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EDITORIAL

Nuclear Power in East Asia

U.S. dominance in nuclear reactor technology is withering, and new leadership is appearing in East Asia. The United States has 110 operable nuclear power reactors, which generate about 20% of the nation's electricity. No new ones have been authorized during the past 10 years. In contrast, large numbers of power reactors have been built quickly (in 4 to 5 years) and operated successfully in East Asia. Some of the new ones are superior in safety and reliability to existing U.S. plants.

Japan has 49 nuclear power reactors and obtains about 30% of its electricity from them. It plans to construct about 40 more and to generate 42% of its electricity from nuclear reactors by 2010. South Korea has 11 in operation, with 19 more under construction or authorized. Taiwan operates six and seeks sites for more. Indonesia plans to acquire 12 power reactors. The People's Republic of China (PRC) has three operating power reactors and three more are under contract.

Most of the power reactors in the United States were custom built. That—coupled with a large number of arbitrary regulations imposed after the Three Mile Island incident—led during the 1980s to an excessive average construction time of 10.5 years. A side effect was huge cost overruns. U.S. utilities and the nuclear industry recognized in the 1980s that if new power reactors were to be built in the United States, their safety must be enhanced and their design simplified and standardized. A determined international collaborative effort has produced substantial improvements. The Nuclear Regulatory Commission has completed its detailed safety review of two advanced designs: the ABB Combustion Engineering System 80+ design and General Electric's Advanced Boiling Water Reactor. Proponents of the new designs have estimated that these large power reactors could supply basic electricity at costs less than those incurred by fossil fuel–fired plants. However, demand for electricity is increasing slowly in the United States, and many years will pass before a new, improved power reactor is likely to be built.

In contrast, economies in East Asia are growing rapidly, as is demand for electricity. This has created an opportunity for South Korea. Starting with its first power reactor, which began service in 1978, the Korean Electric Power Company (Kepco) has studied, planned, and worked successfully to make Korea self-reliant in nuclear technology and manufacturing. One of Kepco's impressive feats has been to improve the performance of its plants. At the beginning of the 1980s, the average capacity factor of nuclear plants in the United States, South Korea, and the rest of the world was about 60%. In 1994, Kepco achieved an 87.4% average capacity factor; that of the United States was 75% and that of the rest of the world was 70%.* The cost of generating nuclear power in South Korea is lower than that of power from alternative sources, and it has decreased to two-thirds of its cost in 1983.

The South Koreans have adopted the ABB Combustion Engineering 80+ pressurized water reactor. They have quickly built and brought into service two standardized plants that are a predecessor version of the 80+ reactor and have added selected features of the 80+ design. They intend to become an exporter of nuclear power plants.

The PRC has the world's fastest growing economy and demand for more electricity is urgent. At present, most of the supply comes from pollution-producing coal-fired power plants. The country has substantial uranium resources and facilities for isotope separation and conversion into reactor fuel. It will soon be a competing international supplier of nuclear reactor fuels. Various regions of the PRC have been negotiating with the French, Russians, Canadians, and South Koreans for help in building power reactors. The U.S. nuclear industry has been relatively absent from the PRC.

Design, construction, and operation of a large number of nuclear power plants in East Asia will support a proliferation of nuclear engineers, technologists, manufacturing facilities, and potential weapons experts. In contrast, the cessation of construction of power reactors in the United States is leading to diminished nuclear capabilities. In 1978, there were 80 university nuclear engineering departments; now there are 35. Without the stimulus provided by the building of competitive advanced plants, U.S. capabilities in nuclear technology will gradually become second class.

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*Bo Hun Chung, *Nuclear News* **38**, 34 (1995).

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