

## **Comprehensive Radiation Monitoring Plan**

Developed on 2 August, 2011

Revised on 15 March, 2012

Revised on 1 April, 2012

Revised on 1 April, 2013

### **Monitoring Coordination Meeting, Japan**

The Meeting consists of the following organizations:

Nuclear Regulation Authority (Headquarters);

Fisheries Agency; Ministry of Land, Infrastructure,

Transport and Tourism; Japan Coast Guard; Japan

Meteorological Agency; Ministry of the Environment;

Fukushima Prefectural Government; and Tokyo Electric

Power Co. Inc.

On 11 March 2011, a massive amount of radioactive material was released from Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi Nuclear Power Station (NPS). No significant increase of the concentrations for radionuclides has been found so far, while two years have passed since the accident at Fukushima Daiichi NPS.

On the other hand, high air dose rates and high concentrations for radionuclides released by the accident at Fukushima Daiichi NPS have been found in some areas around Fukushima Daiichi NPS. Under this situation, it is still important to continue to conduct radiation monitoring.

### **1. Aims**

Aims of Comprehensive Radiation Monitoring Plan - 2013 are as follows:

- (a) To figure out a distribution of radiation doses and radioactive materials on a mid- and long-term basis mainly in residential areas;
- (b) To estimate the current exposure doses (external and internal exposure doses) of people who are living and lived near TEPCO's Fukushima Daiichi NPS and their potential exposure doses in the future;
- (c) To develop and evaluate procedures for reducing exposure doses including decontamination activities to be taken;
- (d) To review the current designation of evacuation areas by means of estimating future exposure and to decide changing it as necessary;
- (e) To develop reference data for the health management of people who are living and lived near TEPCO's Fukushima Daiichi NPS and the assessment of effects to their health;
- (f) To figure out a dispersion, deposition and migration of radioactive materials that were released into the environment.

It is important to develop an appropriate system for integrating monitoring results in a long period of time, and to utilize them as basic data for the health management of residents who lived and/or are living near Fukushima Daiichi NPS and people in other areas.

The Nuclear Regulation Authority (NRA) updates monitoring results on its website compiling information on monitoring results obtained from other central governmental organizations.

## **2. Roles and Tasks**

### **(a) Roles**

With the initiatives of the Nuclear Regulation Authority (NRA), the central governmental organizations coordinate with the local governments, nuclear operator and others. The roles of radiation monitoring are allocated in term of subjects and areas as follows:

#### **Central government organizations**

➤ **Nuclear Regulation Authority (NRA)**

The NRA plays the role of Headquarters to make a necessary coordination with other organizations for conducting a comprehensive radiation monitoring, and to assess monitoring results by the relevant organizations.

➤ **Nuclear Emergency Response Headquarters (Local Nuclear Emergency Response Headquarters and Team in charge of Assisting the Evacuees)**

The Nuclear Emergency Response Headquarters conducts radiation monitoring around Fukushima Daiichi NPS in cooperation with other organizations, and assists Fukushima Prefectural Government for its monitoring.

➤ **Other central governmental organizations**

The other central governmental organizations conduct their monitoring, and analyze monitoring results.

➤ **Monitoring results are open to the public by the central government organizations in a prompt way through their websites.**

#### **Local governments**

The local governments conduct their monitoring in their administrative areas, and disseminate monitoring data openly to the public in cooperation with the central governmental organizations, the nuclear operator and others.

#### **Nuclear operator and others**

Under the authority of the central government, the nuclear operator and others conduct radiation monitoring in cooperation with the local governments, and disseminate monitoring results openly to the public.

**(b) Tasks**

The following table illustrates details of the tasks, and in-kind and/or financial supports are highlighted with shadow-line as follows:

Monitoring subjects or areas	Organizations that initialize monitoring activities and disseminate monitoring results to the public	Organizations that conduct monitoring in the fields	Organizations that measure the concentrations of radionuclides
Air, dust in air, water, seawater, sediment, schoolyards, public facilities and others	NRA	<p><b><u>Monitoring around Fukushima Daiichi NPS:</u></b> Nuclear Emergency Response Headquarters</p> <p><b><u>Monitoring in the field except above:</u></b> NRA, Ministry of the Environment (MOE), Ministry of Economy, Trade and Industry (METI), Japan Coast Guard, local governments, Ministry of Education, Culture, Sports, Science and Technology (MEXT), Ministry of Health, Labor and Welfare (MHLW), Ministry of Defense <sup>*1</sup>, Reconstruction Agency <sup>*2</sup>, the nuclear operator</p>	Technical support organizations for the NRA, Japan Coast Guard, Meteorological Research Institute/Japan Meteorological Agency, Technical Research and Development Institute of the Ministry of Defense, Local governments, the nuclear operator, Public/private testing institutions and others
Ports, airports, parks and sewerage	NRA	<p><b><u>Monitoring around Fukushima Daiichi NPS:</u></b> Nuclear Emergency Response Headquarters</p> <p><b><u>Monitoring in the field except above:</u></b> Local governments, Ministry of Land, Infrastructure and Transportation (MLIT)</p>	Technical supports organizations for the NRA, Local governments, the nuclear operator, Public/private testing institutions and others

River, lake, underground water, natural parks (spring water, wild fauna and flora), wastes and others	MOE	<p><b><u>Monitoring around Fukushima Daiichi NPS:</u></b> Nuclear Emergency Response Headquarters</p> <p><b><u>Monitoring in the field except above:</u></b> MOE, Local governments, the nuclear operator and others</p>	Technical support organizations for the NRA, MOE, Local governments, the nuclear operator, public/private testing institutions and others
Cultivated soil, forests and pasture	Ministry of Agriculture, Forestry and Fisheries (MAFF)	<p><b><u>Monitoring around Fukushima Daiichi NPS:</u></b> Nuclear Emergency Response Headquarters</p> <p><b><u>Monitoring in the field except above:</u></b> MAFF, Local governments</p>	Technical support organizations for MAFF and the NRA, Local governments, the nuclear operator, public/private testing institutions and others
Foodstuff (agricultural/ forestry/ livestock/ fishery products)	MHLW	<p><b><u>Monitoring around Fukushima Daiichi NPS:</u></b> Nuclear Emergency Response Headquarters</p> <p><b><u>Monitoring in the field except above:</u></b> MAFF, Local governments, National Tax Agency <sup>*3</sup> and others</p>	MHLW, Technical support organizations for MAFF, Local governments and Public testing institutions
Tap water	MHLW	<p><b><u>Monitoring around Fukushima Daiichi NPS:</u></b> Nuclear Emergency Response Headquarters</p> <p><b><u>Monitoring in the field except above:</u></b> Local governments, Water supply utilities and others</p>	Local governments, Water supply utilities and Public testing institutions

\*1: Ministry of Defense assists to use aircraft or ships as necessary in cooperation with other central governmental organizations.

\*2: Reconstruction Agency coordinates with other central governmental organizations for the restoration of infrastructures in the evacuation areas and other areas. Reconstruction Agency also supports residents for their return from the evacuation areas.

\*3: National Tax Agency, which has jurisdiction related to the food safety for liquor, coordinates with other central governmental organizations for monitoring food stuff containing liquor.

### **3. Monitoring subjects, areas and methods**

#### **(1) Air, dust in air, water, seawater, sediment, schoolyards, public facilities and others**

##### **Monitoring the whole land area of Japan**

###### **(a) Prefectural-area monitoring using monitoring stations**

- Air dose rates are measured by monitoring stations placed in the prefectures, and the monitoring results are available in the websites at real time. In addition, air dose rates are estimated at 1 meter high above the ground surface near the monitoring stations, and the estimated results are open to the public promptly.
- Prefectural governments conduct monitoring of fallout and tap water once a month and once for 3 months respectively.
- Fukushima Prefectural Government enhances the above-described monitoring with respect to place and frequency.
- The Secretary of NRA supports local governmental staff through training courses to achieve appropriate and effective monitoring.

###### **(b) Wide-area monitoring using aircraft equipped with radiation detectors**

- Air Monitoring is conducted by the NRA to figure out a composition of radioactive materials in Fukushima Prefecture and the prefectures neighboring Fukushima Prefecture, where relatively high level of radioactivity was observed.

##### **Monitoring in land area around Fukushima Daiichi NPS (Monitoring in the whole land area of Fukushima Prefecture)**

###### **(a) Subject: Air dose rates and/or cumulative doses**

- In the vicinity of Fukushima Daiichi NPS, the NRA, Nuclear Emergency Response Headquarters and Fukushima Prefectural Government conduct monitoring using portable monitoring equipment (e.g., dosimeters) to watch changes of air dose rates and cumulative doses. The monitoring results are open to the public on website in a prompt way. Taking into account the measuring points of additionally installed monitoring stations, the measuring way for cumulative doses using simple dosimeters is changed.
- The monitoring results obtained by the NRA and local governments using monitoring detectors in Fukushima Prefecture and its neighboring prefectures (Miyagi, Yamagata, Ibaraki, Tochigi, Gunma and Niigata Prefectures) are open to the public on website at real time, together with the monitoring results obtained at monitoring stations installed nationwide. Taking into account the measuring points of additionally installed monitoring stations, the measuring points using monitoring vehicles and survey meters are determined. Furthermore, for the purpose of obtaining more monitoring data, more monitoring activities using vehicles are implemented.

- Fukushima Prefectural Government measures air dose rates in public facilities in Fukushima Prefecture, by using survey meters. When relatively high air dose rates were found in any point, their causes are need to be surveyed.

**(b) Subject: Dust in air**

- Regarding dust in air, monitoring is conducted with the higher accuracy than that at the time of the latest emergency response mainly in residential areas. Monitoring is conducted more precisely by the NRA, Nuclear Emergency Response Headquarters and Fukushima Prefectural Government.

**(c) Subject: Land sediment**

- Distribution of air dose rates and migration of various radioactive materials on the ground surface are surveyed, so that, air dose rate and soil concentration maps are developed by the NRA, Fukushima Prefectural Government, Nuclear Emergency Response Headquarters and academic institutes.

**(d) Subject: Index-Plants**

- Index-Plants (e.g., pine needle) that should be available in a whole year are specified, and their radioactivities are monitored by the NRA, Nuclear Emergency Response Headquarters and Fukushima Prefectural Government.

**(e) Area: Evacuation areas**

- Precise monitorings are conducted in the evacuation and the planned-evacuation areas, which will contribute to decontamination activities in these areas. Nuclear Emergency Response Headquarters, Reconstruction Agency, other central governmental organizations, the nuclear operator and others conduct the following precise monitorings. Additional monitorings are conducted if necessary.

- ① Air dose rates are periodically measured by car-borne monitoring.
- ② Air dose rates in the uninhabitable areas are measured, as necessary, to evaluate whether annually estimated dose is below 20mSv or not.
- ③ Contribution of monitoring results to recovery tasks of infrastructures in the evacuation and the planned-evacuation areas.

- For the purpose of assisting residents' return to and the recovery of the areas for which an evacuation order was lifted and the areas for which an evacuation order is expected to be lifted, the following monitoring is conducted based on the needs of the local communities. A monitoring system is formulated depending on the needs of local communities under the initiatives of Nuclear Emergency Response Headquarters and the NRA in cooperation with other central governmental organizations, Fukushima Prefectural Government, the nuclear operator and others.

- ① Monitoring for assisting residents' return and remediation:
  - Facilities: Monitoring of air dose rates at facilities (i.e., kindergartens, elementary schools, junior high schools, high schools, nurseries, hospitals, libraries, children's centers, facilities for children with disabilities and after-school children's clubs) that have been located in the areas for which an evacuation order was lifted and the areas for which an evacuation order is expected to be lifted.

- Residential areas: Monitoring of air dose rates using vehicles or unmanned helicopters in the residential areas where the above-described facilities have been located.
- Monitoring is requested by local governments for underground water/well water for drinking and others.

② Monitoring for evaluation of the progress of decontamination activities.

### **Monitoring in sea area**

- Refer to “Implementation Guides on Sea Area Monitoring in FY2013”.

### **Monitoring related to schoolyards and others**

#### **(a) Subject: Schoolyards and others**

- Air dose rates outdoors at kindergartens, elementary schools, junior high schools, high schools, child welfare facilities and nurseries in Fukushima Prefecture are measured once every several months using tele-type monitoring stations and survey meters, and air dose rates are measured in parks and outdoors at other public facilities than the above-described facilities once every several months using tele-type monitoring stations. The frequency of measurement will be re-considered in the future taking into account further deployment of the monitoring stations.

#### **(b) Subject: Outdoor swimming pools**

- The radioactive levels in the water of outdoor swimming pools in Fukushima Prefecture are measured by Fukushima Prefectural Government.

#### **(c) Subject: School meals**

- An examination of school meals, which are supplied by schools and child welfare facilities, is conducted to measure the concentrations of radioactive materials in foodstuff<sup>1</sup>.

### **(2) Ports, airports, parks and sewerage**

#### **(a) Subject: Sewage sludge**

- The concentrations of radioactive materials in sewage sludge are measured by local governments in cooperation with MLIT.

#### **(b) Subject: Seawater in ports**

- Refer to “Implementation Guides on Sea Area Monitoring in FY2013”.
- Air dose rates outdoors at port facilities are measured by MLIT and municipalities.

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<sup>1</sup> The central government grants financial support for installing equipment to examine foodstuff used in school meals in Fukushima Prefecture and other 15 prefectures in the eastern part of Japan using the supplementary budget for FY2011.

**(c) Area: Airports**

- Airport management companies measure air dose rates near major airports in cooperation with MLIT.

**(d) Area: Parks**

- Air dose rates at parks in Fukushima Prefecture are measured by Fukushima Prefectural Government.

**(e) Area: Sightseeing area**

- Air dose rates at sightseeing areas (e.g., tourist facilities, mountainous districts, natural scenic spots, roadside stations) in Fukushima Prefecture are measured by Fukushima Prefectural Government.

**(3) River, lake, underground water, natural parks (spring water, wild fauna and flora), wastes and others**

**Monitoring in water resources**

**(a) Area: River, lake and other water resources**

- MOE and Fukushima Prefectural Government monitor air dose rates and measure the concentrations of radioactive materials in water, sediment and others such as aquatic organisms, which are obtained at the points in rivers, lakes, other water resources and coastal areas in Fukushima Prefecture and neighboring prefectures.
- In Fukushima Prefecture, measurement is conducted furthermore intensively for the concentrations of radioactive materials in water and bottom soil of rivers/lakes, water of other water resources and water at swimming resorts in coastal areas, as well as the air dose rates in the swimming resorts.

**(b) Subject: Underground water and well water**

- MOE and Fukushima Prefectural Government measure the concentrations of radioactive materials in underground water and well water in Fukushima Prefecture and neighboring prefectures. In Fukushima Prefecture, the concentrations in well water for drinking are measured furthermore intensively.

**Natural parks (spring water, wild fauna and flora)**

**(a) Area: Natural parks**

- MOE measures the concentrations of radioactive materials is (i) spring water alongside trails for drinking and (ii) mountain water and mountain stream water in parking lots for drinking. Samples are taken at natural parks within approximately 100km radius from Fukushima Daiichi NPS.

**(b) Subject: Wild fauna and flora**

- Annual gramineae weeds, pine trees and apodemus speciosus are selected within 20km radius from Fukushima Daiichi NPS and its surrounding areas, on the basis of the Reference Animals and Plants of International Commission on Radiological Protection (ICRP). Analysis of the concentrations of radioactive materials containing in those samples is conducted by MOE in cooperation with its related organizations.



- The concentrations of radioactive materials in hunting animals in Fukushima Prefecture and neighboring prefectures are measured, because those are often supplied for food.

## **Wastes**

- Based on the Act on Special Measures concerning the Handling of Radioactive Pollution, MOE, municipalities and others monitor wastes at water supply plants and others, emission dust and sewer water from waste incineration facilities, as well as underground water and water discharged at/from final disposal sites, and air dose rates at the site borders of incineration facilities and final disposal facilities.

### **(4) Cultivated soil, forests and pasture**

#### **(a) Subject: Cultivated soil**

- Cultivated soil is monitored by MAFF.

#### **(b) Area: Forests**

- Forestry Agency measures the concentrations of radioactive materials in forest soil, branches, leaves, tree bark and timber at the test site specified in forest areas in Fukushima Prefecture.

#### **(c) Area: Pasture**

- The relevant prefectural governments, in cooperation with MAFF, measure the concentrations of radioactive materials in pasture grass in their prefecture. MAFF measures the concentrations of radioactive materials in water of irrigation ponds in Fukushima Prefecture.

### **(5) Foodstuff (agricultural/ forestry/ livestock/ fishery products)**

- Inspections for foodstuff are conducted by the relevant prefectural governments<sup>2</sup>, and inspections for fishery products are conducted jointly by Fishery Agency, relevant local governments and fishery unions.
- Fukushima Prefectural Government, MHLW and its related organizations survey actual radiation exposure doses through food ingestion for people who are living in 10 major prefectures including Fukushima Prefecture.

### **(6) Tap water**

- Regarding purified water at water treatment plants and raw water at intake areas, water samples are taken and analyzed by Nuclear Emergency Response Headquarters and relevant prefectural governments including Fukushima Prefectural Government, using germanium semiconductor detectors. Fukushima Prefectural Government measures the concentrations of radioactive materials in water sources for drinking in Fukushima Prefecture.

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<sup>2</sup> The Consumer Agency, jointly with the National Consumer Affairs Center of Japan, lends inspection equipment to local governments that intend to check radioactive materials in foodstuff consumed by their residents, that helps the development of radiation inspection system for foodstuff.

#### **4. Remarks**

- (a) The NRA and relevant organizations make monitoring results open to the public on their websites. They carefully explain and describe how to read monitoring results and what is found therefrom so that the residents can understand the meaning of monitoring results without misleading.
- (b) The NRA develops a database of monitoring results to realize efficient retrieval and effective mapping/presentation.
- (c) The relevant organizations consider monitoring sensitivity, frequency as well as monitoring scope if necessary on the basis of the needs of local communities.
- (d) The relevant organizations need to normalize the measurement and sampling ways. Cross-checking among analytical institutions is necessary as appropriate for each monitoring.
- (e) Monitoring plans and activities should be updated as any new scientific and technological knowledge is obtained.
- (f) The relevant organizations encourage analytical institutes to cooperate in radiation monitoring.

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