[SE1-OR-1] Safety of Nuclear Facilities on the Korean Peninsula

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Full Summary

There are five panelists who are Soon Heung Chang, Won Pil Baek, Fujiie Yoichi, Ki-sig Kang, Jong In Lee. Each of penal addresses different specific topics, but there are concerned with safety against natural disaster like Fukushima and human done. Let us move to each speech.

The first speaker is Won Pil Baek who is working at KAERI (Korea Atomic Energy Research Institute) as a vice president. He has mainly studied on thermal hydraulic field. His presentation focuses on how to enhance safety of nuclear facilities. The goal of safety is protection of society, environment, and facility. The minimum requirement and desirable safety level are important in view of safety. We are able to increase public acceptance through the two features. Moreover, the possible R&D is introduced in terms of design basis and long term operation technology. Finally, he concludes that the safety should be based on knowledge.

He mainly explains the passive safety system as the possible R&D and to enhance nuclear power plant safety. The key point of Fukushima nuclear power plant disaster is the failure in electricity supply to safety system. Through that point, we are able to recognize the necessity of the passive safety system without the electricity supply. The main driven force of the passive safety system is natural phenomenon, such as the gravity, pressure, or temperature difference. The secondary condenser design feature is mainly mentioned as an example of the passive safety system. The residual heat from a reactor vessel is cooled in the steam generator as the steam is condensed in the secondary circuit by the secondary condenser. As it works by natural circulation, there is no need the electric power to operate secondary condenser. The secondary condenser will be adopted at the advanced pressurized water reactor of Korea.

Moreover, he emphasizes the broad prediction of natural phenomena. The seismic design criteria of Fukushima nuclear power plant is 8.0 earthquake level. Also, the design criterion against the wave is 6m. However, 9.0 earthquake level effects on Fukushima reactor as well

as 15m high wave approach to nuclear power plant. It means that we need to assume more extreme conditions by probability safety analysis.

In conclusion, the lessons by Fukushima disaster are indicated that we should effort to not only develop advanced technologies like the passive safety system, but also international cooperation in the future.

The second speaker is Fujiie Yoichi at Tokyo Institute of Technology as Professor Emeritus, who has studied on safety of nuclear system in Japan. He roughly compares among representative nuclear accidents in the world wide, such as Chernobyl, Three Mile Island and Fukushima accident. And he zooms in Fukushima disaster to give messages and comments. The Fukushima accident is happened by earthquake and Tsunami. Fukushima nuclear power plants are able to endure less than 8.0 earthquake level and 6m high wave. However, it is 9.0 earthquake and 15m high wave approach to the sites. The system is successfully shut down, but the long term decay heat removal system is not operated due to attacked diesel power supply system. Especially, No 1 to 3 nuclear power plants are able to be considered as a common cause accident. Nuclear power plant accident level is normally determined by radioisotope discharged. Through the point, even though Fukushima accident is concluded level 7 like Chernobyl accident, the human damages by radiation in Chernobyl accident are not shown in Fukushima disaster. The contamination of environment such as soil and water is not prevented. It means cleaning up of water and soil should be done. Particularly, they have big concern on effect to children and farmer.

After Fukushima accident, the information has been shown with the internet and media. However, the information is not enough to understand the whole of circumstance for people as well as Japan government and Tokyo Electric Power Company do not cooperate with neighbor countries. Therefore, the all of information should be opened to public as well as the coloration with international countries is required. Moreover, the monitoring system of Fukushima nuclear power plant has shown problems such as temperature, pressure, neutron flux, and water level estimating instrument. We need more advanced technology for the monitoring system of a nuclear power plant.

To sum up, Fukushima disaster gives us the chance to review safety of nuclear power plant and a lot of lessons as follows. Fukushima accident is not shown too much disaster compared with Chernobyl. However, it effects on our life such as the soil and water. To solve current problems, we need to communicate and cooperate with other countries as well as the development technology. Through the efforts, we are able to prohibit a nuclear power plant disaster and keep the safety.

The third speaker is Ki-sik Kang who are working in IAEA (International Atomic Energy Agency). He mentions on the safety of nuclear power plant compared with international nuclear power plant. Korea has been changed very rapidly and keeps going the changing. He categorizes five issues in nuclear field as design basis, defense depth, severe accident, management, and regulatory. The most important word is humanism which is able to be separated on-site and off-site managing. He strongly claims that on-site is working reasonably, but off-site shows big problems, especially, under accident condition like Fukushima accident. Let us get back Fukushima accident. There are several groups and company related with Fukushima nuclear power plant such as NISA (Nuclear and Industrial Safety Agency, TEPCO (Tokyo Electric Power Company), and government. When Fukushima nuclear power plant accident happens, they confuse who decide injection water or sea water in nuclear power plant. It is shown the problem of their off-site system. Finally, a prime minister decided the water injection to Fukushima nuclear power plant, however, they lost the best time for water injection and it leads severe problems. It is able to sum up that the well organization is required. Moreover, Japan does not do well forecasting and communication with people and other countries. Japan should make a clear prediction how to effect for people. However, they do not clearly conduct. Also, they do not open the information clearly to other countries. Therefore, we need to find how we get good communication internationally.

To sum up, the off-site should be set up systematic for the efficient organization. Also, we develop new communication skills with other countries as well as advanced new technology. Lastly, it is time to consider energy mixed system such as fossil and nuclear energy.

The last presenter is In Jong Lee. He is the vice president of KINS (Korea Institute of Nuclear Safety). He concerns with safety strategies after Fukushima accident in Korea. The worst recorded earthquake attacks Japan on 11 March 2011. The units one to three in Fukushima nuclear power plant were operating before the event. The Fukushima nuclear power plant system shouted down safely after the earthquake detection. However, the massive tsunami swamped Fukushima nuclear power plant and the AC electrical power supply is failure. Disoperation of the safety systems due to failure in electricity supply leads hydrogen explosion.

KINS radiation emergency response team has conducted the 24 hour working after Fukushima accident. First, KINS tries to analysis of Fukushima nuclear power plant accident and colleting all possible information. Second, they evaluate radiation effect and contamination. Third, KINS provides information to public and presses briefing. In addition, the government requires the re-checking of nuclear power plant in Korea, even though all nuclear power plants in Korea are safe. This is a chance to review safety to prevent a crisis. Particularly, they emphasize safety check on the nuclear power plants which are more than 20

years. Furthermore, we are locating near Japan and China. It means that cooperation among three counties is required for people.
To conclude, we should keep monitoring of radiation and analysis of radiation effect to prevent people. In addition, Korea, Japan and China pledge to increase cooperation on nuclear safety and those countries will promote cooperation among nuclear safety experts.

In rapid changing society, a lot of countries demand tremendous energy supply. In current, the one of main energy source is the fossil energy, while the available energy source is limited in the world. We are looking for the sustainable energy for the future. Therefore, the nuclear energy is spotlighted. However, Fukushima nuclear power plant accident, which is one of the worst accidents in nuclear history, alerts us the safety of nuclear power plant. It is time to think the lessons for the future of nuclear energy.

To begin with, the new technology of safety system is needed. The many of safety systems are operated by electrical supply. The electrical supply system should be protected under any condition. In addition, the passive safety system is required. Active safety system should be supplied electricity to operate; however, we have to consider long term station black out. To prepare extreme long term station black out like Fukushima nuclear power plant, we need the passive safety system which is conducted without electrical supply. For example, there are a lot of conceptual designs for the passive containment cooling system. Generally speaking, the main driven force is the temperature difference between the inlet air and outlet air. The inlet air flows beside of containment and it cools down containment wall. This system is operated without any electrical supply. I firmly believe that we have to develop advanced new safety system to prevent the accident under any extreme conditions.

Furthermore, forecasting system and knowledge should be developed. In current, PSA (Probability Safety Analysis) is representative analysis method for prediction. However, we still cannot imagine and predict very clearly after an accident. In Fukushima accident, nobody worries the spent fuel storage tank. However, the hydrogen is produced from the evaporation of water in the spent fuel storage tank. The high concentrated hydrogen explodes and destroys the containment. Hence a lot of fission product and radiation are able to be released to outside of nuclear power plant. If we predict correctly, we could prevent harmful material release.

Also, the advanced manual and reasonable control tower are needed. There is manual in a nuclear power plant. However, it is not enough to cover the various circumstances. Based on PSA and knowledge, we make a sure how to conduct under severe accident. In addition, the high quality training should be repeated using the manual. The training produces high quality human resource. Also, nuclear power plant control system should take systematic control

tower. In Fukushima nuclear power plant accident, there is no commander to order. Finally, prime minister of Japan ordered sea water injection to containment. However, it was too late in order to prevent radiation release due to the broken reactor containment by the hydrogen explosion.

Lastly, the communication is the very important method to solve problems. The all information related with the accident are reported to people for promoting. The closed reaction makes that people become more chaos. The communication with other countries is required, because probability of finding the best solution. Unfortunately, in Fukushima nuclear power plant accident, Japan does not well communicate with other countries. From now on, Japan should effort interaction with other countries.

In conclusion, the nuclear power plant accident should not happen again. If it may happen, it should be handled safely. To keep the safety, we have to check it up seriously, develop new technologies and knowledge related with safety system and PSA, make a manual and a control tower, train high quality human resource, and communicate with people and international countries. The lessons are able to keep the nuclear safety and insure abundant energy supply from nuclear energy in the future.