



How South Korea is positioning itself for the Nuclear Renaissance

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At present, many countries are participating in the international cooperation to cope with climate change, which is caused by CO₂ emissions from fossil fuels. From the view point of CO₂ reduction, nuclear power is in the limelight again because it can generate electricity with little or no CO₂ emissions. Nowadays, environmentalists suggest nuclear power as a viable option for environmentally-friendly energy to solve the global warming issue.

In Korea, since the first nuclear power plant began operation in 1978, nuclear power has been an essential solution to the issue of national energy security, as well as an environmentally-friendly source of energy. In the same way, many countries are now realising that nuclear power is essential to achieve energy security, to solve global warming, to replace old power plants and to respond to the increasing demand for energy. In this regard, developed countries have promoted the life extension of existing nuclear plants, as well as the construction of new nuclear stations and many developing countries are now also considering the introduction of nuclear generating facilities. According to the IAEA's forecast, some 300 nuclear power plants will be constructed by 2030, and OECD/NEA also forecasts that the total capacity of nuclear power plants will increase 3.8 times by 2050, from 372 GW to 1,400 GW. Nuclear power, which is now recognised as an environmentally-friendly, economical and stable source of energy, will enjoy a renaissance for the next few decades until renewable energy is fully developed enough to replace fossil fuels.

The Korean nuclear industry

Since the commercial operation of Kori 1, Korea's first nuclear power plant began in 1978, the number of nuclear power plants has increased substantially. Currently, 20 nuclear power plants with a total capacity of 17,716 MW are in operation at four sites in Korea. A further eight nuclear power plants are also under construction at three sites, with a capacity of 9,600 MW in total. Also, a further 10 nuclear power plants are planned by 2030, with a total capacity of 15,000 MW. These efforts will increase the share of nuclear power generation from 34 per cent (2009) to 59 per cent (2030) in Korea. In terms of installed capacity, Korea ranks 5th with 17,716 MW as of now, while its capacity factor ranks 1st place with 91.7 per cent, compared to a world average of 79.4 per cent. In addition, its unplanned shutdown rate is 0.3 times per year, easily surpassing the world average of 5.3 times per year.

Korea has continuously accumulated experience in construction and operation since its first adoption of nuclear

power. In addition, many skilled engineers have been trained for decades owing to the continuous construction of nuclear power plant, almost one unit per year on average, while the US and EU have suspended construction of new nuclear power plants since the Three Mile Island and Chernobyl accidents. As a result, Korea has achieved stable project management skills, design standardisation, relatively short construction periods and cost reduction, leading its nuclear power plant to strong economic competitiveness and a high performance operating record. Based on these achievements, Korea has entered into the contract to build four 1,400 MW units for nuclear power plants in the United Arab Emirates, thereby capturing the attention of the world nuclear industry.

Challenges for the global nuclear renaissance

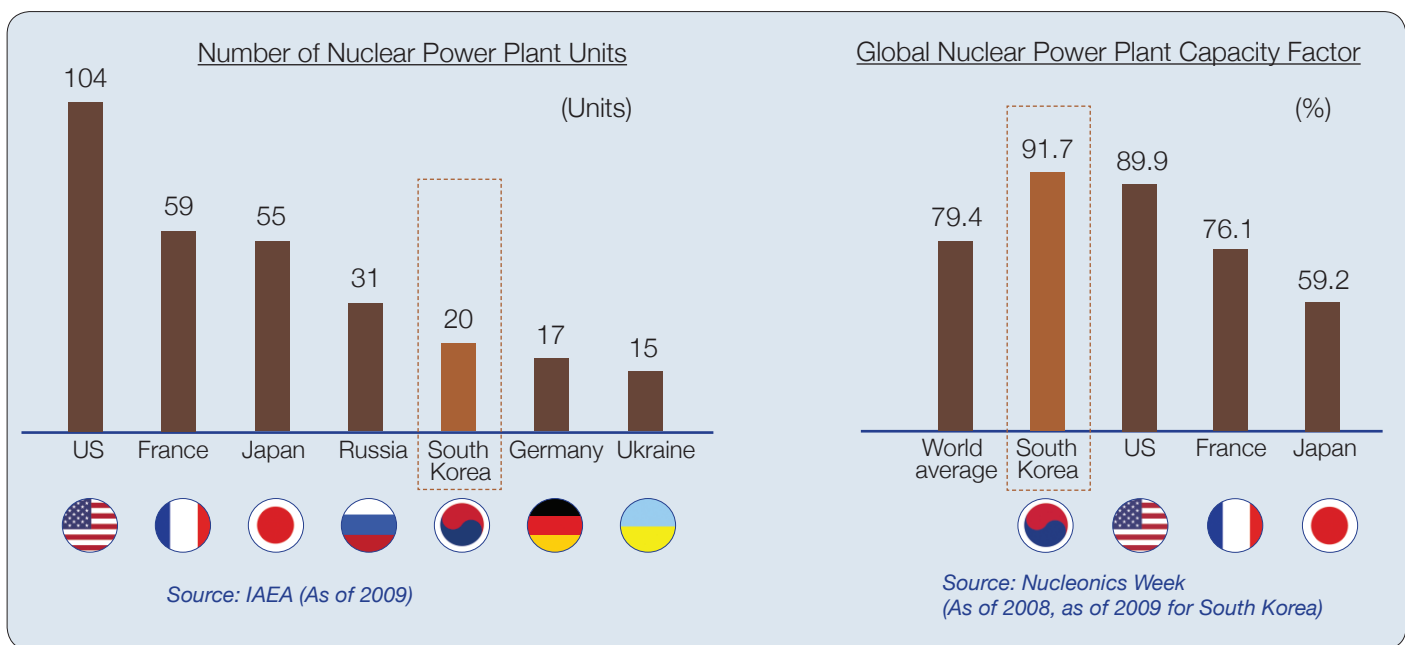
As nuclear power has been proposed as a solution to both global climate change and energy security, the following should be considered for nuclear power to play a substantial role in the world energy environment.

International design standardisation and safety

International design standardisation and certification is a way to secure the safety of a nuclear power plant. By standardising international design and certification for safety-related components, equipment and parts upon designing a new nuclear power plant, it is possible to secure a safe operation, simplify the official construction and operation process, and save time. Although there is a variety of laws and regulations on nuclear power plant construction and operation in the world, economic construction and safe operation of nuclear power plants should be a common goal. Therefore, both economic feasibility and safety have to be achieved by close cooperation among the exporting and importing countries, such as standardising nuclear design through international cooperation.

Training nuclear experts

For the safe operation of nuclear power plants, it is crucial to secure trained technical manpower. However, it takes a long time to train the relevant personnel because nuclear professionals have to be developed through years of training and experience in each field. With the demand for nuclear power growing rapidly all over the world, there is likely to be a shortage of manpower in the area of nuclear power plant design, construction, and operation. In particular, the imbalance between supply and demand of manpower in nuclear operation may act as a critical variable in guaranteeing



the safe and stable operation of nuclear facilities.

To respond to the growing demand for nuclear experts, KEPCO has planned to establish the KEPCO International Nuclear Graduate School (KEPCO-INGGS) since 2008. The goal of the KEPCO-INGGS is to train leading nuclear professionals in each field of the nuclear industry in order to meet the needs of professional manpower, especially in the age of 'Nuclear Renaissance'. The KEPCO-INGGS will operate Masters and Doctoral courses and teach expert knowledge as well as on-site practice-based skills. During the course, full-time professors, technical professors and students will perform the assigned projects, which would be hands-on and very practical. For the application, a bachelor of engineering degree and five years' working experience are required. The class size will be 100 students each year, including 50 per cent students from abroad. All the qualified students will live in a dormitory for focused training.

The roles of these professionals are to be the backbone of global nuclear technology and to build an international human network as working-level nuclear professionals as well. In addition, they will be the driving force for the new era of low carbon and 'green growth' future.

Nuclear industry and financing

As huge funds with a long project period are required to construct a nuclear power plant, it is usually too much for

a utility company to take on such investment risk. In this regard, to boost the nuclear power industry in the countries constructing or planning to construct new nuclear power plants, the financing issue should be discussed first. A way to solve this is that the government guarantees profits to the utility companies from nuclear power plant construction and operation. In addition, the reduction of construction cost and a shortening of the construction period should be pursued at the same time, to ease the financial burden.

Conclusion

After a long-time standstill, nuclear power is now recognised as one of the solutions to climate change in respect of global warming. In contrast to the global nuclear trend, Korea has continued to promote its nuclear power industry through the construction and safe operation of domestic nuclear power plants since it first introduced nuclear power plant in 1978. For the sustainability of nuclear power, which is now proven to be an environmentally-friendly, economically feasible, and stable energy source, such efforts as international design standardisation and certification, nuclear power experts training, and the financing issue should be managed at the same time. The harmonious efforts made through international cooperation will enable nuclear power to enjoy a true Renaissance in the coming years. □