# Provisional Evaluations of Current Emission Rate of Radioactive Materials from the Units 1 to 3 at Fukushima Daiichi Nuclear Power Station, Tokyo Electric Power Company

**Reference 2**

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Tokyo Electric Power Company

As the radioactivity concentration at the west boundary of Fukushima Daiichi Nuclear Power Station has not changed significantly depending on wind directions between the boundary and the reactor buildings, it can be inferred that the dominant contributors to these measured values are radioactive materials released immediately after the accident and that the amount of radioactive materials newly released from the Units 1 to 3 into the air is very small.

Although this might be considered to be too conservative, the release rate on the assumption that all measured radioactivity arises from the current emission from the reactor buildings is evaluated to be approximately one billion Bq/hour. This is approximately two millionth of the emission rate immediately after the accident.

The maximum exposure dose near the site calculated using this release rate is 1.7 mSv/year. (as a reference, the dose limit by reactor facilities at an outside of a nuclear power station is 1 mSv/year)

As the reactor temperature decreases by cooling in accordance with the roadmap, it is expected that the radiation release will be further reduced. We will confirm effects in reducing radiation release by collecting measured data, and will also make efforts to improve accuracy of exposure dose estimation.

1. Evaluations of Current Radioactive Emission Rate from the Units 1 to 3 at the Fukushima Daiichi

We evaluated the release rate of radioactive materials newly released to the atmosphere from the power station (please refer to the attachment “Evaluation of Current Release Rates Based on Environment Monitoring Data”). The result showed that the upper limit is approximately one billion Bq/hour (Cs-134, Cs-137).

On the other hand, according to the 31st Nuclear Safety Commission of Japan report (May 12), the maximum release rate was approximately two quadrillion Bq/hour (Cs-134, Cs-137) on March 15. The same report also shows that the release rate on March 25 was approximately 2.5 trillion Bq/hour and release rate on April 5 was approximately 0.29 trillion Bq/hour (Cs-134, Cs-137). The comparison of these release rates is shown in Figure 1. The release rate in “Evaluation of Current Release Rates Based on Environment Monitoring Data” (approximately one billion Bq/hour) is reduced to approximately two millionths of that immediately after the accident.

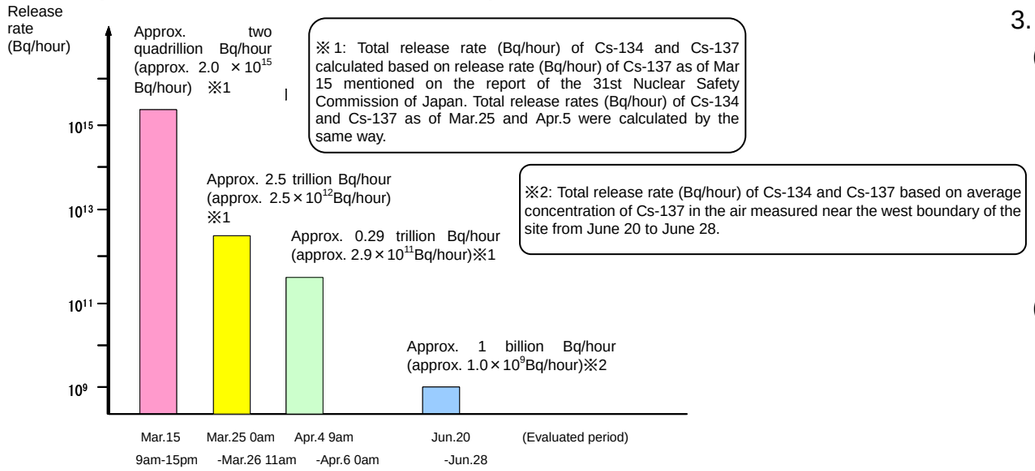
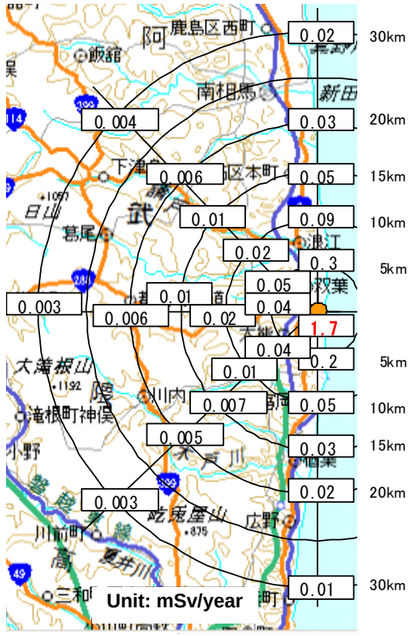



Figure 1 Release rates of radioactive materials from Units 1 to 3 at the Fukushima Daiichi

2. Evaluation of exposure doses based on radioactive materials newly released from the power station (provisional)

Excluding the effect of already released radioactive materials, evaluation of exposure doses at the site boundary using the current release rate (approximately one billion Bq/hour) showed that the maximum exposure dose is 1.7 mSv/year. The evaluated figures near the power station are shown in Figure 2.




(Overview of the evaluated figures)
Site boundary: Less than or equal to approx. 1.7 mSv/year
5km radius : Less than or equal to approx. 0.3 mSv/year
10km radius : Less than or equal to approx. 0.09 mSv/year
20 km radius : Less than or equal to approx. 0.03 mSv/year
As a reference, the dose limit by reactor facilities at an outside of a nuclear power station is 1 mSv/year.

Figure 2 Exposure doses in case that the current release rate from the power station continues for one year (mSv/year)
(Excluding the effect of already released radioactive materials) [Map Source: “Digital Japan" URL http://cyberjapan.jp/ ]

3. Summary of provisional evaluations and future plans for evaluations

(1) According to this provisional evaluation, release rates of radioactive materials have been remarkably reduced.
The release rate as of late June is evaluated to be approx. one billion Bq/hour at maximum, and the maximum exposure doses at the site boundary based on radioactive materials newly released from the power station ever if the rate continues for one year is 1.7 mSv/year.
As the reactor temperature decreases by cooling in accordance with the roadmap, it is expected that the release will be further reduced.

(2) We will analyze the effect of reducing release as well as improve accuracy of estimated exposure doses by improving accuracy of estimated release rates of radioactive materials from the power station through measures including measuring the radioactive materials concentration around the reactor buildings, measuring radioactive materials newly falling at survey points outside of the site, etc.

Attachment

# Evaluation of Current Release Rates Based on Environment Monitoring Data

## 1. Evaluation of the upper limit of release rates based on current environment monitoring data

Measurement results of aerial radioactive material concentrations near the west side boundary of Fukushima Daiichi NPS are shown in Figure 1.

Since the accident, a large quantity of radioactive materials released from the power station into the air has been widely scattered and deposited. It is estimated that some of them are re-floated up in the air and observed in measurements (Figure 2). We analyzed the changes in concentrations by wind directions for the purpose of measuring radioactive material concentrations released from the power station and found out that wind directions made little difference in the concentrations. This infers that the contribution by radioactive materials currently released from the power station is little enough to be included within the fluctuation of measurement.

It is not clear how much fraction of measured values of radioactive materials newly released from the power station account for, however, assuming they account for 100%, the release rate from the reactor building is approximately one billion Bq/hour at the maximum.

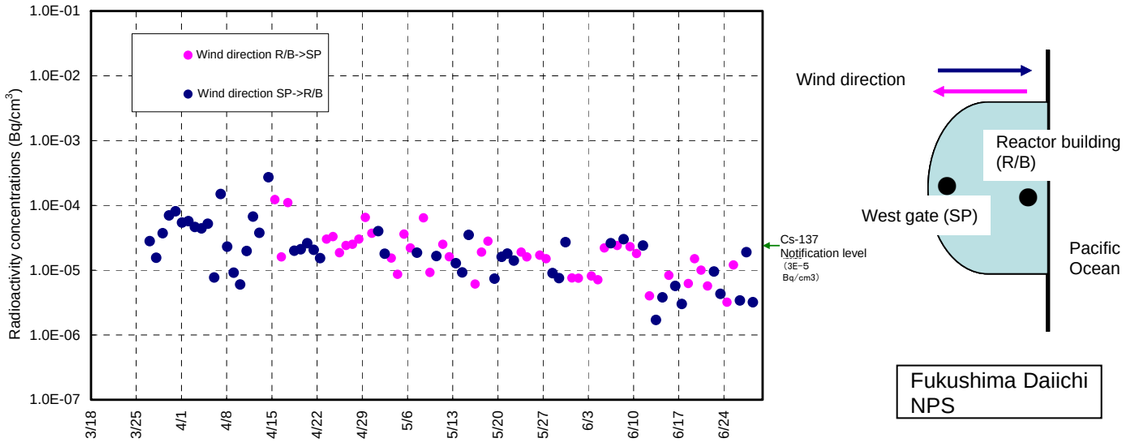



Figure 1 Trend of aerial radioactivity concentrations near the west side boundary of the station (Cs-137)

## 2. Release rate measurement hereafter

We will reinforce dust sampling date of radioactive materials around reactor buildings and near the site in order to improve accuracy of estimated release rates of radioactive materials newly released from reactor buildings. We will consider the following two ways as shown in figure 2.

1) We will measure concentrations of radioactive materials at the plural points around reactor buildings.
2) We will selectly capture radioactive materials falling down by plate etc. at the measurement points around the site and measure concentrations. By this way, we will be able to calculate release rates at this moment, excluding the contribution by floating of radioactive materials deposited on the ground immediately after the accident.

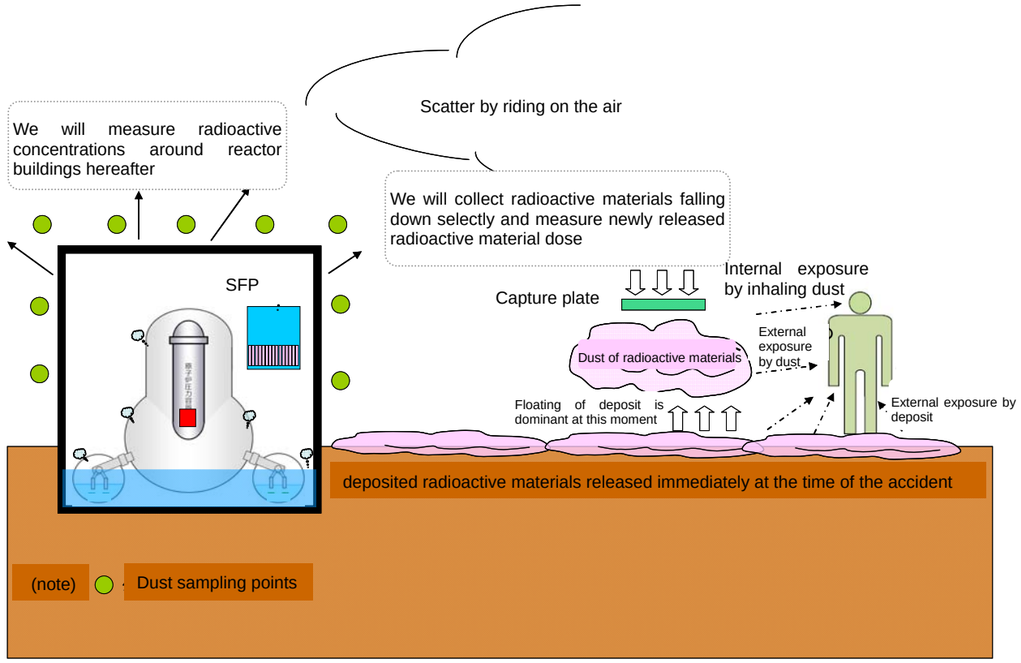



Figure 2 Evaluation of exposure dose by release and scattering of radioactive materials