

Evaluation of the exposure dose of workers engaged in radiation work at  
the Fukushima Daiichi Nuclear Power Station

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TEPCO has been evaluating the exposure dose of workers who engaged in radiation work at the Fukushima Daiichi Nuclear Power Station under two types, internal and external exposure to radiation, and has submitted the evaluation results to the Ministry of Health, Labour and Welfare regularly.

TEPCO today submitted to the Ministry of Health, Labour and Welfare a report on the exposure dose evaluation the data of which are those we collected until the end of July 2022. Here is part of the report: the maximum value of the external exposure dose among the workers who engaged in the work at the power station in July was 9.44 mSv, and regarding the internal exposure dose, no significant value was measured.

## Exposure Dose Distribution

### 1. Effective Dose from External Exposure

Table 1 shows the distribution of external exposure dose of workers who were involved in radiation work at the Fukushima Daiichi Nuclear Power Station for the past three months.

**Table 1. External Exposure Dose**

Dose Ranges (mSv)	May 2022			June 2022			July 2022		
	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total
Above 100	0	0	0	0	0	0	0	0	0
75-100	0	0	0	0	0	0	0	0	0
50-75	0	0	0	0	0	0	0	0	0
20-50	0	0	0	0	0	0	0	0	0
10-20	0	0	0	0	0	0	0	0	0
5-10	0	0	0	0	14	14	0	18	18
1-5	10	340	350	29	612	641	15	505	520
1 or less	980	5347	6327	1045	5431	6476	992	5583	6575
Total	990	5687	6677	1074	6057	7131	1007	6106	7113
Maximum (mSv)	2.78	4.90	4.90	2.27	7.40	7.40	4.37	9.44	9.44
Average (mSv)	0.08	0.24	0.22	0.10	0.36	0.33	0.09	0.30	0.27

• The values of the exposure dose and the number of the workers in the table above are subject to change, because there are cases that APD data are replaced with monthly dose data measured by integral dosimeters. Or dose data of workers who wore only an integral dosimeter (ex., workers who entered only the Seismic Isolation Building) need to be updated in the table after the publication of the data.

### 2. Sum of External and Internal Exposure Dose (Effective Dose)

Table 2 shows the distribution of cumulative exposure dose of workers who are involved in radiation work at Fukushima Daiichi for five years, starting on April 1, 2021. Table 3 shows the distribution of cumulative exposure dose in the fiscal year of 2022. Two different periods of time are shown in the Table 2: from April 1, 2021 to June 30, 2022 and from April 1, 2021 to July 31, 2022, and Table 3: from April 1, 2022 to June 30, 2022 and from April 1, 2022 to July 31, 2022 for comparison.

**Table 2. Cumulative Exposure Dose for Five Years**

Dose Ranges (mSv)	April 2021 - June 2022			April 2021 - July 2022			Difference		
	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total
Above 100	0	0	0	0	0	0	0	0	0
75-100	0	0	0	0	0	0	0	0	0
50-75	0	0	0	0	0	0	0	0	0
20-50	0	57	57	0	106	106	0	49	49
10-20	23	1008	1031	28	1058	1086	5	50	55
5-10	71	999	1070	71	1012	1083	0	13	13
1-5	244	2298	2542	250	2348	2598	6	50	56
1 or less	1110	5272	6382	1131	5398	6529	21	126	147
Total	1448	9634	11082	1480	9922	11402	32	288	320
Maximum (mSv)	16.84	24.22	24.22	17.13	25.93	25.93	-	-	-
Average (mSv)	1.04	3.06	2.79	1.07	3.16	2.89	-	-	-

• The values of the exposure dose and the number of the workers in the table above are subject to change, because there are cases that APD data are replaced with monthly dose data measured by integral dosimeters. Or dose data of workers who wore only an integral dosimeter (ex., workers who entered only the Seismic Isolation Building) need to be updated in the table after the publication of the data.

• No significant internal exposure has been reported since October 2011.

**Table 3. Cumulative Exposure Dose in the Fiscal Year of 2022**

Dose Ranges (mSv)	April 2022 - June 2022			April 2022 - July 2022			Difference		
	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total
Above 100	0	0	0	0	0	0	0	0	0
75-100	0	0	0	0	0	0	0	0	0
50-75	0	0	0	0	0	0	0	0	0
20-50	0	0	0	0	0	0	0	0	0
10-20	0	0	0	0	9	9	0	9	9
5-10	2	162	164	3	329	332	1	167	168
1-5	102	1249	1351	128	1494	1622	26	245	271
1 or less	1112	5473	6585	1134	5530	6664	22	57	79
Total	1216	6884	8100	1265	7362	8627	49	478	527
Maximum (mSv)	7.06	9.40	9.40	7.31	12.21	12.21	-	-	-
Average (mSv)	0.28	0.75	0.68	0.34	0.95	0.86	-	-	-

• The values of the exposure dose and the number of the workers in the table above are subject to change, because there are cases that APD data are replaced with monthly dose data measured by integral dosimeters. Or dose data of workers who wore only an integral dosimeter (ex., workers who entered only the Seismic Isolation Building) need to be updated in the table after the publication of the data.

### 3. Sum of External and Internal Exposure Dose of Workers Exposed to Especially High Radiation (Effective Dose)

Table 4 shows the distribution of cumulative exposure dose of workers exposed to especially high radiation.\*<sup>1</sup>

**Table 4. Cumulative Exposure Dose (workers exposed to especially high radiation)**

Dose Ranges (mSv)	March 2011 - September 2015
Above 100	1
75-100	191
50-75	233
20-50	267
10-20	186
5-10	129
1-5	145
1 or less	51
Total	1203
Maximum (mSv)	102.69
Average (mSv)	36.49

(Since October 2015, TEPCO Holdings has opted not to report to the Labour Standards Inspection Office about workers exposed to especially high radiation.)

\*1. Workers exposed to especially high radiation means workers who are involved in operations in which they could be exposed to the emergency exposure dose limit (100 mSv), which is stipulated in "Ordinance on Prevention of Ionizing Radiation Hazards, Chapter 7." In more detail, they are workers engaged in the work to maintain the function of the cooling facility to cool down the reactor facility or the spent fuel tank in the reactor facility, the steam turbine and its related facilities or the surrounding area where the radiation doses exceed 0.1 mSv/h. Or they are workers who would engage in keeping running the function to control or prevent the release of a large number of radioactive materials should it be likely to occur due to malfunction or damage of the reactor facility.

So far workers who have worked as "workers exposed to especially high radiation" are all TEPCO employees.

\*2. The figures in the cumulative data during the period from March 2011 to September 2015 in Table 4 above include the numbers of workers who have been reported to work as “workers exposed to especially high radiation” at least once.

\*3. The values of the exposure dose and the number of the workers in the table above are subject to change, because there are cases that APD data are replaced with monthly dose data measured by integral dosimeters. Or the dose data of workers who wore only an integral dosimeter (ex., workers who entered only the Seismic Isolation Building) need to be updated in the table after the publication of the data.

\*4. The figure shown in the dose range, “Above 100mSv,” in the cumulative data during the period from March 2011 to September 2015 is the figure when the March 2011 data of the internal exposure dose were reevaluated in July 2013.

#### 4. Equivalent Dose

Table 5 and Table 6 show equivalent dose to the skin and the lens of the eye of the workers, respectively, who were involved in radiation work at the Fukushima Daiichi Nuclear Power Station for the past three months.

**Table 5. Equivalent Dose to the Skin**

Dose Ranges (mSv)	May 2022			June 2022			July 2022		
	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total
Above 500	0	0	0	0	0	0	0	0	0
300-500	0	0	0	0	0	0	0	0	0
250-300	0	0	0	0	0	0	0	0	0
200-250	0	0	0	0	0	0	0	0	0
150-200	0	0	0	0	0	0	0	0	0
100-150	0	0	0	0	0	0	0	0	0
75-100	0	0	0	0	0	0	0	0	0
50-75	0	0	0	0	0	0	0	0	0
20-50	0	0	0	0	2	2	0	0	0
10-20	0	0	0	0	8	8	0	5	5
5-10	0	5	5	0	30	30	0	26	26
1-5	13	405	418	29	695	724	15	537	552
1 or less	977	5277	6254	1045	5322	6367	992	5538	6530
Total	990	5687	6677	1074	6057	7131	1007	6106	7113
Maximum (mSv)	2.78	7.70	7.70	2.64	23.00	23.00	4.37	17.40	17.40
Average (mSv)	0.09	0.27	0.25	0.11	0.44	0.39	0.09	0.34	0.30

• The values of the exposure dose and the number of the workers in the table above are subject to change, because there are cases that APD data are replaced with monthly dose data measured by integral dosimeters. Or the dose data of workers who wore only an integral dosimeter (ex., workers who entered only the Seismic Isolation Building) need to be updated in the table after the publication of the data.

• Equivalent dose is a measure of the radiation dose to organs and tissues, and the equivalent dose limit to the skin is 500 mSv/year (the emergency exposure dose limit is 1 Sv).

• Equivalent dose to the skin is measured at a depth of 70 micrometers from the skin surface. When the equivalent dose is measured with a dosimeter other than the one put on around the chest and the abdomen, for example, a finger dosimeter, and the maximum measurement value is counted as the equivalent dose.

**Table 6. Equivalent Dose to the Lens of the Eye**

Dose Ranges (mSv)	May 2022			June 2022			July 2022		
	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total
Above 150	0	0	0	0	0	0	0	0	0
100-150	0	0	0	0	0	0	0	0	0
75-100	0	0	0	0	0	0	0	0	0
50-75	0	0	0	0	0	0	0	0	0
20-50	0	0	0	0	0	0	0	0	0
10-20	0	0	0	0	0	0	0	0	0
5-10	0	1	1	0	21	21	0	24	24
1-5	10	371	381	29	626	655	15	537	552
1 or less	980	5315	6295	1045	5410	6455	992	5545	6537
Total	990	5687	6677	1074	6057	7131	1007	6106	7113
Maximum (mSv)	2.78	5.20	5.20	2.44	8.70	8.70	4.37	9.44	9.44
Average (mSv)	0.09	0.25	0.23	0.11	0.38	0.34	0.09	0.32	0.29

• The values of the exposure dose and the number of the workers in the table above are subject to change, because there are cases that APD data are replaced with monthly dose data measured by integral dosimeters. Or the dose data of workers who wore only an integral dosimeter (ex., workers who entered only the Seismic Isolation Building) need to be updated in the table after the publication of the data.

• Equivalent dose is a measure of the radiation dose to organs and tissues, and the equivalent dose limit to the lens of the eye is 50 mSv/year and 100 mSv/5 years (the emergency exposure dose limit is 300 mSv). The equivalent dose limit to the lens of the eye before April 1, 2021 was 150mSv/year (the emergency exposure dose limit was 300 mSv).

• The equivalent dose to the lens of the eye is measured at a depth of 1 centimeter for neutron ray, 3 millimeters for X-ray, gamma ray and beta ray from the skin surface. However, as for X-ray, gamma ray and beta ray, it is measured at a depth of 1 centimeter or 70 micrometer when deemed appropriate with consideration for radiation type and energy type (since April, 2021).

## 5. Cumulative Equivalent Dose

Table 7 and Table 8 show the distribution of cumulative equivalent dose to the skins and the lens of the eye of the workers, respectively, who were involved in radiation work at the Fukushima Daiichi Nuclear Power Station during two different periods of time, from April 1, 2022 to June 30, 2022 and from April 1, 2022 to July 31, 2022 for comparison.

Table 9 shows the distribution of cumulative exposure dose for five years, starting on April 1, 2021: from April 1, 2021 to June 30, 2022 and from April 1, 2021 to July 31, 2022 for comparison.

**Table 7. Equivalent Dose to the Skin**

Dose Ranges (mSv)	April 2022 - June 2022			April 2022 - July 2022			Difference		
	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total
Above 500	0	0	0	0	0	0	0	0	0
300-500	0	0	0	0	0	0	0	0	0
250-300	0	0	0	0	0	0	0	0	0
200-250	0	0	0	0	0	0	0	0	0
150-200	0	0	0	0	0	0	0	0	0
100-150	0	0	0	0	0	0	0	0	0
75-100	0	0	0	0	0	0	0	0	0
50-75	0	0	0	0	2	2	0	2	2
20-50	0	5	5	0	3	3	0	-2	-2
10-20	0	11	11	0	34	34	0	23	23
5-10	2	204	206	4	385	389	2	181	183
1-5	106	1316	1422	131	1537	1668	25	221	246
1 or less	1108	5348	6456	1130	5401	6531	22	53	75
<b>Total</b>	<b>1216</b>	<b>6884</b>	<b>8100</b>	<b>1265</b>	<b>7362</b>	<b>8627</b>	<b>49</b>	<b>478</b>	<b>527</b>
Maximum (mSv)	7.06	39.40	39.40	7.31	55.00	55.00	-	-	-
Average (mSv)	0.29	0.87	0.79	0.35	1.10	0.99	-	-	-

- The values of the exposure dose and the number of the workers in the table above are subject to change, because there are cases that APD data are replaced with monthly dose data measured by integral dosimeters. Or the dose data of workers who wore only an integral dosimeter (ex., workers who entered only the Seismic Isolation Building) need to be updated in the table after the publication of the data.

- Equivalent dose is a measure of the radiation dose to organs and tissues, and the equivalent dose limit to the skin is 500 mSv/year (the emergency exposure dose limit is 1 Sv).

- Equivalent dose to the skin is measured at a depth of 70 micrometers from the skin surface. When the equivalent dose is measured with a dosimeter other than the one put on around the chest and the abdomen, for example, a finger dosimeter, and the maximum measurement value is counted as the equivalent dose.

**Table 8. Equivalent Dose to the Lens of the Eye**

Dose Ranges (mSv)	April 2022 - June 2022			April 2022 - July 2022			Difference		
	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total
Above 150	0	0	0	0	0	0	0	0	0
100-150	0	0	0	0	0	0	0	0	0
75-100	0	0	0	0	0	0	0	0	0
50-75	0	0	0	0	0	0	0	0	0
20-50	0	0	0	0	0	0	0	0	0
10-20	0	1	1	0	17	17	0	16	16
5-10	2	179	181	4	360	364	2	181	183
1-5	102	1261	1363	127	1508	1635	25	247	272
1 or less	1112	5443	6555	1134	5477	6611	22	34	56
Total	1216	6884	8100	1265	7362	8627	49	478	527
Maximum (mSv)	7.06	12.10	12.10	7.31	12.57	12.57	-	-	-
Average (mSv)	0.29	0.78	0.71	0.35	1.00	0.90	-	-	-

• The values of the exposure dose and the number of the workers in the table above are subject to change, because there are cases that APD data are replaced with monthly dose data measured by integral dosimeters. Or the dose data of workers who wore only an integral dosimeter (ex., workers who entered only the Seismic Isolation Building) need to be updated in the table after the publication of the data.

• Equivalent dose is a measure of the radiation dose to organs and tissues, and the equivalent dose limit to the lens of the eye is 50 mSv/year and 100 mSv/5 years (the emergency exposure dose limit is 300 mSv).

• The equivalent dose to the lens of the eye is measured at a depth of 1 centimeter for neutron ray, 3 millimeters for X-ray, gamma ray and beta ray from the skin surface. However, as for X-ray, gamma ray and beta ray, it is measured at a depth of 1 centimeter or 70 micrometer when deemed appropriate with consideration for radiation type and energy type.

**Table 9. Equivalent Dose to the Lens of the Eye: Cumulative Exposure Dose for Five Years**

Dose Ranges (mSv)	April 2021 - June 2022			April 2021 - July 2022			Difference		
	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total	TEPCO Employees	Contractors	Total
Above 100	0	0	0	0	0	0	0	0	0
75-100	0	0	0	0	0	0	0	0	0
50-75	0	0	0	0	0	0	0	0	0
20-50	0	81	81	0	143	143	0	62	62
10-20	24	1032	1056	28	1058	1086	4	26	30
5-10	71	998	1069	70	1034	1104	-1	36	35
1-5	246	2267	2513	257	2314	2571	11	47	58
1 or less	1107	5256	6363	1125	5373	6498	18	117	135
Total	1448	9634	11082	1480	9922	11402	32	288	320
Maximum (mSv)	16.54	26.70	26.70	16.83	27.84	27.84	-	-	-
Average (mSv)	1.06	3.15	2.88	1.09	3.26	2.98	-	-	-

• The values of the exposure dose and the number of the workers in the table above are subject to change, because there are cases that APD data are replaced with monthly dose data measured by integral dosimeters. Or the dose data of workers who wore only an integral dosimeter (ex., workers who entered only the Seismic Isolation Building) need to be updated in the table after the publication of the data.

• Equivalent dose is a measure of the radiation dose to organs and tissues, and the equivalent dose limit to the lens of the eye is 50 mSv/year and 100 mSv/5 years (the emergency exposure dose limit is 300 mSv).

• The equivalent dose to the lens of the eye is measured at a depth of 1 centimeter for neutron ray, 3 millimeters for X-ray, gamma ray and beta ray from the skin surface. However, as for X-ray, gamma ray and beta ray, it is measured at a depth of 1 centimeter or 70 micrometer when deemed appropriate with consideration for radiation type and energy type.