

**Eighth Meeting of the Investigation Committee
on the Accidents at the Fukushima Nuclear Power
Stations
of Tokyo Electric Power Company
Summary of the Proceedings**

Dates: February 24 (Friday) and 25 (Saturday), 2012

First day (February 24, 2012)

I Opening

During his opening address, Dr. Hatamura, Chairperson of the Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company (“the Investigation Committee”), greeted experts from other countries who were invited to the meeting, gave them an explanation regarding the Investigation Committee, and introduced Committee members to them. Secretary General Ogawa then introduced the members of the Secretariat.

The experts subsequently introduced themselves.

II Explanation of the Interim Report

Secretary General Ogawa gave a summary of the interim report.

III Expression of Opinions, and Questions & Answers

The experts from other countries gave their impressions of the interim report, then reported on the nuclear power situation in their own countries, as summarized below.

Dr. Meserve:

- I found the interim report most informative, especially for its extensive coverage of the matters you investigated. However, with regard to issues other than specific measures, I suggest you include a wider perspective in your future report, taking into consideration the question of whether safety was really taken seriously, and if it was not, what should be done to improve the situation.
- In the United States, the Nuclear Regulatory Commission (NRC) started investigating the potential vulnerability of nuclear power plants in the country immediately after the Fukushima nuclear accident, and published its report 90 days later. The NRC is soon going to announce new variety of actions as a result. The NRC analysis may be helpful to you as you consider possible recommendations.

Mr. Lacoste:

- I was very impressed by the quality of the interim report, and the quantity of its material.
- Japan and France seem to differ greatly in their approaches to nuclear safety.

Probably from the experience of the Chernobyl accident, people in France acknowledge the possibility of a severe accident, and have emphasized the importance of emergency drills and emergency preparedness.

- “Something unlikely can occur,” has said Philippe Jamet, a commissioner at the French Nuclear Safety Authority(ASN). That is one of the most important lessons from the Fukushima nuclear accident.
- After the Fukushima NPS accident, the European Council decided to have stress tests conducted at nuclear power stations in Europe.

Dr. Holm:

- The interim report contains information that is important for radiation protection experts and nuclear power plant operators.
- Sweden, the first country to detect fallout after the Chernobyl accident, has emphasized emergency preparedness for a long time. Sweden reviews its nuclear safety programs whenever a major disaster occurs anywhere in the world, such as the 2001 terrorist attacks in the United States and the 2004 Sumatra earthquake that generated huge tsunami waves in the Indian Ocean. After the Fukushima nuclear accident, Sweden, like France, had stress tests performed at nuclear power stations, in accordance with the European Council decision.

Prof. Chang:

- I am very impressed by the good content of the interim report.
- Please recall that large quantities of radioactive materials were released from Unit 2 on March 15. I hope you will discover what was happening at the time in that unit.
- It is important to discover when TEPCO became aware of the possibility of a meltdown, because this relates to the question of how information should be made available to the public.
- In response to the Fukushima nuclear accident, the government of the Republic of Korea drew up an action plan of 50 items aimed at enhancing the safety of its nuclear power plants, and conducted special safety inspections at its plants. In addition, the Korean government amended its law on nuclear power safety, removing the Nuclear Safety Commission (NSC) from ministry jurisdiction and placing it directly under the President.

Mr. Chai:

- The interim report contains comprehensive and detailed information, and I find it very valuable as we plan for nuclear safety in the future.
- In response to the Fukushima nuclear accident, the Chinese government ordered comprehensive safety inspections at nuclear power plants in China. It also decided to review the country's long-term nuclear power development plans, and temporarily suspended construction licenses for new nuclear power plants. We have completed safety checks at all of our nuclear power plants, and have prepared nuclear safety plan that are waiting for the government's approval.

The above comments were followed by a Question & Answer session, as summarized below.

Dr. Meserve:

- I suggest that as the Investigation Committee continues its investigation, it take a wide perspective regarding how to develop a truly effective safety culture. Even though the greatest factor in the accident was the tsunami, there may be another initiating event next time. For example, the next accident might be triggered by an earthquake or security problem. Regulatory authorities and operators must be able to fully address safety vulnerabilities of all kinds. I suggest that the Committee consider lessons from the Fukushima accident that will improve safety across the board.

Mr. Lacoste:

- In Japan, nuclear accidents, including the accident at the bituminization plant at Tokai-Mura (1997), the criticality accident at Tokai-Mura (1999) and the pressurized pipe accident at Mihama 3 NPP (2004), have occurred before the Fukushima nuclear accident. These last two accidents, which caused death of several workers, have happened at an interval of only five years. However, people did not look on those accidents as opportunities to rethink safety programs. I suggest you investigate not only the Fukushima nuclear accident, but also circumstances and events in Japan prior to the accident. Were not they precursors?

Dr. Holm:

- Risk communication is important in the development of safety culture. Also important is increasing people's trust in the government. For that, the timely release of information is very important.

Mr. Yanagida:

- It seems that risk communication has been neglected in Japan, due to the prevalence of assumptions like "Nuclear power is safe," and "An accident won't happen." How is the situation in France?

Mr. Lacoste:

- One effective way to communicate about risks is to often hold emergency drills, inviting the media to participate to spread knowledge of them.
- Safety culture is a self-awareness of what could happen if an accident occurs, however improbable it may appear at the time.

Ms. Hayashi:

- Is there anything you wish to suggest to the Japanese government, with regard to international standards and laws?

Mr. Lacoste:

- As a former chairperson of the IAEA's Commission of Safety Standards, I find that Japan's participation in the development of international standards is less than the level one would expect, given the considerable extent of its nuclear power generation and its large number of nuclear power plants. It would be best for Japan to participate more in international discussions.

Mr. Takasu:

- We plan to examine whether Japan has been taking major steps to ensure that its own safety standards are in conformity with IAEA international standards.

Mr. Tanaka:

- In the United States, what efforts are being made to promote the development of safety culture?

Dr. Meserve:

- Although there are many factors, such as cost, that are considered in connection with power generation, safety culture in the United States is nevertheless based on the realization that priority must be given to safety.
- The development of a safety culture requires that organization leaders are fully aware of their responsibility for safety, and that they show this awareness in their decisions and actions.
- In addition, all involved individuals need to be aware of their responsibility for safety. In other words, anyone at a nuclear power plant who becomes aware of a safety problem should have a responsibility to ensure that it is addressed. That is, it should be a part of his or her duty to speak to a superior about a problem. If the superior is not interested and the person nonetheless believes there is a safety issue, he should report the problem to someone higher up.
- Any person who raises safety concerns must be protected from retaliation. In fact, he or she should be rewarded if the reporting uncovers a safety problem.
- Unfounded confidence or complacency, represented assertions that nuclear activities are “absolutely safe,” or that there is “no need to worry,” is most dangerous. It is necessary to build a culture that encourages continual questioning: “Is this really OK?”
- The NRC has recently promulgated a policy on safety culture that is deserving of review. It reveals the various aspects of safety culture.

Mr. Furukawa:

- After the accident, about 7,000 residents evacuated to Kawamata-machi from neighboring municipalities. Their evacuation was extremely difficult because comprehensive evacuation drills had not been conducted in the past, since people had assumed “An accident won’t happen.” How are evacuation drills promoted in France?
- Can you also tell us about how children are taught about safety and risk management?
- In Japan, we are now facing the challenge of finding places to temporarily store radioactive materials removed during decontamination. If you are aware of such experiences in your countries, please tell us what we can learn from them.

Mr. Lacoste:

- In France, we are also very dissatisfied with the present level of evacuation drills.

We face difficulties in the implementation of drills because people consider them a disturbance in their daily lives.

- Educational activities are led by local information committees that are normally chaired by the heads of elected members of Regional Councils. Much progress has been made with regard to citizen participation.
- It is difficult to give advice about decontamination because much depends on the local situation. Appropriate decisions will have to be made by the Japanese government. However, I can't see how the government will be able to make decisions without listening to public opinion and without obtaining citizen participation.

Dr. Holm:

- Sweden has information committees like those in France. The committees are chaired by the heads of local governments, and composed of various members of local communities, including members of local assemblies and representatives of nuclear operators. It is important that steps be taken to ensure the participation of local citizens and to build relationships of trust with them.

Mr. Chai:

- How has the issue regarding instrumentation functionality during a serious emergency been addressed since the Fukushima nuclear accident?

Secretariat:

- Technological issues related to the Fukushima nuclear accident have been examined by the Nuclear and Industrial Safety Agency (NISA), which organized hearings for that purpose. NISA has developed measures to ensure the reliability of instrumentation systems.

Mr. Takano:

- With regard to the Fukushima nuclear accident, I believe the ideal of prompt communication of reliable information was not respected. I would like to hear your opinions on the distribution of information during a critical emergency.
- I would also like to hear your opinions on risk management, in the context of a nuclear accident.

Mr. Takasu:

- The first principle of the IAEA's Basic Safety Principles for Nuclear Power Plants is that nuclear power plant operators have prime responsibility for safety. A report on the Fukushima nuclear accident produced by the IAEA investigation team states that the primary responsibility for taking proper actions in response to the accident rests with the operator, and that the responsibility of regulatory authorities is to supervise the operator, making sure that it is fulfilling its responsibility. I would like to hear your comments on these points.

Dr. Meserve:

- I completely concur with Mr. Takasu's comments on the IAEA's Fundamental Safety Principles. The prime responsibility for safety must rest on the operator, subject to careful oversight by an independent and competent regulator. The operator has to take charge of preventing and limiting an accident, subject to oversight.
- To build a relationship of trust with the public, honesty in communication is most important. When one doesn't know, one should admit it forthrightly: "We don't know. But we will make every effort to learn more about the situation."
- With regard to risk management, it is important that definite arrangements are made in advance to address what decisions are to be made, by whom, at what organizational level.
- With regard to the allocation of responsibility, one must consider who has access to information and best able to make decisions based on a sufficient understanding of the situation. It must be noted that persons in inferior positions may be more qualified to make certain decisions because they may have more technical knowledge and may have ready access to important data.
- It is not appropriate to elevate all decisions to the highest levels. There should be delegation to those in the best position to act, particularly in circumstances where quick action may be necessary to avert an accident or to mitigate its consequences.

Dr. Holm:

- I agree with what Dr. Meserve has said about communication. It is important that people believe that the government is being truthful and will communicate all new information. When one doesn't know, one should admit it, and promise to tell people more as soon as new information becomes available.

- With regard to risk management, it is important to make a clear distinction between the role of the operator and the role of the government. It is also important to clearly define the chain of command and to assign authority to persons at appropriate echelons, making it clear they are to act with all of the responsibility that they have.

Prof. Chang:

- I also agree with what has been said about communication. Governments need to provide information forthrightly and sincerely, both when communicating with people within the country and when communicating with the international community.
- With regard to risk management, operators have a great responsibility and must play a major role. They must be capable and supportive of safety culture. And the government, regulatory authorities, academic societies and researchers must support their efforts.

Mr. Chai:

- I also agree with the principle that operators have a tremendous responsibility to ensure safety. During a response to an accident, the government's responsibility is to provide the required support, and to help the operator take steps to minimize damage.

Mr. Abe (technical advisor):

- We intend to publish reports that are useful to the international community. Do you find any outlook that is missing in the interim report?

Dr. Meserve:

- The interim report provides detailed descriptions of facts, but I recommend that you examine the implications of those facts as a whole. The facts as a whole may reveal something about safety culture, for example. I would say you need a wider perspective that includes recommendations on how Japan should change its fundamental approach, taking into account lessons learned from the Fukushima nuclear accident.

Mr. Lacoste:

- Detailed descriptions of facts are needed, of course. However, people expect to

hear recommendations on what should be done to prevent the recurrence of a serious accident. I suggest you keep this in mind as you work toward your final report.

Dr. Holm:

- The perspective of safety culture should have been included in the interim report. Most of the APDs were damaged by the tsunami and there were not enough dosimeters for every worker to wear an APD. Between March 12 and 13, 500 APDs were provided by Kashiwazaki Kariwa NPS, but they were simply stored and unused until April 1. No one seemed to ask for them despite the shortage. This example shows the weakness of safety culture at the organizational level.

Mr. Takasu:

- The second of the IAEA's Basic Safety Principles for Nuclear Power Plants concerns the independence and effectiveness of regulatory authorities. I would like to hear your opinions on the function of regulatory authorities, based on an analysis of current conditions in your countries.

Dr. Meserve:

- Even though the primal responsibility for safety should rest with operators, regulatory authorities also have a major role to play.
- Regulatory authorities need to be independent. In the United States, the Nuclear Regulatory Commission (NRC) was formed in 1975 in order to establish an independent regulator that had no role in the promotion of the nuclear energy. The promotional role of the former Atomic Energy Commission was transferred to an entity that ultimately became the Department of Energy. The NRC reports directly to the President so it can make decisions independently without political interference.
- It is important to ensure that competent human resources are available to regulatory authorities. Many NRC staff members have advanced degrees, either a doctor's or a master's degree, and are compensated well. Many staff will spend their entire professional career as an NRC staff member. A regulatory authority's career-building system should be commensurate with the importance of its activities and the significance of its responsibility.
- It is possible to create a regulator that provides fulfilling work and that generates

great respect. The NRC has been identified as one of the best agencies of government at which to work in a poll of government workers for several years.

Mr. Lacoste:

- In France, the Autorité de Sûreté Nucléaire (ASN) was formed in 2006 as a nuclear safety authority independent from relevant ministries. As chairman of ASN since it was formed, I can attest to the fact that we have experienced no outside intervention.
- Since the Japanese government has decided to establish a new regulatory authority as an extra-ministerial agency of the Ministry of the Environment, measures must be taken to ensure its independence. Even though the new authority could be the extra-ministerial agency of the Ministry of the Environment in the beginning, Japan may choose to make it fully independent in the future, as the next step to be taken.
- With regard to the function of the future regulatory authority, it is desirable that a single agency is in charge of radiological protection and nuclear safety, and preferably also nuclear security.
- In France, we don't have a system to support the permanent employment of regulatory authority staff.

Dr. Holm:

- Sweden has a fully independent regulatory authority, and government intervention is prevented by the country's constitution. The regulatory authority used to be under the Ministry of Health, but is now since several decades under the Ministry of the Environment. In many countries a minister has the power to intervene directly in the day-to-day operations of government agencies. In Sweden such 'ministerial control' is prohibited by the Constitution, and suspected cases of unlawful ministerial interference are dealt with by the parliamentary Committee on the Constitution.

Second day (February 25, 2012)

IV Key Comments and Recommendations from International Experts

Subsequent to the discussions on the first day, international experts gave the following key suggestions and recommendations of particular significance as lessons regarding the March 2011 nuclear accident and the Committee's future investigative efforts.

Dr. Meserve:

- During your investigation leading up to your final report, you will draw lessons learned from the facts set out in your interim report and develop your recommendations. When you do this, you need to focus on the fundamental aspects of the problems that you expose.
- The operators' roles and their responsibilities are paramount, as espoused by the IAEA's Safety Fundamentals. The operator must take responsibility for safety. Regulatory compliance, although important, is not enough. The operator should consider the possibility of an extreme event and must take the necessary safety precautions accordingly.
- The role of a regulatory authority is to function as a backstop that makes sure operators fulfill their responsibilities.
- Independence of the regulatory authority is extremely important. It also must also have sufficient human and financial resources in order to ensure competence.. A small regulatory authority might not be able to maintain enough staff with sufficient training, specialized knowledge or expertise. In that case, the regulatory authority would need to be backed up by technical support organizations.
- Openness and transparency are also important The regulator needs to ensure the openness in its regulatory activities so that input from all relevant stakeholders is considered. It also should ensure transparency in its decision-making. That is, it must clearly identify its decision-making processes and the basis for its decisions. If openness and transparency are insufficient, public trust will be lost.
- Regulatory activities should be prioritized according to risk. Resources should be concentrated in accordance with risk. This should be the regulatory philosophy in order to ensure that the focus of activities meet the prime objective of ensuring safety.
- An appropriate chain of command is also important. Issues that need to be identified and determined include the role of government, the role of operators, and the level at

which specific decisions are made. It should be a rule that the people making decisions are those who have access to the relevant information, and who are capable of making judgment calls. In this regard, several questions arise from the facts discussed in the Committee's interim report: Was there an intrusion of government into matters that should have been the responsibility of the operator? Is it possible that the roles of relevant bodies were not clearly defined beforehand? Was there a tendency to make spur-of-the-moment decisions when responding, even though response plans had been established beforehand?

- Safety must be the number one priority. Cost and other issues should be lower prioritized.
- The responsibility of individuals is also important for safety management. Each individual involved in safety must have full awareness that he or she is responsible for safety and should maintain a constantly questioning attitude.
- The Institute of Nuclear Power Operations (INPO) in the United States is an organization established by nuclear power station owners/operators as one of the means to improve nuclear safety. INPO conducts a comprehensive series of inspections by which the member operators review each other's performance. They put pressure on each other to improve safety. And they learn from each other as another way to promote safety. This may be a model for Japan.
- Japan is now at a critical turning point. I recommend that the Committee seek to develop a new framework for safety that brings about fundamental change.

Mr. Lacoste:

- In your final report, you should include, in addition to technical aspects of your investigation, lessons learned from the accident, and recommend measures to prevent a recurrence.
- All concerned people need to reflect on the fact that the accident occurred in spite of the experience and knowledge built up over the years, and they also need to look back and examine whether there were signs in the past indicating potential problems. Is not there behind this, an issue of safety culture?
- One has to realize "Something unlikely can occur." Keeping safety margins in mind, one must always keep prepared for the possibility of an accident.
- Regulatory authorities are entrusted with a crucial role, and transparency is important to ensure that they perform their functions properly.
- Training programs and collaboration and communication between operators is also important to ensure safety.

Dr. Holm:

- One significant lesson from the accident is to learn that the improbable can indeed occur. Even something being improbable, accident response plans have to carefully consider it.
- Safety culture is critical. I suggest you include a section on safety culture in your final report.
- You need to consider what could be learned from previous incidents, such as the 1999 criticality accident in Tokaimura and the 2004 accident at the Mihama Nuclear Power Plant. What lessons were reflected in the subsequent development of safety systems? The lessons from this time accident should be shared by everybody as the global asset. Safety culture should be embraced not only by nuclear operators but by regulatory authorities as well.
- The new regulatory authority to be established provides an excellent opportunity to give it sufficient capability and authority (secretariat work, human resources, technical competency) so that it functions effectively.
- The respective roles of government, regulatory authorities and operators have to be clearly separated from one another. Also, the chain of command needs to be clearly specified, and the necessary authority needs to be delegated to the organizations depending on the level of the tasks they are expected to perform.
- Questions that need to be answered include: Even though preparedness plans and manuals had been compiled before the accident, why did they not function as they should have?; and, were appropriate drills not conducted? There is a need to conduct drills periodically to determine whether plans and manuals are effective.
- It is essential that the general public has confidence in the risk communication they receive. Relevant information should be conveyed in an open and honest way, and if something is not known or understood this should be admitted frankly. Risk communication will be more effective if drills employ accident scenarios. Having the media and general public participate in such drills is an effective way to boost confidence in safety systems.
- It should be examined how the System for Prediction of Environmental Emergency Dose Information (SPEEDI) should be used effectively in the future needs.
- The general public needs to be told that continued work will be done to follow up on the question of the effect of radiation on the human body. In order to establish trust, the follow-up program should not be terminated.

Prof. Chang:

- When investigating the Fukushima NPS accident, you need to ascertain what types of hardware was lacking, and what should be installed and upgraded for future preparedness.
- You also need to examine what software was lacking in preparedness measures — such as the Severe Accident Management, Operating Procedures and manuals under the SBO conditions..
- Your investigation should look at whether operators and other staff had sufficient knowledge, and whether they had been properly trained.
- It is important that you examine the safety culture espoused at the time by the government, the operator, and individuals — in other words, whether they placed the number one priority on nuclear safety.
- You should also look at what failures occurred in defense-in-depth measures (Level 1 [Conservative Design Basis]; Level 2 [Safe Shutdown]; Level 3 [Engineered Safety Features]; Level 4 [Severe Accident Management]; Level 5 [Emergency Preparedness]).
- Your approach should consider studies using simulations. Simulations would be effective in validating whether the conclusions of your investigation regarding Units 1 and 3 are correct, and in determining why a large amount of radioactive materials were released from Unit 2 on March 15.
- Your approach should also identify the existing situation. In December 2011 the Japanese government announced that the reactors were in cold shutdown, but it is still necessary to identify their current, actual status.

Mr. Chai:

- Lessons from the Fukushima Nuclear Power Plant accident show the need to consider not only the possibility of an internal event but also the possibility of an external event that may exceed the design basis. There is also a need to prepare defense- in-depth measures for preventing damage from spreading.
- Safety-related systems should be designed with diversity and physically separated, to avoid the simultaneous loss of safety functions.
- With due consideration to ensuring a balance among the five levels of defense-in-depth measures, the containment capability needs to be strengthened as part of enhanced accident management.

- Well balanced evaluation is needed between the deterministic safety approach and the probabilistic safety approach, in order to identify design weaknesses and improve safety.
- The design basis needs to be reviewed and updated periodically, using the latest data, in order to remain prepared for possible external events. One should consider, for tsunami measures for example, installing watertight doors, relocating critical equipment to a higher location, and equipping the facility with mobile generators and pumps.
- Ways to mitigate a severe accident may include increasing battery capacities, enhancing the means to inject water into nuclear reactors, and installing systems to release gas.
- There is a need to establish accident management guidelines to prepare for a total loss of power, and to conduct drills covering such a situation.
- The habitability of the main control room and other centers should be improved.
- There were other foregoing natural events that could have been instructive before the Fukushima NPS accident. These include the 1999 flooding at the Blayais Nuclear Power Plant in France, the 2004 tsunami that hit Indonesia, and the 2007 earthquake at Kashiwazaki, Japan. In 2008, when TEPCO reevaluated tsunami risks at the Fukushima Plant, it posited a wave height exceeding 15 meters. One has to ask why TEPCO did not pay more attention to natural hazards.
- One must also ask whether the initial response after the tsunami was appropriate. This question is especially relevant with regard to Unit 1, because the hydrogen explosion there complicated and worsened the situation.

V Closing Address

Dr. Hatamura, Chairperson of the Investigation Committee, gave the closing address and expressed his warm thanks to the international experts.

※The responsibility for the wording of this article lies with the Secretariat of Investigation Committee on the Accident at the Fukushima Nuclear Power Stations of Tokyo Electric Power Company.