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Lessons Learned and Regulatory Countermeasures of Nuclear Safety Issues Last Year

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1. Introduction

South Korea doesn't have a variety of power generation resources and has been highly depends on the nuclear power generation despite growing public concern over safety in the wake of Japan's Fukushima accident in 2011. Before the public fear on radiation risk caused by neighboring country's severe accident disappeared, a series of nuclear safety issues last year made a few reactors shut down and the public trust much lower than before. Because of these safety issues such as cover-ups, forged certificated items, corruption of manager of licensee and so on, many efforts made during one year after Fukushima accident on improving the nuclear safety were invalidated and even regulators as well as operators have been sharply criticized for its responsibility and transparency. Under situation, competitiveness of nuclear as the electric resource in terms of the least cost and the carbon abatement has been debated. Some institutions insist that the radioactive wastes management cost, nuclear accident cost and cheap shale gas would make the nuclear energy less competitive, while others still address the ability of nuclear energy as economical and low-carbon electric resource. This situation reminds that ensuring nuclear safety is the most important prerequisite to use of nuclear energy.

Therefore, this paper will compare the different views on future nuclear competitiveness discussed right after the Fukushima accident and summarize the lessons learned and regulatory countermeasures from nuclear safety issues last year.

2. Different views on future nuclear competitiveness

French nuclear safety institute IRSN estimated that a nuclear accident similar to the one at Japan's Fukushima reactor would cost France about 430 billion euros ($580 billion), or 20 percent of its economic output.

The chief engineer of Hitachi-GE Nuclear Energy Ltd. said that the new nuclear power plant safety standards being prepared by Japan's Nuclear Regulation Authority would require investments amounting to less than 10% the cost of a new power reactor. About 10% of the equipment cost would mean a backfit cost of Yen 30 billion, or around $316 million, per reactor unit.

The electric utility of the Kewaunee Power Station announced that this plant would be closed because it was unable to find a buyer and the plant was no longer economically viable by slack demand for energy and the low price of natural gas.

On the other hand, the NEA study found that introduction of significant amounts of intermittent renewables like wind and solar power, into electricity markets would generate system costs as high as $80 per MWh in the countries studied. The report also recommended that the value of nuclear energy as a "low-carbon provider of flexible back-up capacity in systems with significant shares of intermittent renewables" be recognized.

Thirty-five of Japan's nuclear units are currently shut undergoing safety inspections, and 13 units are shut due to the follow-up to the March 2011 accident at Fukushima I. According to JAIF data, the decrease in Japan's nuclear generation has put economic pressure on utility companies, has increased electricity rates and has increased CO2 emissions by 200 million metric ton due to the return to the grid of aging fossil plants and increased imports of oil and gas.

3. Lessons Learned from Recent Safety Issues

On February 9, 2012, during the relay test of generator protection, loss of off-site power (LOOP) occurred and one emergency diesel generator (EDG) failed to start while the other EDG was inoperable due to the maintenance, resulting in a station blackout (SBO). As a result of this event, there was no adverse effect on the plant safety and no release of radioactive materials to the environment. However, the problem is the cover-ups that the manager of the Kori 1 NPP decided not to report this event to NSSC right away and did not declare the "alert" status of the event in accordance with the plant emergency plan. NSSC ordered the reactor shutdown and dispatched a regulatory inspection team to investigate. In early July, the NSSC approved the restart of the unit and a month earlier, however, its restart was delayed in order to gain the support from local residents.

It was revealed that 5 units (Yonggwang units 3, 4, 5, 6 & Ulchin unit 3) had been equipped with more than 5,000 falsely-certified items. Most of them were non-critical to the safe operation used in supplementary equipment. The government shut down two units (Yonggwang units 5&6) manually which almost all the unapproved parts were used in. Safety commission launched a "Special Investigation Team" to independently review common grade items dedication for all operating nuclear power units, to check the

existence of additional one and to verify overall effectiveness of licensee's purchasing system. NSSC announced the comprehensive countermeasures on overall licensee's quality management system considering the audit system in manufacturing process.

Recent incidents occurred in 2012 triggered the public fear on "how safely we are protected from the radiation risk and how properly we are informed" and suspicion on "how safe the NPPs in operation or under construction are" before Fukushima shock is completely eliminated. Negative movements on nuclear safety consisted of environmental groups, religious groups, professional groups such as lawyer and medical doctors are growing and these groups set out technically and systemically their logical arguments on anti-nuclear. Anti-nuclear group and local residents are requesting the active participation in the investigation process and they want to open the regulatory decision to the public in a transparent and timely manner.

The public give more credits to explanation by the anti-nuclear groups rather than the regulatory body as well as government. At this point, it is necessary to understand that the public generally consider the government as an advocate for nuclear power and they feel that all information by the government is not transparent. This perception makes it difficult for them to trust the regulatory body as the "impartial source of information" as mentioned in a report from the UK parliament's Science and Technology Committee. Regarding trust in the regulators, Eurobarometer public opinion poll (Eurobarometer, 2007) said that trust in the regulators is crucial to gaining support for nuclear program showing the correlation between trust in regulators and belief that nuclear power plants can be operated safely.

Regarding this matter, KINS as a specialized technical expert organization supporting NSSC recognizes that a strong regulator with the impartial technical competency will play a great role to build up the public trust on nuclear safety.

4. Overview of Regulatory Countermeasures

Especially in relation to utilizing the nuclear energy, the new president promised to set up the responsible management system which puts the top priority to ensure the safe operation of nuclear power plant and build up the public trust as the national agenda. It is the first time that the nuclear safety policy is stated in the national agenda, which expresses the importance of ensuring the nuclear safety as the prerequisite of promoting nuclear energy.

To ensure the safe operation of nuclear power plant, the strict safety assessment on whether the life extension of old reactors such as Kori unit 1 and Wolsong unit 1 would be permitted or not will be performed through the "Stress Test" on the basis of a comprehensive and transparent safety assessment to implement the "Priority to Safety" policy. Currently, the stepwise approach is prepared consisting safety assessment undertaken by the licensee and independently reviews by regulatory body and experts.

In addition, to improve the effectiveness of licensee's quality management system, current two-year period of inspection will be shortened to the one-year period and the numbers of inspectors will be increased from five to fifty inspectors. To prevent the reoccurrence of similar event as the one of the lessons learned of issues on unapproved items with forged certificates last year, the scope of regulatory oversight will be extended to the audit system in the licensee's manufacturing process and subcontractor registration and system will be established for sanctions against violators.

5. Conclusions

Korea has improved the effectiveness of safety regulation up to now and still has been making efforts on further enhancing nuclear safety. The outcomes of these efforts have resulted in a high level of safety in Korean NPPs and contributing largely to the global nuclear safety through sharing and exchanging the information and knowledge of our nuclear experiences. However, now we are faced with the new challenges such as decreasing the public. Additionally, public criticism of the regulatory activities demands more clear regulatory guides and transparent process.

Recently, new president announced the "Priority to Safety and Public Trust" as the precondition to utilize the nuclear energy. We will continue to make much more efforts for the improvement of the quality of regulatory activities and effectiveness of regulatory decision making process than we have done so far. Competence through effective capacity building would be a helpful pathway to build up the public trust and ensure the acceptable level of nuclear safety. We are set to prepare the action items to be taken in the near future for improving the technical competency and transparency as the essential components of the national safety and will make efforts to implement them according to plan.

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