

An Overview of Japan's Nuclear Energy Policy¹

KONDO Shunsuke

Chairman, Atomic Energy Commission of Japan

Mr. Chairman, ladies and gentlemen.

It is a great pleasure and honor for me to be invited to this 22nd joint KAI F and KNS annual conference and to present an overview of Japan's nuclear energy policy. My talk this morning will be on the major policy elements across three different time frames, these are near-term, mid-term and long-term, after a brief introduction of basic policy objectives.

At the outset, however, I would like to emphasize that the research, development and utilization of nuclear energy in Japan has been promoted at all times, strictly limiting it to peaceful purposes. Japan has promoted the use of nuclear science and technology and nuclear materials in a manner that fully takes into account various requirements related to nuclear non-proliferation, fully ensuring international confidence and maintaining high transparency through faithful implementation of the IAEA comprehensive safeguards agreement and since 1999, together with the additional protocol. As a result, the IAEA has concluded the absence of undeclared nuclear material or activities in Japan since 2004, and based on this conclusion, the IAEA has implemented integrated safeguards since then.

Mr. Chairman, the Atomic Energy Commission of Japan decided in 2005 "the Framework for Nuclear Energy Policy", which was later decided by the Cabinet as a basic policy for the Government to promote research, development and utilization of nuclear energy in Japan. Two of the basic objectives of nuclear energy policy depicted in the Framework are; 1) to increase the contribution of nuclear energy to the stable supply of energy as well as to the reduction in carbon dioxide emissions with the basic goal of making the share of nuclear power in electricity generation after the year 2030 similar to or greater than the current level of 30 to 40%, by continuing to utilize light water reactors (LWRs), while replacing the old ones with advanced ones in the first half of this century and from around 2050

¹ Presented at the 22nd KAIF/KNS Annual Conference, held in Sheraton Grande Walkerhill Hotel, Seoul, Korea, 17 April, 2007.

onwards, switching to fast breeder reactors (FBRs) and their fuel cycle systems; and 2) to further improve the characteristics of radiation sources and their application technologies, so that they could play a larger role in the areas of academia, industry, agriculture, medicine, etc.

In order to pursue these objectives, it is important to promote carefully planned yet highly aggressive actions across three different time frames, i.e. near-term, mid-term and long-term.

Near-term actions are those to use existing assets as efficiently as possible with toughness, determination and close attention to detail. The first of this category is to maintain the public confidence in plant operator's safety management as well as regulator's activities of maintaining the safety and security of nuclear energy generation.

In the energy field, Japan has increased the share of nuclear energy in primary energy supply since oil-crisis in 1970's and currently 55 units of nuclear power plants are in operation, which are producing about one-third of electricity generated in Japan. They are contributing to the increase in Japan's degree of self-sufficiency in primary energy supply from 4% to 16% and to the stability of electricity price in spite of recent jumps in crude oil prices, as well as to the significant reduction of carbon dioxide emissions/kWh of electricity generation.

In recent past, however, Japanese nuclear regulators and operators have been working hard in the restoration of public confidence, which has deteriorated severely due to the publication of the result of search for operators' misconducts and reportable events hidden in each operating organization back to days when the importance of safety culture was not necessarily widely appreciated among the operators. In order to restore the public confidence, the operators have reviewed both an existing mechanism to prevent the concealment of such misconducts and the characteristics of current organizational culture to deter them. Nuclear safety regulators are also making efforts to restore the confidence of the public and the inhabitants of the communities where nuclear facilities are located, in particular, by checking the soundness of their current business transaction openly and candidly.

The second of the near-term actions is to improve the availability of operating plants through innovation in maintenance and regulation areas, as

the national average plant availability factor has been floundering at 70-80%, owing to the decision of operators to replace the equipments with permissible defects earlier and accelerate inspection schedule, in addition to the too frequent execution of overhaul maintenance of equipments and components compared with global standards. At the same time, operators and manufacturers are encouraged to make efforts to improve and expand the performance of existing plants by applying a broad range of innovative technologies that can increase their capacity and/or enhance their long-term performances by resolving the problems of material ageing.

The third is to start the use of plutonium recovered by the reprocessing of spent fuel in LWRs and to pursue steady progress in the activities to determine the site for high-level radioactive waste disposal. Japan is pursuing the recycling of nuclear fuel materials through reprocessing of spent fuel because Japan, as a great energy consumption nation with little energy resources, should rely on nuclear power as a long-term and major method of power generation on a scale of more than 50GWe, utilizing nuclear fuel material as efficiently as practicable.

Although most of the spent fuels generated in the past were reprocessed in Europe and the resultant plutonium is still stored by the reprocessing companies in Europe, those generated in this century are to be reprocessed in Rokkasho reprocessing plant that is now in the final stage of commissioning test. The plutonium recovered from spent fuels is to be used in LWRs till the introduction of FBRs and several utility companies have already started the preparation of MOX fuel to be loaded in their plants. We are expecting that the entities concerned will cautiously promote these activities through rigorous business risk assessment and management as the occurrence of a failure in the recycling activities might have a significant negative impact on the stable progress of nuclear power generation in Japan.

As for radioactive waste disposal, a category of low level radioactive wastes has been already commercially disposed in Rokkasho-Mura and the Nuclear Waste Management Organization (NUMO), which is the responsible organization to promote the disposal of high-level radioactive waste, is to start the preliminary review of suitability of an area proposed by a town in Shikoku island to locate a high-level radioactive waste disposal facility.

Mid-term Actions are those to make major capital investments for business innovation, such as the investment by the utilities in the construction of new nuclear power plants and the investment by manufacturers in the pursuance of the innovation of nuclear power plant designs in the category of the third generation or higher so as to make the nuclear power competitive as a candidate for the capacity increase and the replacement of the retiring plants in the social and economic conditions in 20-30 years.

Currently Japanese utilities are constructing two units, a PWR and an ABWR, waiting the completion of licensing review for construction of four units, two APWRs and two ABWRs, and preparing the application for the construction permit for several units within ten years to come. Japanese manufacturers are expected, while maintaining the expertise in design and construction of nuclear power plants through the work for these activities, to strengthen their business structure and to achieve the scale and competitiveness to be better able to compete on the world market by developing unique and innovative technologies and dramatically improving efficiency of the projects through the alliance with foreign manufacturers before a new wave of construction will begin in 20 years or so. In the front end of fuel cycle, being encouraged by the government, private firms are exploring the opportunity to invest into the uranium mining industry abroad, observing the tendency of the uranium price to rise in recent years.

There are also several major investment activities in innovative technologies in the field of radiation application. One of such activities is the construction of a center for cancer therapy utilizing a heavy ion accelerator for medical use in Gunma University based on the success in the research on cancer therapy using heavy ion beams as well as in the development of compact heavy-ion accelerator for medical use based on the Heavy Ion Medical Accelerator in Chiba (HIMAC) facility in National Institutes of Radiological Sciences (NIRS).

Another area of mid-term action that requires major attention of management from the viewpoint of business sustainability is knowledge management. To sustain the research, development, and utilization of nuclear energy technologies in Japan, it is essential that the coming generations smoothly incorporate the knowledge and experience of matured researchers and skillful workers who will continue to retire. It is indispensable, therefore, to establish systems for managing knowledge to assure effective knowledge transfer between generations and to develop

human resources for the ages to come. It is also important to maintain and enhance occasions for the general public and university students in particular to learn about energy, especially nuclear energy, and the relationships between society and nuclear energy so as to maintain and increase the number of young people who will find interest in studying and getting a job in the research, development and utilization of nuclear energy.

In parallel with the investment in industrial and social activities, we should pay attention to the larger framework that nuclear technologies are restricted in, i.e. the international non-proliferation regime, which is currently under strain with challenges such as the nuclear issues of Iran and North Korea. The nuclear test by North Korea in last October is absolutely unacceptable as it has given a blow to the efforts of international communities for nuclear non-proliferation. The Japan Atomic Energy Commission therefore strongly urges North Korea to promptly return to the international nuclear non-proliferation regime.

Faced with the increase in the risk of proliferation of nuclear weapons, IAEA Director General ElBaradei appointed in 2004 an international group of experts to consider possible multilateral approaches to the nuclear fuel cycle, as such multilateral approaches have the potential to provide enhanced assurance to the international community that the most sensitive parts of the civilian nuclear fuel cycle are less vulnerable to misuse for weapons purposes, while removing the motivation and the justification for each country to have its own capability, through assured access to the resources, and with the benefits of cost-effectiveness and economies of scale, besides.

The Group considered, as a framework, multilateral assurances of services, conversion of existing national facilities to multinational facilities, and construction of new joint facilities.

Dr Elbaradei decided to take up the work to develop a mechanism to assure the supply of nuclear fuel, as the first step. In response, six uranium enrichment service exporting nations jointly tabled at the IAEA a concept for a multilateral mechanism for reliable access to enrichment services for nuclear fuel. Japan also tabled a proposal to establish a system that incorporates both an information system to contribute to the prevention of the occurrence of market failure and a backup feature for supply assurance that is similar to that proposed in the six-nation proposal. A special event

was held during the last General Conference of the IAEA to facilitate discussion of these and other proposals and now the Secretariat is studying issues related to the modalities and criteria for possible assurance mechanisms acceptable to all users of nuclear energy.

The long-term actions are those to explore new products and processes that will create new markets or restructure old ones. One of the most important actions in this category is the development of FBR and its fuel cycle technologies, aiming at its commercial introduction at around 2050. The Japan Atomic Energy Agency, a unique nuclear energy R&D organization in Japan, is expected to prepare a design of FBR and its fuel cycle systems that have enhanced safety, economy, neighbor-friendliness and proliferation resistance, and attain both effective fuel utilization and minimization of the volume of heat generating radioactive wastes. At present, the JAEA is promoting a R&D program that will make it possible to get to the construction project of a demonstration plant in 2015, which should start operation in 2025-2030, while preparing the restart of operation of a prototype FBR MONJU in 2008.

It is also important as a long-term action to explore engineering concepts of innovative ideas of nuclear science and technology, such as fusion, nuclear hydrogen, partition and transmutation of nuclear waste by accelerators, and so on. For those purposes, Japan has constructed large scale research facilities such as JT-60, a large-scale Tokamak fusion plasma research and development facility, HTTR, i.e. a high temperature engineering test reactor that produces helium gas of which maximum temperature is 950°C for efficient hydrogen production based on IS method.

We are still more constructing various facilities in this category, including High Intensity Proton Accelerator Facility that consists of three accelerators, a linear accelerator, a 3GeV rapid cycle synchrotron and a 50 GeV synchrotron, each of which provides the experimental facilities for materials and life science, hadron and neutrinos physics, and such nuclear energy technology as transmutation of radioactive material, with a high intensity quantum beam.

International cooperation should be an important element of actions for each time frame, as peaceful uses of nuclear energy, including the application of radiation and radioactive sources, are extremely beneficial for the socio-economic development of the international society, as well as

for the efficient promotion of research, development activities mentioned above. Therefore Japan attaches significance to IAEA technical cooperation activities and is making a considerable contribution to its Regional Cooperative Agreement for Research, Development and Training. In parallel with them, Japan has been playing a leading role in the Forum for Nuclear Cooperation in Asia (FNCA), which is a framework that has promoted peaceful uses of nuclear energy in Asia, through voluntary cooperation among participating countries including Korea.

Japan also intends to assist developing countries to develop infrastructure needed to introduce nuclear power, including legal and regulatory framework, the institutional measures to ensure safety and security, and human and financial resources. Although it is up to each country to decide how and what sort of infrastructure should be developed in the country, Japan will provide expert assistance in any area in responding to the request to do so.

Japan is also pursuing active co-ordination of internationally collaborative activities in R&D activities as in the case of International Thermonuclear Experimental Reactor (ITER), Generation IV International Forum (GIF) and Global Nuclear Energy Partnership (GNEP) since the social rate of return of the investment into long-term nuclear energy R&D to the world as a whole is higher than to the individual countries.

In conclusion, Mr. Chairman, Japan will continue the efforts to expand the use of nuclear energy by rectifying the defects of and improving the competitiveness of systems and technologies related as we are definitely required to increase carbon-free energy supply to stabilize atmospheric CO₂ concentration. We will pursue a thoughtful mix of near-term, mid-term and long-term actions for sustainable development of nuclear energy utilization, while making these actions transparent to the public so as to get its feedback on their direction incessantly.

Japan would like to positively promote the strengthening of nuclear non-proliferation regime and promote endeavors to co-ordinate long term R&D activities among various countries in future, as has been done so already in the cases of universalization of Additional Protocol, Multilateral Approaches to Nuclear fuel cycles, development of the fourth generation nuclear reactor technologies and fusion R&D including ITER, for the benefit of global community.

As Korea is one of the most advanced countries that promote research, development and utilization of nuclear energy, I believe that both Japan and Korea can cooperate in diverse field of such activities for the benefit not only of both countries but also of global community. Thus, I am particularly pleased to have had the opportunity to speak with you today.

Thank you for your kind attention.