

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 February 2020. Here is part of the report: the maximum value of the exposure dose among the workers who engaged in the work at the power station in February was 10.59mSv, 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 month.

**Table 1. External Exposure Dose**

Dose Ranges (mSv)	December 2019			January 2020			February 2020		
	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	5	5	0	1	1	0	6	6
5-10	0	33	33	0	54	54	0	63	63
1-5	13	604	617	10	558	568	15	768	783
1 or less	967	5212	6179	982	5239	6221	918	5176	6094
Total	980	5854	6834	992	5852	6844	933	6013	6946
Maximum (mSv)	2.54	12.20	12.20	2.07	10.01	10.01	2.96	10.59	10.59
Average (mSv)	0.11	0.40	0.36	0.09	0.39	0.35	0.11	0.48	0.43

• 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, 2016. Table 3 shows the distribution of cumulative exposure dose in the fiscal year of 2019. Two different periods of time are shown in the Table 2: from April 1, 2016 to January 31, 2020 and from April 1, 2016 to February 29, 2020, and Table 3: from April 1, 2019 to January 31, 2020 and from April 1, 2019 to February 29, 2020 for comparison.

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

Dose Ranges (mSv)	April 2016 - January 2020			April 2016 - February 2020			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	12	12	0	12	12	0	0	0
50-75	0	189	189	0	208	208	0	19	19
20-50	59	1663	1722	64	1705	1769	5	42	47
10-20	137	2226	2363	133	2279	2412	-4	53	49
5-10	183	2376	2559	187	2378	2565	4	2	6
1-5	585	4523	5108	594	4555	5149	9	32	41
1 or less	1311	9268	10579	1302	9322	10624	-9	54	45
Total	2275	20257	22532	2280	20459	22739	5	202	207
Maximum (mSv)	44.58	79.90	79.90	45.00	79.90	79.90	-	-	-
Average (mSv)	2.87	6.21	5.87	2.91	6.28	5.95	-	-	-

• 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 2019**

Dose Ranges (mSv)	April 2019 - January 2020			April 2019 - February 2020			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	4	575	579	8	756	764	4	181	185
5-10	41	835	876	50	852	902	9	17	26
1-5	275	2144	2419	280	2272	2552	5	128	133
1 or less	1052	5139	6191	1039	5099	6138	-13	-40	-53
Total	1372	8693	10065	1377	8979	10356	5	286	291
Maximum (mSv)	12.72	19.53	19.53	13.06	19.53	19.53	-	-	-
Average (mSv)	0.84	2.31	2.11	0.91	2.55	2.33	-	-	-

• 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.\*1

**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 (100mSv), 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 0.1mSv/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 number of "workers exposed to especially high radiation" each month is the number of the workers who reported working as such workers in a given month and were engaged in that work. 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 eyes 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)	December 2019			January 2020			February 2020		
	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	1	1	0	0	0	0	0	0
10-20	0	9	9	0	6	6	0	6	6
5-10	2	53	55	0	72	72	0	72	72
1-5	12	727	739	10	675	685	15	875	890
1 or less	966	5064	6030	982	5099	6081	918	5060	5978
Total	980	5854	6834	992	5852	6844	933	6013	6946
Maximum (mSv)	6.99	21.70	21.70	2.07	11.60	11.60	2.96	10.59	10.59
Average (mSv)	0.12	0.49	0.44	0.10	0.49	0.43	0.11	0.53	0.47

• 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 500mSv/year (the emergency exposure dose limit is 1Sv).

• 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, the maximum measurement value is counted as the equivalent dose.

**Table 6. Equivalent Dose to the Lens of the Eyes (Including inside of full-face mask)**

Dose Ranges (mSv)	December 2019			January 2020			February 2020		
	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	7	7	0	4	4	0	6	6
5-10	2	37	39	0	60	60	0	72	72
1-5	11	638	649	10	588	598	15	875	890
1 or less	967	5172	6139	982	5200	6182	918	5060	5978
Total	980	5854	6834	992	5852	6844	933	6013	6946
Maximum (mSv)	6.99	13.00	13.00	2.07	11.50	11.50	2.96	10.59	10.59
Average (mSv)	0.12	0.43	0.38	0.10	0.42	0.38	0.11	0.53	0.47

• 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 150mSv/year (the emergency exposure dose limit is 300mSv).

• The equivalent dose to the lens of the eyes is measured at an appropriate depth of 1 centimeter or 70 micrometers from the skin surface using one of the following method:

- ① The case of using dosimeter put inside full face mask
- ② The case of using dosimeter put around the chest, the abdomen or the head and neck ( excluding the case of ① )

## 5. Cumulative Equivalent Dose

Table 7 and Table 8 show the distribution of cumulative equivalent dose to the skins and the lens of the eyes 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, 2019 to January 31, 2020 and from April 1, 2019 to February 29, 2020 for comparison.

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

Dose Ranges (mSv)	April 2019 - January 2020			April 2019 - February 2020			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	0	0	0	0	0
20-50	0	103	103	0	119	119	0	16	16
10-20	8	726	734	11	879	890	3	153	156
5-10	42	829	871	53	865	918	11	36	47
1-5	280	2085	2365	282	2191	2473	2	106	108
1 or less	1042	4950	5992	1031	4925	5956	-11	-25	-36
Total	1372	8693	10065	1377	8979	10356	5	286	291
Maximum (mSv)	14.97	43.80	43.80	15.18	45.87	45.87	-	-	-
Average (mSv)	0.89	2.85	2.58	0.97	3.11	2.83	-	-	-

• 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 500mSv/year (the emergency exposure dose limit is 1Sv).

• 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, the maximum measurement value is counted as the equivalent dose.

**Table 8. Equivalent Dose to the Lens of the Eyes (Including inside of full-face mask)**

Dose Ranges (mSv)	April 2019 - January 2020			April 2019 - February 2020			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	41	41	0	49	49	0	8	8
10-20	8	593	601	11	776	787	3	183	186
5-10	41	845	886	51	885	936	10	40	50
1-5	280	2166	2446	284	2268	2552	4	102	106
1 or less	1043	5048	6091	1031	5001	6032	-12	-47	-59
Total	1372	8693	10065	1377	8979	10356	5	286	291
Maximum (mSv)	14.47	25.80	25.80	14.68	25.96	25.96	-	-	-
Average (mSv)	0.88	2.47	2.25	0.95	2.75	2.51	-	-	-

• 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 eyes is 150mSv/year (the emergency exposure dose limit is 300mSv).

• The equivalent dose to the lens of the eyes is measured at an appropriate depth of 1 centimeter or 70 micrometers from the skin surface using one of the following method:

- ① The case of using dosimeter put inside full face mask
- ② The case of using dosimeter put around the chest, the abdomen or the head and neck ( excluding the case of ① )