

Interim Report

(Main text)

December 26, 2011

Investigation Committee on the Accident at Fukushima Nuclear

Power Stations of Tokyo Electric Power Company

V. Emergency Response Measures Primarily Implemented outside the Fukushima Dai-ichi Nuclear Power Station in Response to the Accident

1. Environmental radiation monitoring

(1) Preparedness for environmental radiation monitoring and the initial situation regarding radiation after the accident

a. Role sharing among the central government, local governments, and nuclear power operators before the accident occurred

The “Basic Disaster Prevention Plans “ created by the Central Disaster Management Council stipulates that the radiation monitoring at the nuclear disaster should be undertaken by local governments; and that the Ministry of Education, Culture, Sports, Science and Technology (hereinafter referred to as "MEXT"), operators, and designated public institutions including the National Institute of Radiological Sciences (hereinafter referred to as "NIRS") and Japan Atomic Energy Agency (JAEA), should support the emergency monitoring of local governments by mobilizing both a mandatory emergency monitoring workforce and all necessary equipment to disaster-stricken areas.

According to the "Nuclear Emergency Response Manual" (hereinafter referred to as the "NE Response Manual", after the declaration of a nuclear emergency, a radiation monitoring team from the Nuclear Emergency Response Local Headquarters (“NERLHQ”) of Japanese Government should collect and arrange radiation monitoring data. Such data will provide the basis for establishing which areas will be evacuated of all residents, as well as determining where the consumption of food and drink by the residents is to be restricted or forbidden. Moreover, the NE Response Manual stipulates that if a nuclear accident has occurred at a commercial reactor, the NERLHQ should provide a comprehensive summary of all monitoring data to the Secretariat of the Nuclear Emergency Response Headquarters (hereinafter referred to as the "MITI-ERHQ), which is located at the Emergency Response Center (ERC) of the Ministry of Economy, Trade and Industry (“MITI”), and that the NERHQ Secretariat should provide this data to the Cabinet Secretariat of the Nuclear Safety Commission (hereinafter referred to as the "NSC"), as well as all other designated administrative agencies.

The Fukushima regional disaster prevention plan stipulates that the Fukushima

prefectural government should implement monitoring tasks even during normal times, that they should make provisions to take swift countermeasures if they receive a report of any unusual state of affairs based on the Act on Special Measures Concerning Nuclear Emergency Preparedness, and that they should make an effort to be well-positioned to implement emergency monitoring. This includes the need to work out a radiation monitoring strategy, prepare and maintain radiation monitoring facilities and equipment, secure all required radiation monitoring personnel, and ensure cooperation among relevant organizations.

The Fukushima prefectural government has monitoring posts established in twenty-four locations based on the Fukushima regional disaster prevention plan. Moreover, the Fukushima prefectural government constantly observes the radiation levels in the surrounding areas of the nuclear power station, which are measured through the monitoring posts operated by Environmental Radioactivity Monitoring Centre (hereinafter referred to as the "Monitoring Center"), which is adjacent to the emergency preparedness and response center (hereinafter referred to as the "Off-site Center"). The prefectural government has a total of thirteen monitoring cars for all relevant organizations including the off-site center. In addition, the local government's analytical equipment includes four germanium semiconductor detectors as well as NaI scintillation detectors located within the Monitoring Center¹.

Concerning nuclear operators' roles in monitoring, the Basic Disaster Prevention Plans stipulates that nuclear operators should prepare and maintain all the required measuring equipment (for each nuclear operator's facility), including site border monitoring posts, portable type measuring instruments and stack monitors in order to ensure that monitoring results are reported accurately when a specific incident occurs, and that nuclear operators should continue monitoring at site borders in order to notify the Nuclear Emergency Response Local Headquarters of any monitoring results.

Based on this stipulation, the Nuclear Operator Emergency Action Plan" of the Tokyo

¹ The Monitoring Center Fukushima branch, located in Fukushima City, has two germanium semiconductor detectors and one NaI scintillation detector. In addition, each of the seven Development bureaus in Fukushima Prefecture has one NaI scintillation detector.

Electric Power Company (hereinafter referred to as "TEPCO") stipulates that the health physics team of the Emergency Response Center, which is to be established at the Emergency Response Control Room in the Seismic Isolation Building of the power station, should be in charge of monitoring activities if an accident occurs at either the TEPCO Fukushima Dai-ichi Nuclear Power Station (hereinafter referred to as the "Fukushima Dai-ichi NPS") or the TEPCO Fukushima Dai-ni Nuclear Power Station (hereinafter referred to as the "Fukushima Dai-ni NPS"). With regard to monitoring equipment, TEPCO has eight monitoring posts, 14 stack monitors (two stack monitors for each stack), six liquid discharge monitors, and one monitoring car (located at the Fukushima Dai-ichi NPS).

Government's NE response manual stipulates that the monitoring data collected by the NERLHQ is to be released to the public. The NERLHQ radiation monitoring team shall create press releases on emergency monitoring for press conferences. The NERLHQ public relations team shall deal with the press and all PR presentations and answer reporters' questions, while maintaining close contact and cooperation with the NERLHQ administrative team, the Secretariat of the NERHQ and the PR groups of the emergency response headquarters of various local governments. In addition, TEPCO shall publish all data collected through the monitoring posts and stack monitors installed in each power station on its homepage.

This section mainly describes monitoring activities concerning the decisions the Government makes to limit the extent of any hazards.

b. The primary monitoring activities that were conducted outside the premises of the Fukushima Dai-ichi NPS after the accident

As a result of the earthquake and the ensuing tsunami damage, 23 of the 24 monitoring posts the Fukushima government had installed in the prefecture were rendered inoperative, the sole exception being the one installed at Ono station². In addition, due to severe

² Sometime after 16:00, four monitoring posts (those installed at Tanashio, Ukedo, Hotokehama and Kumagawa stations) were swept away by the tsunami. The monitoring post at Namikura station had its line for transferring data rendered inoperative due to the tsunami. Eighteen additional monitoring posts were unable to transfer data to the Monitoring Center because the backup power supply to the base station for the transfer data line was cut off.

earthquake damage, two of the four germanium semiconductor detectors that had been installed at the Monitoring Center were rendered inoperative.

The Fukushima prefectural government discussed the possibility of monitoring being conducted via monitoring cars starting on March 11, 2011. They determined, however, that it might be too risky to conduct monitoring at night with caved-in roads and widespread power failure. Instead, they started the monitoring early in the morning of March 12, 2011³.

Also, following the nuclear accident on March 11, 2011, the Ministry of Education, Culture, Sports, Science and Technology decided to dispatch monitoring cars to the Off-site Center, pursuant to the National Basic Disaster Prevention Plans.. However, it was some time late in the evening of March 12 that they actually issued directions for their dispatch. It was around 11:20 the next day on March 13 that their professional support members arrived at the Monitoring Center⁴.

From March 13, staff from the Fukushima local government as well as the national government used the monitoring cars, working together to conduct monitoring activities such as measuring radiation levels in the air, collecting dust suspended in the atmosphere, environment samples and soil samples based on the radiation monitoring strategy developed by the staff of the Monitoring Center and accepted by the Local Emergency Response Center. The collected samples were analyzed using the two germanium semiconductor detectors, located at the Monitoring Center. The results of the analysis were

³ On the night of March 11, 2011, the Fukushima Prefectural Emergency Response Center summoned approximately 30 monitoring members from relevant organizations at the request of the Monitoring Center. The following day, on March 12, these monitoring members were dispatched to the Monitoring Center together with 12 vehicles that could be used as monitoring cars. The same day, the Monitoring Center staff started monitoring activities with these members who had been summoned to monitor. However, by 21:00 that same day, they had disbanded the monitoring team, with the exception of ten of their staff who had specialized knowledge of and skills in radioactive substances, when monitoring activities turned out to be impossible due to devastating damage of the roads caused by the earthquake, fuel shortages, and increased radiation from the explosion at the Reactor Building of Unit 1 that had occurred earlier in the day.

⁴ These support teams had a total of four vehicles consisting of three monitoring cars, from the Mito atomic energy office of MEXT, the Ibaraki Prefectural nuclear safety office and JAEA/NEAT, and one passenger car that tailed the monitoring cars. These four vehicles gathered at the JAEA Nuclear Emergency Response Support and Nuclear Emergency Assistance & Training Center (JAEA/NFAT). According to MEXT staff, the reason the directions to dispatch the monitoring cars were not given until some time after the evening of March 12 is that they decided it was too risky for the monitoring members to move around during the night since tsunami warnings were still in effect and the condition of the roads in the affected area was unknown.

reported to the NERLHQ located at the adjacent off-site center.

The initial monitoring activities did not work out as intended due to a host of reasons including hazardous road conditions from earthquake damage, flat tires, vehicles that had fallen into cracks in the ground and fuel shortages. In addition, as described in Chapter III 5(1) b5 , it was difficult to consolidate the monitoring data for sharing with the Secretariat of the Government Nuclear Emergency Response Headquarters Headquarters (NERHQ) and other agencies since the Off-site Center had very limited means of communication due to widespread power failure.

The NERLHQ and the Prefectural Nuclear Emergency Response Center have played a central role in conducting monitoring activities since March 15, when the NERLHQ that had been located at the Off-site Center, was moved to the Fukushima Prefectural Office⁵.

In addition, the NERLHQ (the Off-site Center) was supposed to publish the monitoring data that was gathered from the affected areas between March 11 and 15. However, the press conference scheduled at the Off-site Center was not held since, as described in III5(2), the Off-site Center was located in the mandatory evacuation zone that was announced early in the morning of March 12.

However, the NERLHQ staff faxed the monitoring data that had been collected via monitoring cars from March 12 to the ERC where the NERHQ Secretariat was located. On March 12, the NERLHQ staff delivered a report of the measurement results to the ERC as measured, which had been created by a team of monitoring members. It was determined, however, that from the following day, March 13, the radiation monitoring team of the NERLHQ should summarize the monitoring results each day and deliver them to the ERC under the name of the site superintendent of the NERLHQ.

The Secretariat of the NERHQ, which received monitoring data from the NERLHQ, successively published only the data that was believed to be summarized well enough to

⁵ Once the NERLHQ was moved to the Fukushima Prefectural Office, the staff dispatched from the national government left the monitoring cars (which were out of fuel) behind at the off-site center. After that, there were no monitoring cars available in the affected areas. MEXT thus ordered or requested all relevant organizations to dispatch monitoring cars and monitoring personnel. A maximum of 15 monitoring cars were used from March 15 to measure the radiation levels in the air. The Fukushima prefectural government had no choice but to leave most of the monitoring devices at the Off-site Center when the NERLHQ was moved to the Fukushima Prefectural Office.

be officially published. As described above, the data and monitoring results, which the radiation monitoring team of the NERLHQ summarized each day to deliver to the ERC, from March 13 was published on the website of the Nuclear and Industrial Safety Agency (hereinafter referred to as "NISA").

Moreover, on June 3, NISA published additional data, which had not yet been made public, from the monitoring data that was collected between March 11 and 15 including the results of the monitoring that was conducted on March 12 (refer to Section 8(6)).

c. The monitoring activities that were conducted within the premises of the Fukushima Dai-ichi NPS after the accident

Due to the total loss of AC power supplies resulting from the earthquake and the impact of the ensuing tsunami, on March 11 the eight monitoring posts that had been installed within the premises of the Fukushima Dai-ichi NPS and the fourteen stack monitors that had been connected to each Unit were all unable to be used to monitor. Thus monitoring activities at the Fukushima Dai-ichi NPS began at 17:00 on the same day at more than two locations within the premises of the power station to evaluate changes in the level of radiation dose and estimate the situation of the power plants using the monitoring car⁶ that belonged to the power station. The monitoring results were successively made available to the public on the websites of TEPCO and NISA.

Afterwards, from March 23, TEPCO installed three temporary monitoring posts within the premises of the Fukushima Dai-ichi NPS to collect data and published their monitoring results from March 27. On March 25 and 29, the existing eight monitoring posts, which had been rendered inoperative, were restored to their former state using a temporary power supply. TEPCO resumed collecting data by making the rounds once a day from April 1. On April 9, the data transmission systems of these existing eight monitoring posts were restored to their former states enabling them to collect and publish data automatically.

At the Fukushima Dai-ichi NPS, TEPCO started collecting and analyzing samples from

⁶ The next day, March 12, another monitoring car dispatched by the TEPCO Kashiwazaki-Kariwa Nuclear Power Plant joined the monitoring activities within the premises of the Fukushima Dai-ichi NPS. This vehicle was, however, rendered inoperative due to fuel shortages from March 14.

the sea near the two water discharge canals on the premises from March 21, when the rubble and debris created by the tsunami were sufficiently cleared away to allow access to the seashore. Because seawater was sprayed into the reactor building, and due to rainfall, water contaminated with radioactivity may have flowed out into the sea. In addition, for the comparison of data, TEPCO also started collecting and analyzing samples from the sea near the two water discharge canals on the premises of the Fukushima Dai-ichi NPS⁷.

On or around March 20, TEPCO corrected its previously published data concerning neutron measurement frequency. Taking advantage of this opportunity, TEPCO conducted an in-depth investigation and discovered that some monitoring data for a certain period of time that had been collected within the premises of the Fukushima Dai-ichi NPS immediately after the accident had not yet been published.

Following NISA's directions, TEPCO started preparing to publish these data. All data that had not been published was added to the previously published data between March 11 and 21 and this combined data was published on May 28. In addition, as directed by the Prime Minister's Office to explain the delay in the publication of the data, TEPCO put the monitoring data on its website again accompanied by an explanation for the delay in publishing the data.

⁷ Dai-ichiTEPCO also monitored the water in the water intake and the subdrain at the Fukushima Dai-ichi NPS as follows:

- On March 26, it was discovered that highly concentrated radioactive water had accumulated in the first basement of the turbine building of Unit 2. Based on expert advice provided by NSC on March 28 that sampling of the groundwater in the subdrain should be conducted, sampling of the water in the subdrain started from March 30.
- On April 2, it was discovered that highly contaminated radioactive water had been flowing into the sea from the part of concrete near the water intake of Unit 2. Thus the sampling of seawater began near the water intake from the same day.
- It was decided that the highly concentrated radioactive waste water should be transferred to the main processing building of the centralized waste treatment facility from April 19. Based on this decision, sampling and analysis of the water in the subdrain of the centralized waste treatment facility started from April 16 to confirm that no radioactive materials had leaked from the transferred contaminated water into the groundwater.

(2) Efforts to assign responsibility for radiation monitoring and the subsequent enhancement of monitoring activities

a. Efforts to assign responsibility for radiation monitoring within the Government for the overland area more than 20km from the Fukushima Dai-ichi NPS

As described in Section (1)b above, radiation monitoring activities based in the Local Emergency Response Center located in the Off-site Center were not sufficient to satisfy the parties concerned within the government. Thus around and after March 13, Special Advisor to the Prime Minister, Mr. Goshi Hosono (hereinafter referred to as "Special Advisor Hosono"), contacted executive officials at MEXT to for details on the status of the radiation monitoring, and the government asked all parties concerned several times to conduct more proactive radiation monitoring activities on a national basis.

On the night of March 15, the monitoring of the radiation level in the air conducted by a monitoring car traveling around Hirusone in Namie-machi in Futaba-gun, Fukushima Prefecture observed radiation levels as high as 330 μ Sv/h. MEXT thus recognized that it might also be necessary to explain its evaluation of how these levels should be dealt with. On the other hand, the Ministry also recognized that it might be difficult to handle everything on its own, including the collection, publication and evaluation of the monitoring data⁸.

A meeting in relation to the above chaired by Chief Cabinet Secretary, Mr. Yukio Edano (hereinafter referred to as "Chief Cabinet Secretary Edano"), was held on the morning of March 16. It was decided in the meeting that the roles and responsibilities within the government should be as follows: MEXT should compile and publish the monitoring data collected by each organization concerned using monitoring cars in the land area beyond 20km from the Fukushima Dai-ichi NPS; the NSC should evaluate this monitoring data; and the Government Emergency Response Center should take any necessary measures based on the evaluations of the NSC.

⁸ MEXT was asked by the media how the Ministry had evaluated the monitoring data mentioned above when it released the results of the monitoring conducted around Hirusone at a press conference held by the Ministry on March 16. The officials from the Ministry responded by saying that the results of monitoring activities were to be evaluated by the NSC from March 16 based on the assignment of responsibility concerning radiation monitoring activities within the Government (refer to the next paragraph of this report) on the same day.

From March 16, based on the roles and responsibilities within the government that had been decided in the aforementioned meeting, theNERLHQ⁹, located at the Fukushima Prefectural Office, decided to deliver the monitoring data compiled by its own to both the ERC and the Emergency Operating Center (EOC) of MEXT while MEXT collected this data to deliver to the NSC for its evaluation for its evaluation and started publishing it from the same day¹⁰.

Moreover, the NSC shared the results of its evaluation of the monitoring data with the all relevant ministries and agencies by delivering the data to the ERC, EOC, and the Prime Minister's Office¹¹. The Commission did not initially release its evaluation results when the roles and responsibilities within the government were determined on March 16 as Chief Cabinet Secretary Edano had continually held press conferences, addressing various issues including the evaluation of the monitoring activities. Subsequently, however, the Commission started to release its evaluation results from March 25 since it had been strongly urged to and also because it had been pointed out by the media that its activities were hard for the general public to understand.

⁹ On March 15, the Local Emergency Response Center was moved from the Off-site Center to the Fukushima Prefectural Office (for details of the circumstances surrounding this move, refer to Section III5(3) above).

¹⁰ MEXT decided that if any discrepancies were found in the monitored values, the monitoring data should be verified and validated first within the Ministry before being made public. If no discrepancies were found in the monitoring data, then to ensure speed the Ministry should contact the three most important officials (the Minister, the Vice Minister, and the Parliamentary Secretary) of the Ministry and the Fukushima prefectural government in advance before making the monitoring data public.

¹¹ On March 21, MEXT released a "plan to improve monitoring activities in the area beyond 20km from the Fukushima Dai-ichi NPS" based on recommendations (including implementing efficient environmental radiation monitoring in extensive contaminated zones, strengthening the environmental radiation monitoring team and implementing reasonable environmental radiation monitoring) of the Advisory Team led by Mr. Toshisou Kosako, a professor at the University of Tokyo Graduate School, who had been appointed Cabinet Secretariat advisor on March 16 (refer to Section III2(6)).

Also, on April 22, the Government Emergency Response Center released a "plan to enhance environmental radiation monitoring activities." This plan was created by a team led by Cabinet Office advisor, Mr. Kenkichi Hirose, with a view to enhancing the environmental radiation monitoring activities in order to capture the full scope of the nuclear accident and to reduce or eliminate the designated evacuation zone and the emergency evacuation preparation zone (refer to Section 3(2)d below), the implementation of which had been discussed within the government.

b. The monitoring activities conducted in the area beyond 20km from the Fukushima Dai-ichi NPS from March 15

As described in Section (1)b above, the monitoring activities implemented immediately after the nuclear accident were based on the radiation monitoring plan that had been devised by the Fukushima prefectural government staff and approved by NERLHQ. On the contrary, regarding the monitoring activities in the area beyond 20km from the Fukushima Dai-ichi NPS, the monitoring plans had been separately devised by the NERLHQ and the Fukushima Prefectural Emergency Response Center since NERLHQ was moved to the Fukushima Prefectural Office on March 15.

Subsequently, the national government decided to conduct radiation monitoring mainly in an area where high levels of radiation had been detected in order to estimate the levels in a wider area. On the contrary, in response to requests from local communities, the Fukushima prefectural government decided to develop a radiation monitoring strategy in the Fukushima Prefectural Emergency Response Center (hereinafter referred to as the "Prefectural Headquarters") and collaborate closely with the NERLHQ to implement monitoring activities since it had been planning to conduct radiation monitoring mainly in highly populated areas within the prefecture.

MEXT started to discuss monitoring by aircraft in order to do survey a wide area from around March 12 and released its "MEXT Aircraft Monitoring Action Program" on March 25. On the same day, with the cooperation of the Japan Aerospace Exploration Agency (JAXA), an independent administrative organization, the Ministry measured the levels of radiation in the air beyond 30km from the Fukushima Dai-ichi NPS¹². In response to a request from MEXT, the Self Defense Forces measured the concentration of radioactive materials in airborne dust particles above Fukushima Prefecture between March 24 and April 1.

In addition, the Japanese and US Governments met to start discussing how the two nations could cooperate to conduct aircraft monitoring in a U.S.-Japanese conference (hereinafter referred to as the "U.S.-Japanese conference"), which began around the end of

¹² This aircraft monitoring was conducted using JAXA's small aircraft equipped with radiation measuring instruments provided by the Nuclear Safety Technology Center.

March. Previously, the United States Department of Energy (DOE) had independently conducted aircraft monitoring after the nuclear accident. Two subsequent joint U.S.-Japan aircraft surveys were conducted¹³.

Moreover, from March 21, with the cooperation of the Maritime Safety Agency and the Fisheries Agency, MEXT monitored the sea area beyond a 30km radius of the Fukushima Dai-ichi NPS. The geographical scope of the monitoring area was extended because TEPCO had discharged retained water including low-level radioactive water into the sea on April 4¹⁴. TEPCO also conducted coastal sea area monitoring in Fukushima Prefecture and Ibaraki Prefecture in the sea area beyond a 30km radius of the Fukushima Dai-ichi NPS.

¹³ This aircraft monitoring was conducted by MEXT and the U.S. DOE working within their respective designated air space from April 6 to 29 and from May 18 to 26. They measured the levels of radiation in the air at a height of 1m above the ground within an 80km radius and within an 80 to 100km radius (and within a 120km radius to the south of the NPS) respectively from the Fukushima Dai-ichi NPS and confirmed the accumulation of radioactive substance on the ground. MEXT released these results on May 6 and on June 16. In addition, between May 31 and July 2, with the cooperation of the Defense Agency, MEXT conducted its third aircraft monitoring within an 80km radius of the Fukushima Dai-ichi NPS to measure the level of radiation in the air dose at a height of 1m above the ground and the accumulation of radioactive substance on the ground. The Ministry released these results on July 8. In addition to the aircraft monitoring described above, in response to requests from the prefectures concerned, MEXT conducted joint aircraft monitoring in Miyagi, Tochigi, Ibaraki, and Yamagata prefectures. The results of the monitoring were subsequently released.

¹⁴ In response to the recommendations of the Advisory Team led by Cabinet Secretariat advisor, Mr. Toshisou Kosako, MEXT developed a policy to conduct sea area monitoring with the cooperation of the Maritime Safety Agency on March 21 and released its "sea area monitoring action program" on March 22. The next day on March 23, MEXT requested that the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) conducted a sampling of seawater from the sea area precisely like the "comprehensive evaluation of radioactivity in the marine environment" that the Marine Ecology Research Institute had been conducting before the nuclear accident occurred. The results of the sampling were compared with those of past surveys in terms of concentration of radioactive materials in the seawater, levels of radiation in the air above the sea and concentration of radioactive materials in dust particles in the atmosphere above the sea. In addition, in response to the "plan to enhance the environmental radiation monitoring activities," which was released by NERHQ on April 22, (which stipulates that, in terms of ocean areas, the number of measurement points should be increased and that predictions on the dispersion of radioactive materials should be successively performed based on the predictions of ocean currents), the Ministry released the "planned enhancement of sea area monitoring" in response to the "plan to enhance environmental monitoring," and 11 sampling points were added on April 25.

On May 6, based on the anticipation that radioactive materials could disperse in the sea, the Ministry released a plan of "wider sea area monitoring." In response to this, it was decided that JAMSTEC should conduct monitoring in more pelagic zones and that TEPCO should perform water sampling at some of the sampling points within the sea area of 30km offshore from the Fukushima Dai-ichi NPS, a zone which had previously been overseen by JAMSTEC since late March.

c. The monitoring activities conducted in the areas surrounding the Fukushima Dai-ichi NPS

As described in Section (1)b above, between March 12 and 14, the monitoring activities were intermittently conducted using monitoring cars that were provided by the Fukushima prefectural government in the areas within a 20km radius of the Fukushima Dai-ichi NPS. From March 14, the monitoring activities using monitoring cars were suspended because evacuations were completed within a 20km radius and the levels of radiation increased in the areas of land outside that radius¹⁵.

In response to directions from Chief Cabinet Secretary Edano, the Emergency Gathering Team subsequently started to discuss how to conduct monitoring in the area within a 20km radius of the Fukushima Dai-ichi NPS to establish restricted areas and make a temporary access plan to those restricted areas (refer to Section 3(2)g). On March 30 and 31, with the cooperation of the Federation of Electric Power Companies (hereinafter referred to as "FEPC"), TEPCO thus conducted radiation monitoring at 33 locations in the area within a 20km radius of the Fukushima Dai-ichi NPS. Subsequently on April 2, MEXT conducted additional monitoring at 17 locations in the area within a 20km radius of the Fukushima Dai-ichi NPS.

In mid-April, the zoning of restricted areas and the planning of temporary access to the restricted areas were nearly finished. The emergency operations team decided to conduct radiation monitoring to grasp the areal dispersion of radioactive materials within a 20km radius of the Fukushima Dai-ichi NPS in order to implement temporary access to the restricted areas. In response to this decision, on April 18 and 19, MEXT, TEPCO and FEPC conducted joint monitoring activities at 128 locations in the area within a 20km radius of the Fukushima Dai-ichi NPS. The results of these monitoring activities were published on MEXT website along with the joint monitoring activities that were conducted

¹⁵ In the aftermath of the nuclear accident, the Defense Agency provided dosimeters to an emergency team of Self-Defense Force personnel, which had been summoned to work around the Nuclear Power Station, to prevent them from being exposed to radiation and to measure the levels of radiation in the air where necessary, depending on the prescribed activities of the Self-Defense Force personnel. On March 28, the Defense Agency shared its monitoring data obtained within 20km radius from the NPS with the government emergency operations team in order to use as a reference for the establishment of restricted areas and to help organize temporary access to those restricted areas.

by MEXT and TEPCO in the area within a 20km radius of the Fukushima Dai-ichi NPS from late March to early April.

As described previously it was discovered that highly concentrated radioactive water had accumulated in the basement of the turbine building of Unit 2. On March 28, and NSC issued an advisory that sea area monitoring activities should be enhanced for safety purposes. Thus from April 2, TEPCO started sea area monitoring activities at multiple locations in the area 15km offshore from the Fukushima Dai-ichi NPS. To conduct sea area monitoring activities, TEPCO initially requested, via the NERHQships and vessels from the Maritime Safety Agency because TEPCO could not afford to provide them. Subsequently, in early April, highly radioactive water was discharged or found to be leaking. In response to this situation, TEPCO added water sampling points to the sea area monitoring zone situated in the area 30km offshore from the Fukushima Dai-ichi NPS after holding consultations with MEXT and NISA.

d. Monitoring coordination meeting

MEXT was compiling and releasing the data that had been collected through monitoring activities conducted by the Ministry, TEPCO, the National Police Agency and the Defense Agency based on the responsibility concerning radiation monitoring activities assigned within the Government on March 16. Subsequently, because further dispersion and accumulation of radioactive materials were observed, monitoring activities for a wider range of items including foods, were conducted by relevant organizations (refer to Section 5 below). Based on this situation, to ensure various monitoring activities both on the environment and foods the monitoring coordination meeting was held on July 4.

During this meeting, it was decided that MEXT should not only conduct environmental radiation monitoring, but also provide comprehensive coordination of monitoring activities conducted by relevant organizations. The NSC was supposed to not only perform a comprehensive evaluation of the results of these monitoring activities, but also to provide these relevant organizations with advice concerning their monitoring activities. In addition, each of the governmental organizations, relevant local governments and nuclear power operators were supposed to conduct their own monitoring activities to collect monitoring

data.

On August 2, the meeting participants released a "Comprehensive Monitoring Strategy " to clarify the scope of monitoring conducted by relevant governments, local governments and TEPCO as well as their respective roles and responsibilities.

2. Utilization and dissemination of information yielded by SPEEDI

(1) Overview of the SPEEDI system

The System for Prediction of Environmental Emergency Dose Information (SPEEDI) quickly predicts the atmospheric concentration of radioactive materials and radiation dose in the surrounding area of an emergency situation, including nuclear power stations, based on release sources, meteorological conditions and topographical data. Predicted results are shown with symbols and isolines on a map.

Release sources data for the calculations of the SPEEDI are to be provided by the Emergency Response Support System (ERSS). The ERSS predicts and analyzes the outcome and subsequent development of the accident based on information concerning the behavior of the reactor, which is provided by nuclear power station operators, and its predicted amounts of discharged radioactive materials are provided to SPEEDI.

The Basic Disaster Prevention Plans stipulates that MEXT should adequately prepare and maintain the SPEEDI system even during normal times and improve necessary functions, including connections to the Off-site center. The Plan also stipulates that MEXT should shift SPEEDI to emergency mode immediately after the Ministry is notified of the occurrence of a specified event (stipulated in Article 10 (1) of the Act on Special Measures Concerning Nuclear Emergency Preparedness (Specific Event)), and make proper predictions on the impacts of radioation and share the results of those predictions with all relevant ministries and agencies.

The Government's NE Response Manual stipulates that if an accident occurs in a commercial reactor, NISA should activate ERSS to grasp release source information, which is transferred to the MEXT. MEXT should predict based on this release source information the impacts of radioation using the SPEEDI computer, which is installed at the Nuclear Safety Technology Center (hereinafter referred to as the "Nuclear Safety Technology

Center") and provide the results to the NISA, NSC, all relevant prefectural governments and the Off-site center

This NE Response Manual stipulates that the results of the SPEEDI calculations should be used at a nuclear incident as the basis of discussions on how to take measures to protect residents in the vicinity of the NPS. Actually, when the national government conducted a comprehensive nuclear emergency response drill in Fukushima Prefecture in 2008, drills on shifting SPEEDI to emergency mode, taking adequate protective actions and verifying the results using SPEEDI were included.

In this Accident the release source information from ERSS on which SPEEDI calculations are based was not obtained. To be more precise, due to the loss of external power supply caused by the earthquake on March 11, TEPCO's Safety Parameter Display System (SPDS), which was installed within the premises of the Fukushima Dai-ichi NPS to provide the reactor data to ERSS, ended up being unable to transfer data to ERSS¹⁶. Moreover, as described in Section III5(1)b, after 16:43 on March 11, the Government's dedicated line, which sends data from the Fukushima Dai-ichi NPS to the main computer of ERSS through the Off-site Center, became unavailable¹⁷.

Thus in the implementation of response measures for the nuclear accident, SPEEDI which is based on release source information from ERSS, was not able to perform calculation predictions on the dispersion of radioactive materials since plant data could not be transferred to ERSS as a result of at least two transfer line failures. Against the expectation of forementioned training drills, it was impossible to utilize the SPEEDI for setting the evacuation zones because SPEEDI could not predict the atmospheric concentration of radioactivity and radiation dose.

¹⁶ This was most probably due to the fact that neither an emergency power source nor batteries were connected to the equipment that was supposed to send data collected by SPDS to ERSS. The equipment most likely stopped due to the loss of its emergency power source after the earthquake hit.

¹⁷ On the other hand, some equipment at the Fukushima Dai-ichi NPS including SPDS was functioning properly even after the earthquake hit and the SPDS plant data was being transferred outside the NPS. However, as described above, the dedicated line that connected the Off-site Center and the ERSS main computer was rendered unavailable after 16:43 on March 11. From that point in time, the Fukushima Dai-ichi NPS was unable to send its data to the main computer of ERSS.

(2)Utilization and dissemination of information yielded by SPEEDI up to March 15

a. Utilization and dissemination of the results of a hourly basis calculation, assuming a unit radioactivity release rate

As described in Section (1) above, MEXT directed the Nuclear Safety Technology Center, which manages and operates SPEEDI, to switch the SPEEDI system to emergency mode at 16:40 on March 11.

In response to this directive, the Center switched SPEEDI to emergency mode at 16:49 that day. At the same time, the Center started calculations to predict the atmospheric dispersion of radioactive materials on hourly basis using the meteorological data from 16:00 that day and assuming a unit radioactivity release rate of a 1Bq/h from the Fukushima Dai-ichi NPS based on the Environmental Radiation Monitoring Guidelines prepared by NSC. It should be noted, however, that the results of the calculations above was not a prediction based on an actual release rate, but simply a prediction of the direction of dispersion and the relative concentration of radioactive materials in the air based on a unit release rate.

In response to the directive from MEXT, the Nuclear Safety Technology Center provided the predicted results of their unit release rate calculation, to MEXT, the ERC, the NSC, the Off-site Center, the Fukushima Prefectural Office, and JAEA¹⁸. The Nuclear Center requested that the Nuclear Safety Technology Center adjacent to the Off-site Center provide the results of their unit release rate calculation¹⁹. In response to the request, at approximately 23:00 on March 11, the Nuclear Safety Technology Center provided the results of their unit release rate calculations only once to the Fukushima prefectural

¹⁸ The Fukushima Prefectural Office and the Off-site Center were unable to provide SPEEDI predicted results, since their data communication links for transferring SPEEDI calculation results were disrupted by the earthquake on March 11. In addition, the SPEEDI terminal that had been installed at the Fukushima Prefectural Office was unavailable since the Prefectural Office building was severely damaged and the staff were not able to access the data by any means. As a result, the Nuclear Safety Technology Center faxed copies of the results of the calculations assuming radioactive release at the unit release rate, which had been conducted from March 11, to the off-site center. Meanwhile, the Fukushima Prefectural Office was able to use their internet lines effectively immediately after the earthquake and thus received the SPEEDI calculation results by email from the Nuclear Safety Technology Center from the night of March 12.

¹⁹ The Monitoring Center was not able to receive the calculation results because the SPEEDI terminal that had been installed at the Center was unavailable to use due to the earthquake on March 11 and could not receive the calculation results.

Monitoring Center via email, which had been intermittently available during that time.

Among the organizations that received the unit release rate calculations, the Monitoring Center used the results as a reference to formulate their monitoring program from March 12. Other organizations did not use these results to discuss practical and concrete measures since they thought that the calculations based on an assumed unit release rate did not show any actual radiation dose levels. They also had no idea of making the results public. As described earlier, the results of the unit release rate calculation, however, had predict the direction of dispersion of radioactive materials and the distribution of relative amounts of radioactive materials, they could have been useful in determining the direction of evacuation of residents (refer to Section 3(3)c and f).

b. Utilization and dissemination of the results of calculations conducted by organizations based on various assumptions

Besides the unit release rate calculations, between March 11 and 15, MEXT, NISA and NSC conducted calculations to predict the impact of radioactive materials released from the Fukushima Dai-ichi NPS by entering various assumed values into SPEEDI as release source information. Between March 12 and 16, the MEXT, conducted 38 SPEEDI calculations with various release source information and shared the results within the MEXT emergency operation Center (EOC), and provided some of the calculation results to both the ERC and the NSC.

Aside from this, on the night of March 12, NSC made one request for a SPEEDI calculation to the Nuclear Safety Technology Center. The NSC received the calculation results and shared them with its members, members of its technical advisory body at an emergency, and some staff members of the NSC Secretariat. The NSC, however, believed that the calculation results should only be utilized for internal discussion. As a result, the calculation results were not shared with any other organizations.

Meanwhile between March 11 and 15, NISA conducted 45 SPEEDI calculations by entering various assumptions of release source information in order to grasp the diffusion feature of radioactive materials. The obtained predicted results were shared with various functional teams within the MEXT-ERC. The first set of results were provided to the

Prime Minister's Office and the Off-site center

NISA had requested that the Nuclear Safety Technology Center to conduct a SPEEDI calculation to predict the impacts of radioactive materials released from Unit 1 of the Fukushima Dai-ichi NPS and provided the SPEEDI predictions to the Agency staff at just past 1:30 on March 12. The officials gave the predictions to the staff of the Cabinet Secretariat who attempted to share the predictions with the staff of various ministries who were stationed in the basement of the Prime Minister's Office.

NISA sent the Prime Minister's Office the SPEEDI predictions with an accompanying message that NISA believed that the SPEEDI predictions were of low reliability because of calculations based on assumed release source information. Cabinet Secretariat staff, who received the predictions from NISA staff before dawn on the morning of March 12, treated them as reference information and did not report to Prime Minister Naoto Kan (hereinafter referred to as "Prime Minister Kan")²⁰. Also NISA itself did not report the predictions to Prime Minister Kan either.

Moreover, the SPEEDI predictions of various organizations based on assumed input data as well as those of the unit release rate were not made public for a certain period of time after the earthquake. As a result, the predictions were not utilized by local governments for their implementation of evacuation measures (for details on how the SPEEDI calculation results were made public, refer to Section (3)c and for details on how local governments implemented evacuation measures, refer to Section 3(3) below.

(3) Utilization and dissemination of information produced by SPEEDI from March 16 onward

a. Assignment of roles and responsibilities concerning how to operate and utilize SPEEDI within the Government from March 16 onward

MEXT was urged by the media to release SPEEDI predictions at a press conference held by the Ministry on March 15. In response to this, the Ministry held an in-ministry meeting attended by the three most important officials (the Minister, the Vice Minister and the Parliamentary Secretary) of the Ministry. The predictions were obtained by both

²⁰ It is expected that this matter will be investigated further.

SPEEDI and the global version of SPEEDI (WSPEEDI), which covers wider regions, assuming that all radioactive materials (10^{18} Bq of iodine and 10^{19} Bq of noble gas) are released at one time. The predictions provided in the meeting showed that high level radioactive clouds would move over the Tohoku District and there was opinions that a release of the predictions could cause people unnecessary confusion. No concrete decision was made as to whether it might be necessary to publicize the SPEEDI predictions.

The next day, on March 16, at a meeting attended by the three most important officials of MEXT, Vice Minister Kan Suzuki of MEXT mentioned that the roles and responsibilities concerning monitoring activities within the Government had been decided at a meeting held in the Prime Minister's Office in the morning of that same day (refer to Section 1(2) above): MEXT should collect and publicize monitoring data, the NSC should evaluate the data and the NERHQ should implement measures based on the evaluation. No mention was made of SPEEDI. Thus he proposed that SPEEDI matters should hereafter be operated and its predictions should be publicized by the NSC, because the NSC was designated the role of evaluating monitoring data. His proposal was agreed by the attendance.

In response to this decision, MEXT verbally informed NSC this decision of a change of an operation body of SPEEDI. The Ministry then sent both the operators of the Nuclear Safety Technology Center, who had been working in EOC, to the Secretariat of NSC.

In response to this MEXT decision on the SPEEDI operation, the NSC understood that SPEEDI control had not yet been transferred to the Agency, but that the Agency was supposed to conduct calculations using SPEEDI. At that point, the Agency (NSC) started operating and maintaining the SPEEDI system.

b. Performing a retrospective estimation on release source information by SPEEDI and publicizing the predictions

In response to the change of operation body of SPEEDI from MEXT to NSC, as described in Section a above, from March 16, NSC began discussions on how to utilize SPEEDI in a situation where release source information from ERSS was not available.

As part of the discussion, on the following day, March 17, in response to the direction of

the Vice Chairman of NSC, Mr. Yutaka Kukita (hereinafter referred to as "NSC Vice Chairman Kukita") and under the cooperation of JAEA and the Japan Chemical Analysis Center, the NSC, led by a member of the Emergency Response Technical Advisory Body, started discussions on how to estimate release source information using SPEEDI and how to estimate the radiation dose based on the estimated release source information.

What is specifically meant by estimating release source information using SPEEDI in a situation where release source information is not available, is to estimate the actual amount of radioactivity released by multiplying the unit amount of radioactivity released by a ratio of observed radiation dose rate at a specific point to a calculated radiation dose rate of the unit release rate at the same point. In the calculation above, NSC used radiation dose rates in the air obtained by air monitoring and the atmospheric concentration of radioactive materials obtained by dust sampling. To be more precise, the NSC selected data for calculation by analyzing the monitoring data collected before March 15 and newly obtained data from MEXT.

As a result, at around 09:00 on March 23, NSC obtained the results of calculation concerning the cumulative radiation dose in the surrounding areas of the Fukushima Dai-ichi NPS between March 11 and 24. It was found that an equivalent dose of the thyroid gland of infants, which were part of the calculation results, exceeded 100mSv of the criteria for stable iodine distribution (refer to Section 4(1)c below) indicated in the "Emergency Preparedness for Nuclear Facilities" (hereinafter referred to as "Regulatory Guide"), which was prepared by the NSC. Thus NSC Chairman Haruki Madarame (hereinafter referred to as "NSC Chairman Madarame") and NSC member Ms. Shizuyo Kusumi reported these results to the Prime Minister's Office (for the results of this report, refer to Section 3(2)a below).

As According to the direction of the Prime Minister's Office, the NSC held a press conference at around 21 p.m. on March 23 and publicize the calculation results²¹.

²¹ In addition to this press conference, the NSC subsequently held three additional press conferences on April 10, 25, and 27 and published the SPEEDI calculation result with higher precision of the retrospective estimation method.

c. Disclosure of SPEEDI calculation results

People had become increasingly interested in SPEEDI calculation results and the disclosure of them before they were disclosed on March 23.

Subsequently, on the occasion of MEXT response on March 24, to a request to disclose SPEEDI calculation results based on the Administrative Organs Information Disclosure Act (hereinafter referred to as "Information Disclosure Act"), MEXT, NISA and NSC discussed how to respond to a request to disclose SPEEDI calculation results based on the Information Disclosure Act.

As a result, by around mid-April, a disclosure policy for SPEEDI calculation results was decided as a result of discussion based on Information Disclosure Act among MEXT, NISA and NSC. In response to a request to disclose the SPEEDI calculation results based on Information Disclosure Act: (i) the results of calculation assuming radioactive release at the unit rate of 1Bq/h should be disclosed; (ii) the results of SPEEDI calculations of cumulative dose, which is estimated by the retrospective method which contains the release source information estimated by the observed monitoring data, should be disclosed when the predictions are judged by the NSC to be reliable enough for the disclosure; and (iii) the results of the SPEEDI calculations conducted by MEXT, NISA, NSC and other organizations based on the assumption of input data should not be disclosed since people would confuse if such the results were disclosed.²²

I, On the other hand, some media reported that the Government had not disclose the SPEEDI calculation results. In response to these reports, further discussion was held regarding this matter. On April 25, according to the direction of the Prime Minister's Office, it was determined that all SPEEDI calculation results of categories from (i) to (iii) above should be disclosed. In response to this, MEXT, NISA and NSC published the SPEEDI calculation results on their websites by May 3.

²² The discussion and categorization was done in consultation with the Prime Minister's Office. It will be further investigated, however, how exactly the Prime Minister's Office was involved in, the discussion and categorization.

3. Evacuation of Citizens

(1) Initial situation regarding the decision, instruction, communication and implementation of evacuation programs

a. Implementation of evacuation programs regarding the Fukushima Dai-ichi NPS accident

In response to the fact that all AC power supplies were lost and the Emergency Core Cooling System was unable to provide water to Fukushima Dai-ichi NPS, Prime Minister Kan declared a nuclear emergency situation at 19:03 on March 11 and established the Nuclear Emergency Response Headquarters (NERHQ) in the Prime Minister's Office (refer to Section III2(1)).

In response to the declaration of the nuclear emergency state at the Fukushima Dai-ichi NPS, the Prefectural Nuclear Emergency Response Center discussed an instruction of evacuation for citizens within a 2km radius of the nuclear power plant, where regular nuclear emergency drills and exercises were conducted. At 20:50 that day, Prefectural Governor Yuhei Sato instructed citizens an evacuation within a 2km radius of the Fukushima Dai-ichi NPS.

This evacuation instruction was not issued on the basis of a specific act but de facto measure to prevent a disastrous scenario. In response to this order, officials from the towns of Okuma and Futaba took all possible measures by alerting citizens in the area, using a municipal disaster management radio communication network, sound trucks and having fire fighters make door-to-door visits.

Later, after a press conference by Chief Cabinet Secretary Edano concerning the declaration of the nuclear emergency state, NSC Chairman Madarame, Vice Chairman of the Nuclear and Industrial Safety Agency, Eiji Hiraoka (hereinafter referred to as "Vice Director-General of NISA Hiraoka"), and TEPCO executives convened on the fifth floor of the Prime Minister's Office (not at the Crisis Control Center on the basement floor), where concerned ministers asked for their opinions on the conditions of the nuclear reactors, the range of the evacuation area and other matters²³.

²³ The NE Response Manual stipulates that if it is too difficult for the Joint Council for Nuclear Emergency Response, which is organized by Local Emergency Response Center and other relevant organizations, to discuss a

In that discussion, various opinions were offered including "reactor cores might be damaged in the worst case scenario" and "a vent operation is required to avoid that." In terms of the range of the evacuation area, the Nuclear Emergency Guideline, which was created by the NSC, states that the range of the emergency preparedness zone (EPZ) where emergency countermeasures are sufficiently taken should be within a 10km radius but the preventive action zone (PAZ) that is described in a document of the International Atomic Energy Agency (IAEA) is the area within a 3km radius. So "within a 3km radius" is sufficient, even if it assumed that a vent operation is required. In addition, Vice Director-General of NISA Hiraoka explained that a regular evacuation drill is conducted within a 3km radius under a supposed vent operation. Based on these opinions and explanations, the evacuation was instructed for the zone within a 3km radius, and a stay-indoors was instructed for the zone within a 3 to 10km radius from the Fukushima Dai-ichi NPS.

In response to this decision reached in a meeting held on the fifth floor of the Prime Minister's Office at 21:23 that day, the NERHQ instructed the Fukushima Prefectural Governor and all relevant local governments to issue an evacuation order to citizens within a 3km radius of the Fukushima Dai-ichi NPS and to issue a stay-indoors order to citizens within a 10km radius of the power station. At 21:52 the same day, Chief Cabinet Secretary Edano held a press conference concerning the evacuation orders.

Subsequently, no vent operation was conducted despite an abnormal increase in the pressure inside the primary containment vessel at Unit 1 and despite the fact that the implementation of a vent operation at Units 1 and 2 was instructed by the Prime Minister. Before dawn on the morning of March 12, concerned ministers discussed the range of the evacuation zone again on the fifth floor of the Prime Minister's Office in the presence of Vice Director-General of NISA Hiraoka and NSC Chairman Madarame. During this discussion, an opinion was expressed that it would not be necessary to extend the

draft evacuation order in the case of a commercial nuclear power plant disaster, then the Ministry of Economy, Trade and Industry (METI) should discuss a draft evacuation order and the METI Minister, in the presence of the Deputy Chief Cabinet Secretary for Crisis Management, the NISA Vice Chairman, and the Disaster Prevention Minister, should present the draft evacuation order to the Chief of the Government Emergency Response Center, who should then Emergency Response Center issue an evacuation order. In the case of the nuclear accident at the Fukushima Nuclear Power Station, an evacuation order was ordered without following this protocol.

evacuation zone if a vent operation were conducted under well-controlled conditions but, if taking a conservative stance on this matter, even a relatively significant hazard could be handled if an EPZ were expanded to within a 10km radius. Based on this opinion, it was decided that the evacuation zone would be expanded to within a 10km radius. At 05:44 on March 12, the NERHQ instructed the Fukushima Prefectural Governor and all relevant local governments to issue an evacuation order to citizens within a 10km radius of the Fukushima Dai-ichi NPS. At 09:35 the same day, Chief Cabinet Secretary Edano held a press conference about the evacuation order. At 06:15 the same day, after the decision was made to expand the evacuation zone, Prime Minister Kan flew to Fukushima Dai-ichi NPS by helicopter.

During a vent operation had still been tried at 15:36 on March 12, there was an explosion in the Reactor Building of Unit 1. A discussion was held on the fifth floor of the Prime Minister's Office about how to grasp the plant situation and how to take protective measures. It was decided that an evacuation order would be issued to citizens within a 20km radius. At 18:25 on March 12, the NERHQ instructed the Fukushima Prefectural Governor and relevant local governments to issue an evacuation order to citizens within a 20km radius of the Fukushima Dai-ichi NPS.

At 20:32 the same day, Prime Minister Kan addressed the Japanese people to explain the expansion of the evacuation zone range. Following Prime Minister Kan, at 20:50 the same day, Chief Cabinet Secretary Edano talked about the explosion at the Reactor Building of Unit 1, explaining that it was not the explosion of the primary containment vessel so a large volume of radioactive material would not leak out. He also explained the expansion of the evacuation zone range.

Subsequently, the following incidents occurred in succession: at 11:01 on March 14, Unit 3 exploded; at around 06:00 on March 15, a big boom was heard from Unit 4; at around 08:11 the same day, some damage to the fifth floor of the Reactor Building of Unit 4 was confirmed; and at 09:38 on the same day, a fire broke out in the northwest section of the third floor of the Reactor Building of Unit 4. In response to these incidents, at 11:00 on the same day, the NERHQ issued an order to the Fukushima Prefectural Governor and all relevant local governments to issue a stay-indoors order to citizens within a 20 to 30km

radius of the Fukushima Dai-ichi NPS²⁴. Immediately after this, A press conference by the Prime Minister and the Chief Cabinet Secretary was held to explain the order in greater detail.

b. Implementation of evacuation plans regarding the Fukushima Dai-ni NPS

At 18:33 on March 11, the cooling function of the reactor cores at Units 1, 2 and 4 of the Fukushima Dai-ni NPS was lost. In response to this incident, a notice to that effect pursuant to the provisions of Article 10, Paragraph 1 of the Act on Special Measures Concerning Nuclear Emergency Preparedness was issued. At 05:22 the next day, March 12, at Unit 1, at 05:32 on the same day at Unit 2 and at 06:07 the same day at Unit 4, the pressure suppression function was lost. A report of a specified event to that effect, pursuant to the provisions of Article 15, Paragraph 1 of the Act on Special Measures Concerning Nuclear Emergency Preparedness was submitted.

In response to this report, METI judged that a nuclear emergency had occurred and reported to this to Prime Minister Kan, who was at the Fukushima Dai-ichi NPS. Having obtained approval from Prime Minister Kan, at 7:45 on March 12, METI issued a declaration of a nuclear emergency state concerning the Fukushima Dai-ni NPS and established the government nuclear emergency response headquarters. This emergency response headquarters was integrated into the NERHQ, which had been established the previous day to take care of Fukushima Dai-ichi NPS.

At the same time that METI issued a declaration of nuclear emergency state in the name of the Prime Minister, they also issued an evacuation order to citizens within a 3km radius of the Fukushima Dai-ichi NPS and issued a stay-indoors order to citizens within a 3 to 10km radius of the power station.

At 15:36 on March 12, an explosion occurred in Unit 1 of the Fukushima Dai-ichi NPS. In response to this explosion, a discussion was held in a meeting held on the fifth floor of the Prime Minister's Office on how to grasp the plant situation and how to take protective

²⁴ On the previous day at the Prime Minister's Office, NSC Chairman Madarame, NSC Vice Chairman Kukita and JAEA staff talked to Prime Minister Kan and Chief Cabinet Secretary Edano suggesting that Dai-ichi the evacuation zone should not be expanded beyond a 20km radius of Fukushima Dai-ichi NPS and that a stay-indoors order for those within a 30km radius should be issued instead.

measures. A similar incident is expected to occur at the Fukushima Dai-ni NPS. Thus, on the off chance that an incident might occur, it was decided that the range of the evacuation zone be extended. At 17:39 the same day, the NERHQ instructed the Fukushima prefectural government and other relevant local governments to issue an evacuation order to citizens within a 10km radius of the Fukushima Dai-ni NPS.

Moreover, it was less probable that any additional hazardous incidents might occur at the Fukushima Dai-ni NPS. Even if a hazardous incident were to occur, it would most likely be an incident that would not be too difficult to handle and its impact on the surrounding area might be limited. In response to this probability, on April 21, the NERHQ issued an order to reduce the range of the evacuation zone to within an 8km of radius of the Fukushima Dai-ni NPS excluding the zone within a 20km radius of the Fukushima Dai-ichi NPS.

c. How evacuation orders were communicated

The NE Response Manual prescribes that the head of Local Headquarters shall communicate an evacuation order to each municipality including cities, towns and villages.

In fact, however, immediately after the earthquake, communication by telephone proved to be difficult. Moreover, the relevant personnel were unable to reach the Local Emergency Response Headquarters (NERLHQ). Thus it was decided that a new communication route through the Fukushima Prefectural Office and another one through the Secretariat of the NERHQ be added to the NERLHQ communication route.

However, most of the municipalities actually learned of the evacuation orders through the mass media including TV since it took a long time for a telephone call to get through²⁵.

²⁵ As far as most of the municipalities located in the evacuation zone were concerned, no confirmation was ever given that any of the municipalities received notification of an evacuation order from the Secretariat of Government Emergency Response Center, the Fukushima prefectural government or the Local Emergency Response Center. One significant reason for this is that communication from the Off-site Center to the cities, towns and villages took a long time after an evacuation order was issued. Since citizens learned through media such as TV that an evacuation order had been issued and started evacuating on their own, the city, town and village leaders did not dare to communicate the evacuation order directly to citizens. Instead, they simply confirmed how the evacuation had been conducted. That is most likely why these cities, towns and villages have no recognition that they received any evacuation order.

Some learned through the verbal announcements by police vehicles, including police patrol cars.

The cities, towns and villages communicated with citizens in the area by using a municipal disaster management radio communication network, sound trucks, police cars, and by fire fighters making door-to-door visits.

In addition, when an evacuation order went out to residents in the area within a 3km radius of the Fukushima Dai-ichi NPS on March 11, nearly all of the residents had already evacuated outside a 3km radius. At 00:30 the next day, March 12, the Emergency Operators Team confirmed that all the residents within a 3km radius had been evacuated (the team confirmed that again at 01:45).

d. How evacuation buses were arranged

After the declaration of a nuclear emergency state regarding the Fukushima Dai-ichi NPS on March 11, the Crisis Control Center supposed a situation that a mandatory evacuation of residents might be required. The Center needed to arrange buses for evacuation and so at around 21:00 the same day, it requested the Passenger Transport Division of the Automobile Bureau of the Ministry of Land, Infrastructure, Transport and Tourism to charter about 100 buses for evacuation.

Since detailed information on dispatch locations, dispatch times and periods of jobs was required in order to contact bus companies about organizing buses, the Passenger Transport Division coordinated all necessary matters with the Prime Minister's Office and the Crisis Control Center and then asked bus companies in the Tohoku and Kanto areas to organize the buses²⁶.

The buses that had been organized, which were gathered at the Off-site Center in the town of Okuma, were allotted to the municipalities located in the evacuation zone by Local Emergency Response Center staff. In response to the evacuation order issued at 05:44 on March 12, the buses were used for the evacuation of residents in the area within a

²⁶ A list of relevant ministries that are supposed to gather in the event of a nuclear hazard contained in the NE Response Manual. The Passenger Transport Division, Automobile Bureau of Ministry of Land, Infrastructure, Transport and Tourism, however, is not included in the list. Thus, the Passenger Transport Division has never participated in any nuclear emergency drill or exercise.

10km radius of the Fukushima Dai-ichi NPS.

However, since there were not enough personnel who had assembled at the NERLHQ, the buses were not assigned efficiently. In addition, since roads were damaged by the earthquake and streets were congested with evacuation vehicles, the number of buses dispatched to the municipalities was not enough to fulfill their needs. As a result, most of the buses were only used to evacuate some of the municipalities including the town of Okuma.

(2) Decision, instruction, communication and implementation of long-term evacuation programs (refer to Attachment V—1)

a. How high-level radiation points were found outside the evacuation zone and how the Government handled them

From March 16, the NSC evaluated the radiation monitoring data that was collected by MEXT (refer to Section 1(2)a) above. As a result, high levels of radiation (values greater than 10mSv of the stay-indoors evacuation criteria prescribed in the Nuclear Emergency Guideline) were located at points outside the 30km radius. On March 18, the NSC asked NISA to investigate the presence of private houses around these points. The NSC then asked MEXT to install fixed cumulative radiation level meters at these points to conduct environmental monitoring²⁷.

However, on March 20, the NSC judged that high radiation level had occurred at this time of year due to the influence of both radioactive clouds (plumes) that passed from midnight to the early morning of March 15 and the rainfall that deposited radioactive materials on the ground surface and that because radiation levels would decrease due to both physical decay of radioactive materials and rainfall, it was not necessary to immediately change the stay-indoors evacuation zone in this situation.

In the meantime, the NSC, as described in Section 2(3)b above, performed the SPEEDI retrospective estimation on release source information. On March 23, the NSC performed

²⁷ On March 18, NISA responded to the request regarding the presence of private houses in the area as shown on house maps. On March 23, MEXT installed cumulative radiation level meters in the area and started taking measurements, (which MEXT released on March 25).

a SPEEDI infant thyroid gland equivalent dose calculation based on a limited number of monitoring results. As a result, the NSC estimated that there were areas with high equivalent doses beyond the designated evacuation zone to the northwest and south of the Fukushima Dai-ichi NPS. The NSC took this fact serious and reported the following to the Prime Minister's Office: (i) the SPEEDI retrospective estimation on release source information, which was conducted for an outdoor stay for 24 hours, should be considered to be overestimation of the radiation dose.. (ii) the estimation, which was based only on data obtained from two locations in Fukushima prefecture and one location (Tokai-mura) in Ibaraki prefecture, were lacking in accuracy, and (iii) it might require a great deal of time to make prior arrangements to facilitate the implementation of evacuation programs. Based on this report, it was decided that the evacuation zone should not be expanded immediately and that further discussion should be devoted to this issue by conducting research on the exposure of infant thyroid glands to radiation to confirm the data values based on actual measurement. In addition, the retrospective estimation results were publicized on the same day.

In response to the results of the SPEEDI retrospective estimation, on March 24, Cabinet Secretariat advisor, Mr. Toshiso Kosako (hereinafter referred to as "Advisor Kosako"), provided an advisory report of "Advice for Evacuation Zone and Intake of Iodine Tablets" to the Prime Minister's Office stating that it would not be immediately necessary to implement the intake of iodine tablets and that, as a temporary countermeasure against the current situation, it might be preferable to begin a voluntary evacuation of residents in stay-indoors evacuation zones within a 20 to 30km radius. The NSC received an order from the Prime Minister's Office to summarize what the NSC would suggest doing based on the advice of Advisor Kosako. On March 25, the NSC provided NERHQ with "Advice for emergency monitoring and protective countermeasures," stating that, at this time, it might not be necessary to change the current evacuation and stay-indoors evacuation zones; it might be necessary to strongly advise residents in areas where radiation levels were likely to be relatively high to begin voluntary evacuation, even if they were in a stay-indoors evacuation zone within a 20 to 30km radius; and it might be better, from a protective point of view, to advise residents in areas where radiation levels were not very

high to begin voluntary evacuation.

In addition, on March 29, in response to a request for further consideration from the Prime Minister's Office, the NSC submitted its summary report of recommendations on high radiation level locations (Namie-machi, Iitate-mura) beyond a 30km radius of the Fukushima Dai-ichi NPS to the Prime Minister's Office stating that, concerning areas of high radiation doses, cumulative radiation doses might be approximately 28mSv if a person regularly spent time outdoors from March 15 to March 28; cumulative radiation doses might be approximately 21mSv, even taking into consideration the shield effect of wooden houses; and the cumulative radiation doses were already considered to be beyond the 10mSv of the stay-indoors evacuation dose level and that residents in these areas should stay indoors for as long as possible.

Subsequently, in response to instructions from the Prime Minister's Office, NISA instructed officials from Namie-machi and Iitate-mura to tell residents to stay-indoors for as long as possible in order to avoid radiation exposure, even if they lived outside the 30km radius.

b. Dissemination of IAEA's opinions

In the meantime, on March 30, IAEA announced that the radiation dose level in Iitate-mura had exceeded the IAEA criterion for evacuation, which corresponded to 100mSv for 7 days. The IAEA value, which exceeded its criteria was one data from one point of total 9 points, was presented after converting the data measured by Japan to the IAEA's standard.

The inconsistency between Japan and IAEA happened even the same original data was used. It might be caused by different criteria and method of judgement for evacuation. IAEA criteria²⁸ was based on a value of the ground surface density of radioactivity (Bq/m^2) which was derived by converting 100mSv for 7days, while Japanese criteria for

²⁸ The IAEA criteria prescribes that the criterion for radioactive iodine 131 should be 10MBq/m^2 . It was discovered that the value that had been measured and converted at one particular point was an average value for the concentration of radioactive iodine (Bq/kg) in the soil that had actually been measured between March 19 and 27, that it was obtained by converting the surface concentration of radioactivity of radioactive iodine (Bq/m^2), and that the value was approximately 20MBq/m^2 .

evacuation is based on the radiation dose in the air. Moreover IAEA judged the necessity of evacuation based on only one value above while Japan judged taking into account the extended area of the radiation dose because only one one particular point data of higher radiation dose in the air does not necessarily indicates a higher level of air dose in the living space.

In addition, on April 1, the NSC determined that the air radiation dose rate was decreasing day by day and that it might not be necessary to change the protective zone. Subsequently, the NSC made an announcement to that effect.

c. Halt of daily services

From March 15, when the stay-indoors evacuation order was issued, more and more residents began to stay indoors. Supermarkets, banks and other stores, which were necessary for daily life, were rapidly disappearing. Under these conditions, it was hard not only for residents who lived within the stay-indoors evacuation zones, but also for those who lived outside the zones to live their lives.

For example, in Iwaki-shi, from March 15, a stay-indoors evacuation order was issued to residents in one area in the north of the city. However, since misinformation had spread that the stay-indoors evacuation order had been issued to the whole city, convenience stores and supermarkets, whose employees had been evacuated, successively closed down. In addition, there were fewer and fewer trucks available in the city. Under these circumstances, for example, a firefighter with a heavy-vehicle license had to go to Koriyama-shi to drive a tank truck filled with basic necessities back to Iwaki-shi.

In Minami-soma-shi, residents who lived within the stay-indoors evacuation zone voluntarily evacuated and stores in the city began to close down. In addition, fewer and fewer trucks were available within a 30km radius of the stay-indoors evacuation zone. Such a situation caused the distribution of essential items to be interrupted making it hard for residents to live their daily lives. Thus, between March 18 and 20, and on March 25, chartered buses were made available to evacuate groups of residents.

In response to this situation, on March 25, Chief Cabinet Secretary Edano held a press conference stating that the distribution of essential items had been interrupted making it

hard for residents to maintain their daily social lives and that, depending on how things developed, there was no denying that the levels of radiation could increase and another evacuation order might be issued. He concluded by instructing residents in the evacuation zone to stay indoors.

In addition, at the NERLHQ on the same day, Chief Cabinet Secretary Edano instructed NERLHQ that there be adequate communication with cities, towns and villages located within the stay-indoors evacuation zone and that, depending on their needs, proper countermeasures should be taken either by providing residents with support for their daily lives or by helping them with their evacuation. In response to the instructions, it was decided that the head of the Local Headquarters should visit cities, towns and villages in the stay-indoors evacuation zone. On March 25, he visited the mayors of Minami-soma-shi and Namie-machi. Subsequently, he visited the heads of the each city, town and village located in the stay-indoors evacuation zone and explained the evacuation plans and exchanged opinions with them.

In addition, between March 26 and 27, NERHQ first-hand observations both in Minami-soma-shi and Soma-shi allowed the NERLHQ to conduct a comprehensive study of the halt of daily commodities. On March 26, the NERLHQ dispatched staff to Minami-soma-shi to be stationed as government liaison officers.

d. Establishment of deliberate evacuation zones and emergency evacuation preparation zones

In the NE Guideline, it is not assumed that a stay-indoors evacuation is carried out for a long period of time. As per the description above, the results of radiation monitoring and SPEEDI retrospective estimation showed there were areas with high levels of radiation dose even in areas more than 20km from the Fukushima Dai-ichi NPS. The distribution of essential items was interrupted in stay-indoors evacuation zones and it was hard for residents to conduct their daily lives. In response, from March 31, the NERHQ started further discussions on additional evacuation zones based on estimation results of the annual cumulative exposure that had been created by MEXT.

In this discussion, it was decided that actual measurement data should be used for

cumulative exposure between the start date and the latest date of measurements, values corrected by SPEEDI simulation results should be used for cumulative exposure before measurement started, the latest actual measured values should be used for cumulative exposure after the latest measurement date for the conservative purpose, and then a cumulative exposure dose over a year from the nuclear accident was decided to be estimated, and all these results were decided to be mapped.

In addition, the guidelines in the NE Guideline stating that "stay-indoors evacuation orders shall be issued if cumulative dose is 10mSv or more, and evacuation orders if 50mSv or more" might be appropriate for incidents where radioactive material is released for a relatively short period of time. But these indices might not be appropriate for the current nuclear accident where there has been an extended period of exposure to radioactive materials accumulated on the ground. Hence, it was decided to take the lowest limit of 20mSv out of the range from 20mSv to 100mSv²⁹ which ICRP defined as indices for the evacuation under the nuclear emergency situation. It was decided that residents in an area higher than 20mSv/year should be evacuated according to the evacuation program, and residents in an area lower than 20mSv/year should be prepared to begin evacuating or follow a stay-indoors evacuation order at a nuclear emergency, assuming a worst case scenario for the conservative purpose, even if a hydrogen explosion is less likely due to the filling of nitrogen.

On April 10, the NERHQ officially asked the NSC for their advice on the evacuation strategy for residents living in (i) areas beyond a 20km radius of the Fukushima Dai-ichi NPS that had high levels of radiation dose, and (ii) areas beyond a 20km radius of the Fukushima Dai-ichi NPS with a probability of high levels of radiation dose at the emergency,.

On the same day, in response to the request of NERHQ, the NSC proposed the following advice: with regards to (i), areas beyond a 20km radius of the Fukushima Dai-ichi NPS (including areas beyond a 30km radius) where cumulative dose may reach 20mSv within the period of one year from the date of the nuclear accident shall be designated "deliberate evacuation zones"; areas that are in stay-indoors evacuation zones

²⁹ Refer to Section 4(1)b below.

within a 20 to 30km radius but outside deliberate evacuation zones shall be designated "emergency evacuation preparation zones"; and residents should always be ready and able to follow a stay-indoors evacuation order or evacuation order at the emergency³⁰. In addition, even residents in emergency evacuation preparation zones are advised to begin voluntary evacuation. Because it is anticipated that it may be difficult to complete evacuations swiftly in an emergency situation, it is strongly recommended that children, pregnant women, those who require nursing care and hospitalized patients should not enter these areas.

On April 11, based on the advice of the NSC, Chief Cabinet Secretary Edano announced a fundamental concept of how deliberate evacuation zones and emergency evacuation preparation zones should be established.

Subsequently, the government issued early advice to the affected municipalities and then, on April 22, based on "Estimated Values of Cumulative Exposure Based on Actual Measurements" concerning zones beyond a 20km radius of the Fukushima Dai-ichi NPS, which was prepared by MEXT on April 10, the NERHQ established deliberate evacuation zones³¹ and emergency evacuation preparation zones³² pursuant to the provisions of Article 20, Paragraph 3 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. In addition, the NERHQ provided those municipalities with a directive to tell residents in the former zones to be prepared to leave their homes in an evacuation after a period of approximately one month, and those in the latter zones to always be prepared to either evacuate from their homes at the emergency or to be prepared to begin a stay-indoors evacuation. Further, the stay-indoors evacuation order to residents in areas within a 20 to 30km radius of the Fukushima Dai-ichi NPS was lifted.

³⁰ This idea that an emergency evacuation preparation zone should be established based on a 20mSv criterion in order to take countermeasures against a deliberate evacuation zone and the current nuclear power plant conditions was created by Cabinet Office advisor, Mr. Kenkichi Hirose, after careful consultation with all relevant ministers.

³¹ Katsurao-mura, Namie-machi, Iitate-mura, Kawamata-machi and part of Minami-soma-shi, (excluding those areas within a 20km radius of the Fukushima Dai-ichi NPS that had already been issued with evacuation orders).

³² Hirono-machi, Naraha-machi, Kawauchi-mura, Tamura-shi and part of Minami-soma-shi, (excluding those areas within a 20km radius of the Fukushima Dai-ichi NPS that had already been issued with evacuation orders).

e. Radiation monitoring activities in evacuation zones

The NERHQ developed an environmental radiation monitoring enhancement program to grasp the entire picture of the nuclear accident and establish deliberate evacuation zones and other zones, and then released a statement to that effect on April 22.

Based on this program, two maps were decided to create: one was "a radiation dose measurement map" to grasp the current status of radiation dose distribution, and another was a cumulative radiation dose estimation map to grasp the cumulative dose distribution for one year after the accident. MEXT should be in charge of creating and publishing these maps. Following this program, it was decided that additional radiation monitoring points should be installed in areas within a 20km radius of the Fukushima Dai-ichi NPS and that MEXT should conduct radiation monitoring activities via monitoring cars at fifty designated points. Subsequently, the radiation dose measurement maps and cumulative radiation dose estimation map, which have been published regularly, are now used for establishing specific evacuation recommendation points (refer to f below).

In addition, on June 13, the Team in Charge of Assisting the Lives of Disaster Victims from the Cabinet Office (refer to Section III2 (6)) and MEXT developed a "Plan to Conduct Detailed Monitoring in Restricted Areas and Planned Evacuation Zones" and decided to conduct detailed research on air radiation dose rates in the restricted zones and deliberate evacuation zones. By late August, they had divided the restricted zones and deliberate evacuation zones into a 2kmx2km mesh, selected 20 monitoring points per mesh and conducted extensive monitoring to subsequently measure the selected points. In addition, it was decided that detailed research on houses, roads and streets, as well as school yards was to be conducted based on this extensive monitoring to obtain basic data to be used to improve the environment in these zones.

f. Establishment of specific spots recommended for evacuation

By April 22 when deliberate evacuation areas and emergency evacuation preparation zones had been established, spots where annual cumulative radiation dose might exceed 20mSv assuming that the radiation dose levels continued afterwards had been found in parts of Date-shi and Minami-soma-shi. However, the distribution of these spots was not

understood for an extended area, but for a limited area. Hence, the Government Emergency Response Center did not designate those entire areas including these points as deliberate evacuation zones. Instead, they decided to take a wait-and-see approach to observe how radiation dose might decrease with time by monitoring them over time.

Subsequently, however, on June 3, MEXT estimated cumulative radiation dose and found that there were spots where the estimated annual cumulative radiation dose for one year after the nuclear accident might exceed 20mSv of a criteria for deliberate evacuation zones, in parts of Date-shi and Minami-soma-shi, which are located outside the deliberate evacuation zone.

In response to this fact, the NERHQ discussed the adoption of concrete measures for locations where spots with high radiation dose were found in some areas and created a guideline referred to as "Response to specific spots estimated to exceed an integral level of exposure of 20mSv over a one-year period after the accident." The guideline stated that spots where the estimated annual cumulative radiation dose over a one-year period after the nuclear accident might exceed 20mSv should be designated as "specific spots recommended for evacuation," and that the NERHQ should notify all residents living in these spots and assist and support their evacuation. On June 16, the Government Emergency Response Center asked the NSC for its advice on this guideline. That same day, the NSC responded to this request replying to the effect that it had no objection to the Government Emergency Response Center' ideas, although it might be necessary to consider possible ways to solve this problem without conducting an evacuation, including finding ways to decontaminate the areas that were only partially contaminated with high concentration of radioactive materials.

Based on this advice, the NERHQ decided that the spots where the estimated annual cumulative radiation dose over a one-year period might exceed 20mSv should be designated as specific spots recommended for evacuation. That same day, Chief Cabinet Secretary Edano released a statement to that effect.

It was decided that the NERLHQ should specify spots, per house, where decontamination is not easy and are estimated to exceed 20mSv/year, through mutual consultation between the Fukushima prefectural government and the cities, towns or

villages where those spots are located. Through mutual consultation with the respective municipal governments, the NERLHQ designated parts of Date-shi on June 30 and November 25, parts of Minami-soma-shi on July 21 and August 3, and parts of Kawauchi-mura as specific spots recommended for evacuation.

Additionally, specific spots recommended for evacuation have not been issued with evacuation orders pursuant to the provisions of Article 20, Paragraph 3 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. This policy is based on the idea that specific spots recommended for evacuation are not dangerous enough to instruct all residents to begin evacuation since radiation levels will be minimal if residents leave the area, and that the government will provide information to alert them to the possibility of radiation exposure and support residents if they need to be evacuated.

g. Establishment of restricted areas and temporary access to the restricted areas

Following an evacuation order issued at 18:25 on March 12, residents in regions within a 20km radius were evacuated to areas outside the designated regions. During their ongoing and prolonged life as evacuees, some of the residents started to return home to the evacuation zones to collect their belongings. The Local Nuclear Emergency Response Center (NERLHQ) submitted a report on this situation the Government Emergency Response Center (NERHQ). Around and after March 24, the NERHQ started discussions on how to deal with this situation and enthusiastically work on this matter corresponding to, Chief Cabinet Secretary Edano's directive issued on March 28.

On March 28, as a measure to prohibit residents from entering the evacuation zones, the NERLHQ provided all the cities, towns and villages concerned with a notification of "Prohibition of access to evacuation zones within a 20km radius". On March 30, the Prefectural Headquarters also notified all evacuation centers and other facilities of this measure.

Based on discussions about temporary access to the restricted areas and mutual consultation with the relevant heads of cities, towns and villages, the NERHQ had already

asked the NSC for its advice on the implementation of restricted areas³³ within a 20km radius of the Fukushima Dai-ichi NPS, and the NSC replied that it had no objection to the NERHQ' ideas. At 11:00 on April 21, the NERHQ issued a directive to the heads of all the cities, towns and villages concerned that restricted areas should be established within the specified radius³⁴.

Additionally, temporary access to an established restricted area within a 20km radius of the Fukushima Dai-ichi NPS was permitted only to those individuals who were exposed to air radiation dose rate lower than 200μSv/h and were planning to stay in the area for five hours. This value of 200μSv/h was obtained by assuming five hours consisting of a three-hour round trip from the boundary of the 20km radius to the furthest access area and two hours spent at home or other access points, and by dividing 1mSv of annual permissible radiation dose, advised by the NSC, by 5.

The steps for applying for temporary access to an established restricted area were as follows: first, all applications for temporary access to an established restricted area were accepted at an information booth established by the Fukushima prefectural government³⁵; lists of names were sorted by cities, towns or villages and sent to the respective municipalities; those lists of names were further sorted by regions and grouped into smaller districts; and then preferred dates were arranged. Additionally, it was decided that the staff of cities, towns or villages should attend to those temporarily accessing the established restricted areas.

However, this work created a great burden for cities, towns and villages suffering from the nuclear accident and the tsunami. Thus a total of approximately 5,560 staff was dispatched from METI and other government offices to support the related work³⁶.

Initially, areas within a 3km radius of the Fukushima Dai-ichi NPS were excluded from

³³ Restricted areas, established pursuant to the provisions of Article 63, Paragraph (1) of the Basic Act on Disaster Control Measures, applied by replacing the terms and phrases pursuant to Article 28, Paragraph (2) of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

³⁴ The official establishment date is 00:00 on April 22.

³⁵ These applications were accepted between May 13 and June 30 and in 11,609 households (19,717 residents) in total were accepted.

³⁶ As of October 28, a total of an additional 390 staff were subsequently dispatched from METI to create nuclear evacuation programs and disaster recovery programs, and support decontamination-related work to reconstruct the disaster areas.

this initiative to temporarily access restricted areas. The zones within a 3km radius of the Fukushima Dai-ichi NPS were those to which were initially issued with evacuation orders. In a situation where the impact of the nuclear accident had not been settled, it was necessary to take successive measures against an unforeseen emergency.

Subsequently, the conditions of the nuclear reactors at the Fukushima Dai-ichi NPS stabilized. In response to this, on August 9, NERHQ confirmed that it was safe to enter the areas within a 3km radius of the Fukushima Dai-ichi NPS and issued an announcement to that effect. Thus, temporary access to those established restricted areas in Okuma-machi and Futaba-machi was officially granted.

(3) Implementation of evacuation programs in various municipalities³⁷

a. Implementation of evacuation programs in Okuma-machi

Okuma-machi received an evacuation order for residents within a 3km radius of the Fukushima Dai-ichi NPS at 21:23 on March 11. Okuma-machi officials took all possible measures by alerting citizens in the area, using a municipal disaster management radio communication network and making door-to-door visits to take residents to safer places. The evacuation was completed around midnight on March 11. Okuma-machi received a second evacuation order for residents within a 10km radius of the Fukushima Dai-ichi NPS at 05:44 on March 12. These residents evacuated traveling in buses that had been arranged by the Ministry of Land, Infrastructure, Transport and Tourism. At 18:25 the same day, Okuma-machi received a third evacuation order this time for residents within a 20km radius of the Fukushima Dai-ichi NPS. At that point, an evacuation directive was issued to residents throughout the entire town. Residents evacuated to Tamura-shi, Koriyama-shi, Miharu-machi and Ono-machi.

Subsequently, from April 3, transition of the town hall began as office functions were shifted to Aizu-wakamatsu-shi. Currently, all of Okuma-machi is designated as a restricted area. As of September 30, 7,734 displaced residents remain in various parts of Fukushima Prefecture and 3,757 displaced residents remain in other prefectures.

³⁷ Numbers of evacuees in this section were obtained from research conducted by each of the municipalities concerned.

b. Implementation of evacuation programs in Futaba-machi

Futaba-machi received an evacuation order for residents within a 3km radius of the Fukushima Dai-ichi NPS at 21:23 on March 11. Futaba-machi officials took all possible measures by alerting citizens in the area, using a municipal disaster management radio communication network and making door-to-door visits in order to take residents to safer places. Futaba-machi received a second evacuation order for residents within a 10km radius of the Fukushima Dai-ichi NPS at 05:44 the next day on March 12. Finally, Futaba-machi officials order residents throughout the entire town, including the area beyond a 10km radius, to evacuate to Kawamata-machi. The Futaba-machi town office is located about 3km from the Fukushima Dai-ichi NPS. Although the town office was situated within the evacuation zone, some Futaba-machi officials chose to remain to help residents move to safer places. At approximately 15:30 the same day, a big boom was heard and white smoke was seen rising³⁸ from the site of the Fukushima Dai-ichi NPS. The town office was thrown into chaos and all remaining officials were evacuated to Kawamata-machi. Looking back, the mayor of Futaba-machi, Mr. Katsutaka Idokawa, said that heat insulating materials and other matters were falling from the sky like snow.

While Futaba-machi residents had already been evacuated to Kawamata-machi, on March 19, the mayor of Futaba-machi, at his own discretion, decided to transfer all official functions from the town office to Saitama Super Arena and proceeded with the move. Subsequently, over a period of two days, on March 30 and 31, all official functions were moved from Saitama Super Arena to Kazo-shi in Saitama Prefecture (formerly the Kisai Senior High School building). Currently, the entire area of Futaba-machi is designated as a restricted area. As of November 22, 3,319 displaced residents remain in various parts of Fukushima Prefecture, and 3,694 displaced residents remain in other prefectures.

c. Implementation of evacuation programs in Namie-machi

Namie-machi received an evacuation order for residents within a 10km radius of the Fukushima Dai-ichi NPS at 05:44 on March 12. It was decided to transfer all official

³⁸ At 15:36 the same day, a hydrogen explosion occurred at Unit 1 of the Fukushima Dai-ichi NPS.

functions from the town office to Tsushima branch in Tsushima district (in the northwest of the town), which is located beyond a 20km radius of the Fukushima Dai-ichi NPS. Using the private bus companies buses and town's minibuses, Namie-machi officials helped residents evacuate to Tatsuno, Murohara and Suenomori districts within a 10 to 20km radius of the Fukushima Dai-ichi NPS, and the Tsushima district.

Namie-machi received a second evacuation order for residents within a 20km radius of the Fukushima Dai-ichi NPS at 18:25 the same day. Namie-machi officials helped residents who lived within a 20km radius and those who had previously been evacuated to Tatsuno, Murohara and Suenomori and were also within a 20km radius, evacuate to a new location.

Subsequently, based on the situation concerning the Fukushima Dai-ichi NPS, the mayor of Namie-machi, at his own discretion, decided to evacuate residents to Nihonmatsu-shi (Towa district) and gave residents instructions to begin evacuating. Their evacuation route eventually overlapped with that of the spread of radioactive materials. Many residents took this evacuation route not knowing this because SPEEDI calculation results had not been publicized³⁹. Additionally, Namie-machi, which was designated as a deliberate evacuation area, transferred all official functions to the Men-Women Coexistence Center in Nihonmatsu-shi on May 23.

Namie-machi was designated as a restricted area within a 20km radius of the Fukushima Dai-ichi NPS. All areas in the town beyond a 20km radius were designated as deliberate evacuation zones. As of September 17, its 21,541 residents have been evacuated from the town.

d. Implementation of evacuation programs in Tomioka-machi

Tomioka-machi received an evacuation order for residents within a 10km radius of the Fukushima Dai-ichi NPS at 05:44 on March 12 and then received a second evacuation order for residents within a 3km radius of the Fukushima Dai-ichi NPS at 07:45 the same

³⁹ As described in Section 2(1) (2), predictive data on the dispersion of radioactive materials based on release source information from ERSS was not obtained, but results of the calculation assuming radioactive release at a unit release rate had been obtained

day. Most of the town was designated as an evacuation area. The head of the town gave residents instructions to evacuate to Kawauchi-mura and transferred all official functions to Kawauchi-mura.

From March 13, news of the nuclear power stations made residents depressed and anxious. While the town office was flooded with inquiries about the nuclear power station accidents, town office staff had no idea what was going on there except for information from the media. Some time on the night of March 14, the head of Tomioka-machi used a satellite-based mobile phone to call a NISA executive official to ask if any further evacuation should be carried out. The NISA executive official replied that the current 20km evacuation had been determined from a safer viewpoint and that no further evacuation was necessary⁴⁰. The head of the town gave an explanation to that effect to both Kawauchi-mura residents and Tomioka-machi residents who had been evacuated to Kawauchi-mura.

However, Tomioka-machi received another evacuation order for residents within a 20 to 30km radius of the Fukushima Dai-ichi NPS at 11:00 the following day, March 15. To make matters worse, nearly the entire area of Kawauchi-mura, where Tomioka-machi residents had been evacuated, was designated as a stay-indoors evacuation zone. It was decided through mutual discussion with Kawauchi-mura to transfer all official functions to Koriyama-shi and, on March 16, all official functions were transferred to Koriyama Big Palette. Currently, the entire area of Tomioka-machi is designated as a restricted area. As of November 4, 10,169 displaced residents remain in other parts of Fukushima Prefecture and 5,563 displaced residents remain outside the prefecture.

e. Implementation of evacuation programs in Kawauchi-mura

Kawauchi-mura received a request from Tomioka-machi, which had been designated as a restricted area within a 10km radius of the Fukushima Dai-ichi NPS at 05:44 on March 12, to accept its residents. The head of Kawauchi-mura agreed to accept them and established evacuation facilities mainly in buildings at elementary and junior high schools

⁴⁰ A NISA executive official did not attend a meeting at Prime Minister's Office to discuss a stay-indoors evacuation order that was issued on March 15.

in the village, where evacuees from Tomioka-machi were to be evacuated. Kawauchi-mura received a second evacuation order for residents within a 20km radius of the Fukushima Dai-ichi NPS at 18:25 the same day. The eastern part of the village was designated as an evacuation zone and residents in that zone started evacuating to areas beyond a 20km radius.

From March 13, the town office was flooded with inquiries about the accident at the nuclear power stations, but the town office staff had little information to offer except what they had got from the media. In the meantime, as per the description above (refer to d), the head of Tomioka-machi explained to residents what he had heard from a NISA officer.

Kawauchi-mura received a stay-indoors evacuation order for residents within a 20 to 30km radius of the Fukushima Dai-ichi NPS at 11:00 on March 15. Nearly the entire area of Kawauchi-mura was within an evacuation zone or a stay-indoors evacuation zone. It was decided through mutual discussions with leaders from Tomioka-machi, whose residents had been evacuated to this village, to transfer all official functions from the village office to Koriyama-shi and, on March 16, all official functions were transferred to Koriyama Big Palette.

Kawauchi-mura was designated as a restricted area within a 20km radius of the Fukushima Dai-ichi NPS. Shimo-kawauchi district, which is beyond a 20km radius, was designated as a specific spot recommended for evacuation and, as of November 17, 2,679 residents were evacuated from the village.

f. Implementation of evacuation programs in Minami-soma-shi

Minami-soma-shi received an evacuation order for residents within a 20km radius of the Fukushima Dai-ichi NPS at 18:25 on March 12. In response to this evacuation order, residents in the southern part of the city, within the evacuation zone, began evacuating to Haramachi district located in the central part of the city. Subsequently, Minami-soma-shi received a stay-indoors evacuation order for residents within a 20 to 30km radius of the Fukushima Dai-ichi NPS at 11:00 on March 15. To make matters worse, Haramachi district was within a stay-indoors evacuation zone. Following a discussion about this evacuation plan Minami-soma-shi officials helped residents willing to be evacuated from

the city from March 15.

There were three main evacuation routes: the first was the Iwaki trail, the second the Sendai trail and the third the Iitate/Kawamata trail. The Iwaki trail passed very close to the Fukushima Dai-ichi NPS. The Sendai trail was, they imagined, severely damaged by the earthquake and the tsunami. Thus many residents opted to evacuate via the Iitate/Kawamata trail after arrangements were made by the city staff.

The path of the Iitate/Kawamata trail eventually overlapped with the spread of radioactive material. Many residents took that evacuation trail unwittingly because SPEEDI calculation results had not been released⁴¹.

On April 22, the stay-indoors evacuation order was lifted and Minami-soma-shi was designated as a deliberate evacuation zone or an emergency evacuation preparation zone. Its residents gradually returned home to the emergency evacuation preparation zone.

Part of Minami-soma-shi, situated within a 20km radius of the Fukushima Dai-ichi NPS, was designated as a restricted area and an area beyond a 20km radius, the western part of the city, was designated as a deliberate evacuation zone. Some houses near the deliberate evacuation zone were designated as a specific spot recommended for evacuation. As of November 2, 8,728 residents have been evacuated to other parts of Fukushima Prefecture and 14,401 residents have been evacuated to locations outside the Prefecture.

g. Implementation of evacuation programs in Naraha-machi

Naraha-machi received an evacuation order for residents within a 3km radius of the Fukushima Dai-ichi NPS at 07:45 on March 12. The town office took a conservative approach deciding to evacuate all of its residents to Iwaki-shi more than 30km away from the town and began the evacuation immediately. Subsequently, Naraha-machi received a stay-indoors evacuation order for residents within a 20 to 30km radius of the Fukushima Dai-ichi NPS at 11:00 on March 15. To make matters worse, part of Iwaki-shi was within a stay-indoors evacuation zone and the distribution of essential items had been interrupted (refer to Section (2)c). Given that Iwaki-shi was also badly damaged by the tsunami, the

⁴¹ See footnote 39.

town office discussed transferring its office functions to Aizu-misato-machi, which has an agreement with Naraha-machi to work together to help each other through disasters. From March 25, the town office helped its residents evacuate to Aizu-misato-machi.

Most of Naraha-machi is now designated as a restricted area within a 20km radius of the Fukushima Dai-ichi NPS. As of November 1, its 7,714 residents remain evacuated outside the city.

h. Implementation of evacuation programs in Iwaki-shi

In response to requests from Naraha-machi and Hirono-machi, Iwaki-shi allowed residents to be evacuated to the city. Subsequently, the city received an evacuation order for residents within a 20 to 30km radius of the Fukushima Dai-ichi NPS at 18:25 on March 12. Although part of the city was beyond the 30 km radius and thus outside the evacuation zone, city officials discussed whether, in terms of safety, a total evacuation was necessary and ultimately advised all residents within 30 km of the Fukushima Dai-ichi NPS to leave.

Iwaki-shi received a stay-indoors evacuation order⁴² for residents within a 20 to 30km radius of the Fukushima Dai-ichi NPS at 11:00 on March 15. Subsequently, the distribution of essential items was interrupted even though most of the city was outside of the stay-indoors evacuation zone and more and more residents started evacuating voluntarily (refer to Section (2)c above). At present, due to various efforts including "All Iwaki Caravan Sales - Buy Iwaki's safe farm products" held in the city and Tokyo and the fact that the stay-indoors evacuation order was lifted, many of the evacuees have now returned to their homes. As of September 30, 7,709 residents (3,716 households) were evacuated from the city.

i. Implementation of evacuation programs in Tamura-shi

Tamura-shi received a request from Okuma-machi, which had been designated as a restricted area within a 10km radius of the Fukushima Dai-ichi NPS at 05:44 on March 12, to accept its evacuated residents. The two offices agreed and established evacuation facilities where evacuees from Okuma-machi could be relocated. At approximately 20:10

⁴² The northern part of Iwaki-shi is partly within the zone.

the same day, Tamura-shi received an evacuation order from the Fukushima Prefectural Government for residents within a 20km radius of the Fukushima Dai-ichi NPS. The town office gave instructions to that effect to both residents in the greater area of the former Toro-mura, situated within the designated evacuation zone, and to the evacuees from Okuma-machi. The town staff assisted in the evacuation of everyone using town office-owned school buses until some time in the morning of March 13.

Subsequently, the town office received a stay-indoors evacuation order for residents within a 20 to 30km radius of the Fukushima Dai-ichi NPS at 11:00 on March 15. Residents in Toro district, which was the most densely populated area within a 30km radius, had already been evacuated. The town office alerted its residents to stay indoors unless specifically asked to evacuate.

At present, only a part of Tamura-shi has been designated as a restricted area. As of October 31, 379 residents (120 households) in the restricted area have been evacuated to and 2,168 residents (658 households) in formerly an emergency evacuation preparation zone have been evacuated.

j. Implementation of evacuation programs in Katsurao-mura

Katsurao-mura received requests from Namie-machi, Futaba-machi and Okuma-machi, which had been designated as restricted areas within a 10km radius of the Fukushima Dai-ichi NPS at 05:44 on March 12, to accept their evacuees and Katsurao-mura leaders agreed to do so. Katsurao-mura received an evacuation order for residents within a 20km radius of the Fukushima Dai-ichi NPS at 18:25 the same day. Part of the village was within the specified radius. The village office gave notice to that effect to concerned residents using an IP telephone system, which had been installed throughout the entire village.

From March 13, while waiting to see what would transpire at Unit 3 of the Fukushima Dai-ichi NPS, the village office had several discussions on the necessity of an evacuation. However, there was very little information about what to do next and the village office was not able to decide whether to evacuate its residents at its own discretion.

In the meantime, at approximately 21:00 on March 14, the village office received

information⁴³ from the regional fire department that the Off-site Center was to be evacuated. The village office decided, at its own discretion, to evacuate everyone from the village and gave notified its residents. The village office began the evacuation at 22:00 using village-owned buses and office cars to transport its residents to Fukushima-shi (Azuma Sports Park) and finished around 23:50.

The village office was informed that there had been an explosion near Unit 2 the following morning on March 15. While continuing discussions of its evacuation program, the village office heard that Aizu-bange-machi town officials were willing to accept their evacuees. The village office decided, at its own discretion, to evacuate its residents to Aizu-bange-machi and, after explaining this decision, began moving everyone the same day. By 17:00 all residents had arrived at Aizu-bange-machi and the evacuation was complete.

Additionally, Miharu-machi decided to accept temporary housing to accommodate the influx of people. In response to this situation, the Katsurao-mura village office completed transferring its office functions to Miharu-machi by August 11.

Currently, part of Katsurao-mura is designated as a restricted area and the rest of it is designated as a deliberate evacuation zone. As of October 1, 120 residents have been evacuated out of the prefecture and 1,404 residents have been evacuated to other locations within Fukushima Prefecture.

k. Implementation of evacuation programs in Hirono-machi

Hirono-machi received an evacuation order for residents within a 10km radius of the Fukushima Dai-ni NPS at 17:39 on March 12. On behalf of the mayor, the town office, alerted all its residents within the entire town, including the area beyond a 10km radius, to prepare for voluntary evacuation and began helping its residents if they chose to relocate. By March 13, the town office finished organizing its plan to evacuate all of its residents to the following six municipalities: Ono-machi, Hirata-mura, Ishikawa-machi, Asakawa-machi, Iwaki-shi and Misato-shi in Saitama Prefecture. They implemented their

⁴³ For detailed information on the transfer of the Off-site Center, refer to Section III15 (3).

evacuation program by using town-owned buses as well as additional buses, which had been arranged for this purpose.

The town office staff, at its own discretion, organized where its residents were to be evacuated to and completed these arrangements by March 13⁴⁴. On March 12, when the town office staff had not yet completed these arrangements, many residents had already reached their own evacuation sites with the help of relatives and friends. The town office staff received a great deal of criticism and many complaints because of this uncoordinated arrangement, which held that the town office staff should not have given evacuation instructions when relocation sites had not yet been determined.

Hirono-machi town office staff transferred its office functions to the town gymnasium of Ono-machi on March 15 by which time the Hirono-machi town office staff had nearly completed the evacuation of its residents. Subsequently, more and more evacuees from Hirono-machi gathered in Iwaki-shi. In response to this situation, the Hirono-machi town office transferred its office functions to Iwaki-shi.

The emergency evacuation preparation zone designation was lifted on September 30. At present, Hirono-machi has not yet received an official evacuation order, but its approximately 5,200 residents have been evacuated.

I. Implementation of evacuation programs in Iitate-mura

Iitate-mura received a stay-indoors evacuation order for residents within a 20 to 30km radius of the Fukushima Dai-ichi NPS at 11:00 on March 15. The eastern part of the village was partially within the stay-indoors evacuation zone. The village office gave a stay-indoors evacuation order to that effect. Subsequently, on March 21, restrictions on tap water intake were announced (refer to Section 5(1) f below). In response to this announcement, more and more residents, mainly families with infants, started evacuating voluntarily. The voluntary evacuees slowly started returning home to the village after the restrictions on tap water intake had been lifted. The Japanese Government informed the Iitate-mura village office that the village would be designated as a deliberate evacuation zone. The village office held a meeting with its residents to explain this. In the meeting,

⁴⁴ It was difficult for town office staff to complete the arrangements of evacuation destination at night.

some residents did not accept the explanation provided by village officers as to why they had to be evacuated. On April 22, the entire village was designated as a deliberate evacuation zone. As of October 1, its 6,164 residents have been evacuated.

m. Implementation of evacuation programs in Kawamata-machi

Kawamata-machi, which is located beyond a 30km radius of the Fukushima Dai-ichi NPS, was not initially designated as an evacuation zone. Kawamata-machi town office accepted evacuees from Futaba-machi, Namie-machi, Minami-soma-shi and Okuma-machi. However, the southeastern part of the town (Yamakiya district) was partially designated as a deliberate evacuation zone on April 22 when Futaba-machi town office had its office functions transferred to Saitama Prefecture. Subsequently, nearly all 1,250 residents in that area have been evacuated. Additionally, as of November 7, 140 residents from Kawamata-machi (excluding those in the deliberate evacuation zone) have voluntarily evacuated mainly out of concern about the effect of radiation on their infants.

n. Implementation of evacuation programs in Date-shi

Date-shi town office had accepted about 1,800 evacuees mainly from Soso district (Soma district and Futaba district) since the earthquake disaster on March 11. MEXT monitoring data that was published on April 11 ("Estimated Values of Cumulative Dose Based on Actual Measurement" (refer to Section (2) d above) showed that some spots in the city exceeded the estimated annual cumulative dose of 20mSv. In response to this, the city office conducted its own monitoring. On June 30, spots where some (113) of the city's households were located were designated as specific spots recommended for evacuation. Eighty households (272 residents) were evacuated. Moreover, on November 25, additional spots where 15 households were located were designated as specific spots recommended for evacuation. Additionally, as of November 4, 180 households (516 residents) had been evacuated from Date-shi.

(4) Cancellation of areas prepared for emergency evacuation (refer to Attachment V-2)

On August 4, the NERHQ asked the NSC for advice on how to deal with zones where