

Status of Fast Reactor Technology Development in Korea

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Electricity demand in Korea is increasing rapidly due to its industrialization and higher standard of living. However, there are limited domestic energy resources and limited potential for renewable energy in the near future. In order to secure stable supply of electricity, Korea has to rely on nuclear energy which can generate electricity in a clean, economical and technology-driven manner with sustainability.

The first commercial nuclear power plant Kori Unit 1 started its operation in 1978, and currently there are 21 plants in operation. 24% of the total installed capacity and 31% of the total electricity generation is from nuclear plants for the year 2010. The role of nuclear power plants in electricity generation in Korea is expected to become more important in the years to come due to the poor natural resources and emission control of green house gases. Currently three OPR1000s and four APR1400s are under construction as scheduled.

There are growing public concerns on the safety of nuclear power plants after the Fukushima accident. However, it needs to be noted that nuclear power is needed in order to meet increasing demand for energy in economical and environmentally friendly manner. For the promotion of nuclear energy, higher level safety has to be ensured and communications with the public has to be improved. With the efforts for enhanced safety of nuclear power plants, nuclear promotion policy remains the same after the Fukushima accident and the share of nuclear power in our national energy mix will be increased to 59% by 2030 according to the National Energy Basic Plan. Five basic elements of nuclear promotion policy include development of nuclear energy as driver for economic growth, development of advanced technologies, enhancement of safety, contribution to higher standard of living, and expansion of nuclear infra-structure.

In order to implement the nuclear promotion policy, comprehensive nuclear energy promotion plan has been established for the five year period of 2012-2016. There are various important research and development activities related to safety enhancement and development of advanced nuclear systems.

With reliable operation of nuclear power plants, the overall spent fuel storage capacity is foreseen to be saturated, and the current spent fuel storage pools at nuclear power plant sites will be full from 2016. In order to reduce the volume and radio toxicity of high level waste for final disposal, sodium-cooled fast reactor (SFR) technologies will be developed by the Korea Atomic Energy Research Institute (KAERI). Final goal of the SFR development effort is the construction of a prototype reactor by the year 2028 with intermediate goal of obtaining design approval from the regulatory authority by 2020.

KAERI is now conducting various research and development activities for the development of fast reactor technologies in order to manage spent fuels in an environment-friendly manner and to utilize uranium resources efficiently. In addition to KAERI's own research and development efforts, international collaboration is important for joint development of advanced technologies using already existing experimental facilities.

KAERI is actively participating in international collaborations including Generation IV International Forum (GIF) SFR Program whose member countries are China, France, Euratom, Japan, Korea, Russia and US. Under the framework of GIF SFR Program, plans for JAEA-KAERI joint work have been established for the safety enhancement utilizing Monju operation in the near future. Monju design, construction and operational experience can play an important role for SFR technology development in Korea.

It is believed that Monju is a unique and valuable asset not only for Japan but also for the whole world. The restart of Monju will provide a significant momentum for strengthening joint efforts on fast reactor technology development. It will not only accelerate our R&D efforts for developing fast reactor technology but also provide valuable information to those countries involved in fast reactor technology development.

Although there was a slowdown after the Monju sodium leak in 1995, Japanese efforts for the SFR technology development have been consistent. Lots of progress has been made towards early commercialization of SFR and Japan became one of leading countries for SFR technology. However, difficult times are anticipated for the time being not only for nuclear energy in general but also for fast reactor technologies due to the impact of Fukushima accident.

Since there are no reliable alternatives for energy supply in the near future, nuclear energy has to be

utilized with higher level of safety. Strong research and development activities for safety enhancement can bring back public support for the promotion of nuclear energy. It is hoped that Japan keep world leader status for SFR technology development and continue contributing to international community by sharing the benefit of this important technology.