Status of the Fukushima Daiichi Nuclear Power Plant

Updated information (22-05-2011 at 1300hrs)

(Prepared by Health Safety & Environment Group)

1. Current situation

Overall, the situation at the Fukushima Daiichi nuclear power plant remains very serious.

Fukushima Daiichi Nuclear Power Plant Status

Progress made for each of **Units 1 - 4** towards fulfilling the three basic safety functions of the IAEA safety standards: prevention of criticality, removal of decay heat and mitigation of radioactive releases.

On 17 May 2011, TEPCO provided a status report against the TEPCO "Roadmap". Progress has been made during the last month since the issuing of the Roadmap on 17 April 2011. While the basic policy and targets defined in the Roadmap remain, several changes were made to account for new information obtained and progress made to date.

On 13 May TEPCO commenced the preparatory work for the installation of a cover for the reactor building of **Unit 1**. The reactor building cover will be installed as an emergency measure to prevent the dispersion of radioactive substances until mid- to long term measures, including radiation shielding, are implemented.

TEPCO has reported that information obtained after calibration of the reactor water level gauges of **Unit 1** shows that the actual water level in the **Unit 1** reactor pressure vessel was lower than was indicated, showing that the fuel was completely uncovered. The results of provisional analysis show that fuel pellets melted and fell to the bottom of reactor pressure vessel at a relatively early stage in the accident.

TEPCO reported that "most part of the fuel is considered to be submerged in the bottom of reactor pressure vessel and some part exposed." TEPCO also reported that leakage of cooling water from the reactor pressure vessel is likely to have occurred. However, TEPCO considers that the actual damage to the reactor pressure vessel is limited, on the basis of the temperatures now being measured around the reactor pressure vessel.

With regard to the status of the reactor core of **Unit 1**, TEPCO believes that because the fuel has been being cooled continuously by means of water injection, it is unlikely that the situation could result in a future release of large amounts of radioactive material.

The results of the analysis are provisional; TEPCO will continue to conduct investigations. Similar analyses will be conducted for **Units 2 and 3**.

Nitrogen gas is still being injected into the containment vessel in **Unit 1** to reduce the possibility of hydrogen combustion inside the containment vessel.

In **Units 1, 2 and 3** fresh water is being continuously injected into the reactor pressure vessel; temperatures and pressures remain stable.

To protect against potential damage as a result of future earthquakes, TEPCO started work on 9 May to install a supporting structure for the floor of the spent fuel pool of **Unit 4**.

Fresh water is being injected as necessary into the spent fuel pools of **Units 1 - 4**.

Stagnant water with high levels of radioactivity in the basement of the turbine buildings of **Units 1, 2 and 3** is being transferred to the condensers, the radioactive waste treatment facility, the high-temperature incinerator building and temporary storage tanks. Stagnant water in the basement of the turbine building of **Unit 6** is being transferred to a temporary tank. Countermeasures against the outflow of water to the sea and to prevent and minimize the dispersion of radionuclides in water have been put in place.

Full-scale spraying of anti-scattering agent is continuing at the site with the use of both conventional and remote controlled equipment.

2. Radiation Monitoring

Deposition in 47 Prefectures

The daily monitoring of the deposition of caesium and iodine radionuclides for 47 prefectures is continuing. Since 12 May negligible deposition has occurred. I-131 was reported in only one prefecture and Cs-137 was reported in three prefectures, with a value of 4.8 Bq/m2 for I-131 and a range of from 4.7 to 10 Bq/m2 for Cs-137.

Gamma Dose Rates in 47 Prefectures

Gamma dose rates are measured daily in all 47 prefectures. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan reports values on the basis of data collected from each prefecture. On 18 May the value of gamma dose rate reported for Fukushima prefecture was 1.6 µSv/h. In all other prefectures, reported gamma dose rates were below 0.1 µSv/h, with a general decreasing trend.

Gamma Dose Rates in Areas More Than 30 km from Fukushima Daiichi Plant

Gamma dose rates reported specifically for the monitoring points in the eastern part of Fukushima prefecture, for distances of more than 30 km from the Fukushima Daiichi plant, showed a general decreasing trend, ranging from 0.1 µSv/h to 17 &nicro;Sv/h, as reported for 17 May.

Maps of gamma dose rates, deposition of Cs-134 and deposition of Cs-137 within the 80 km zone around the Fukushima Daiichi plant were produced by means of aerial gamma ray monitoring by the Nuclear Safety Technology Centre of MEXT and the United States Department of Energy.

The map of the deposition of radiocaesium is presented in Fig. 1. The values represent the sum of Cs-134 and Cs-137. The areas in green show a deposition of these two radionuclides of between 0.6 and 1 MBq/m2. The areas in yellow indicate a deposition of between 1 and 3 MBq/m2. The areas in red indicate a deposition of between 3 and 30 MBq/m2. All are normalized to 29 April 2011.

The map shows that the results obtained are consistent with all previous reported measurements of deposition in soil and of gamma dose rates.

Air Concentrations of Radionuclides On-site at Fukushima Daiichi Plant

On-site measurements at the west gate of the Fukushima Daiichi plant indicate the presence of I-131 and Cs-137 in the air in the close vicinity of the plant (within approximately 1 km). The values observed in the previous days show daily fluctuations with an overall decreasing tendency.

Concentrations of Radionuclides in Drinking Water

As of 10 May, the restriction on the consumption of drinking water relating to I-131 - which had been applied since 1 April as a precautionary measure for one remaining location (the village of Iitate in Fukushima prefecture), and only for infants - was lifted.

Food Monitoring and Food Restrictions (12 - 18 May 2011)

Food Monitoring

From 12 to 18 May, the Ministry of Health, Labour and Welfare reported results of continued monitoring for radioactivity in food. Over this period, results for 503 food samples from fifteen different prefectures were reported. Most of this monitoring continues to be concentrated within Fukushima prefecture (39% of samples reported for 12 - 18 May). The majority of results were below regulation values, but 28 out of these 503 samples (fewer than 6%) were found to have radioactivity levels above the Japanese regulation values for radiocaesium. These samples were collected in three prefectures (Fukushima, Ibaraki and Kanagawa). None of the 503 samples was found to have radioiodine in excess of the regulation values.

In Fukushima prefecture, 175 of the 194 samples (more than 90%) had radiocaesium levels below the regulation values set by the Japanese authorities. However, 19 of the 194 samples (fewer than 10%) exceeded the regulation values for Cs-134/Cs-137. Samples above the regulation values were bamboo shoots (ten samples), shiitake mushrooms (five samples), and four samples of fish (two samples of whitebait, one sample of ayu and one sample of Japanese smelt).

In Kanagawa prefecture, 6 out of 33 samples (18%) were found to exceed the regulation values set by the Japanese authorities for Cs-134/Cs-137, these were six samples of unprocessed tea leaves (an additional ten samples of unprocessed tea leaves were found to have levels below this regulation value).

In Ibaraki prefecture, 3 of the 66 samples (4%) reported were above the regulation values set by the Japanese authorities for Cs-134/Cs-137. These were unprocessed tea leaves (two samples) and parsley (one sample).

Food Restrictions

As of 18 May, the only food restrictions remaining are in Fukushima prefecture and for the cities of Kitaibaraki and Takahagi in Ibaraki prefecture.

In Fukushima prefecture there are restrictions on the distribution and consumption of sand lance fish. In specified areas of Fukushima prefecture there are also restrictions on the distribution of raw unprocessed milk, turnips, bamboo shoots, ostrich ferns and shiitake mushrooms, and restrictions on the distribution and consumption of specific non-head type and head-type vegetables (e.g. spinach and cabbage), flowerhead brassicas (e.g. cauliflower) and shiitake mushrooms.

In Ibaraki prefecture there is a continuing restriction on the distribution of spinach produced in the cities of Kitaibaraki and Takahagi.

3. Marine Monitoring

The marine monitoring programme is carried out both near the discharge areas of the Fukushima Daiichi plant by TEPCO and at off-shore stations by MEXT. The increase in the radioactivity in the marine environment had occurred by aerial deposition and by continuing discharges and outflow of water with high levels of radioactivity from the Daiichi plant.

Seawater Monitoring

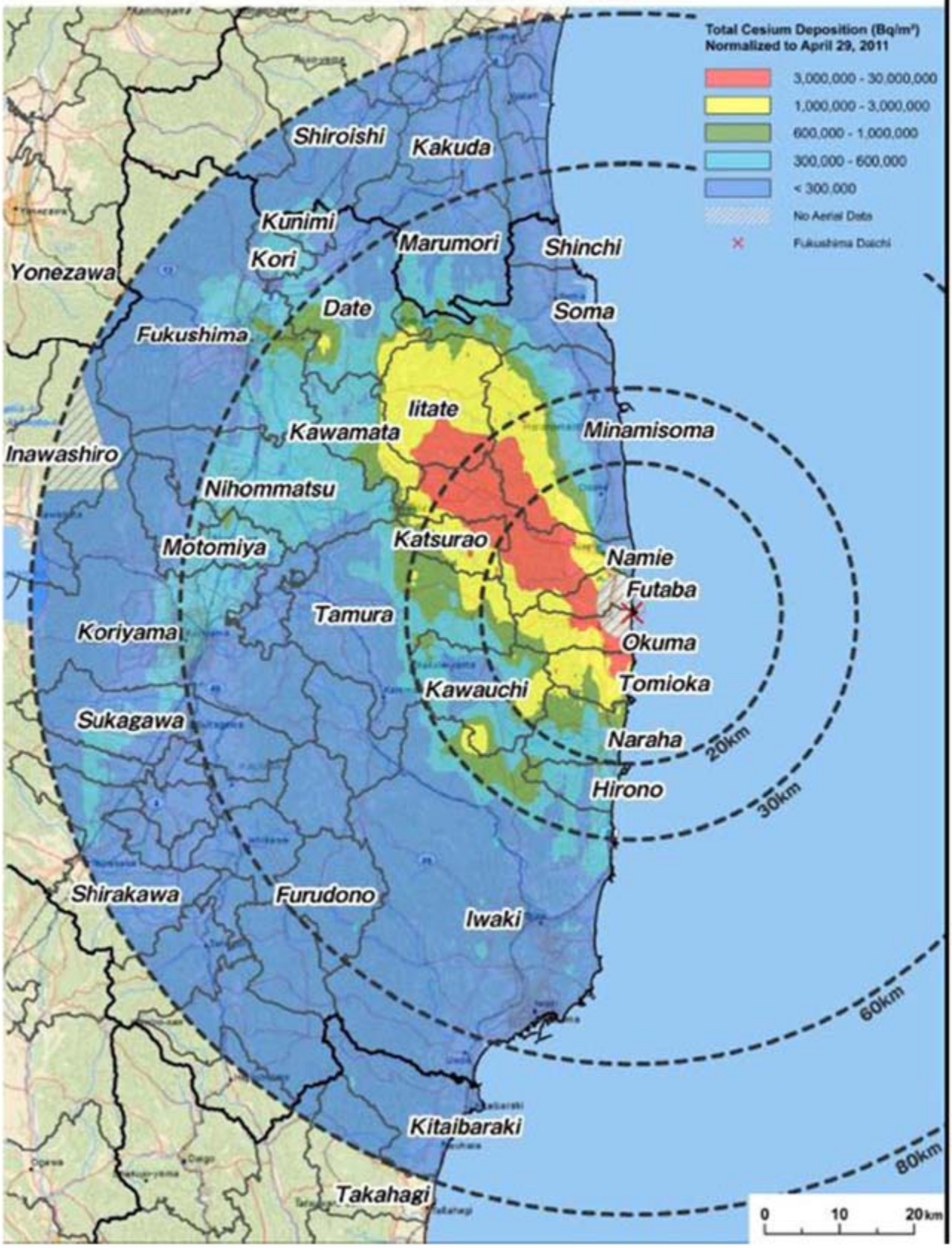
The activity concentrations of I-131, Cs-134 and Cs-137 in seawater close to the Fukushima Daiichi plant at the screen of **Unit 2** have been measured every day since 2 April. Concentrations of Cs-134 and Cs-137 decreased from initial values of more than 100 MBq/L to less than 5 kBq/L on 7 May, but increased to levels of around 20 kBq/L on 16 May, and to about 10 kBq/L on 17 May. There was a significant increase in levels of I-131 from about 8 to 80 kBq/L from 10 to 11 May, in parallel with the increase for both radiocaesium isotopes. This indicates that there is still some production of fission products. The I-131 levels decreased to about 20 kBq/L on 17 May.

Monitoring of the marine environment is performed by TEPCO in the near field area and by MEXT at off-shore sampling positions. The monitoring of MEXT also includes: measurement of ambient dose rates in air above the sea; analysis of ambient dust above the sea; analysis of surface samples of sea water; and analysis of samples of sea water collected at 10 m above the sea bottom and in a mid-layer, as well as at several locations for sediments. At most of the offshore stations, I-131, Cs-134 and Cs-137 reached levels below the detection limit of 10 Bq/L.

Fig. 1.: Map of deposition of radiocaesium (sum of Cs-134 and Cs-137) for the land area within 80 km of the Fukushima Daiichi plant, as reported by the Japanese authorities (MEXT):

Aerial Measuring Results

Joint US / Japan Survey Data

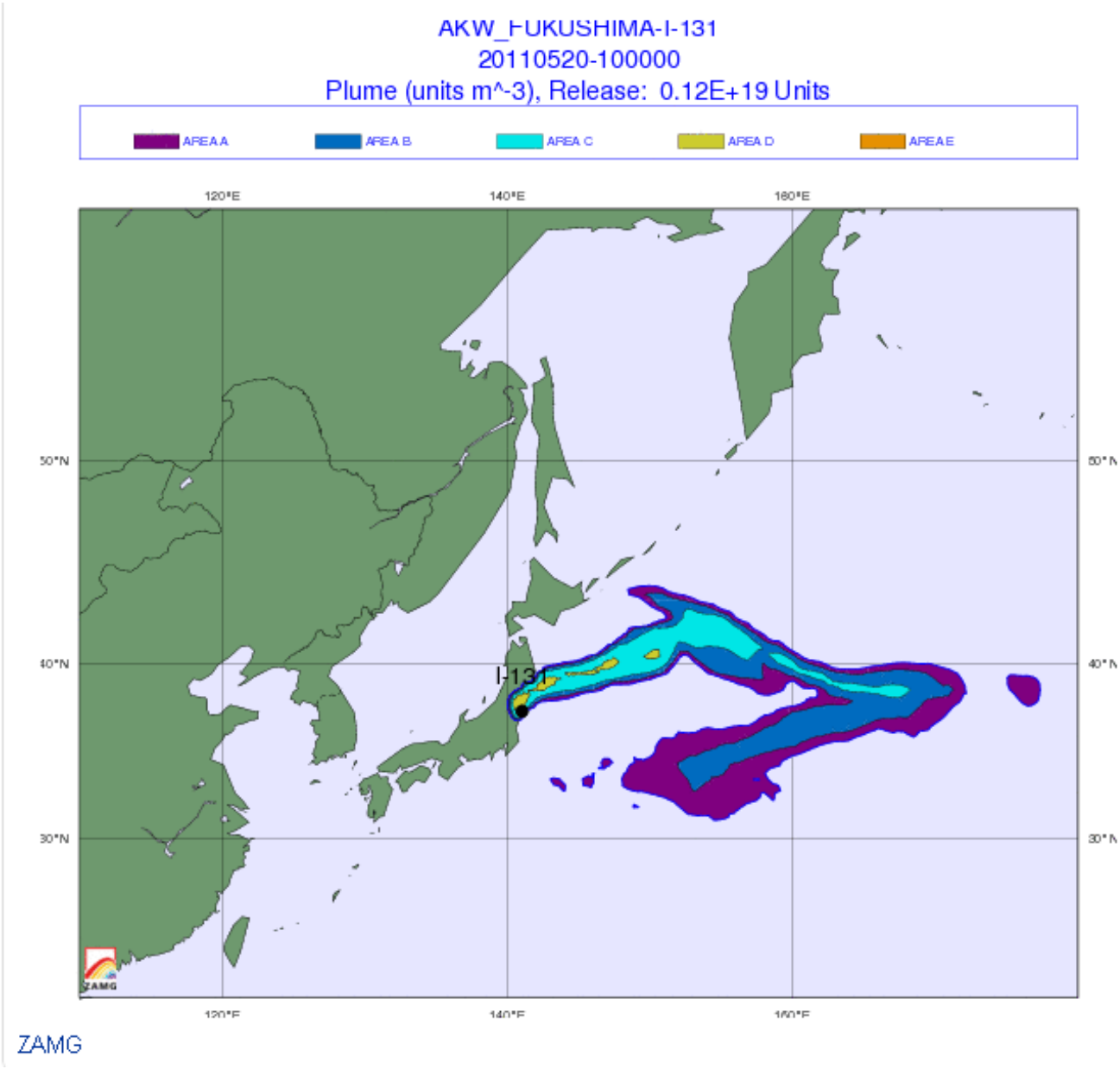


Environmental Data

1. Wind direction and wind speed (Persisting & prediction)

Date	Day	Wind direction	Wind speed (mph)
20th May 2011	Friday	SSW	11
21st May 2011	Saturday	SSW	7
22nd May 2011	Sunday	SSE	3

Plume behaviour on 20/05/2011 at 10:00 hrs



Source: http://www.weatheronline.co.uk/

Updated Environmental monitoring data from ESLs

Sampling Sites	**Date of collection**	**Air ($Bq.m^{-3}$)**		**Water ($Bq.l^{-1}$)**		**Vegetables ($Bq.kg^{-1}$ fresh wt.)**	
		I-131	**Cs-137**	**I-131**	**Cs-137**	**I-131**	**Cs-137**
Kakrapar	18/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3
Kudankulam	18/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3
Jaduguda	18/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3
Chattarpur	18/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3
Hyderabad	18/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3
Mumbai	18/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3

No detectable activity was observed in any of the locations.

Updated Environmental monitoring data from ESLs

Sampling Sites	**Date of collection**	**Air ($Bq.m^{-3}$)**		**Water ($Bq.l^{-1}$)**		**Vegetables ($Bq.kg^{-1}$ fresh wt.)**	
		I-131	**Cs-137**	**I-131**	**Cs-137**	**I-131**	**Cs-137**
Chattarpur	19/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3
Hyderabad	19/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3
Mumbai	19/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3
Tarapur	19/5/11	< 0.002	< 0.002	< 0.1	< 0.1	< 0.3	< 0.3

No detectable activity was observed in any of the locations.

IERMON data not available for 21/05/2011 and 22/05/2011