Fukushima Nuclear Accident Analysis Report
<Summary Attachment>

June 20, 2012

Tokyo Electric Power Company, Inc.

This material reorganizes the contents of the Summary of the Fukushima Nuclear Accident Analysis Report according to specific focal contents, in order to aid readers' understanding of the main report.
Use the information to refer to the full report for more details.

[Contents]

<Items examined before the earthquake and tsunami>

<Items examined after the earthquake and tsunami>

*Supplementary information has been inserted as footnotes in this material in addition to excerpts from the main report to aid readers' understanding.

1. Response to seismic safety assessment (Seismic Back-Check)

In accordance with the revision of the Regulatory Guide for Reviewing Seismic Design of Nuclear Power Reactor Facilities in September 2006, the Nuclear and Industrial Safety Agency (NISA) instructed nuclear licensees to conduct seismic safety assessment (Seismic Back-Check).

Some have criticized that the process of Seismic Back-Check is taking too long, questioning whether actual work has ever commenced.

This investigation covers TEPCO's response to the seismic safety assessment (Seismic Back-Check). The following are excerpts of relevant sections from the Report:

[Descriptions of the Report] (Report [3.4])

○ In September 2006, the Regulatory Guide for Reviewing Seismic Design of Nuclear Power Reactor Facilities was revised (hereinafter referred to as "New Seismic Guide"). Accordingly, NISA instructed nuclear licensees to conduct seismic safety assessment (hereinafter referred to as "Seismic Back-Check") in light of the New Seismic Guide and submit its implementation plan.

○ The Niigata-Chuetsu-Oki Earthquake occurred on July 16, 2007 during this process. In response, on July 20, 2007, the Ministry of Economy, Trade and Industry (METI) issued a directive demanding that nuclear licensees reflect the knowledge obtained from the Niigata-Chuetsu-Oki Earthquake adequately to the seismic safety assessment of nuclear power reactor facilities, and submit a report on the results of their inquiry into revising the implementation plan for the seismic safety assessment.

○ TEPCO therefore conducted additional geological surveys, and revised its implementation plan, selecting two plants as representative (Fukushima Daiichi Unit 5 and Fukushima Daini Unit 4) and deciding to compile an interim report, which was originally not planned, by March 2008 from the perspective of presenting the safety of Fukushima and other nuclear power stations to the people of Japan at an early stage.

○ In the Interim Report, based on studies reflecting knowledge gained from the Niigata-Chuetsu-Oki Earthquake, TEPCO formulated the Design Basis Seismic Ground Motion Ss and carried out a Seismic Back-Check on reactor buildings and other main facilities with vital safety functions, rated seismic class S. The completed Interim Report for the selected Fukushima Daiichi Unit 5 and Fukushima Daini Unit 4 was submitted to the government in March 2008. The Interim Report for Fukushima Daini Units 1 – 3 and Fukushima Daiichi Units 1 – 4 / 6 was also submitted to the government in April 2009 and June 2009 respectively.

○ Findings of the investigation into foundation subgrade stability and events accompanying earthquakes (tsunami safety, stability of surrounding slopes) are to be covered in the Final Report, as publicly stated in TEPCO's press announcement at the time of the Interim Report on the representative plants.

○ Subsequent investigations into the Niigata-Chuetsu-Oki Earthquake identified matters that should be checked at other nuclear power stations. NISA compiled them into a report (Interim Report) on matters that should be reflected in the seismic safety assessment of nuclear power stations on December 27, 2007. Furthermore, on September 4, 2008, the Agency issued a directive on matters that should be reflected in the seismic safety assessment of nuclear power stations in view of the Niigata-Chuetsu-Oki Earthquake.

○ Due to the need for extra time to conduct investigations, etc. to respond to the new directive, TEPCO decided to revise the implementation plan for the Seismic Back-Check on December 8, 2008. Due to the postponement of the Seismic Back-Check, TEPCO decided to expand the scope of compiling an interim report from the selected representative plans to all the plants. The timing for submitting the Final Report was not defined. Instead, TEPCO was to publish the date once more specific timing became available.

○ On occasions including a meeting organized by the Fukushima Prefectural government, as part of its description of the Interim Reports, TEPCO referred to a plan to carry out seismic margin improvement work in advance wherever possible based on the experience of the Niigata-Chuetsu-Oki Earthquake, past knowledge and the results of various analyses. Among engineering work conducted based on lessons learned from the Niigata-Chuetsu-Oki Earthquake included countermeasures for transformer foundation subsidence / oil leakage, subgrade improvement on areas around ducting for the emergency sea water system, subgrade reinforcement around on-site priority emergency routes, reinforcement of cut slopes and vibration isolation work on Fukushima Daini NPS's exhaust stack, shared among 4 reactor units.

○ TEPCO provided description of the seismic tolerance enhancement work at a meeting organized by the Fukushima Prefectural government, and published its progress on its website.

○ Geological surveys and revised analyses became necessary for the Seismic Back-Check, ordered in relation to the New Seismic Guide, following two written orders from NISA.

A geological survey necessitates time for conducting the actual survey itself as well as time for explaining the survey to area residents to gain their understanding, and time for arranging and organizing marine vessels and equipment required for the survey. Be it underground prospecting in land areas or sonic prospecting in sea areas, such a survey uses special equipment, limiting the timing for implementation.

Analytical work also requires engineers well-versed in analysis and field work for preparing a survey model and exploring countermeasures. However, the fact that all the licensees commenced the work simultaneously upon instruction from NISA, created shortages of engineers capable of undertaking the tasks.

As a result, TEPCO was too busy incorporating lessons learned from damage caused by the Niigata-Chuetsu-Oki Earthquake and addressing the interim report for the Seismic Back-Check, to even establish a timeframe for submitting the Final Report.

○ TEPCO internally examined the schedule and drew up a plan, as of December 2010, to submit the final report in around FY2011 – FY2015. However, the aforementioned issues have made it difficult to quantitatively grasp all the schedule details, leaving TEPCO in no position to publish a solid schedule.

END

2. Tsunami measures and positioning of tsunami trial calculations, etc.

At 14:46 on March 11, 2011, the Tohoku-Pacific Ocean Earthquake occurred, the epicenter of which was in the area offshore from Sanriku, and later, the tsunami, which was one of the largest scale in history, struck the Fukushima Daiichi.

Although TEPCO had implemented various initiatives for countering tsunami, the tsunami this time far exceeded estimations.

There are indications that TEPCO failed to respond to the tsunami despite the fact that TEPCO had anticipated tsunami through a trial calculation based on a hypothesis with respect to claims by earthquake-related research institutions that was used by TEPCO as a reference in studying regarding tsunami as well as study sessions with NISA and the Japan Nuclear Energy Safety Organization.

The following are excerpts of relevant sections from the Report:

[Descriptions of the Report] (Report [3.5, 4.4])

<Positioning of Trial Calculations (perception of concerned parties)>

○ Neither the “Opinion of the Earthquake Headquarters” nor the model for the “Jogan tsunami” provided enough information to solidly calculate tsunami. The figures of the tsunami height estimated by means of the trial calculation was calculated based on hypothetical conditions, and was thought to be an unrealistic tsunami height (a tsunami height with no probability).

○ Even the tsunami height previously calculated based on the Tsunami Assessment Methodology was thought by several parties involved to be, on average, around as much as double the highest recorded tsunami. Due to the conservative approach of taking the uncertainty of wave sources into consideration, the estimation was perceived to have allowed sufficient margin against actual tsunami.

<Trial Calculation in response to the Opinion of the Earthquake Headquarters>

○ In 2008, TEPCO conducted a hypothetical trial calculation stated below in the seismic back-check as a reference for internal discussion on how to cope with the opinion of the Earthquake Headquarters that “there is the possibility that an earthquake could occur anywhere in the area off-shore from Sanriku to Bousou along the ocean trench”.

○ In the region along the ocean trench off-shore of Fukushima Prefecture, there had been no large earthquakes in the past. It was attributed to the theory that weak coupling between converging plates lead to ‘slippage” before strains great enough to cause a large earthquake, and as such considerable energy is not accumulated.

Consequently, the tsunami water level was estimated assuming that the wave source model of the Meiji Sanriku-oki Earthquake (M8.3), which would be most severe for the Fukushima site, would be brought about along the trench off-shore Fukushima, although a wave source model required to implement an evaluation of tsunami in the region along the ocean trench off-shore of Fukushima Prefecture had not been established and it does not match the earthquake size (M8.2) presented by the Earthquake Headquarters.

○ The result of the trial calculation showed a maximum tsunami height of O.P.+8.4m to 10.2m at the front of the intake point and a maximum flood height of 15.7m on the south side of the premises for major buildings of Units 1 – 4 at the Fukushima Daiichi.

○ Regarding the handling of the opinion of the Earthquake Headquarters, TEPCO requested the Japan Society of Civil Engineers ("JSCE") to discuss the formulation of a specific wave source model in order to conduct tsunami evaluations based on the Opinion of the Earthquake Headquarters because of the following reasons:

- The JSCE's "Tsunami Assessment Methodology," which is used by Japanese electric power companies as a guideline for tsunami assessment, does not take into account the occurrence of a tsunami along the ocean trench off-shore Fukushima.
- A wave source model to be assumed as a wave source of tsunami had not been determined.

<Trial Calculation for the Jogan tsunami>

○ Since wave source models, although they were not verified, were proposed in a research paper provided by Mr. Satake of the National Institute of Advanced Industrial Science and Technology (at the time) in December 2008, TEPCO conducted a trial calculation using the models.

The result of the trial calculation showed a tsunami height of about O.P. +7.8m to 8.9m in front of the Fukushima Daiichi and Fukushima Daini intake points. In addition, an implementation of a tsunami deposit investigation of the coastal area of Fukushima Prefecture was also planned.

○ The research paper was officially published in April 2009. It stated that tsunami deposit investigation of the coastal area of Fukushima Prefecture, etc. was required to establish the wave source model for the Jogan tsunami.

○ In June 2009, a discussion regarding the establishment of a specific wave source model for tsunami evaluation was requested to the JSCE together with the discussion on the handling of the opinion of the Earthquake Headquarters.

○ In order to investigate the presence of tsunami impacts on the Fukushima Daiichi and Daini due to the Jogan earthquake, TEPCO conducted a tsunami deposit investigation on the Pacific coast of Fukushima Prefecture. As a result of the investigations, tsunami deposits from Jogan tsunami were confirmed to an altitude of about 4 meters in the northern area of Fukushima Prefecture, while no tsunami deposits were found in the southern area (Tomioka to Iwaki).

○ As inconsistencies between the investigation results and the proposed wave source model that was used for the trial calculation were found, it was considered necessary to conduct further investigation and research in the future in order to establish the wave source of the Jogan tsunami.

<Flooding Study Group (established by NISA and Japan Nuclear Energy Safety Organization in 2006)>

○ The Flooding Study Group conducted an evaluation, as an evaluation of the impact of tsunami on nuclear power stations, based on the hypothesis that tsunami with the height of 1 meter plus the ground level of major buildings continued indefinitely.

○ Since the indefinite continuation of tsunami at the height of ground level plus 1 meter would lead to the indefinite entry of seawater into station buildings from their openings, the result unsurprisingly pointed to the loss of functionality for many of the electrical facilities and motor-driven facilities.

○ Around the same time, a trainee, who was based at the Headquarters for a short term, became inspired by the Flooding Study Group and took up the impact of tsunami exceeding estimations as his training theme.

○ However, these studies did not consider a possibility or probability of the actual occurrence of a tsunami that is greater than the ground level.

<Relevant organizations' evaluation of this earthquake and tsunami>

○ A massive M9-class earthquake extending over areas where earthquakes at plate boundaries off-shore from the Pacific coast of the Tohoku region could occur, was not anticipated even in the Opinion of the Earthquake Headquarters. The long-term evaluation by the Earthquake Headquarters published on January 11, two months before the Tohoku-Pacific Ocean Earthquake occurring, did not indicate the coupling of focal areas that was observed in this earthquake.

○ Following this earthquake, the Earthquake Headquarters (the Earthquake Investigation Committee) released the following ("Evaluation of the Tohoku-Pacific Ocean Earthquake of 2011"):

- "The focal areas of this earthquake are believed to be spread widely from the area offshore from Iwate Prefecture to the area offshore of Ibaraki Prefecture. While the Earthquake Investigation Committee had evaluated seismic motions and tsunami for the individual areas covering offshore of Miyagi Prefecture, the southern ocean trench offshore of Sanriku to the east and offshore of Ibaraki Prefecture to the south, an earthquake coupling all of these areas had not been anticipated.

○ "The characteristics and tasks concerning the Tohoku-Pacific Ocean Earthquake (the Great East Japan Earthquake)" was presented at the Central Disaster Prevention Council on April 27, 2011. As a major characteristic of this earthquake / tsunami, the scale of the massive earthquake and tsunami that far exceeded anticipation and the devastating extent of damage suffered from tsunami were described in that report.

○ In addition, the Central Disaster Prevention Council set up an expert committee on the disaster this time, and compiled the "Special Investigation Committee report on countermeasures for earthquake and tsunami, based on lessons learned from the

Tohoku-Pacific Ocean Earthquake" (issued on September 28, 2011). The report stated that the earthquake and tsunami this time were unanticipated before March 11, describing therein the characteristic of the tsunami as follows:

- "The tsunami that occurred in this disaster was of a scale that vastly exceeded pre-disaster assumptions. The main reason was an enormous earthquake with a magnitude of 9.0, a size that could not be envisaged from the history of earthquakes in Japan that stretches back for several hundred years, erupted as an earthquake with a wide epicentral area that interlocked several regions."
- "The reasons why such enormous tsunamis occurred include the fact that the mechanism causing the tsunami consisted not only of a slipping movement at the deep plate boundaries that lead to a normal ocean trench earthquake, but also a considerable simultaneous slipping movement at the shallow plate boundaries."

○ Since no earthquake institutes in Japan had anticipated the broad coupling of focal areas around Japan, like they did in the Tohoku-Pacific Ocean Earthquake, it was indeed a massive earthquake and massive tsunami that far surpassed our knowledge.

END

3. Preparedness for Severe Accidents

As part of the initiative for reducing the nuclear disaster risk so far, TEPCO has worked on improving safety through continuous improvements such as adequately designing and administrating nuclear facilities and reflecting insight and knowledge to such facilities as they become available.

One of the actions under the initiative was to draw up a set of Accident Management (AM) measures to enhance safety, in response to the TMI (Three Mile Island) accident and Chernobyl accident.

Some have pointed out that, since the AM measures developed between 1994 and 2002 were a voluntary undertaking by electric utilities themselves, TEPCO did not sufficiently consider or prepare them and could not respond to this accident, and that the efforts to deal with external events including earthquake and tsunami were insufficient.

This Report also covers the process of developing these measures, etc. The following are excerpts of relevant sections from the Report:

[Descriptions of the Report] (Report [4.5])

<AM preparation>

○ The “Shutdown,” “Cooling” and “Containment" functions needed for accident response as well as their power source systems have been strengthened so that they have multiplicity, diversity and independence, and they will not, at the time of an accident, to the greatest extent possible, lose their functions by simulating the occurrence of an accident to the extent exceeding the anticipated design for incidents. Furthermore, in order to respond to an accident appropriately with the aid of these facilities, the framework, procedural manuals, etc., have been prepared, and training has been conducted.

<AM measures and this accident>

○ In addition, to regular feedwater lines, various emergency water injection means, including reactor core isolation cooling system (RCIC), were prepared. Furthermore, several preparations were also made for allowing water injection into the reactor by various ways via control rod drive hydraulic pressure systems, condensate feedwater systems, and FP line, etc., none of which were originally intended to be used for reactor water injection.

○ Since power supply was lost due to the impact of the tsunami, ultimately all these measures of water injection into reactor were lost.

○ Almost all equipment and power sources, which were expected to be activated in the case of accidents, including equipment put in place as the AM measures that were prepared together with the government, lost their function.

<PSA approach in AM measures>

○ Since PSA is an effective approach for evaluating a severe accident that involves multiple sequences of an accident, has low probability of occurring and for which it is, therefore, difficult to gather actual data, establishing the PSA approach is necessary and effective for developing AM measures.

○ Around 1992, when the Nuclear Safety Commission released the report on "Accident Management for Severe Accidents at Light Water Power Reactor Installations," the PSA approach for internal events during plant operations was being established.

○ The approach had not been established for other PSA during plant shutdown (internal events) and external event PSA.

○ Even after the end of 2002, when utilities' AM preparation work was being completed, TEPCO has continued to examine seismic PSA and, at the same time, explored standard procedures at the Atomic Energy Society of Japan.

○ Even without any prompting from Ministry of International Trade and Industry, TEPCO had already worked on PSA for external events. However, even in the field of earthquakes, for which research was relatively advanced among external events, there was no established specific means of evaluation, and thus, with respect to tsunami, it was increasingly difficult to address.

END

4. Initiatives in safety culture and risk management

Since the nuclear scandal in August 2002, TEPCO has made utmost efforts group-wide to achieve corporate ethics, compliance, thorough safety / quality management and transparency through information disclosure in areas even beyond the boundary of the nuclear power division.

Some have pointed out a possibility that in the backdrop of this accident there is the nuclear power division's disregard for safety culture and closed nature.

This time, TEPCO's initiatives for nuclear safety, etc. so far was investigated, and the following are excerpts of relevant sections from the Report:

[Descriptions of the Report] (Report [4.6])

<Initiatives toward improving safety and quality>
(Recurrence prevention of nuclear scandals)

○ In the wake of the scandals in 2002 and 2006, TEPCO worked on building a "corporate culture for preventing sandals," "mechanisms for preventing sandals," and "mechanisms for encouraging whistle-blowing" in an effort to regain public trust. TEPCO has made utmost efforts group-wide to achieve corporate ethics, compliance thorough safety / quality management and transparency through information disclosure in areas even beyond the boundary of the nuclear power division[1].

(Nuclear power division's quality assurance activities)

○ In the wake of the scandal of 2002, a "Quality Management System" was created and efforts were made to further enhance PDCA regarding safety and quality improvement by the nuclear power division in order to systematically implement activities for ensuring the safety of nuclear power stations.

(Introduction of third-party perspectives)

○ Following the nuclear scandals, TEPCO set up the "Nuclear Safety and Quality Assurance Meeting" consisting of external members for conducting comprehensive deliberations, which evaluates and gives opinions on nuclear safety and quality assurance from third-party perspectives.

○ TEPCO has also set up opportunities for actively accepting the world's top-level perspectives and receiving their opinions, etc. through reviews by domestic and overseas specialized organizations such as the World Association of Nuclear Operators (WANO) and International Atomic Energy Agency (IAEA).

[1] Some point out that information disclosure to local communities might have served as the constraint for safety measures. TEPCO has actively reported any plant problems to local governments, explained any plans for facility changes and informed local residents on the status of plant operations, considering them as important opportunities for gaining the understanding and trust of local communities. TEPCO has never opted not to implement necessary safety measures just because that would require explanation to local residents.

(Development of safety culture)

○ Under management leadership, TEPCO has worked on developing the culture of humble learning (learning from others and learning from failures) and securing transparency through information disclosure, etc., so as to develop and establish safety culture.

○ Having received comments aiming at further improvement (on areas that need to be improved) related to TEPCO's safety culture in the WANO corporate peer review in 2008, TEPCO established the "Seven Principles of Safety Culture" (November 2009).

○ The WANO's follow-up review conducted in 2010 stated that, with respect to the said comments regarding safety culture, TEPCO has sufficiently improved.

<Initiatives in cross-functional risk management>

(Company-wide initiatives)

○ TEPCO has built a cross-functional risk management mechanism as detailed below, while maintaining the basic approach of designating each of the departments at the headquarters, each of the business sites and Group affiliates as risk management locations, where risks within those organizational units are managed through their day-to-day business operations.

・ In July 2004, the "Risk Management Committee" was set up to conduct company-wide and cross-functional management of damage control activities (prevention of the damage from spreading), taken at the time of the occurrence of the "violation of laws," and other events that could have a very serious impact on business management.

・ Then, with the diversification of issues that it should cope with and the mandatory requirement to develop internal control, TEPCO defined the basic policy for company-wide risk management and developed a risk management system for the entire TEPCO Group in order to recognize and manage the Group's overall risks at normal times in addition to emergency risk control (damage control).

・ Of these, factors that hamper management and business goals were identified as risks, and a risk management table was prepared (recognition). TEPCO has drawn up a risk map that takes into account each risk's level of impact, probability, etc., set the priority order of further responses (evaluation) and determined the response strategy according to the evaluation and responded to the risks (response).

・ In addition, with respect to the risks that are considered as having a serious impact, especially upon management, from the perspective of the degree of impact on the management objectives and the urgency of response, and from a company-wide perspective ("key risks for management control"), the status of management and a countermeasure policy against such risks are confirmed and evaluated by the Risk Management Committee.

(Initiatives in the nuclear power division)

○ In the nuclear power division, similarly to other departments, each department inside the Nuclear Power & Plant Siting Division and nuclear power stations was designated as a risk management location. On the premise of securing nuclear safety through safety management in day-to-day work, and to coincide with the company-wide efforts to reinforce the risk management system, the "Nuclear Power Risk Management Committee (led by the Deputy Chief Nuclear Officer of the Nuclear Power & Plant Siting Division and administrated by the Nuclear Power & Plant Siting Administration Department)" was established in June 2007 as the entity for consolidating the status of risk management of the division in normal situations. The Committee has been used to identify risk-related scenarios for each of the sites, and drawn up risk management tables[2] and risk maps to explore and implement evaluation and countermeasures.

○ At a meeting of the Nuclear Power Risk Management [Committee/Conference] before this earthquake (October 2010), with respect to the specific effects on nuclear power plants due to tsunami, it was anticipated that, if new knowledge based upon the Jogan tsunami research paper (2008) were to be established, the countermeasures on equipment, which could lead to "a drop in the capacity rate of equipment, subsequent strains on power supply and demand, increase of fuel costs" and "the costs for additional countermeasures,[3]" would be required due to the revision of the guidelines, etc. It was perceived at that time that the new knowledge had yet to be established, and there was no urgency or probability of such developments that could immediately threaten plant safety.

END

[2] The risk management table of the nuclear power department cites "incorporating severe accident measures into regulations" as a risk scenario. This captures the possible failure to sufficiently consider the actual status of facilities and plant operations, and the enforcement of regulations as formality without effective safety improvement, as risks, rather than the regulations for safety improvement themselves. Naturally, this is on the premise that TEPCO take necessary response if a regulatory authority makes a final judgment and turns such measures into regulations.

[3] Some point out that, since the Niigata-Chuetsu-Oki Earthquake, safety measures might have been neglected out of the need for cost cutting. With limited management resources available, there are occasions whereby TEPCO prioritizes some measures over others. However, the company has never neglected safety for cost reasons, as failure to assure plant safety would eventually affect its business performance.

5. Recognition of IC operation at Unit 1

Isolation Condenser (“IC”) is a devise for drawing steam from a reactor, condensing it into water and using it to lower the pressure inside the reactor, if the reactor pressure increases. At the Fukushima Daiichi, the device was installed only on Unit 1.

Some have pointed out the following in regard to the operation of IC at Unit 1 after the tsunami onslaught on March 11, 2011:

・The TEPCO Headquarters and the ERC at the power station did not fully grasp the status of IC operation.
・The failure to correctly recognize the status of IC operation was due to insufficiency in education and personnel training on IC.
・Why was the system’s restoration operation not carried out immediately?
・The failure to correctly recognize IC’s operation status caused delay in PCV venting and cooling water injection.

The following are excerpts of relevant sections from the Report, explaining how the Fukushima Daiichi handled IC operation, how the operation developed and how the system’s status was identified under tough conditions of having to cope with the loss of all AC power affecting multiple reactor units of the Fukushima Daiichi at the same time.

[Descriptions of the Report] (Report [8.2])

<Difficulty of identifying the status of IC isolation valves>

○ The IC isolation valves inside PCV are driven with AC power, while those on the outside are driven with DC power. This time, both the AC power and DC power were lost.

The opening / closing status of the isolation valves varies based on to what extent DC and AC power sources for driving the valves were active when the isolation signal was issued upon the loss of control power (DC power). In this case, whereby power sources were lost almost simultaneously and the status indicator lights were turned off, it was actually difficult to identify the opening / closing status of the isolation valves and respond to them.

<Acquiring knowledge on IC through training and OJT>

○ In addition to learning about the IC system while carrying out training in the operation procedure manual for times of accident, etc., workers gain knowledge through performing actual work in daily field patrols and monthly regular testing, maintenance activities during regular inspections, etc., and workers gain an understanding of system and functions and the interlock while performing such actual work.

<Field check by Main Control Room operators>

○ Field check could not be readily started in the situation in which tsunami submerged the basement levels of the turbine buildings and flooded the first floor of the service buildings amidst continuous aftershocks and large-scale tsunami warning, with tsunami of various heights constantly rolling in many times and confirming tsunami covering over the seaside areas.

The Shift Supervisor was asked by plant operators to permit them to check the field for restoration work, and was personally aware of that necessity. However, with no confirmation of safety in the field and lack of necessary equipment, the Shift Supervisor could not immediately dispatch the operators to the field.

○ However, since the plant status could not be confirmed at the Main Control Room(MCR), where all the monitoring instruments and indicator lights went out, the Shift Supervisor began arranging for the field check to figure out the status of the damage inside buildings, identify access routes, confirm water damage from tsunami on power supply facilities and the usability of plant facilities, etc. in preparation for subsequent restoration work.

○ On March 11 at 16:35, it was found that the status indicator light for diesel-driven fire pumps(DDFP) at the MCR was on to indicate that they were in the shut-down state. Since preparation for the field check was ready, the Shift Supervisor decided to start the field check. While plant operators set off for the field check at 16:55, they returned upon obtaining information on the way to the field that tsunami was approaching.

○ On March 11 at 17:19, the operators set off to the field, but aborted the field check because the contamination examination radiation meter held by the operators showed a measurement above the normal level around the entrance to the reactor building and it could not be determined how high the radiation level actually was, only that the condition was out of the ordinary.)

<Limited communication tools and tough environment>

○ The ERCs at the power station and the Headquarters were unable to use the Safety Parameters Display System ("SPDS"), making it impossible to identify the plant status visually. In addition, since the Hotline became the only available communication tool with the MCR, information provided from the MCR and field became important to identify the plant status from the ERCs at the power station and the Headquarters.

○ While trying to respond to situations at multiple reactor units due to lack of information about the cooling water injection status of Unit 2 since receiving information about the activation of IC after earthquake, the ERCs at the power station and the Headquarters could not realize, as at 21:19 on March 11, when they received the reading of reactor water level, the shutdown of IC, because of the factors that there was no information about IC shutdown after the tsunami onslaught, that the reactor water level, temporarily confirmed at 16:42 on March 11, was above the top of active fuel, and that steam generation from IC was reportedly confirmed at 16:44.

<Impact on response due to the misunderstanding about the IC operation status >

○ Following the instruction by the Site Superintendent to consider the use of fire engines for alternate water injection at 17:12 on March 11, the emergency safety department brought an available fire engine on standby beside the seismic isolated building, and the restoration team, in-house fire-fighting unit, etc. were working toward restoring access routes, removing scattered debris and searching for hose connections.

○ On March 11 at 17:19, operators set off for the field again, and DDFP automatically started up at 17:30 by the operators' fault recovery operations. However, since alternate water injection lines to the reactors were not prepared, it was decided that DDFP would be shut down until the alternate water injection lines were prepared.

On March 11 at 18:35, the MCR began an operation to manually open motor operated valves so as to establish alternate water injection lines to the reactors using the fire protection system. Operators and the operation team of the ERC at the power station set off for the reactor buildings using flashlights in total darkness where the lighting was not working.

On March 11 at 20:50, since the configuration of the alternate water injection lines to the reactors, using the fire protection system, was completed, operators started up the DDFP so that cooling water injection after the depressurization of the reactors[4] would occur.

○ Since it was immediately recognized after the tsunami damage that PCV venting would become necessary depending on how the situation would develop, TEPCO began preparation work and consideration for PCV venting including confirming the procedure and checking whether valves required for PCV venting could be opened and closed manually.

○ As described above, TEPCO began preparing for and considering cooling water injection and PCV venting from an early stage. Therefore, it is unlikely that the identification of the operation status of the IC system had any impact on an early realization of cooling water injection and PCV venting.

END

[4] At the time, the safety relief valves could not have been opened immediately due to the loss of power. Considering the substantial time required for arranging batteries and connecting them at Unit 3, it was difficult to catch up with the fast paced series of events at Unit 1.

6. Alternate water injection into Unit 3

Some have pointed out the following in regard to the operation of Unit 3 at the Fukushima Daiichi:

- The procedure for switching from the High Pressure Coolant Injection ("HPCI") system to low-pressure alternate water injection was handled erroneously in terms of the following:
  - ・The depletion of the source of electricity for operating the SRV should have been anticipated.
  - ・The configuration of the alternate water injection lines should have been confirmed when shutting down the HPCI system.
- The decision to shut down the HPCI system was made between shift personnel and the operation team of the ERC at the power station. In addition, there was a delay in reporting the failure to switch to alternate water injection to the leader of the operation team, and subsequent responses were delayed as well.

The following are excerpts of relevant sections on the responses and other details from the Report.

[Descriptions of the Report] (Report [8.4])

<Reason for considering that operation of opening the SRV was possible >

○ The power supply for the status indicator light of the SRV was the same for operating the solenoid valve, which could be switched on and off at the MCR, and upon the operation of the SRV, its status indicator light was on. Since the solenoid valve could be opened with excitation that requires a slight amount of electricity, the fact that the status indicator light was on led to the assumption that the operation of opening the valve was possible.

Judging from the facts that the status indicator light was on and that the HPCI system (with the 5600W oil pump required for running the HPCI system in the operational status) was working until just before the operation, it was natural to assume that the small solenoid valve (requiring 8.5W of power to drive) for opening the SRV was operational.

<Decision to shut down the HPCI system>

○ The HPCI system was continuously in a state of coming to a stop at any time, with the turbine revolution count dropping and the revolution speed slowing down to a level below the operational range described in the operating manual. Amidst the situation, the HPCI system entered into a difficult operating condition with the reactor pressure showing a downward trend. Even though the pressure reached the level that would ordinarily require stopping (isolated), the system did not stop.
(If the system had continued operating, the turbine vibrations could have become larger and potentially cause facility damage. Such damage near the turbines could have released the steam, which rotated the turbines, inside the reactor into the chamber of the HPCI system.)

Furthermore, since the discharge pressure of the HPCI system was at the same level as that of the reactor pressure, the cooling water was not injected into the reactors.

For these reasons, it became necessary to shut down the HPCI system at an early stage.

○ With no communication tools such as a pager or PHS (cell) phone, field operating conditions could not be confirmed directly between field locations, but since the reactor cooling water injection line switchover that used the DDFP had already started, even before the shutdown of the HPCI system, it was assumed, at the time of the shutdown operation, that the line configuration had been completed.

<Operation strategy and instruction by the Shift Supervisor>

○ The MCR and all the ERC at the power station were mutually aware of the injection of cooling water into the reactors with the DDFP after the HPCI system.
In switching from the HPCI system to cooling water injection using the DDFP, the Shift Supervisor had the authority to determine specific operations, e.g., shutting down the HPCI system, and the response strategy had already been established as common consensus.

○ Considering that the cooling water injection lines using the DDFP was configured, that the status indicator light for the SRV was on, and that the MCR was in the state capable of performing the operation, it is believed that there was no need to seek an instruction from the ERC at the power station before initiating the operation to switch to the low-pressure cooling water injection system.

<Delay in information sharing and subsequent response>

○ While a series of information about the lack of success in the depressurizing operation using the SRV was shared with the operation team in ERC at the power station, it took around one hour before the information became recognized at the power station in whole.

○ Although the information was not conveyed to the ERC at the power station until about one hour later, even during that period of time, an attempt at an open-operation of the SRV, an attempt to inject cooling water by a high pressure system, the process to restore power sources, etc., were proceeding, and by the time reactor depressurization started, the preparation for the injection of cooling water with a fire engine was completed. In view of these factors, it is considered that the fact that it took around one hour for the ERC at the power station in the whole to recognize a series of information about the lack of success in reactor depressurization after the shutdown of the HPCI system, had no bearing on the response measures taken later.

○ TEPCO made efforts to secure means of cooling water injection, e.g., the restoration of the SRV, HPCI system and RCIC system, consideration for cooling water injection into the reactor using the Standby Liquid Control System, and the arrangement of a fire engine. Although the event led to reactor core damage, the Site Superintendent and the Shift Supervisor issued instructions according to the status of the plants at any given time, and were working toward bringing the accident under control.

END

7. Chain of Command (venting and injection of seawater)

In regard to PCV venting and injection of seawater, some point out that TEPCO delayed PCV venting due to the discharge of radioactive materials and hesitated on the injection of seawater for fear of having to decommission the nuclear plants.

Opinions also vary about the power station's decision to continue injecting seawater despite the headquarters' decision to suspend it based on the recommendation of suspension by a person dispatched from TEPCO to the Prime Minister's Office.

The following are excerpts from the Report concerning how TEPCO made decisions for PCV venting, injection of seawater and suspension of seawater injection, and whether there was any issue with the chain of command at the power station and the headquarters:

[Descriptions of the Report] (Report [5.2, 8.2])

<The roles of the ERCs at the power station and the headquarters, and the confirmation / approval of important matters>

○ The Site Superintendent (head of the ERC at the power station) has the authority for drawing up the emergency restoration plan and implementing emergency measures. The head of the ERC at the headquarters (president) engages in additional personnel and equipment / material support to the ERC at the power station.

○ The power station and the headquarters are constantly linked with a video conferencing system so that the power station can seek confirmation / approval from the headquarters about important matters while sharing information.

For example, in the PCV venting of Fukushima Daiichi Unit 1, since it was a matter of significance involving the discharge of radioactive materials, the decision was made by the Site Superintendent, confirmed / approved by the president, and conveyed to the national government.

Similarly, in regard to the decision to switch the injection of cooling water into Unit 1 from fresh water to seawater, the instruction to prepare for the switch was issued by the Site Superintendent, and confirmed / approved by the president.

<PCV venting at Unit 1>

○ After the tsunami, the operation team and restoration team of the ERC at the power station as well as the MCR immediately recognized the possible need for PCV venting depending on how the situation would develop, and began preparing for or considering PCV venting, e.g., confirming the procedure and checking whether the valves required for PCV venting could be opened and closed manually.

○ On March 11 at 23:50, the pressure at Dry Well was found to be at 600kPa, prompting the Site Superintendent to instruct the preparation of PCV venting at 0:06 on March 12.

Then, the ERC at the power station started drawing up a venting operation procedure without power supplies, referring to plant drawings and Accident Management operating manuals.

In carrying out Japan's first ever PCV venting, TEPCO was making every effort to minimize radiation exposure through checking the status of local personnel evacuation and coordinating with the national and local governments (contacting the president by phone to obtain confirmation / approval at around 1:00 – 1:30 on March 12, and seeking and obtaining the approval of the Prime Minister, METI and NISA in regard to PCV venting at Unit 1 and Unit 2, at around 1:30).

Meanwhile, the MCR was proceeding with preparation work, e.g., checking specific procedures and arranging for working teams only under emergency lights, despite having no pre-defined procedure and despite having to carry out other works.

○ On March 12 at 9:04, plant personnel set off to commence the operation of venting valves, but could not open an air-operated valve due to a high level of radiation. Even after that, the ERC at the power station was continuously working toward PCV venting, e.g., arranging, installing and connecting temporary air compressors.

○ As explained above, there was no hesitation for, or intentional delay of PCV venting.

<Injection of seawater into Unit 1>

○ Immediately after the tsunami, the ERC at the power station was aware of the need for cooling water injection to cool the reactors, regardless of whether the cooling water might be fresh water or seawater.

○ While TEPCO had considered using seawater, which was in unlimited supply from the early stage of the accident, water was drawn from the fire protection tank near the hose connection for Unit 1 to start cooling water injection at around 4:00 on March 12 due to the need to start cooling water injection early.

○ Due to the limited supply of fresh water, the Site Superintendent exercised its authority to instruct the preparation for injection of seawater at around noon of March 12 after gaining confirmation / approval from the president while still conducting fresh water injection. On March 12 at 14:54, the Site Superintendent issued an instruction for injection of seawater on completion of the preparation work.

○ However, on March 12 at 15:36, before the injection of seawater lines were completed, an explosion occurred in the reactor building of Unit 1. Following the evacuation and safety confirmation of field workers, a walk-down in the field was launched at around 17:20. The hoses, prepared for injection of seawater, became damaged and unavailable.

The explosion scattered debris with high radiation levels. Injection of seawater using a fire engine commenced at 19:04 after removing scattered debris and gathering hoses to be laid again.

○ As described above, there was no hesitation for, or intentional delay of injection of seawater.

<Suspension of seawater injection at Unit 1>

○ On March 12 at 19:06, TEPCO reported the start of injection of seawater to NISA.

○ On March 12 at 19:25, TEPCO personnel dispatched to the Prime Minister's Office told the ERCs at the power station and the headquarters that they had yet to obtain the approval by the Prime Minister for the injection of seawater. Following consultation between the headquarters and the power station, they decided that seawater injection should be temporarily suspended.

○ TEPCO Executive Fellow Takekuro, dispatched to the Prime Minister's Office, felt that TEPCO should not proceed further without first convincing Prime Minister Kan because the Prime Minister expressed concerns about the effect of injection of seawater and asked detailed questions about the status of field preparation in the first briefing that started at around 18:00. The Prime Minister especially demanded assurances that the injection of seawater would not result in recriticality. The relevant parties decided to make preparations for the second briefing session again.

○ The temporary suspension of cooling water injection was recommended based on the following:

・ In view of the situation at the Prime Minister's Office, it was thought that proceeding with field work without the approval of the Prime Minister, who holds the highest authority in the Nuclear Disaster Response Headquarters, could undermine future collaboration with government offices, which would be required even more in the future.

・ It was thought that the suspension should only last for a short period of time as long as TEPCO was able to explain that there was no possibility of the re criticality.

○ It was the understanding of the ERC at the headquarters that it was difficult to proceed with injection of seawater without the approval of the Prime Minister when the validity of performing seawater injection was still being examined under the Prime Minister, who heads the Nuclear Disaster Response Headquarters, and with advice from the Nuclear Safety Commission. It was also thought that, according to the explanation by TEPCO personnel dispatched to the Prime Minister's Office, the suspension should only last for a short period of time.

○ However, the site superintended continued the injection of seawater operation, believing that the continuation of this operation was more important than anything else. The circumstances forced the Site Superintendent into making a decision against the judgment of the ERC at the headquarters.

- The ERC at the headquarters was forced into a decision to suspend the seawater injection based on a report by TEPCO personnel dispatched to the Prime Minister's Office. This was a case of causing confusion to the field operation by prioritizing the opinion of an external party over the judgment of the head of the ERC at the power station (Site Superintendent), who was responsible for emergency accident restoration. This points to the need to examine the protocols on the support for power station operations by external parties such as the Prime Minister's Office and the ERC at the headquarters, and the chain of command concerning emergency restoration work.

- The ERC at the headquarters should provide personnel support, material support and technical support such as event analysis. In handling coordination with external organizations, the ERC at the headquarters should provide support for specific accident management activities implemented by the Site Superintendent without hampering onsite accident management activities, e.g., causing direct interference to confuse commands for activities in the power station.

END

8. Partial personnel evacuation from the Fukushima Daiichi Nuclear Power Station

On March 14 and 15, 2011, Unit 2 of the Fukushima Daiichi was in a critical status.

Some hold an opinion that TEPCO was planning to withdraw all the personnel from the Fukushima Daiichi.

The following are excerpts of relevant sections from the Report:

[Descriptions of the Report] (Report [5.3 (7)])

○ In the evening of March 14, Unit 2 of the Fukushima Daiichi was in an extremely serious situation due to the extreme difficulty in injecting cooling water into the reactor and the inability to vent PCV.

○ At this time, about 700 people had remained at the power station, all of whom would be exposed to danger. They included administrative staff, women and people who had no direct involvement in any immediate emergency work. While TEPCO was to continue with cooling water injection, development of venting lines and other accident response operations to avert the crisis, it was becoming necessary to consider the physical safety of the large number of workers remaining at the power station.

○ For this purpose, evacuation guidelines were discussed between the Headquarters and the power station at around 19:30 on March 14. The Headquarters and the power station engaged in the discussion on the grand premise of keeping necessary personnel to continue accident response activities.[5]

○ On March 14 at around 19:45, Mr. Muto, Chief Nuclear Officer of the Nuclear Power & Plant Siting Division instructed his subordinates to examine an "evacuation procedure", and an evacuation manual was subsequently prepared. This manual clearly stated that the evacuees excluded emergency response personnel, indicating the company's intention to continue the operations to avert the crisis. The manual was last updated at 3:13 on March 15, which was before Prime Minister Kan summoned TEPCO President Shimizu to question him about TEPCO's withdrawal.

○ It was confirmed that President Shimizu made telephone calls to the executive assistant to the Minister of Economy, Trade and Industry and relevant persons between 18:41 and 20:34 on March 14, and at around 1:30 on March 15. In summary, President Shimizu told Economy, Trade and Industry Minister Kaieda that, due to the difficult situations at the power station, TEPCO intended to consider temporary evacuation of its employees who were not directly involved in emergency work, which would become necessary at some point, and there was no mention of

[5] On March 14 between 19:40 and 20:20, the Executive Fellow Takahashi, who was at the ERC of headquarters, said something along the lines of, “everyone at 1F are to evacuate to the Visitors’ Hall at 2F,” in regard to evacuation during a video conference. The statement was made on the assumption of leaving all the necessary personnel at 1F. However, in retrospect, the remark should have been worded more accurately.

"complete withdrawal" (The term "evacuation" rather than "withdrawal" was used[6]). Site Superintendent Yoshida had been consistent from the beginning about keeping personnel required for emergency work on the site. The official residence appears to have confirmed an intention of Site Superintendent Yoshida, and confirmed that full withdrawal was not being considered.

○ After some while, President Shimizu was summoned to the official residence. On March 15 at about 4:17, President Shimizu arrived at the official residence and was questioned by Prime Minister Kan about the true intentions. The following is a summary of the interactions between them:

Prime Minister Kan: "What is going on? Is TEPCO withdrawing from the site?"
President Shimizu : "That is not the case at all. We are not considering any withdrawal."
Prime Minister Kan: "I see."

President Shimizu thought that the Prime Minister understood the company's stance by his response to the effect that the company was not considering full withdrawal from the site.

○ Incidentally, these interactions are consistent with statements made by Prime Minister Kan to the Budget Committee of House of Councilors on April 18, April 25 and May 2, not too long after the accident.

《Example of Prime Minister Kan's statement》(at the Budget Committee of House of Councilors on April 18)

> "In the early hours, a TEPCO official informed me, via a government minister, about the company's plan to evacuate from the site. Since that would be a development of serious significance, I asked TEPCO President Shimizu to come and explain it to me in person. President Shimizu then told me that they were, by no means, planning a withdrawal."

○ On March 15 at 5:35, Prime Minister Kan came to the TEPCO Headquarters. The Prime Minister spent over 10 minutes in a rage harshly condemning the employees at the Headquarters and power station personnel connected via the video conferencing system regarding full withdrawal and he clearly said that he would not allow full withdrawal from the site.
The incident left an awkward impression as both the TEPCO Headquarters and the power station had always intended to leave personnel required for accident response at the site.

○ Thereafter, when Prime Minister Kan proceeded to assemble senior TEPCO executives of the Headquarters in a small room at the Headquarters and ask questions, a loud boom and tremors occurred in the power station at around 6:14. At 6:30, Site Superintendent Yoshida informed of the plan for temporary evacuation and confirmation of plant parameters. President Shimizu instructed the evacuation except for the minimum-required group of personnel. Site Superintendent Yoshida

6 Minister Kaieda did not ask to stop the evacuation.

responded that the team leader would name workers who were considered essential to stay on the site. Following these interactions, Site Superintendent Yoshida made a decision for partial evacuation, which President Shimizu confirmed and approved.

○ It is an undeniable fact that, although the plant was in a crisis situation, Site Superintendent Yoshida, senior power station officers and workers named by the leader of the emergency response team, totaling around 70 people, were resolutely prepared to stay at the power station in fear of their own lives and actually continued response activities. This action was not influenced by Prime Minister Kan's statements.

END

9. Inter-organizational information sharing

Some have pointed out that information was not shared smoothly between the power station and TEPCO Headquarters, between the TEPCO Headquarters and the government, and between the power station and relevant local government offices.

The following are excerpts of sections from the Report on how TEPCO handled sharing and providing information.

[Descriptions of the Report] (Report [5.3, 15.2])

<Information sharing between the power station and TEPCO Headquarters>

○ Since the plant data available was limited due to a station blackout, and obtaining information itself became a time-consuming task due to the scarcity of communication tools available between the power station and the field, the absolute volume of information regarding the plant available at both the Headquarters and the power station was small, and information that could be communicated was limited.

○ However, as to information obtained, the power station and the Headquarters were constantly connected via the Video conferencing system for sharing information and the Headquarters appropriately confirmed and approved any important matters. For example, PCV venting at Unit 1 was performed based not only on the decision made by the Site Superintendent but also on confirmation and acceptance by the president, as well as reporting to the government. In regard to the decision of switching from fresh water to seawater in cooling water injection into the reactor of Unit 1, the Site Superintendent instructed the preparation and the president confirmed and approved it.

<Information provision to the national and local governments (reporting and communication)>

○ With none of the monitoring instruments in the MCR, and all the emergency information transmission system also having been lost, the ERC at the power station gleaned information by word of mouth from those coming back from the field and by the hotline that were only remaining means of communication, and attempted to identify the status of the accident and transmit the information.

○ As to reporting and communication, information on the plant as the situation progressed, advance notice of PCV venting, information on the evaluation of radiation exposure at the time of venting and other information, although limited, were continuously and appropriately provided by simultaneous fax and telephone to the relevant organizations such as the government (Cabinet Secretariat, METI, Ministry of Education, Culture, Sports, Science and Technology, etc.), prefectural government, municipal governments, etc.

○ Of the communications made from Fukushima Daiichi, after attempting to send a fax message (receipt of which could not be acknowledged), repeated attempts were made to communicate with Namie by regular telephone, disaster priority mobile phone, satellite mobile phone and hotline, but since all of the means of communication were out of order, contact by phone could not be made until March 13, when TEPCO's employees visited in person and explained the condition. In addition, starting March 11, TEPCO employees visited the four towns in which the nuclear power station is located to explain the conditions.

○ It is seemed that one of the factors that caused communication difficulties with relevant organizations was the fact that the Off-site Center did not work.

○ At the time of the occurrence of the nuclear disasters, the government is to uniformly carry out public information activities; in the case of this accident, the off-site center functionality was lost; therefore, from the night of March 11, TEPCO conducted its own information providing activities as impromptu measures, such as, radio broadcasts and TV subtitling services, which were used in Fukushima Prefecture for provision of information as well as Fukushima Daini PR vehicles to provide information to local residents in the area.

<Information provision to NISA (reporting and communication, personnel dispatch, response to questions, etc.)>

○ TEPCO sent out reports about once an hour up to March 15. In addition to sending reports, TEPCO also dispatched 3 – 5 liaison officers to the Emergency Response Center at NISA to communicate with the ERC at the Headquarters. The dispatched personnel attended meetings of the Emergency Response Center's plant team and responded to queries from NISA as the liaison.

○ Queries that required an investigation and could not be answered immediately on the spot were answered by asking the relevant teams of the ERC at the Headquarters or the power station. The points of contact between the Headquarters and the power station were unified so as to avoid any confusion regarding queries to the power station. In addition, responses were gathered and accumulated by the information team to avoid having to address the same questions repeatedly.

○ It is unclear how NISA used information it obtained in this process. According to TEPCO liaison officers, however, the information was immediately shared with the Emergency Response Center's plant team of NISA at the meetings.

○ Since the plant data available was limited due to a station black out, and obtaining information itself became a time-consuming task due to the scarcity of communication tools available between the ERC at the power station and the field, the absolute volume of information regarding the plant available at ERCs at both the Headquarters and the power station was small, and information that could be communicated was limited. Both the Headquarters and the power station sent obtained information to the government and other offices via facsimile, telephone, etc.

<Information sharing with the official residence>

○ The information regarding the power station is normally conveyed via the Headquarters to METI and on to the Emergency Response Center at the official residence .

○ The nuclear licensees' operation plan for emergency preparation did not include a procedure for dispatching TEPCO's personnel to the official residence at the time of nuclear emergency. However, prior to the establishment of the government's Emergency Response Center (at 19:03 on March 11), there was a request for TEPCO to visit the official residence to speak about nuclear power , and TEPCO urgently sent the Executive Fellow Takekuro, the general manager of the nuclear power department and two others as technical assistance officers.

○ Since mobile phone communications were shut out at the Crisis Management Center and the medium-floor room where the officers were stationed at the official residence, they were not able to communicate with external parties. In addition, since the Crisis Management Center had not provided any information, the television installed at the room was basically the only source of information available to the four officers. During their time stationed there, they were allowed to use a fixed telephone at the Crisis Management Center to communicate with external parties, but information obtained was limited. For this reason, they had no way to answer any questions about the status of the power station until around noon on March 12.

○ From March 13 onwards, the number of TEPCO's personnel at the official residence was increased by about 4 or 5, stationed on the 2nd floor. From March 14 onwards, in addition, an additional 4 employees were sent to the Crisis Management Center in the basement to be stationed on duty round the clock.

○ Furthermore, upon request from the official residence, a direct telephone line linking the official residence with the power station was installed at 6:20 on March 13. Until then, there was difficulty in getting through to the power station with general phone lines. The establishment of the direct line meant the official residence was able to reach the power station directly. According to the Site Superintendent, the Prime Minister and personnel at the official residence used the line frequently to make queries.

A direct hotline linking the official residence with the Site Superintendent was established. Queries from the official residence included basic questions as well as questions about the validity of the scope of evacuation zones, which the official residence and the government were responsible for defining.

○ In this accident, due to the nature of the accident where all types of power sources were lost, the monitoring functions and communication facilities were lost, information itself regarding the power station was limited, and further, it took time to obtain such information.

TEPCO's information was distributed, according to past training and defined procedures, to the Crisis Management Center of the official residence, established in preparation for disasters, as well as the Emergency Response Center of NISA and the Off-Site Center. It is seemed that there was a high possibility that the countermeasures, including the hook-up of the government's video conferencing system with TEPCO's video conferencing system, could have enabled more streamlined operations by trained organizational units and many more personnel.

In addition, if the video conferencing system in the official residence had been utilized, considering that TEPCO dispatched personnel to NISA to provide information, senior government officials at the official residence could have obtained information at an earlier stage and taken more appropriate responses.

END

<Conclusion>

○ Based on the descriptions in the Main Report, this material reorganized the descriptions with focusing specific topics.

○ TEPCO has been pursuing the reduction of risks of nuclear disasters from various perspectives.

However, as summarized in the Main Report, almost all functions of the facilities that were expected to operate for accident response were lost in this accident due to the effect of the tsunami which was an unprecedented scale.

Since the frameworks and procedure manual for accident response were developed on the premise of using such facilities, responses at the field were forced to adapt to the sudden change of circumstances and they became extremely difficult.

As a result, TEPCO was unable to prevent the reactor core damage, which the company regrets deeply.

○ After actually encountering this tsunami, TEPCO now sincerely reflects upon its lack of sufficient prior preparedness, and is determined to steadily put in place countermeasures that are compiled in the Main Report based upon the lessons learned this time.

○ TEPCO sincerely apologizes for the anxiety and inconvenience caused to the local residents around the power station, the residents of Fukushima Prefecture, and the entire society. At the same time, TEPCO would like to express its gratitude towards the government, relevant organizations, and manufacturers, etc. for their support and cooperation in resolving this accident.

END