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THE PROMISES AND CHALLENGES OF FUTURE REACTOR SYSTEM DEVELOPMENTS**Si-Hwan Kim, Moon Hee Chang and Hyun-Jun Kim**

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E-mail: *shkim@kaeri.re.kr, mhchang@kaeri.re.kr, hjkim@kaeri.re.kr***ABSTRACT**

Nuclear power is an inevitable option in Korea to overcome the scarcity of national energy resources and to reduce its overseas energy dependency. During the past three decades, Korea has accomplished outstanding achievements in facilitating a nuclear power development. The share of nuclear power in electricity generation has been rapidly increasing since 1978. Nuclear power has provided Korea with a most economically and environmentally-friendly way of generating electric energy, and has contributed a lot to its national economy growth. It will continue to do so in the future. For a stable and economical supply of electricity, nationwide efforts toward achieving self-reliance in nuclear power technology have been pursued. To date, a series of nuclear technology self-reliance programs such as CANDU fuel technology, PWR fuel technology, and nuclear reactor (KSNPP) technology have been successfully completed. KSNP is a technologically advanced power plant modified by Korea's own operating experience and domestic technology and designed by adapting several advanced technologies suitable for its national situation. The KSNP was applied to the construction of Yonggwang 5&6 and Ulchin 5&6 and is now being replicated to provide a stable, economical and reliable electric power supply. Through a comprehensive nuclear R&D programs, an enhancement of its indigenous nuclear technology capability is currently being pursued. The effort has focused on improving its indigenous nuclear power technology such as improvements in safety and economy of the KSNP (KSNP+), a 600 MWe class KSNP and advanced fuels, and the establishment of industrial codes & standards. In addition, a Korean Advanced Power Reactor (APR 1400) and a System-integrated Modular Advanced Reactor (SMART) are currently under development.

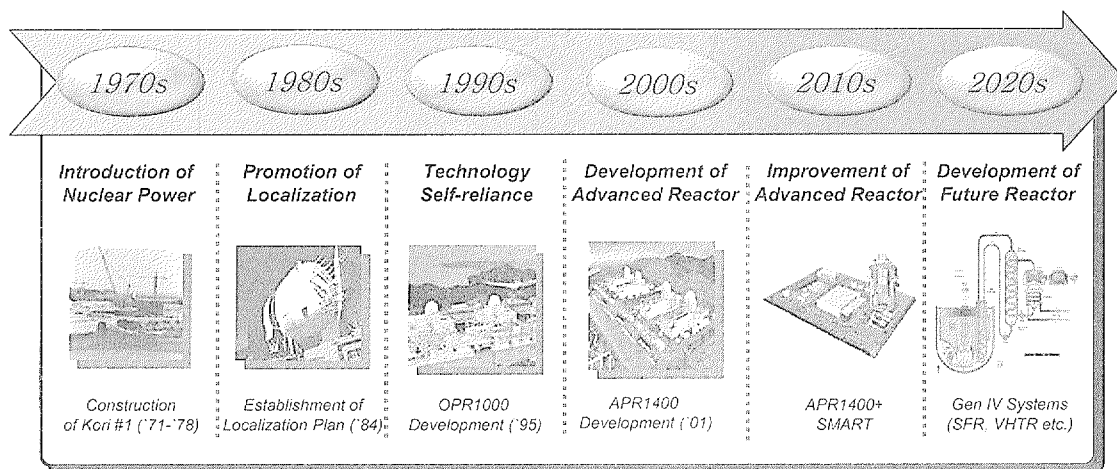
The APR 1400 with a capacity of 1,400 MWe will be characterized by its drastically enhanced safety, reliability, and operability as well as its improved economy when compared to currently the existing plants. The APR 1400 has been developed since 1991 and it is expected that its first commercial operation will be in 2012. In the short term by 2011, the APR-1400 design will be improved from the viewpoints of safety, economics and performance. We are also developing a small integral reactor SMART, which is a promising advanced small and medium-size power category of nuclear reactors. It is an integral type reactor with a sensible mixture of new innovative design features and proven technologies aimed at achieving a highly enhanced safety and improved economics. SMART is purposed for dual applications such as for seawater desalination and electricity generation. Since the SMART technology is technically sound and has sufficient economics, the SMART desalination plant has good prospects of being deployed as a nuclear desalination plant.

We are also actively participating in the GEN IV collaboration (GIF: GEN IV International Forum) for a VHTR and a SFR technology development. Through close collaboration with GIF, a proliferation-resistant SFR technology will be developed based on KALIMAER for an effective uranium utilization and waste minimization. Also a high temperature reactor is currently under

development to demonstrate a nuclear based hydrogen production technology. Korea is really looking ahead by developing new generation of advanced nuclear reactor systems for a sustainable development, economical benefits, a clean environment and public confidence.

In this paper, Korean nuclear reactor technology development program is described together with lessons learned from self-reliance in nuclear reactor technology. In addition, this paper presents the status of the next generation reactor system development program and the future reactor system development program for addressing these challenges.

Nuclear Reactor Development Program



* OPR1000 (Optimized Power Reactor 1,000) is new name for the former KSNP