Where Japan is and where Japan will go: Update of the Fukushima Accident and Post-Fukushima Nuclear Energy Policy Deliberation in Japan[1]

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Thank you Mr. Chairman for your kind introduction
Good morning Ladies and Gentlemen

It is a great honor and pleasure to present you my personal view where Japan is and where Japan will go, updating the current situation of Fukushima Accident and the deliberation of post-Fukushima Nuclear Energy Policy in Japan.

The Great East-Japan Earthquake and the resulting tsunamis struck the Fukushima Daiichi Nuclear Power Plant on March 11, this year, and caused a serious nuclear accident. The fact that this accident has raised concerns around the world about the safety of nuclear power generation is a matter Japan and Japan Atomic Energy Commission take with the utmost seriousness and remorse.

At the same time, I would like to express our sincere gratitude to you all, as Japan has received support and expressions of solidarity from around the world in the face of this hardship. Japan profoundly felt the deepness of the bond or kizuna in Japanese, which we have with countries around the world and the United States of America, in particular. We are especially indebted to the experts of US DOE and NRC for their helping us in our endeavor to solve difficult problems on-site and off-site.

My goal here this morning is to give you my thought on the accident progression, onsite and offsite situation at Fukushima and finally the current status of deliberation of post-Fukushima nuclear energy policy including the deliberation of regulatory system reform based on root causes of the accident and activity to assure the availability of funds for satisfying liability claims.

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ACCIDENT PROGRESSION

The Fukushima Daiichi nuclear power station, which is operated by TEPCO, is located in the Fukushima prefecture, approximately 260 km from Tokyo, on the northeast coast of Japan. It consists of six BWRs capable of generating 5,480 MWe total. The units are designed such that units 1 and 2, 3 and 4, and 5 and 6 share common facilities and structures, such as a shared control room and turbine building.

When the earthquake hit the plant, units 1 to 3 were in operation and unit 4 was in a maintenance mode. Sensing the earthquake, the operating units were automatically shutdown and as external power sources were interrupted due to the earthquake, emergency diesel generators of all units and shutdown cooling systems supported by them were started successfully.

In 40 minutes or so, the site was flooded by huge tsunamis to the level of 4 m height and the emergency diesel generators and sea water pumps became inoperable as they were not prepared for such flooding, and the shutdown cooling system and the path to the ultimate heat sink became unavailable.

Although the alternative core cooling systems started operation and worked for some time, their capability was eventually lost due to the depletion of DC batteries. In such occasions operators should have found ways to depressurize the Reactor Pressure Vessel and started the fire pump to inject water into the core and vented the Containment Vessel to assist the core cooling. Operators could not do so timely at this time, however, due to insufficient preparation and the devastation of the site due to violent tsunamis.

Consequently the core melting started, the hydrogen that was generated due to zirconium-water reaction in the core leaked out to the containment vessel and then to the reactor building, as the pressure and temperature of the containment vessel became high enough for damaging the penetration seals, which provided leak paths for hydrogen. The explosion of hydrogen thus accumulated in the reactor buildings destroyed the upper parts of reactor buildings of units 1 and 3.

The fission products leaked out in the containment vessels were released into the environment depending on the severity of such damage of containment vessels, though some of them were

trapped in the water of suppression pool in the course of wet-well venting operation. Owing to releases of significant amount of radioactive materials for a few days, a large area around the site was contaminated.

On March 12th, PM ordered the evacuation of the population within a 20 km radius of the NPS and on March 15th, he directed residents living between 20 and 30 km of the NPS take shelter. On April 22, the evacuation area was designated as Restricted Area and areas beyond 20km from the NPS where accumulated dose was likely to reach 20mSv within a year after the accidents were designated as “Deliberate Evacuation Area” and areas other than the Deliberate Evacuation Area in the Shelter Zone were designated as “Evacuation-Prepared Areas” as emergency responses may be required in these areas due to unsettled situation of the accident at the NPS.

THE ON-SITE MANAGEMENT

TEPCO published in April a roadmap towards restoration from the accident that was composed of Step 1, Step 2 and mid-term measures. The target of Step 1 to realize steady decline of radiation dose at the site was completed on July 19, 2011 by the establishment of systems to inject circulating water for RPV cooling. Currently, the target of Step 2 to put the release of radioactive material under control and significantly hold down the radiation dose around the site are being pursued by lowering the temperature of RPV bottom below 100 degree Centigrade.

The treatment of accumulated water is a big issue for TEPCO to increase the water for RPV cooling and reduce the total amount of water in the reactor buildings. Currently various works are being done to improve the performance and the reliability of the system for decontaminating and then desalinating the highly contaminated water in the buildings. We hope that the step 2 will be completed before the end of the year.

After the completion of Step 2, cleanup activities at Fukushima should be started as a mid- and long-term program at the site, as it will not be allowed to turn the damaged plants into nuclear waste disposal facility. The objectives of the program are, to maintain the reactors in a safe condition, remove the spent fuel from spent fuel pools, collect and dispose the radioactive materials resultant from the accident and disassembling the reactors, identify the location and configuration of the damaged fuel cores and remove and dispose them.

Currently TEPCO is developing a roadmap for cleanup program including scenarios of decontamination and defueling and necessary technology R&D activities, of which noteworthy milestones are the initiation of defueling from spent fuel pool in two years and the initiation of removal of core debris in ten years.

THE OFF-SITE MANAGEMENT

As the area around the site was contaminated due to the large release of radioactive materials, Government has been pursuing to limit the radiation exposure of a people by means of a) restriction of inhabiting in the area where expected annual additional dose is larger than 20 mSv, b) strict shipping control for agricultural products, animal products and marine products through comprehensive radiological surveys and c) step-by-step decontamination of the land.

The strategy for decontamination is firstly to reduce the annual additional exposure to 1 mSv by steady decontamination activities in inhabitation area where it is currently below 20 mSv but above 1 mSv and secondly to reduce the area where estimated annual additional exposure is larger than 20 mSv and residents have been evacuated through step by step decontamination activities.

In the inhabitation area, municipal governments are leading the execution of such decontamination activities. Based on the decontamination guidelines established by asking experts for advice, they are promoting regional decontamination in highly contaminated areas and localized decontamination in relatively low contamination areas, identifying hot spots such as those locations where sludge in the drains or gutters has collected.

Special attention has been paid for the decontamination of schools so as to reduce the exposure of children as low as practicable. As a result, utmost efforts have been made to reduce the effective annual additional exposure at most schools in this area to 1 mSv.

As for the evacuated area, Government is currently promoting a set of large scale demonstration projects to test the effectiveness of various decontamination approaches so as to prepare guides for safe, effective and efficient decontamination activities. Utilizing such guides, Government will promote a full-scale decontamination activity from the beginning of the next year so that more than 100, 000 displaced persons can return home as soon as possible.

A big challenge at present is to find places for the facility to store contaminated soil and waste collected by such decontamination activities temporarily. Promising that a large-scale interim storage facility that will accept both soil and waste will be available in three years, Government hopes that each municipality or community will determine the place for such facility in due time.

REORGANIZATION OF REGULATORY SYSTEM

The direct cause of the accident was obviously the losses of emergency diesel generators, power centers, and ultimate heat sink due to the flooding of the site by tsunami, of which height was significantly higher than the design basis.

Why had all the units essentially no mitigating features against such flooding events? The reason was that the operators and regulators have lacked keen attention to the importance of preventing land contamination. The regulators and operators were shy with PRA and did not promote the IPEEE forcefully, however, and lost the opportunity to identify the need for severe accident mitigation features that should prevent large releases of iodine and cesium even in prolonged station blackout cases caused by severe external events.

To be specific, they failed to let the experts in external events and tsunami in particular, know the necessity of having information about a tsunami that has a frequency of exceedance of less than 1 in 10,000 years. Before 2000 or so the experts of tsunami have been interested in estimating the evidence-based historical maximum tsunami height at a given site within limited research funds available to them. The nuclear safety people have utilized the result of such activities as a design basis, however, with paying little attention to such situation in tsunami study community.

In addition, nuclear regulator failed to request plant designers/operators to satisfy the internationally recognized need for defense-in-depth features that would prevent a disproportionate increase in radiological consequences from an appropriate range of events which are more severe than the design basis event.

Thinking over such situation that has come to light, Government has decided in August to establish "The Nuclear Safety and Security Agency" as an external agency of the Ministry of Environment around April of next year, by separating off the Nuclear and Industrial Safety Agency (NISA) from the Ministry of Economy, Trade and Industry, with a view to

centralizing the regulatory function and ensuring a thorough safety culture.

COMPENSATION OF DAMAGE CAUSED BY THE ACCIDENT

Another important and urgent task for the Government was to ensure that adequate funds would be available for TEPCO to satisfy liability claims of members of the public for damage. Japan has two laws governing nuclear third party liability: the Law on Compensation for Nuclear Damage and Law on Contract for Liability Insurance for Nuclear Damage. These laws say that plant operator liability is exclusive and absolute, and power plant operators must provide a financial security amount of JPY 120 billion (US$ 1.4 billion). The government may relieve the operator of liability if it determines that damage results from “a grave natural disaster of an exceptional character”, In any case liability is unlimited, however.

Judging the Fukushima accident was a man-made disaster, though precisely speaking, TEPCO asked the Government to postpone the legal decision of the applicability of the relief clause related with a grave natural disaster to expedite the damage compensation, Government set up Nuclear Damage Liability Facilitation Fund; a new state-backed institution to expedite payments to those affected. The Fund is to receive financial contributions from electric power companies with nuclear power plants in Japan, and from the government through special bonds that can be cashed whenever necessary. The government bonds total JPY 5 trillion ($62 billion). The provision for contributions from other nuclear operators is similar to that in the USA. The TEPCO will pay an annual fee for the government support, maintaining adequate power supplies and ensuring plant safety.

POST FUKUSHIMA NUCLEAR ENEGY POLICY

Before March 11, Japan was a major energy consuming country in the world and the energy self-sufficiency was only 4% and if nuclear is categorized as domestic energy, it was about 15% in 2009. Therefore, the volatility in global energy prices, the need for secure supply of fossil fuel and the reduction of greenhouse gas emission had been unfailing issues for Japan. Needless to say, nuclear energy had contributed to resolve these issues and had been expected to do so in the future.

After March 11th, the top priority issues in energy sector in Japan was how to cope with the shortage of electric power supply, since 10 fossil fuel power plants and 9 nuclear power plants suddenly stopped power generation by the earthquake and tsunami. The electric utilities have

done their best to assure power supply capacity by restoring standstill power plants and securing fossil fuel for such plants. Government has asked the industry and the public to enhance power saving and efficiency improvement.

Under such conditions, the short-term goal of nuclear energy policy was to make best use of existing nuclear power plants, making sure the safety of them against the flooding by tsunami and restoring the public trust in nuclear safety regulation. In reality, however, the number of nuclear power plant in operation has reduced from 26, rest of which were 9 units affected and 16 units in the state of scheduled maintenance outage, in March to 10 in October due to the difficulty in obtaining the consent of central and local governments to restart the plants that completed their scheduled maintenance outage. Why are we in such situation?

Just after the accident at Fukushima, the NISA, nuclear safety regulator of Japan asked every nuclear power operator to implement emergency safety measure for preventing the occurrence of severe core damage even when they are hit by beyond design basis tsunami such as preparation of fire engine, power supply cars and emergency drill to utilize them, and establish a plan to further improve the safety of their plants against external hazards such as the improvement of water tightness of safety significant SSCs. On May 6, the NISA confirmed that as all NPP operators had properly implemented the measure requested, all the nuclear power plants that had completed scheduled maintenance outage were eligible to resume operation.

However, Prime Minister expressed his view that the NPP should pass a test similar to European “stress test” before the restart. The discredited NISA therefore deliberated under the guidance of the Nuclear Safety Commission the content of the test called “comprehensive safety assessment (CSA), which should clarify the margin or distance between design basis event and the threshold of events beyond which severe accident will be inevitable.

Currently plant operators are submitting the result of their preliminary CSA for restarting the plants in outage state, The evaluation of the result is still in preliminary state, however, and no decision has yet been made on restarting any units.

We are expecting the regulators and operators work hard for restoring the public trust in their activities asking international organizations for help and support as the number of operating units will dwindle away to nothing by mid-2012 if no reactor restart approvals are given in due time.

MID AND LONG TERM ENERGY POLICY

As for mid- and long-term energy policies, the Energy and Environment Council of the government, that is a ministerial committee in the cabinet, has initiated the work to formulate them based on the deep reflection on the March 11 event at Fukushima. They set the goals of energy policy as stability of supply, economy, friendliness to environment and safety & security or ANSIN in Japanese that means peace of mind.

The Council already decided to start the discussion about the best use of fossil energy, renewable energy, nuclear energy and efficient use of energy for the attainment of these goals from the beginning of 2012. Considering that majority of the public are in favor of abolishing the nuclear power plants in future, the discussion will be focused on the practicality of reducing the share of nuclear energy and instead, drastically increasing the share of renewable energy for attaining these goals in Japan, which is an island nation making a living by foreign trading.

It is imperative for nuclear energy community at this juncture to make every effort to explore the ways to make the nuclear power system acceptable to the public in a rage by explaining the merit and reduce the demerit as a way to attain the specified energy policy goals.

At the same time we should deliberate how we can continue to promote bilateral, multilateral and international cooperation and joint activities for R& D with a view to assuring safety, security, safeguards and sustainability of nuclear energy as a responsible country.

Needless to say, we should never forget that it is a prerequisite for us even in this or more severe societal condition to assure the safety, security and proliferation resistance of nuclear energy supply system, developing human resource that is enthusiastic about these tasks.

CONCLUSIONS

The accident at Fukushima Daiichi Nuclear Power Plant of TEPCO on March 11, 2011 was caused by the unprepared attack of tsunami and contaminated a wide area around the plant. Many people have been traumatized by the relocation, the breakdown in social contacts, fear and anxiety about what health effects might result from the exposure to radiation. To recover

the life of suffered people and society by way of the on-site and off-site activities should be a prime task for Japan: we are still in the midst of the crisis.

The deliberation of future energy policy has been started, however, searching the possibility of reducing the dependence on nuclear power in future. Nuclear energy community should make every effort to explore the ways to make nuclear power system acceptable to the public in a rage based on deep reflection of the occurrence and results of the severe accident at Fukushima Daiichi, in addition to making every effort for the recovery of the life of suffered people and society.