Evaluation of Emissions of Radioactive Materials (Tritium, Cesium and Strontium)

August 21, 2013
Tokyo Electric Power Company

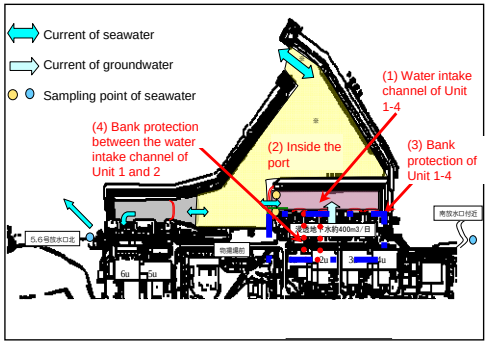
Evaluation of emissions of Strontium and Cesium

Radioactive materials in the water intake channel are taken away to the outside of the channel due to the tide, but the same amount is coming from the soil. Therefore, the densities are kept constant.

Evaluation of the sea side ⇔ Comparison ⇔ **Evaluation of the mountain side**

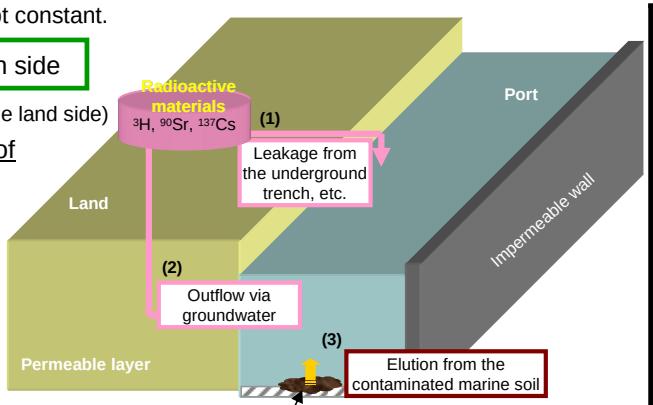
(Evaluation based on the radioactive material density, etc. in seawater)

(Evaluation based on the outflow amount from the land side)



3 estimated transfer route of radioactive materials

(1) Outflow from the trench, etc.
Water in the underground trench is flowing into the sea.
(2) Transfer via groundwater
Water is flowing through the soil to the sea with groundwater.
(3) Radioactive materials accumulated in the marine soil at the port is eluting



Contaminated marine soil attributed by the outflow of the contaminated water after the disaster (Already covered by concrete)

Evaluation of emissions of Tritium

Previously announced on August 2, 2013

	Evaluation of the sea side	Evaluation of the mountain side
Evaluation method	Evaluation based on the radioactive material density, etc. in seawater	Evaluation based on the outflow amount from the land side via groundwater
Outflow rate (Bq/day)	(Until April 2013) Approximately 2 x 10^{10} (Until May 2013) Approximately 1 x 10^{11}	Approximately 5 x 10^{10}
Outflow amount (Bq)	Approximately 2 x 10^{13}	Approximately 4 x 10^{13}

⇒ As for Tritium, overview of evaluation on the sea side and on the mountain side was accorded.

Evaluation of emissions of Strontium and Cesium

Evaluation of the sea side	Evaluation of the mountain side	Comparison of the evaluations on the sea side and on the mountain side
<Strontium-90> 3 x 10^{9} ～ 1 x 10^{10} (Bq/day) <Cesium-137> 4 x 10^{9} ～ 2 x 10^{10} (Bq/day)	(1) Outflow from the trench, etc. Water of contamination source is flowing 0.01 ton a day, and amount of radioactive materials in this water accord with the evaluation on the sea side. However, Sr/Cs density ratio of water in the contamination source does not accord with that of water obtained at the water intake channel.	There is a possibility
	(2) Transfer via groundwater <Strontium-90> 2 x 10^{6} ～ 2 x 10^{8} (Bq/day) <Cesium-137> 7 x 10^{4} ～ 3 x 10^{5} (Bq/day)	There is no possibility
	(3) Radioactive materials accumulated in the marine soil at the port was eluted <Strontium-90> 4 x 10^{9} (Bq) <Cesium-137> 3 x 10^{12} (Bq)	There is no possibility

Approximate calculation of the outflow amount (interim)

* Evaluation on the sea side and that on the mountain side were not accorded. However, we used the evaluation on the sea side to calculate the outflow amount.
<Strontium-90> 7 x 10^{11} ～ 1 x 10^{13} (Bq)
<Cesium-137> 1 x 10^{12} ～ 2 x 10^{13} (Bq)
* Although outflow amount exceeded the annual emission control target levels under normal operation of nuclear plant, ^{90}Sr and ^{137}Cs densities in seawater outside the port (north of Unit 5,6 discharge channel) were below the notification level which was allowed under safety regulations.

Notification densities at the discharge channel	^{90}Sr: 30 (Bq/L), ^{137}Cs: 90 (Bq/L)
Annual emission control target levels of radioactivity liquid waste (excludes Tritium) under normal operation of Fukushima Daiichi Nuclear Power Station	2.2 x 10^{11} (Bq) (3.7 x 10^{10} Bq/reactor x 6)

Future plan

* Evaluation of emission of radioactivity, which was flowed from the mountain side to the sea, was attempted by a nuclide transfer analysis. However, identification of distribution coefficient and contamination source of the soil will be needed. Evaluation will be implemented based on the investigation results obtained this time.
* Leakage location, transfer route and behavior of the radioactive materials in the seawater will be investigated/considered, so that we can explain the reason of transition of densities in seawater.
* Results obtained this time and the next time will have evaluated by the experts, and we will make efforts to increase accuracy of the evaluation accordingly.
* Monitoring of surrounding sea area has already enhanced. We will investigate the impact on the seawater and the fish.
* Outflow amount after implementation of countermeasures, which is to prevent contaminated water from spreading, will be estimated.