure including all types of associated back-end businesses and profitability of the nuclear power industry as a whole. The findings will then be used to perform a study of economic measures and other types of specific measures or programs to be implemented for nuclear power back-end businesses by the end of 2004, with the necessary measures to be implemented thereafter. The Electricity Industry Committee, Advisory Committee for Natural Resources and Energy has already embarked on this study beginning from September 2003.

(2) Measures to prevent global warming and nuclear power generation

In June 2002, Japan became a Party to the Kyoto Protocol pledging to reduce emissions of greenhouse gases. The government summarized a list of actual measures to be taken to achieve the promised reductions in its Guidelines for Measures to Prevent Global Warming, and this document identifies nuclear power as an important source of electricity from the standpoint of taking action against global warming as well.

In these guidelines, it is recognized that there is a need to promote the increased use of non-fossil energy resources such as nuclear power, renewal energy, and other types of energy in order to ensure stable supplies of energy and in order to achieve a balance with the measures for preventing global warming to be implemented. The guideline also calls for promoting the switch to the use of different types of the fossil fuels which will continue to constitute the main source of energy supplies while responding to demands for increased efficiencies and working to create an energy supply system more in tune with the environment.

While it is also important to work to develop solar power systems, wind power systems, and other types of renewable energy which generate virtually no carbon dioxide, because power systems such as these require vast amounts of space in order to produce large amounts of electricity and because the amount of electricity generated varies greatly depending on the weather or amount of sunlight received, such sources of power are problematic in terms of providing stable energy supplies. It is for this reason that when selecting a key source of energy which not only reduces the amount of carbon dioxide generated to the lowest possible level but also provides a stable supply of electricity in the quantities needed in our daily lives, nuclear power may be said to be an important and effective alternative.

The reductions in carbon dioxide emissions which would be achieved if a coal-fired power plant were replaced by a single 1.35-million-kilowatt class nuclear power plant would be equivalent to approximately 0.7% of all anthropogenic carbon dioxide emissions for 1990, and as a major source of electrical power, nuclear power thus has a major role to play in helping to prevent global warming.

As a result of the failures to follow prescribed testing and inspection procedures and other problems occurring at TEPCO nuclear power plants, the company was forced to halt operations and perform inspections of its nuclear power plants. The amount of carbon dioxide generated by the thermal power plants used by the company to as alternative electrical power systems over the one-year period from September 2002 to August 2003 as a result of these shutdowns is estimated to be some 42.0 million tons-CO₂, a figure roughly equivalent to 3.4% of total annual greenhouse gas emissions for the base year in Japan. If these circumstances were to continue, they might well have an adverse affect on the effectiveness of the measures for the prevention of global warming.

- Total emissions for the 2001 year represent a 5.2% increase over total emissions in the base year.
- In order to achieve the promised target of a 6% reduction in emissions, it will be necessary to reduce emissions by an amount roughly equivalent to 11.2% beginning from the 2001 year.

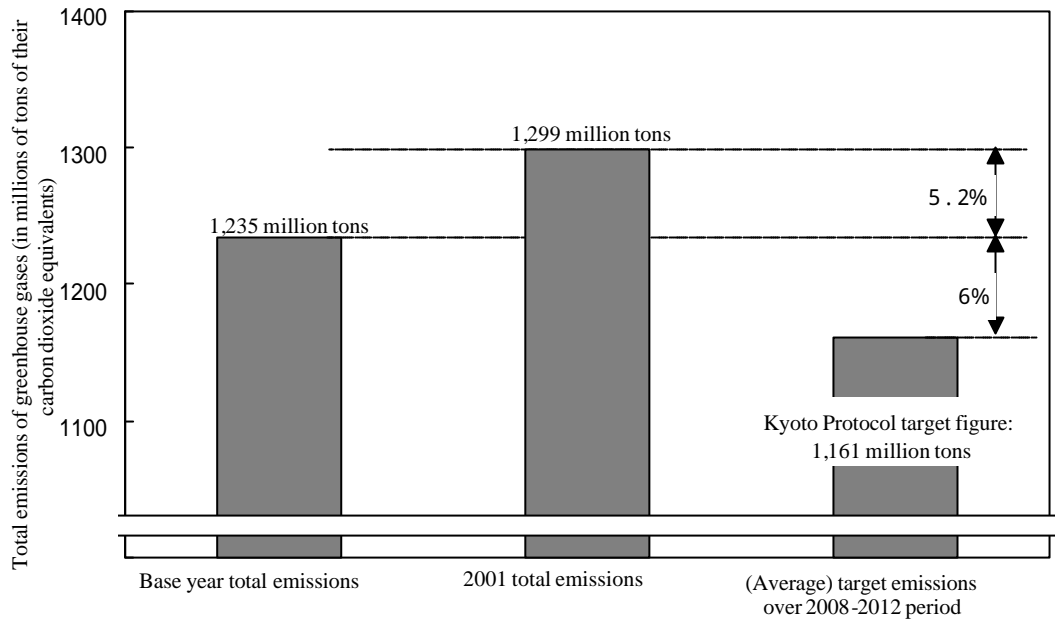


Figure 3: Volumes of emissions of greenhouse gases in Japan

2. Regaining public trust

(1) The JCO accident and the establishment of nuclear disaster preparedness procedures

In September 1999, a criticality accident occurred at JCO Co. Ltd. in Tokaimura, Ibaraki Prefecture (hereinafter referred to as ‘the JCO accident’). In this accident, the state of criticality continued for a period of about 20 hours, and the severity of the accident reached a level where it became necessary for residents in the area around the plant to evacuate and for residents living within a 10-kilometer radius of the facility to remain indoors to avoid exposure. The criticality event not only caused radiation to be released into the surrounding area over an extended period, but also resulted in the release of minute quantities of radioactive gases generated from the resulting nuclear fission, thus causing plant workers, rescue personnel, and surrounding residents to be exposed to radiation and resulting in the death of two workers who had suffered from high levels of radiation exposure.

In the handling of this accident the existence of several problems which included a delay in gaining a proper understanding of the circumstances of the accident during the early stages became clear, and to address these problems the Special Law of Emergency Preparedness for Nuclear Disaster was passed and revisions were made to the Law for the Regulations on Nuclear Source Material, Nuclear Fuel Material and Reactors (hereinafter referred to as the ‘Nuclear Reactor Regulations Law’) to make the fundamental changes needed to strengthen our preparedness for dealing with nuclear disasters and related safety regulations.

In the time following the passage of the Special Law of Emergency Preparedness for Nuclear Disaster, a great deal of work has been done to improve the effectiveness of disaster control procedures. The national government has established off-site centers located in each of the areas in which nuclear power facilities are located and now provides financial aid for use by local governments for the stocking of disaster control materials and equipment, the holding of disaster response drills, and other similar purposes. Revisions have also been made to the Basic Plan for Disaster Control describing measures to be implemented in cases of nuclear accidents.

Local governments, on the other hand, are revising their local disaster preparedness plans and stocking disaster preparedness equipment and materials and conducting disaster response drills with the help of aid from the national government.

As part of the disaster response drills being conducted in accordance with the Special Law of Emergency Preparedness for Nuclear Disaster, general nuclear disaster response drills are now conducted each year with the participation of the Prime Minister and other cabinet ministers, related government ministries and agencies, local governments, utilities, institutes and local residents.

(2) On the problems of negligence and improper record keeping in the performance of testing and inspections at nuclear power plants

In August 2002, it was discovered that there was a suspicion that there had been falsifications in the records of the repairs performed and of the results of inspections performed during routine voluntary inspections over the period from the late 1980s to the 1990s at three TEPCO nuclear power plants. It was also discovered that falsifications had occurred in the performance of inspections of the rate of leakage occurring in nuclear storage containers at the TEPCO Fukushima Dai-ichi Nuclear Power Plant Unit No.1.

To prevent these problems from reoccurring and to establish a code of safety regulations in keeping with international standards, the Japan Nuclear Energy Safety Organization (JNES) Law was passed to create the JNES as an independent administrative agency and revisions were made to the Electric Utilities Law and the Nuclear Reactor Regulations Law which provided for clearer identification of the responsibilities of utilities and stronger government checks and stricter double-checking to be performed by the Nuclear Safety Commission. These new regulations all came into effect in October 2003.

To deal with the problems raised by the falsification of records at TEPCO, the AEC held the Conference for Public Participation and Decision Making for Nuclear Energy Policy in Tokyo in November 2002 under the title of *Are you getting the information you want?: An examination of the problems associated with the falsification of records at TEPCO*, and in the city of Saitama in October 2003 another conference was held under the title of *Looking at this summer's electric power crisis: The issue of stable supplies as viewed from the electric power consuming regions*.

(3) Long-Term Program for Research, Development and Utilization of Nuclear Energy

(Round-Table Conference on Nuclear Power Policy)

In December of 1995, an accident involving a sodium leak at the Monju fast breeder reactor (hereinafter referred to as the 'Monju accident') operated by the former Power Reactor and Nuclear Fuel Development Corporation (now the Japan Nuclear Cycle Development Institute) led to a sharp increase in concern and distrust amongst ordinary citizens and served as a stimulus for the voicing of many opinions, demands, and proposals on safety at the Monju plant.

Then in response to proposals from the governors of the three prefectures of Fukushima, Niigata, and Fukui, in March of 1996 the AEC established the Round-Table Conference on Nuclear Power Policy in order to obtain various opinions of people from all areas and walks of life and reflect them in future nuclear power policy. Proposals from conference meetings held in June and October of that same year were then submitted to the AEC, and in response to these proposals the AEC decided to promote disclosure of information on nuclear power, to promote the participation of ordinary citizens in the formulation of policy, and to hold new round-table conferences.

New round-table conferences were held five times in 1998 and seven times in 1999, and a total of 83 invited speakers participated in these meetings. These new round-table conferences were held with the aim of providing a place for people from the general public with a wide range of different viewpoints to speak freely in an open forum about different types of problems, events, and controversies surrounding nuclear power and to reflect the concerns voiced in actual policy. In February 2000, the discussions at these new round-table conferences were used by the moderator of the Round-Table Conference on Nuclear Power Policy as a basis from which to create a set of proposals, and these proposals were then incorporated into discussions directed towards the creation of the Long-Term Program for Research, Development and Utilization of Nuclear Energy.

Throughout the original and new round-table conferences a wide range of people were invited from amongst those supporting, opposing, or neutral to nuclear power and this resulted in lively ongoing discussions, but there were also times when those in support and those opposing overcame their differences to find points of agreement or similar attitudes on given issues, and we believe that these conferences made it possible for the dialogue to proceed further than in the past and for a deeper level of discussion to be reached.

(Long-Term Program)

The Long-Term Program as set forth by the AEC serves as the basic framework upon which nuclear power policy is formulated in Japan, and it is upon this basic framework that the cabinet and individual government agencies and ministries build in the planning and proposal or the implementation of actual policies. In recognition of the changes in circumstances which have occurred since the time of the creation of the Long-Term Program in 1994, and with the objective of identifying the basic policies and methods of implementation which ought to be adopted by the nation in the twenty-first century to promote the research, development, and utilization of nuclear power to the Japanese people, to international society, and to people involved in the nuclear power industry, in May 1999 the AEC decided to create a new Long-Term Program and entrust the Long-Term Program

Planning Committee (hereinafter referred as the 'planning committee') with the task of performing studies and holding talks towards the creation of such a plan.

In recognition that all discussion must take place against the background of the concerns and distrust on the part of the people towards nuclear power which have arisen as a result of the Monju accident and all the other accidents and scandals which have occurred in the industry, the planning committee has worked to provide people from all areas and walks of life with the opportunity to participate in wide and free-ranging discussions and to make the process whereby policy decisions are made a more transparent one. To achieve the former goal the planning committee has been formed not just from people involved in the nuclear power industry but rather consists of 35 members chosen for the influence in law, the mass media, business and finance, local surrounding communities, and other areas, and in summarizing its findings the committee has striven to incorporate into the Long-Term Program the views expressed in 1,190 statements from 773 persons received in response to open calls for statements from the general public and the views expressed directly by a total of 31 persons in the opinion hearings held publicly in three locations nationwide.

To achieve the latter goal, in addition to opening to the public all of the 16 planning committee meetings and the 6 subcommittee meetings (with 115 members and a total of 57 meetings) held for the discussion of individual critical issues, the materials used in discussions and detailed minutes of the meetings have been made publicly available through the Internet and other media. It was thus after the completion of this process that the AEC finally released its Long-Term Program in November 2000.

(4) Work being performed towards an improved mutual understanding between the government and the people

The Long-Term Program notes that the basic prerequisites for any nuclear power policy are that a greater emphasis than ever before must be placed on relations with ordinary people and society as a whole, that it is necessary to have the public's trust, and that it is necessary to ensure the common well-being of both plant operators and the communities in which plants are located. The circumstances with which nuclear power policy is now faced are severer than ever, and there is a serious need for efforts to be made to rebuild a relationship of trust with the people and with society as a whole.

To see that these needs are met, the AEC has established the Conference for Public Participation and Decision Making for Nuclear Energy Policy with the objective of working to increase the participation of ordinary citizens in the process of the formulation of nuclear power policy and of making it possible to identify and implement the kind of policies needed in order to establish a relationship of trust with the general public with respect to such policies. The AEC also sponsors core-member meetings of the Conference for Public Participation and Decision Making for Nuclear Energy Policy attended by people from academia, journalists, opinion leaders, and other people with a wide range of different backgrounds, and it is otherwise involved in the holding of local conferences and performing planning and conducting studies of a wide range of measures designed to increase the participation of average citizens in the formulation of nuclear power policy.

Conferences in the series of Conferences for Public Participation and Decision Making for Nuclear Energy Policy have already been held thus far in the cities of Tokyo, Aomori,

Tsuruga, and Saitama and in Kariwamura in Niigata Prefecture, and plans calls for additional conferences to be held several times each year.

In addition to work such as this, national and local government organizations are also working to create programs to provide aid for the holding of symposiums and education and are otherwise involved in a wide range of work designed to ensure a better mutual understanding of nuclear power policy.

Table 1: Main activities of the Conference for Public Participation and Decision Making for Nuclear Energy Policy

July 3, 2001	Conference for Public Participation and Decision Making for Nuclear Energy Policy created
January 15, 2002	Conference for Public Participation and Decision Making for Nuclear Energy Policy in Kariwa (Site: Kariwamura Elderly Social Center) <ul style="list-style-type: none"> · <i>What kind of lifestyle would be best to allow us to use energy more carefully?</i> · <i>What is required of a system for energy supply?</i> · <i>What is presently required of nuclear energy?</i>
July 24, 2002	Conference for Public Participation and Decision Making for Nuclear Energy Policy in Tokyo (Site: Shufu Kaikan Plaza F) <ul style="list-style-type: none"> · <i>What would be best in terms of energy supply and demand in Japan?</i> · <i>Do we need nuclear power or not?</i> · <i>The formulation of nuclear power policy and its relevance to ordinary citizens</i>
November 19, 2002	Conference for Public Participation and Decision Making for Nuclear Energy Policy in Tokyo (Site: Tokyo Women's Plaza Hall) <ul style="list-style-type: none"> · <i>Are you getting the information you want? An examination of the problems associated with the falsification of records at Tokyo Electric</i>
March 15, 2003	Conference for Public Participation and Decision Making for Nuclear Energy Policy in Aomori (Site: Kadaru Men & Women's Joint Participation Plaza) <ul style="list-style-type: none"> · <i>Are you getting the information you want? Thinking about the nuclear cycle</i>
June 28, 2003	Conference for Public Participation and Decision Making for Nuclear Energy Policy in Tsuruga (Site: Aiai Plaza Social Center) <ul style="list-style-type: none"> · <i>Nuclear power and local communities: Thinking about the positive and negative effects of nuclear power on local communities</i>
October 14, 2003	Conference for Public Participation and Decision Making for Nuclear Energy Policy in Saitama (Site: Rafre Saitama) <ul style="list-style-type: none"> · <i>Looking at this summer's electric power crisis: The issue of stable supplies as viewed from the electric power consuming regions</i>

(5) What needs to be done to regain public trust

Beginning with the Monju accident, a whole series of accidents and incidents have occurred which have had a major social impact. This has resulted in a significant loss of public trust in nuclear power, and the question of how to regain the public's trust is an important issue which must be taken into consideration when formulating nuclear power policy for the twenty-first century.

To regain public trust in nuclear power, in addition to ensuring that nuclear safety regulations are strictly observed to restore public confidence in safety, it has also become important for the national government and utility operators promoting the use of nuclear power and residents of areas around power plants and other ordinary citizens to reach a deeper level of mutual understanding. In regards to the first of these objectives, the JCO nuclear accident and the discovery of laxness and negligence in testing and inspections at nuclear power plants has served as a stimulus for the passage of new laws and the revision of existing laws on nuclear safety as well as a stimulus for many other reforms, and strict safety regulations of the kind needed to meet citizens' demands are now expected to be implemented. As for the second of these objectives, in order to obtain a mutual understanding with the people the national government must perform 'extensive public hearing activities' in which it adopts the people's point of view and then proceeds from there by conducting a dialogue with the people in a search for a mutual understanding.

The Conference for Public Participation and Decision Making for Nuclear Energy Policy plays a main role in these activities, and the national government and power utilities should follow these conferences by an even broader range of public conferences and hearings. The AEC aims to use the results as part of a process of reflecting varied opinions of people from all areas and walks of life in nuclear power policy.

3. The nuclear fuel cycle

(1) Recent developments in nuclear fuel cycle projects

In making it possible to handle all stages of the nuclear fuel cycle domestically within Japan it is vital that the preparations for doing so be made carefully with the understanding of local communities, and work towards that end is being performed by the national government and utility operators.

(Reprocessing plants)

In February 2002, water leaks were discovered in a fuel storage pool for the pressurized water reactor (PWR) at a spent fuel processing and storage facility at the Japan Nuclear Fuel Limited Rokkasho reprocessing plant (hereinafter referred to as the 'Rokkasho reprocessing plant'), and in November of the same year it was announced an investigation into the causes of the problem had revealed that improper welding had been the cause of the incident. To deal with this and other problems, in September 2003 Japan Nuclear Fuel Limited moved the scheduled date for the completion of the Rokkasho reprocessing plant to July 2006.

In regards to this incident, in recognition of the fact that it is necessary to take all relevant measures to ensure safety at reprocessing facilities, the AEC considers this change in schedule to have been a necessary measure. We also believe that in addition to Japan Nuclear Fuel Limited working to obtain the understanding of the local community and placing the highest possible priority on safety in careful preparation for the beginning of operations, the AEC should continue to work through extensive public hearing activities to achieve a better level of understanding.

(The Pluthermal plan)

Ever since the earliest days of using nuclear power to generate electricity in Japan, research and development work has continued to be performed on Pluthermal (Plutonium-thermal) technology, in which plutonium-uranium mixed oxide (MOX) fuels are burned in light-water reactors. Ever since the announcement of the Pluthermal plan in 1997, electric utility companies have continued to work towards its implementation, and at one time local government approval had been issued on the basis of a safety agreement for Pluthermal projects at TEPCO's Fukushima Daiichi and Kashiwazaki-Kariwa nuclear power plants and Kansai Electric Power Company's Takahama nuclear power plant.

In line with the provisions of the Nuclear Reactor Regulations Law, authorization for the use of MOX fuel was issued by the Minister of International Trade and Industry in December 1998 for units 3 and 4 at the Takahama nuclear power plant, in July 1992 for unit 3 at the Fukushima Daiichi nuclear power plant, and in March 2000 for unit 3 at the Kashiwazaki-Kariwa nuclear power plant.

Problems arose, however, when it was discovered in September 1999 that data on MOX fuels from BNFL scheduled to be used at the Takahama power plant had been falsified, thus resulting in a loss of trust on the part of residents of areas around the plants where the Pluthermal plan was to be implemented and on the part of the general public, and because of this and the need to make improvements to the import inspection procedures for MOX fuel at Tokyo Electric's two plants, the implementation of the pluthermal plan was postponed. This was then followed by reports of a scandal involving improper record keeping on voluntary inspections at TEPCO which led to a meeting being called in Niigata Prefecture in September 2003 between the prefecture's governor, the mayor of Kashiwazaki, and the mayor of Kariwa in which it was agreed to withdraw the original approval for the plan. In Fukushima prefecture, the governor announced at a prefectural assembly held that same month that all support for the plan would be withdrawn.

The national government has played a leading role in promoting the Pluthermal plan by creating and distributing easy-to-understand explanatory materials describing the need for Pluthermal as part of nuclear fuel cycle energy policy, by working to provide more and better energy education, by holding symposiums designed to help improve the understanding between residents of areas around power plants and residents of areas of electric power consumption, and by establishing government representative offices in power plant areas.

The AEC views the light-water reactor cycle including Pluthermal technology as the first step towards the establishment of the nuclear fuel cycle and will continue to work with the understanding of local communities towards the realization of that goal.

(2) Disposal of radioactive wastes

The disposal of high-level radioactive wastes consisting of vitrified fission products from spent nuclear fuel which is created during reprocessing is currently performed in accordance with the Law on the Final Disposal of Designated Radioactive Wastes. This law establishes procedures for the establishment of waste disposal organizations, ways of obtaining funding for disposal, the selection of disposal sites, and otherwise sets forth a framework for a radioactive waste disposal operation.

The Nuclear Waste Management Organization of Japan (NUMO), the entity responsible for the disposal of radioactive wastes, was established and certified by the government in October 2000, and in December 2002 NUMO began issuing calls amongst cities, towns, and villages nationwide as a preliminary exploratory step towards the selection of a disposal site.

By 2000, the AEC had already completed work on its basic policy for the processing and disposal of transuranic (TRU) wastes, uranium wastes, radioisotope (RI) wastes, and wastes from research facilities, and at the current time work is now proceeding on the formulation of a basic policy on safety regulations governing the disposal of such radioactive wastes.

(3) An examination of the nuclear fuel cycle

As a result of incidents such as the falsification of testing and inspection records at TEPCO's nuclear power plants and the issuing by the Kanazawa branch of the Nagoya High Court of the verdict in January 2003 revoking the government permit for the construction of the Monju reactor, questions from a broad range of quarters have come to be raised against the nuclear fuel cycle.

In response to these events, over the period from November 2002 to June 2003 the AEC held a series of the Nuclear Fuel Cycle Study Conference meetings. The views expressed in these conference meetings were then taken into consideration to produce the Nuclear Fuel Cycle report summarizing the AEC's views on the importance of and issues related to the nuclear fuel cycle to present the AEC's ideas to the public at large.

The AEC shall continue to take advantage of every opportunity to engage in discussions with local residents of areas with nuclear facilities and the public at large about the question of why the nuclear fuel cycle is important to Japan's future energy policies and the question of why a nuclear fuel cycle is needed.

(4) The importance of and issues facing the nuclear fuel cycle

(The importance of the nuclear fuel cycle)

The reasons for the introduction of a nuclear fuel cycle are because using the plutonium generated in nuclear reactors which constitutes an energy resource produced entirely in Japan together with the leftover uranium which remains unused after not undergoing nuclear fission makes it possible to make effective use of resources and because doing so would make Japan, a nation highly susceptible to fluctuations in energy supplies, less reliant on other sources of energy. It may also be argued that the adoption of such a policy would also demonstrate to the world our constant commitment to reducing our dependency on foreign energy, and this in

turn could serve to improve our bargaining position in securing supplies of energy resources from overseas.

Additionally, with a nuclear fuel cycle using fast breeder reactors (i.e., a fast breeder reactor cycle), usage efficiencies could be improved dramatically by over 100 times those possible under a direct disposal system in which spent fuel is disposed of as waste. When viewed from the standpoint of making efficient use of resources, the establishment of a fast breeder reactor cycle may therefore be viewed as an alternative energy technology which represents the ultimate goal in energy technologies.

(The economics of the nuclear fuel cycle)

In an estimate of the cost of generating electricity from nuclear power when Plutothermal technology is introduced under certain conditions, the Agency for Natural Resources and Energy calculates that the cost would be lower than that for generating electricity from thermal-fired, hydroelectric, or other electric power generation systems. In contrast to this, according to figures from the OECD Nuclear Energy Agency, it is estimated that the total cost of generating electricity when spent fuel is disposed of directly would be reduced by about 2.3% from the cost in the case of nuclear fuel cycle.

However, when discussing policy from a long-term perspective, it is important to select policies in accordance with national conditions, and to view things not only in economical terms such as the cost of generating electricity but to take a broader perspective which includes things which are difficult to quantify economically such as energy security, the efficient use of energy resources, environmental compatibility, and national security.

As the electricity market becomes more and more deregulated, we must carefully study, analyze, and evaluate the situation, and we must know how to take appropriate measures in order to proceed smoothly with the development of nuclear power generation and with the establishment of a nuclear fuel cycle. In order to do so, it is necessary that the issues are discussed on the basis of a common knowledge between the parties concerned, and that information be disclosed on estimated costs and related issues in the future. The Advisory Committee for Natural Resources and Energy is currently performing a study for the analysis and evaluation of cost structures related to all types of backend utilities and of the profitability of nuclear power generation as a whole, and when problems arise which may affect the very foundations of nuclear energy policy, the Atomic Energy Commission will actively engage in discussions of basic policy.

(Future prospects for the nuclear fuel cycle)

When examining the prospects for the future development of the nuclear fuel cycle, it is proper to divide the development process of nuclear energy use in Japan into three stages and to examine forecasts of the completion of each stage.

The first stage is the commercialization of a nuclear power plant using a light-water reactor. At the present time, there are 52 light-water reactors in operation, including state-of-the-art advanced boiling water reactors (ABWRs). We accordingly conclude that the first stage has already been completed.

Table 2: Electricity generation costs over duration of operation for nuclear power and other types of power in Japan

Power Costs calculated on a trial basis under certain assumptions, using hypothetical model plant starting operation in FY1998

- For the purpose of comparison, and based on past results, an operating period of 40 years is applied for all power sources, along with a capacity factor of 80% (except for hydropower generation).

<<Estimated costs>>

Power Source	Nuclear power	Hydroelectric power	Oil-fired thermal	LNG-fired thermal	Coal-fired thermal
Power cost (yen/kWh)	5.9	13.6	10.2	6.4	6.5

Source: A Report of the 70th Nuclear Energy Subcommittee, Advisory Committee for Energy, December 1999.

Note: Power costs as described in an Application for Permission to Install a Reactor are calculated on different assumptions from those supporting the above figures; for example, an operating period of 16 years and 70% capacity factor.

Table 3: An evaluation of the economics of the nuclear fuel cycle

(From an evaluation performed by the OECD Nuclear Energy Agency*)

- Comparison of the costs for a hypothetical pressurized water reactor (PWR) beginning operation in 2000 between case in which spent fuel is reprocessed and plutonium is used (reprocessing) and case in which fuel is disposed of directly without reprocessing (once-through)
- Results of comparison (Where cost of electricity generation in once-through case is set to '1')

	Electricity generation cost	
		Fuel cost
Once-through	1	0.15–0.25
Reprocessing	About 1.015–1.025	About 0.165–0.275

Note 1: The cycle cost in the case of reprocessing is evaluated as being 1.1 times the cycle cost in the case of a once-through system.

Note 2: The term 'cycle cost' refers to the cost of concentration, reprocessing, fuel extraction, and related processes and corresponds to about 15–25% of the cost of electricity generation.

* OECD/NEA: The Economics of the Nuclear Fuel Cycle (1994)

The second stage is the establishment of a light-water reactor cycle, namely commercial reprocessing performed by private enterprises and use of Plutothermal technology; at the present time, we are at the beginning of the second stage. In this regard, there are some who say that after storing spent fuels for a period of several decades or so, we can afford to make the decision whether to choose to adopt a reprocessing fuel cycle or choose the direct disposal option instead in consideration of the social conditions and technological developments at that time. However, even if that decision were to be made in the future, preparations must begin now because once the policy decision has been made we would need to take into consideration the long period of preparation and the considerable costs which would be involved until the time when the policy was actually implemented. Therefore in order not to place a burden on future generations, the making of the decision should not be postponed.

The third stage is the establishment of a fast breeder reactor cycle through the introduction of fast breeder reactors. We believe that in terms of energy security and other related issues it is desirable to proceed to the third stage of a fast breeder reactor cycle as soon as possible by working to make the practical use of fast breeder reactors an achievable goal and by using the experience to be gained from the second stage of the light-water reactor cycle.

(Plutonium use)

In implementing a nuclear fuel cycle, as a leading nation in the world of nuclear power generation and as a non-nuclear-weapon state, we should provide clear information on the need for and the safety of plutonium, and in regards to our use of plutonium, we are committed to the formulation and implementation of specific policies designed to increase the transparency of our plutonium programs based on our principle of not retaining surplus plutonium supplies.

This is especially important in the case of the Rokkasho reprocessing plant since once the plant goes into operation, considerable quantities of plutonium will be extracted and reclaimed, and in order to increase transparency as required for peaceful use when proceeding with the use of plutonium, the AEC has set forth a policy whereby utilities shall publicly release their plans for plutonium use before beginning reprocessing so as to show evidence providing clear indications that the only purpose for which plutonium is to be used is for peaceful use.

(5) Work being performed in relation to the Monju fast breeder reactor

Of all the technological options available designed to solve the energy problems of the future, fast breeder reactor cycle technology is one of the most promising options in terms of its underlying potential. This is especially true in the case of the Monju reactor, where achieving the expected results of proving its reliability as an electric power generation plant and establishing technologies for the handling of sodium from the experience in operating the plant makes the Monju reactor serve as a basis of comparison for all other technological options, and it is for this reason that we consider placing a higher priority on these goals and working towards their achievement to be especially important to future research and development.

In January 2003, the Kanazawa branch of the Nagoya High Court issued a verdict revoking the construction permit for the Monju reactor. The Minister of Economy, Trade and Industry, declaring the verdict to be unjustified, appealed the decision to the Supreme Court later on in the same month.

The Ministry of Education, Culture, Sports, Science and Technology, as part of its work to promote the Monju project and with the objective of working to fulfill its obligation to provide an explanation to the public, began to hold meetings and symposiums and to dispatch instructors and undertake other types of grass-root activities.

In regards to the Monju project, the AEC believes that a serious and dedicated effort ought to be made to ensure sufficient safety and then to enhance the understanding of the public while maintaining a clear recognition of the goal of the project to prove the facility to be technologically sound as an electric power plant, and we are currently providing our cooperation in these activities.

(6) Working towards the establishment of a nuclear fuel cycle

When one views the facts from a long-term perspective, since the nuclear fuel cycle is capable of playing a major role in ensuring stable supplies of energy and since it will take many years for the cycle to be established, even as we maintain flexibility in terms of the speed at which the project is implemented, we ought to work to make steady progress towards the goal of making the nuclear fuel cycle a reality while continuing to work towards information disclosure and working to deepen a mutual understanding with the public, assuming that the basic prerequisites of ensuring safety and nuclear non-proliferation can be met.

As part of this larger effort, the fact that the Nuclear Waste Management Organization of Japan (NUMO)—the entity to be responsible for the disposal of high-level radioactive wastes—has been established and the fact that NUMO has begun issuing calls to prospective sites as a preliminary exploratory step towards the selection of a disposal site serve as milestones along the path of progress to solve the major problems for the establishment of a nuclear fuel cycle.

Furthermore, the Monju project and other fast breeder reactor cycle projects represent technologies which will have the revolutionary effect of being able to dramatically improve uranium usage efficiencies, and it is necessary that we continue with research and development work directed towards the practical use of these technologies.

4. Research and development work on the creation of innovative nuclear power technologies

(1) The ITER project

The International Thermonuclear Experimental Reactor (ITER) project is a joint international project undertaken with the objective of demonstrating the scientific and technological feasibility of using nuclear fusion energy for peaceful purposes.

In December 1996 the AEC set up the ITER Project Committee in order to discuss how to progress the ITER project ought to be conducted in Japan, and a committee report was published in May 2001. In response to this report, with the objective of attracting the ITER project to Japan and in recognition of the need for site selection surveys to be performed and talks to be held with other ITER project members, in June of the same year the AEC made the decision that the results of past studies and the progress of ongoing ones ought to be taken into account in the making of all necessary decisions.

Based on the findings of the studies performed by the AEC, in June 2001 the Council for Science and Technology Policy began its own study to consider questions from the perspective of scientific and technological policy, questions which included determining the importance of the participation of Japan in the ITER project and the meaning of attracting the project to Japan and determining who ought to pay for the cost of the project. Then in May 2002 a set of conclusions were drawn up stating that in addition to offering full government support for the project, the government ought to select the optimal candidate sites for the project and engage in talks with other governments with an eye to attracting ITER to Japan. It was further stated that the distribution of the costs amongst participating nations ought to be calculated in accordance with the relative sizes of their economies. In the same month, agreement by the Cabinet was given to the selection of Rokkashomura in Aomori prefecture as the Japanese candidate site and to the proposal of its selection in intergovernmental talks.

Future plans call for the completion of talks between project participants on the selection of a site sometime by the end of this year, for work to proceed on studies of technical issues related to the proposed ITER Joint International Agreement, and for the establishment of an international organization for the construction of ITER as early as sometime within the 2004 fiscal year.



Figure 4: International candidate ITER sites

(2) Research and development of innovative nuclear power systems

In order to meet future energy demand and meet society's needs, research and development work on innovative nuclear reactors and innovative nuclear fuel cycle technologies is being performed in many countries around the world. Just as with large-scale research and development projects in other areas, in research and development in this field as well, it has become a commonly accepted practice to split the costs incurred in terms of resources and personnel across multiple countries and share the benefits together rather than to try to develop them within a single country alone.

There are currently two major international programs for the development of innovative nuclear power systems: the Generation IV International Forum (GIF) and the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO).

In Japan, a wide range of different types of research and development in innovative nuclear power systems is being performed at national, private-sector, and academic research institutions, and the Ministry of Education, Culture, Sports, Science and Technology and Ministry of Economy, Trade and Industry have implemented public research programs to promote cooperative work on the research and development of innovative nuclear power systems by government, industry, and academia.

In recognition of the existence of these trends in Japan and abroad and in recognition of the need for innovative nuclear power systems and the expectations of society towards such systems, the AEC has established an Innovative Reactors Study Committee under the AEC Specialized Subcommittee on Research and Development to study what research and development for such systems should be performed and to produce a summary describing in general detail some of the most promising systems to be developed; this subcommittee has also produced a report summarizing some of the important issues which must be addressed in research and development.

(3) The creation of a new government organization for nuclear power research and development

Until now the Japan Atomic Energy Research Institute and the Japan Nuclear Cycle Development Institute (hereinafter referred to as 'JAERI' and 'JNC') have played a central role as special public corporations involved in atomic energy research and development working in accordance with our Long-Term Program, but as part of a larger program of administrative reforms implemented following the reorganization of central government agencies and ministries, in December 2001 a *Plan for the Reorganization and Rationalization of Special Public Corporations* was adopted as a cabinet decision. The plan states, "The draft law for the new organization designed to integrate the JAERI and JNC as an incorporated administrative agency for comprehensive research and development of atomic energy should be submitted to the Diet by fiscal year 2004."

In response to this decision the AEC issued a policy report in April 2004 entitled *Basic Policy on the Elimination and Integration of the Japan Atomic Energy Research Institute and the Japan Nuclear Cycle Development Institute and their Reestablishment as an Independent Administrative Agency*, which noted that it was important not only for the new independent administrative agency to play a central role in atomic energy research and development, but

also for it to continue to play its role as an innovative, unified, and comprehensive institute for research and development.

Meanwhile, the Ministry of Education, Culture, Sports, Science and Technology established the JAERI/JNC Integration Preparatory Committee, in which discussions were held based on the basic policy proposals submitted by the AEC, consultations with the AEC and the Nuclear Safety Commission of Japan (NSC), and opinions were called for from experts and others in industry, academia, and people from municipalities where nuclear power plants are located and others to hear a broad range of opinion. This resulted first in the release of the *Basic Report on the Integration of the Japan Atomic Energy Research Institute and Japan Nuclear Cycle Development Institute* in August 2002, which was followed by a summary report entitled *Report on the Integration of the Japan Atomic Energy Research Institute and Japan Nuclear Cycle Development Institute* in September 2003, which described the basic thinking behind the plan, the basic philosophy behind the establishment of the new organization, the mission of the new organization, a description of its work, the directions to be pursued, and what the structure and the form of operation of the new organization should be.

The government and the JAERI and JNC must make the preparations needed in order to establish the new agency in accordance with the results of these past studies, and the AEC remains committed to working on the integration of the JAERI and JNC.

(4) International frameworks for research and development

Because nuclear energy research and development generally requires the use of large-scale devices and equipment, it requires large amounts of funding. Projects also usually take place over long periods of time. Therefore, international frameworks for research and development are now being constructed in order to conduct projects such as the ITER project. For Japan, it is important to conduct research and development in conjunction with international activities.

When participating in cooperative international efforts to perform research and development, it is necessary to play a leading role in R&D and in the development of commercial applications in order to obtain results commensurate with the investments made. To play such a role and to provide whatever scientific or technological expertise we possess in any given field to contribute to a project being conducted as a joint international effort, it is important that any research and development work being performed domestically be conducted in close coordination with the joint international project.

The newly established independent administrative agency for the conduct of nuclear research and development will become the largest institute in this field in Japan. This agency should build upon the results of past R&D investment to play a leading role in nuclear research and development internationally as well.

5. International developments in nuclear power

(1) Conditions in different regions throughout the world

(The United States)

In May 2001, President Bush announced his National Energy Policy. Set against the background of the California energy crisis and other similar events, it set forth the five goals of modernizing conservation, modernizing energy infrastructure, increasing energy supplies, accelerating the protection and improvement of the environment, and increasing national energy security as the basis from which a wide range of policies were to be implemented. Nuclear energy was assigned an important role in ensuring national energy security and reducing greenhouse gases, thus providing an indication of the government's strong support for the promotion of nuclear energy.

In addition to this, following procedures required by the amended Nuclear Waste Policy Act, a decision was passed in July 2002 to build a high-level nuclear waste repository at Yucca Mountain in Nevada.

(Europe)

While there are some nations in Western Europe which are actively pursuing nuclear power as a means of generating electricity, there are also other nations which have decided to end the use of nuclear power in stages, and differences can be seen in the attitudes of these different nations. Progress has already been made towards the integration of electricity markets in Europe, and when examining the work being performed in nuclear power it is important not to examine one country at a time but rather to examine Western Europe as a whole. Liberalization of the electricity market has also led to an increasing emphasis on economic efficiency.

In June 2002 the EU Commission released its final report on the Green Paper *European strategy for the security of energy supply* in which it states that nuclear power ought to be considered as one possible option as an energy source when viewed from the standpoint of the need to ensure supplies and reduce greenhouse gas emissions. As may be seen from the example of Finland, where the Finnish government decided to construct a new nuclear power plant in January 2002 and the decision was then approved by the Finnish parliament in April, in recent years moves towards promoting nuclear power may be seen.

In Russia, the nuclear power industry is seen as one of the leading industries in earning foreign currency, and a great deal of energy is being committed to developing foreign business. Russia is currently involved in uranium enrichment and the export of uranium fuel to foreign power plants and it is also providing assistance to China, Iran, and India in the construction of nuclear power plants. A bill has also been passed by the Russian Duma which would make it possible to provide intermediate storage or reprocessing services for spent fuel from other nations or nuclear fuel leasing services in which nuclear fuel produced in Russia may be returned to Russia after it has been used, and this bill was then signed in July 2001 by President Putin to take effect as law.

As for middle and eastern Europe, not only is the entire region with the exception of Romania extremely poor in oil resources, in spite of the plentiful amount of coal which can be

produced, the problem of carbon dioxide emissions and the need to deal with this and other environmental issues have made it difficult to make aggressive use of these resources, and the attitude towards nuclear power is a positive one.

(Asia and the Middle East)

With an eye to fostering the growth and development of its nuclear power industry, South Korea has announced its backing for the South Korean standard nuclear reactor design, and in addition to this work is also being done on the development of a 1.4-million-kW next-generation pressurized water reactor (PWR). This is not directed only at domestic markets but is rather also being performed with the intent of exporting technologies and equipment and—over the long term—exporting whole plants as well. The handling of radioactive wastes, however, is another matter, and the selection of candidate sites for intermediate storage facilities and disposal sites remains as an issue which has yet to be addressed.

In its tenth five-year plan, China includes no concrete figures concerning nuclear power but instead states simply that, “nuclear power shall be developed to an appropriate degree.” However driven in part by the effects of the heat wave of last summer and the serious shortages in electricity supplies which have occurred, the People’s Congress has issued preliminary approval for the construction of four nuclear power plants.

As a result of the reemergence of serious fears on the part of the international community in regards to North Korea’s nuclear weapons development program, the Korean Peninsula Energy Development Organization (KEDO) light-water reactor project in North Korea was brought to a temporary halt for a period of one year beginning from December 2003 at the decision of the executive board of KEDO showing that it would not be appropriate to continue with the light-water reactor project under current circumstances.

As for Iran, in response to reports revealing that a uranium enrichment facility and heavy water production facility are being constructed, the world community has demanded that Iran cooperate fully with the IAEA and sign new agreements and conform fully with the terms of those agreements.

(2) Work being done to address international issues

(Steps being taken against nuclear terror)

As a result in part of the terrorist attacks which occurred in the United States on September 11, 2001, the level of concern about possible terrorist attacks on nuclear facilities has increased significantly. While there do exist measures for the protection of nuclear materials by power utilities in nuclear facilities in Japan as required under the Nuclear Reactor Regulations Law, in consideration of the terrorist attacks of September 11 further and stricter measures have been imposed and steps have been taken to strengthen security through the use of police and security forces.

The G8 has recognized the need for measures to be taken against terror at both the 2002 Kananaskis summit and the 2003 Evian summit. In the latter summit a G8 statement and action plan on securing radioactive sources were released.

(Nuclear non-proliferation)

The maintenance of existing frameworks for nuclear non-proliferation is an extremely important issue not only in terms of security but also in terms of smoothing the path towards the peaceful use of nuclear energy. Many different international frameworks have been developed towards this end. These include the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the additional IAEA safeguards agreements which build upon the foundation laid by the NPT, and the Comprehensive Test Ban Treaty (CTBT).

Driven in part by suspicions of the existence of nuclear weapons programs in Iraq and North Korea, talks have been held on strengthening the IAEA safeguards. These talks have led to the development of the IAEA Additional Protocol. Japan was one of the first nations to sign this protocol, and at the 2000 IAEA conference Japan presented an action plan urging all nations to sign the protocol agreements. Working in cooperation with the IAEA, in December 2002 Japan hosted the International Conference on Wider Adherence to Strengthened IAEA Safeguards as part of its ongoing effort to promote wider adherence to the Additional Protocol.

Meanwhile, in October 2002 it was discovered that North Korea remained in possession of a nuclear weapons development program even after the formation of the Agreed Framework it had signed with the United States and North Korea in 1994, and this led to calls from Japan and other nations demanding a halt to any and all actual development. Viewing this matter as an extremely grave one, the AEC released a statement demanding that North Korea accept IAEA inspections without delay and bring an immediate halt to nuclear weapons development.

Ever since the seriousness of the issue was noted at the April 1996 Moscow Summit, the G8 and other organizations have continued to work on the issue of the disposition of plutonium from the dismantling of nuclear weapons by Russia and the United States. In Japan, the JNC has reached an agreement with Russia under which joint research is now being performed to produce MOX fuel from excess Russian plutonium and to burn this fuel using Russia's BN-600 fast reactor. It is Japan's hope that the use of this technology will lead to the earliest possible completion of the disposition of Russia's excess plutonium.

We are also working to proceed with joint projects to be conducted in cooperation between Japan and Russia for the dismantling of nuclear submarines in the Russian Far East which have been decommissioned as a result of the end of the Cold War; in the first such effort, an implementing agreement has been reached for the dismantling of a single Viktor III-class nuclear submarine, and other agreements related to this agreement have also been reached.

As a country committed to the principle that the use of nuclear power must be limited to peaceful use, Japan continues to play a leading role through these and other efforts to strengthen systems of safeguards against nuclear proliferation.

(Liability for nuclear damage)

While the assurance of safety is indispensable to any effort towards the development or use of nuclear energy, for the purpose of providing for the victims of any nuclear accidents which might occur in a worst-case scenario, a framework for the provision of compensation for nuclear damage was created with the passage of the Law on Liability for Nuclear Damage in 1962.

Outside of Japan, work on the formulation of international treaties on liability for nuclear damage has been performed by the IAEA, the OECD's NEA, and other international organizations. Representative examples of efforts to create a single unified legal framework on liability for nuclear damage include the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (i.e., the revised Vienna Convention), the Convention on Supplementary Compensation for Nuclear Damage, and the Paris Convention on Third Party Liability in the Field of Nuclear Energy (i.e., the Paris Convention), and it is the AEC's opinion that serious consideration ought to be given to the question of whether or not Japan become a signatory to these treaties.

6. A nuclear energy policy evaluation

(1) A nuclear energy policy evaluation

In order to ensure that nuclear energy policy meets with the expectations of the people, it is important to evaluate the policies at the of their implementation and that they be reviewed, revised, or terminated whenever it is necessary to do so. The AEC, through its General Planning and Assessment Subcommittee, accordingly monitors the results of measures taken in the implementation of the Long-Term Program which forms the basis of all other nuclear energy policy. It also regularly performs preliminary and post-implementation evaluation of all facets of nuclear energy policy through the subcommittee.

In addition to the evaluation performed by the AEC, the cabinet and individual government agencies and ministries also conduct their own regular policy evaluation in accordance with the Law on Assessments of Policy Performed by Government Organizations.

(2) Funding for nuclear energy and prioritization of research and development

The AEC works to obtain input concerning individual policies from related government organizations in regards to the need for such policies, their expected outcomes, and the results so far obtained in order to assess the conformity of AEC policies with the basic philosophy and basic policies for nuclear energy research, development and utilization as stated in the Long-Term Program and to determine whether or not steps are being taken towards their implementation, and whether or not steps have been taken towards prioritization, rationalization, and efficiency in accordance with the tight budgetary conditions of these recent years. It is from this stance that the AEC has produced a nuclear energy budget for the 2004 fiscal year.

In regards to the FY2004 estimated budget request, it should be noted that priorities have been assigned to all policies related to science and technology, including nuclear energy research and development. The assignment was made by evaluating and grouping those policies into four levels: S, A, B and C (i.e., 'SABC' priorities).

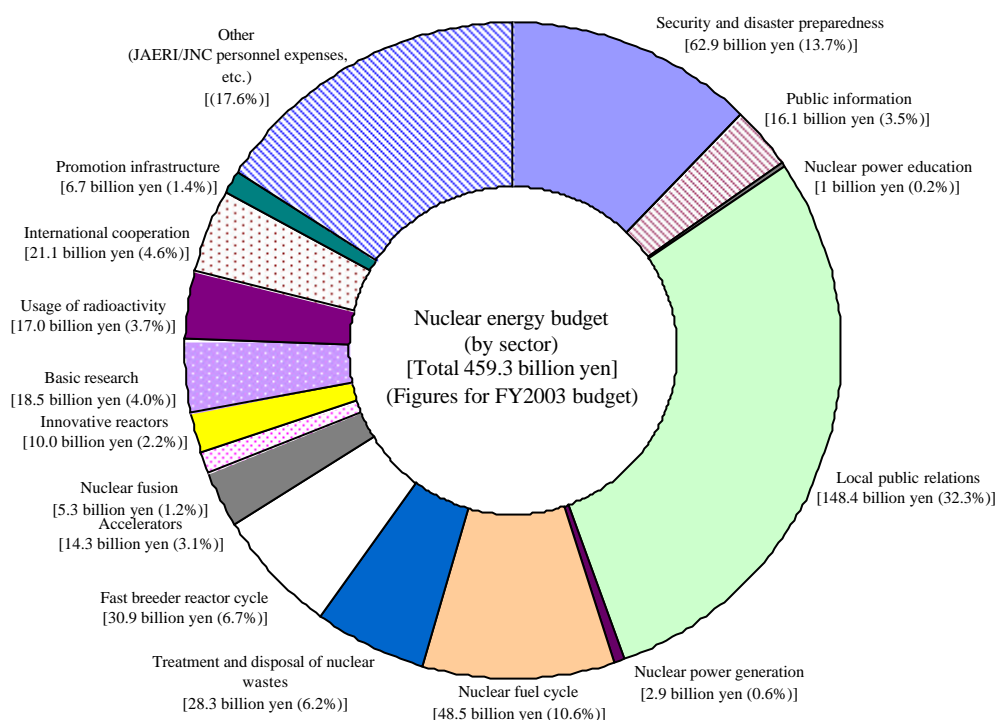


Figure 5: Nuclear energy budget (by sector)

7. The AEC and the future of nuclear energy policy

A look back at the developments in nuclear power of the past five years shows that the JCO accident, the falsification of testing and inspection records at nuclear power plants, and other incidents which have occurred over this period have resulted in a major loss of trust in nuclear energy on the part of the people, and this has had a serious effect on the execution of nuclear energy policy.

In regards to issues such as the carrying out of the pluthermal plan or the making of improvements to the Monju reactor, work on such projects may proceed only with the understanding of local residents and the public at large, and these projects are failing to proceed as originally planned.

While the AEC recognizes the severity of the conditions with which nuclear energy is now faced, in consideration of the role played by nuclear energy in ensuring energy security and its compatibility with environmental considerations, we believe that not only should nuclear energy occupy a position as one of the country's main sources of electric power, but also that the establishment of a nuclear fuel cycle in which spent fuel is reprocessed and recovered and in which plutonium, uranium can be effectively reused should form the basis of Japan's nuclear energy policy. We believe that we should continue to promote the implementation of this policy.

It is with this understanding that we believe that in order to proceed smoothly towards the establishment of a nuclear fuel cycle it is important that we relieve the concerns of the

people about nuclear energy and achieve a balance between local concerns and national nuclear energy policy.

Spurred on by the JCO accident and other events, those in and around the nuclear power industry have enacted many different types of reforms of laws and regulations designed to increase nuclear safety and design to improve confidence and regain public trust. However at this time of writing things can be said to be only half done.

In order to regain the public's trust in nuclear energy policy, we must continue to propose appropriate policies and fulfill our obligation to provide explanations to establish a broad-based trust amongst the Japanese public. In doing so we must examine questions such as what sort of policies the government should implement in order to find solutions to different types of issues and what the public's views are concerning given issues, and in examining such questions we must proceed through a dialogue based on objective data to attempt to reach a policy consensus. Until now, the policies put forth by the government have been framed in opaque language and have not been designed to answer clearly the questions of the people, and because of this there has been a tendency for them to be little more than passing statements. On the other hand, there have been some amongst those criticizing nuclear energy policy who have done so without a proper understanding of the issues which ought to be addressed by the government, and there have been times when the arguments of both sides have simply failed to meet.

Responding to the public's questions is the first step towards establishing a dialogue between the public and the AEC, and we believe that continuing to engage in a direct exchange of opinions between the public and the AEC is one possible way to establish such a dialogue. In addition, the AEC recognizes that the holding of meetings open to the public in which we can listen to citizens' views on issues related to nuclear energy is important for reaching a mutual understanding with the people.

We believe that an approach such as this would be meaningful not only towards the establishment of a nuclear fuel cycle, but also with respect to the promotion of nuclear energy policy in general, and it is our hope that by applying the same approach to other areas in nuclear energy we will be able to present policies which satisfy public expectations.

With the increasing extent of the liberalization of the electricity market, the integration of the JAERI and JNC, delays in development of the nuclear fuel cycle, moves towards an increased use of nuclear energy in the United States and other countries, and other related developments, the conditions facing nuclear energy have changed since those of November 2000 when the current Long-Term Program was first created, and we accordingly plan to conduct the studies needed in order to create a new long-term plan for nuclear energy.

Chapter 2: The state of nuclear power research, development, and utilization in Japan and around the world

Section 1: Nuclear energy policy in Japan

Section 2: Harmony between People, Society and Nuclear Energy

Section 3: Nuclear Power Generation and the Nuclear Fuel Cycle

Section 4: Diversified Development of Nuclear Science and Technology

Section 5: Utilization of Radiation Contributing to People's Lives

Section 6: Harmony between International Society and Nuclear Energy

Section 7: Foundation to Promote Research, Development and Utilization of Nuclear Energy

Part II: Supplementary materials