

An Overview of Japan's Nuclear Reactor Strategy¹

Shunsuke Kondo
Chairman
Japan Atomic Energy Commission

Thank you Mr. Chairman. Distinguished colleagues, ladies and gentlemen, it is a great pleasure for me to have the chance to give you a quick overview of the Japanese nuclear reactor strategy.

In Japan, now 53 nuclear power generation units which are large scale light water reactors (LWRs) except four first generation units each of which capacity is less than 500 MWe are operating and have supplied about 30% of electricity in Japan since 2000. Electric utilities currently plan to add 13 large scale nuclear power generation units within a decade or so in order to make nuclear power contribute to about 50% of electricity generation in 2030 as a major effort to combat global warming.

The current strategic goals of nuclear energy policy in Japan are a) to operate nuclear power plant safely, effectively and efficiently, adding new capacity steadily; b) to reprocess used-fuel for better utilization of resource and better management of radioactive waste; c) to develop next generation LWRs as a replacer of existing plants and innovative nuclear reactors that can be used in an isolated grid or for various purposes including hydrogen production and d) to develop a fast breeder reactor and its fuel cycle technology to realize a sustainable nuclear energy technology.

In order to pursue these goals, Japan is promoting actions across three different time frames: short term, medium term and long-term.

The short-term actions are a) to continue safe, reliable and efficient operation of existing plants, incessantly cultivating the public confidence in operators and regulators; b) to promote the mixed oxide (MOX) fuel utilization in LWRs by utilizing plutonium recovered and stored by European reprocessors and that to be recovered at Rokkasho Reprocessing Plant (RRP) under construction and c) to steadily promote the process to determine the site of a geologic disposal facility for a vitrified high-level radioactive waste from the reprocessing.

As for the safe operation of existing plants, Japanese operators should be proud of the fact that the annual frequency of unscheduled shutdown of Japanese nuclear power plants has been sufficiently low for past 20 years. As for the efficient operation of their plants,

¹ Presented at the American Nuclear Society (ANS) President Special Session on Global Opportunities for Right-Sized Reactors, ANS 2009 Winter Meeting and Nuclear Technology Expo, November 15-19, 2009, Washington, DC, Omni Shoreham Hotel.

however, they have suffered for low plant availability factors in recent years. The reason for this is the fact that for some reasons or other, a number of Boiling Water Reactors (BWRs) have experienced unexpectedly strong seismic motions and their operation has been suspended till the re-evaluation of their seismic safety taking into account lessons learned from such unexpected experiences is accepted by the safety authority. Owing to this, the past 12 months' average availability factor of BWRs in Japan has been about 50%, though that of Pressurized Water Reactors (PWRs) has been above 80%.

As for the management of used-fuel, one of the key actions has been the operation of light water reactor (LWR) with partial loading of MOX fuel that has just started at one plant this month and we hope that several nuclear power plants (NPP) operators will follow this within a year. The Japan Nuclear Fuel Limited has almost finished the construction of the RRP. But the company is currently still working hard for establishing the operation procedure of the ceramic-melter for vitrification in the plant, which may take one more year at least.

We have started to a plan to construct away-from-reactor interim storage facilities of used-fuel and we are struggling to obtain the application from municipalities to our invitation to site a geologic repository for the disposal of high level waste.

One of the major medium term actions is to prepare the design of the next generation LWRs that will replace the currently operating LWRs starting from 2030 or so, consolidating Japanese experiences in construction and operation of LWRs and making the most of various innovative science and technologies on the horizon. The project has already started, aiming at the completion of basic designs of one or two large scale LWRs in 2015.

The government, electric utility and nuclear reactor vendors are also promoting the development of small and medium sized reactors for power generation and heat sources for industrial activity / district heating / potable water production. The designers of these reactors have claimed that the reactors based on their designs will be competitive in the market if a number of construction orders are placed to rationalize the investment into the preparation for adopting factory fabrication and innovative construction approaches, which are proposed as major approaches to overcome the scale demerit of small plants in cooperation with design simplification.

It is generally accepted in Japan, however, that the biggest hurdle to start the construction of nuclear reactors is to obtain the agreement from the local government around the plant and to do so is rather independent on the size of reactors. Therefore it would be required to work out innovative public relation strategy or siting strategy to get over this hurdle if promoters want to realize the construction of innovative small and medium size reactor. The resident is the king in nuclear reactor siting processes.

One of the major long term actions is the promotion of the research and development of fast breeder reactor and its fuel cycle technology. Design goals we have specified for the project

includes enhanced economy, safety, reliability and utilization of fuel, and high proliferation resistance. We expect that we will have a conceptual design that will satisfy these performance requirements in 2015.

As for the goal for nuclear safety in this project, we have struggled to reach agreement with our society on the question how safe is safe enough and we have now safety goals and even quantitative safety objectives in place. As for the goal for nuclear security, we have established a system to define a design basis threat that outlines the set of adversary characteristics for which the facility operators and state organizations together have protection responsibility and accountability. As for nuclear nonproliferation, however, we have not yet agreed upon any goals, except that any nuclear facility should be put under the International Atomic Energy Agency (IAEA) safeguards.

This is because the proliferation concerns come not only from the facilities itself but also from the actions to be taken by a country, as indicated in the speech Dr Elbaradei of the IAEA made in Beijing this spring. According to him, the safeguards system that is the core of the NPT gives too narrow a margin of nonproliferation and therefore a multinational approach to the entire fuel cycle - including the back end – should be pursued to facilitate the expanded safe and secure use of nuclear energy for peaceful purposes, while reducing the risk of proliferation.

Personally I am inclined to believe it desirable to impose the multilateralization on any nuclear fuel cycle activities in the future as another line of defense for nonproliferation. Obviously there will be a long way to go before us, however, and we global nuclear community should struggle to conquer many difficulties along this line. In any way, we should make this precious nuclear energy technology sustainable for the benefit of global community in some way or other by exploring and satisfying the goals for nuclear nonproliferation also.

Thank you for your kind attention.