Basic Policy for Nuclear Research and Development (R&D)

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Japan Atomic Energy Commission

1. Basic Policy

(1) Basic Policy for Nuclear Energy Research and Development (R&D) after the liberalization of energy retail market

Nuclear energy is expected to play a key role in supplying energy at lower prices, in a safe and stable manner at the foundation of people's lives and economic activities, while addressing global warming issues. Therefore, it is important to invest effort in the safe, stable, and long-term utilization of Light Water Reactors (LWRs) through the restarting of the existent LWRs. Further, due to the full liberalization of the retail electricity market and the removal of the fully distributed cost method, all the concerned parties, including the relevant industries and the R&D institutes, should make their best efforts for their survival through creative thinking, competitions, and cooperation among themselves for the sake of people's benefit, recognizing the basics to supply safe, stable, and cost-efficient electricity to the people. The government should promote a framework in which the relevant governmental administrations and the R&D institutes are expected to support the innovations to be led by the private sector from their respective points of view in terms of functions and responsibility.

This concept should also be applied to the mid-long term R&D assignments. The reactor type of next nuclear power generation should be determined by the requirements of the market, and therefore diverse options and strategic flexibility should be maintained upon the choice of the reactor type. It should not be taken for granted that the shift of the reactor type would naturally take place from the 3rd to 4th generation. Under a circumstance in which the liberalization of the retail electricity market is in progress, the power generation companies who are the users of reactors would not necessarily choose the 4th-generation reactor if the cost of electricity that the 4th would generate is expected to be excessively high. The power generation companies may individually determine to choose the 4th- generation reactor, or to prefer using the existent LWRs for longer periods of time, improving their operational efficiency. Since nuclear power generation is the aggregation of application technologies, it becomes meaningful only when it is utilized in the market. Accordingly, a scheme in which the R&D is led by individual power generation companies or equipment manufacturers, who shall also bear the expense to a reasonable extent, should be introduced under the guidance of the government hereafter.

When R&D on nuclear energy is implemented, the market where the technology is to be commercialized or the environment for investment where the investment is to be made for the technology should deliberately be taken into account, and the R&D should be more world-market conscious. In this sense, international collaboration would be an important policy to be seriously reviewed. The collaboration should

be made with such partners who are able to share the same philosophy on the R&D for nuclear energy to keep strategic flexibility mutually. It should be avoided that a commitment to a certain international project constrains the flexibility of the R&D performance for a long time, and therefore the stance to be taken should be that the countries concerned with the R&D provide jointly the private sector, which should lead the development activities with common intellectual underpinnings.

Taking into account the changing situations due to electricity deregulation, this decision was made officially by the Japan Atomic Energy Commission to specify the direction which power utility companies, the relevant governmental bodies and the R&D institutions (except regulatory bodies and their related organizations) should follow in respect of the R&D activities for the utilization of nuclear energy technology hereafter.

(2) R&D related to nuclear fuel cycle

In the same context as above, R&D related to the nuclear fuel cycle should be discussed in parallel. As Japan adheres to the Nuclear Fuel Cycle Policy, the development of Fast Breeder Reactor (FBR) is an indispensable issue.

According to the current Strategic Energy Plan, the Nuclear Fuel Cycle Policy is defined as the reprocessing of spent fuel and the effective utilization of plutonium to be retrieved, from the perspective of effective utilization of natural resources and the reduction of volume and harmfulness of high level radioactive waste. At the same time, it states that the nuclear fuel cycle program should be carried out, taking into consideration all factors and ensuring strategic flexibility in accordance with changing environments.

The development of FBR or the choice of reactor type should also be made, ensuring strategic flexibility in accordance with changing situations. While the Sodium-Cooled Fast Reactor has been placed at the center of related R&D to achieve the nuclear fuel cycle through several steps taken politically, a more flexible approach should be considered and taken while always being vigilant for varying international situations and the change of evaluation criteria due to changing circumstances.

Under the circumstance that several technological approaches or challenges have been made for the development of FBR currently in the world, Japan should also be more flexible and practical about those challenges or choices, including the tempo of FBR development. While the roadmap of the development has been under study in the Strategic Working Group of the Fast Reactor Development Conference for the time being, it should be worked out in such manner as being flexible and practical.

To materialize the Nuclear Fuel Cycle, an earlier start of the processing facility operation and the acceleration of the Plu-Thermal by LWRs that have so far been operated in Japan should provide a good roadmap that will meet most practically the market requirements at this moment. In addition, for the

assurance of long-term flexibility, active cooperation among the government and the power utility companies is imperative to address imminent issues such as expansion of interim storage facility of spent fuel and the active usage of Plutonium through Plu-Thermal.

The Role of Stakeholders

(1) The role of the government

Because nuclear energy technology is long-standing, support from the government to its R&D is generally required. However, in the field of power generation by nuclear energy, where the practical R&D activities for power generation system should be carried out by individual private companies through fair and economic competition at their own reasonable expense, the government's role should be restrictive in that its support should be limited, mainly to the basic R&D from a long-term point of view. The studies for specific issues like the selection of reactor type or individual technology should be led by relevant private companies, researchers and power utility companies through their active discussions.

In this regard, the government should create a new scheme of assistance that is different from the existing scheme that a reactor type was specified and entrusted to private companies for R&D by the government. This new scheme is not regarded simply as R&D for a new type of reactor; it is defined as a supporting scheme to private sector companies who select and determine a power generation system by nuclear energy through their own R&D activities among various choices. Based on this point, financial support to be given by the government through the scheme should basically be applied to the activities of the private sector and adjusted monetarily according to the degree of maturity or the purpose of the R&D. Even when the very basic R&D of LWRs, like safety improvement, is entrusted to the private sector, it should be reviewed and governed from the view of public interest more strictly than it was before.

Further, the nuclear industry should have active discussions with the regulatory body on the technologies which are going to be put in practical use, paying sufficient attention to the independence of the regulatory body or to potential conflicts of interest, referring to the precedents of the United States. In case of the US, the nuclear industry obtains a license, taking steps one by one to satisfy the regulatory requirements through the consultation with the regulatory body for each step, and secures the predictability of the process to obtain a license.

(2) Appropriate role of the national R&D institutes

Further, the R&D activities for which the national R&D Institutes are originally responsible should be the attempt to develop an intellectual infrastructure, and therefore stronger support by the national R&D institutes is expected to be given hereafter to the private sector for efforts toward their R&D activities. Through the firm sharing of the intellectual infrastructure with the researchers of the private sector, the

national R&D institutes will be able not only to cope with real needs efficiently but also to establish the intellectual infrastructure for innovation. We will also be able to reinforce the competitiveness of the entire nuclear energy research and industry of Japan in a multi-layered manner.

For instance, the following effort is being made in the Western countries

○Europe: NUGENIA, which is coordinated by the European Commission, to link transversely the R&D activities of nuclear energy R&D institutes of respective countries together. This aims not only at taking several needs of industries into the R&D but also training human resources through R&D activities, which is in turn promoting people's understanding on nuclear energy use.

The UK--a top runner of the liberalization of power generation--has been strategically promoting innovation led by the private sector in an effort to reinstate nuclear energy. And the national R&D institute has been providing the intellectual infrastructure for various R&D activities.

France, in which the liberalization of power generation took place around the year 2000, has been changing the assignment of the R&D to be more practical.

○The US Department of Energy (DOE) shows a long-term vision and promotes a cost-sharing system with the industry, including a supply of vouchers, which entitles the industry to use the infrastructures of the R&D institutes. Also measures encouraging universities to collaborate with the R&D institutes are included in the supporting scheme from the DOE to them.

In the industry of the US, there's a scheme in which the Electric Power Research Institute (EPRI) plays a main role in proposing projects and implementing them with their own funding arrangement. Also the National Regulatory Commission (NRC) is able to participate independently in those projects and utilize outcomes in their regulatory performance based on their own technological judgment. Thus, the intellectual infrastructure is shared by both of user side and regulator side.

On the other hand, while the Japan Atomic Energy Agency (JAEA) has conventionally emphasized launching projects to develop new types of reactors like MONJYU and the implementation of those projects up to now, their R&D activities should now be driven by market requirements, getting rid of such conventional mindset. Currently, the poor relationship with the industry and incomplete building of the intellectual infrastructure relating to nuclear energy are the structural issues in the entire R&D of nuclear energy. This situation exerts influence on the activities of the industry, and produces inadequate knowledge sharing between JAEA and the industry, with respect to disaster prevention and disaster mitigation or

the utilization of LWRs etc. From the above mentioned points of view, the tight and adequate collaboration among JAEA and the other concerned parties should be seriously contemplated when JAEA seeks collaboration with R&D institutes or universities in addition to the power utilities or manufacturers, or when governmental support for the R&D activities is given to JAEA. Now, the Japan Atomic Energy Commission (JAEC) has launched 3 platforms i.e. disaster prevention, safety and long term use of LWRs, and Decommissioning and Radioactive Waste, and is promoting joint activities with the power utility companies, the manufacturers, the R&D institutes and the universities. It also collaborates with the relevant governmental organizations continuously.

(3) The role of the Industry

The industry should strongly appreciate and recognize again that the fully distributed cost method has been removed and the electricity retail market has been liberalized. Especially in the technology development or the R&D activities, it is required to recognize their mission that they should supply cost-efficient electricity in a safe and stable manner for the benefit of society in the liberalized market. They should guide themselves toward what needs to be developed, and which technology to be improved at their expense to a fair extent, and be leaders in innovation.

Since the manufacturers will be required not only to provide safety but also to have further cost consciousness hereafter, they should run their businesses seriously with a sense of urgency, and be responsible for the reinforcement of company resources to compete with rivals in the global market.

The role of the power utility companies is also very important as the end-users of R&D outcomes. For the nuclear energy to be chosen as a future source of power supply, the power utility companies recognize their mission that they should supply cost-efficient electricity in a safe and stable manner on a long term basis for the benefit of society, being flexible in the recent changing circumstance. Resting on the premise of constant improvement of safety, they are expected to guide the R&D of nuclear energy to a right direction for commercial use in the future.