

This document shows the contents reported to the Ministry of Health, Labor and Welfare on November 30, 2012, to which some guidance received on October 30, 2012 was added.

November 30, 2012

Tokyo Electric Power Company

### Improved Dosage Control at the Fukushima Daiichi Nuclear Power Station

In accordance with the “Complete exposure control within the TEPCO Fukushima Daiichi Nuclear Power Station” (Kian Notice No. 1030-1, issued on October 30, 2012) that required us to reconfirm exposure control within the power station, TEPCO reports the implementation of the following measures:

#### (1) Data Management

To resolve certain cases seemingly involving incorrect exposure dose data for audible personal dosimeter alarms (hereinafter referred to as “APD”) or data loss of personal integral dosimeters (hereinafter referred to as “Glass Badges”), TEPCO Head Office and the general manager of the power station shall collaborate with the main contractors to review the data and its management method at the radiation control department, correct the data if the same cases are detected, and take the required measures to prevent recurrence.

TEPCO is now striving to confirm the exposure dose together with the main contractors. Any managerial problems detected during the confirmation process are improved as required (e.g. by establishing a system). The exposure dose data will be resubmitted after correcting the previous data.

#### (2) Management of APDs

The general manager of the power station shall take the following actions:

- a) APDs shall be provided to individuals to precisely check that each person receives a APD. For TEPCO employees, strictly control the individual provision of APDs and ensure the early operation start of the entrance control zone facilities now under construction. For workers of main contractors and related subcontractors, ensure that APDs are provided individually after the operation start, and as far as possible before the same.

TEPCO continues to strictly comply with the requirements of individual APD provisions for our employees. For workers of main contractors and related subcontractors, TEPCO is now building entrance control zone facilities by the planned operation start within the 1<sup>st</sup> quarter in 2013 to ensure APDs are provided individually. After the operation start of the entrance control zone facilities, the facilities will be the single means of entry for workers to the power station premises.

- b) When returning the APD, all workers shall have their exposure dose checked. If the exposure dose is abnormal, e.g. significantly low compared to the alarm setting value (i.e. 5-10% or lower than the alarm setting value), check the work detail. If an excessive alarm setting value is set compared to the work, the value shall be amended appropriately for TEPCO employees, and the required assistance provided for workers of main contractors.

TEPCO checks the usage status of APD for all workers having worn APDs the previous day. The work detail of workers whose APD alarm setting value exceeded 1 mSv and for whom the exposure dose was 5% or less of the APD alarm setting value is checked as described:

#### Measures for TEPCO employees

TEPCO outputs a list of our employees who worked the previous day while wearing APDs, whose APD alarm setting value exceeded 1mSv and where the exposure dose was 5% or less of the APD alarm setting value. TEPCO checks the list for the validity of the APD alarm setting values.

If any APD alarm setting value is obviously excessive compared to the work (work time and environment), TEPCO gives, through their group manager (GM), the relevant employees the required guidance and advice concerning an appropriate APD alarm setting value.

#### Measures for workers of main contractors

TEPCO outputs a list of workers who were in service the previous day while wearing APDs, whose APD alarm setting values exceeded 1mSv and for whom the exposure dose was 5% or less of the APD alarm setting value. TEPCO checks the work detail and submits the list to the relevant main contractors.

If the survey results conducted by the relevant main contractors based on separate plans set for each company show that any APD alarm setting value is obviously too high, TEPCO gives the main contractors the required guidance and advice concerning improvement measures, etc., as necessary.

- c) To check whether an APD is worn, a non-woven fabric cloth-type protective garment with a transparent window on the chest (hereinafter referred to as a “Tyvek”) is effective. Ensure the early introduction of Tyvek wearing for all workers using APDs.

TEPCO has already provided Tyvek with a transparent window on its chest and transparent anoraks to workers whose APD alarm setting value is 3 mSv or higher in the Fukushima Daiichi Main Anti-Earthquake Building (since October 15 for Tyvek and since October 31 for anorak respectively). We are preparing to provide them to all workers using APDs by February 2013.

d) For TEPCO employees whose exposure dose is significantly lower than other workers in a working group adopting the same alarm setting value (i.e. 5-10% or less than workers of the highest exposure dose), check the work detail. If the alarm setting value is excessive compared to the work, amend the value appropriately.

Via the measure shown in section (2) b), TEPCO checks and evaluates the APD alarm setting and measured values and corrects the APD alarm setting values for our employees. We also check on the variation among actual exposure dose values in each group regularly (weekly).

For the measures shown in sections (2) b) c) and d), we continue to take rational and flexible actions following the PDCA cycle, based on the results of each measure after implementation.

### (3) Management of Glass Badges

The power station chief shall appropriately implement the following actions for TEPCO employees:

#### a) Management Method

As Glass Badges should be worn only for working hours to appropriately measure occupational exposure dose, and onsite offices have already been constructed, Glass Badges shall be collected after working hours, stored them in an appropriate place, and provided at the start of the next working hours.

At present, TEPCO lacks sufficient space to verify, collect and store the Glass Badges of our employees in a single location. Until all TEPCO employees collaborate in a single office, we shall adopt and ensure the following actions to store and manage Glass Badges:

- TEPCO employees shall wear Glass Badges only for working hours, including commuting time.
- The Glass Badges are to be stored and managed in residences where employees regularly reside (including Shinhirono single-person dormitory in J-Village) or the Fukushima Daini Power Station (hereinafter referred to as “Fukushima Daini”).
- TEPCO employees shall not wear Glass Badges during times other than TEPCO’s work (for community volunteers, etc.).

b) Control Badges

To appropriately measure the occupation exposure dose when wearing Glass Badges, appropriate operation of Control Badges, calculated by deducting the exposure dose during non-working hours, is important. The Control Badges shall be stored appropriately in a place exposed to the same air dose rate as the storage of Control Badges in service.

Control Badges which have yet to be used shall be stored in a place exposed to the same air dose rate as the storage of Control Badges in service.

As shown in the following table, the air dose rate of Shinhirono dormitory (J-Village) and the rate in Iwaki city, where most of our employees live, are equivalent to or exceed that of the place where the Control Badges (to be used to deduct exposure dose during non-working hours) are stored, which leads to a conservative evaluation. TEPCO has stored and managed the Control Badges on the round table in Fukushima Daini Main Anti-Earthquake Building and unused Control Badges on the 2<sup>nd</sup> floor corridor in the Fukushima Daini Information Building beginning with the GBs of November 2012.

Place	Air Dose Rate [ $\mu\text{Sv/h}$ ]
The roundtable center in the Fukushima Daini Main Anti-Earthquake Building	0.07 (Sep 28: Appendix 1)
The corridor in front of the Health Safety Group Office on the 2 <sup>nd</sup> floor in the Fukushima Daini Information Building	0.08 (Nov 16: Appendix 2)
In Iwaki city (*)	0.06 to 0.68 (Appendix 3)
Hirono town (*)	0.14 to 0.29 (Appendix 3)

\* “Environmental Dosimetry Results in Each Region (Provisional) (Report No. 481): Fukushima Prefecture”

(4) Comparison/ Evaluation of APD and Glass Badge

The power station chief shall appropriately implement the following actions for TEPCO employees:

- a) Glass Badges are regarded as more reliable than APDs because they can be worn continuously during working hours, and are subject to fewer errors by directional characteristics and other causes than APDs. However, the following shall be considered for Glass Badge and APD values. If any gap exceeding a certain standard is detected, a survey should be conducted including checks of the data:

Japanese Industrial Standards (JIS) permit a margin of  $\pm 30\%$  as a pointing error for APD. The safety standard of the International Atomic Energy Agency (IAEA) permits margins up to around 35% for gaps between two different meters. However,

for workers working close to the legal exposure limit of 40mSv per year in power stations, more careful handling is required.

Therefore, as the standard for gap surveys, it is desirable to set a value not exceeding  $\pm 20\%$ , twice as strict as the standard deviation (0.094), by this data analysis.

TEPCO compares the monthly APD and Glass Badge values for employees whose exposure dose exceeds 1 mSv/day within the actual dose results from November 2011, and investigates the cause. This survey continues on a monthly basis.

- b) If the APD value still exceeds the Glass Badge value after the data check of the section a), the APD value shall be adopted as the record value.

TEPCO adopts the APD value as the record value, if the APD value exceeds the Glass Badge value and is judged as appropriate (the value is unaffected by mechanical errors or electric noises).

(5) Setting of Planned Dose and Alarm Setting Value

The power station chief shall appropriately implement the following actions for TEPCO employees:

- a) The alarm setting is used to control the exposure dose for not exceeding the expected maximum exposure dose per day. However, as the alarm setting value has a wide margin (up to 1.5 to 3 times larger than the original value), its original function as an alarm did not work in some cases. Moreover, except for some high dose works, including those inside the reactor buildings, air dose rate data is appropriately collected. Based on these facts, the alarm setting value shall be set to a value closest to the expected maximum dose per day as much as possible.
- b) By checking the work detail specified in section (2), the alarm setting value shall continuously be shifted to the actual exposure dose results.

Except for cases involving the equivalent air dose rate of some high dose works, including inside the reactor buildings, TEPCO instructs our employees to set their APD alarm setting value to the value closest to the expected maximum exposure dose per day as much as possible; based on the planned dose calculated by multiplying the environmental dose rate of their workplace by the relevant work volume (work hours) and aiming to reduce their dose. We also shift the APD alarm setting value to the actual exposure dose results by methods shown in sections (2) a) and d).

(6) Notification of Dose

The power station chief shall appropriately implement the actions shown in the following section i). He shall also provide the required guidance or assistance to ensure related subcontractors of the power station appropriately implement the following actions shown in section ii):

- a) If the notification of confirmed dose is delayed, investigate the cause of the delay with some main contractors, and assist them as required to ensure they can notify the dose promptly.
- b) Some related subcontractors do not distribute individual dose notification in a document but display the list on the office wall. To ensure that their exposure dose is notified to workers, provide required guidance or assistance to ensure documented notification is distributed.

At the radiation managers' liaison meeting or the safety promotion liaison meeting, TEPCO instructs the main contractors to ensure related subcontractors provide documented dose notification to workers. We will also revise the individual dose (APD value) notification, which has been sent daily since April 2011, to main contractors who attended the radiation managers' liaison meeting, as necessary.

On July 4, 2012, TEPCO started a system allowing each worker to check his or her actual dose results via the internal intra system. We are also revising this system to allow our employees to print the documented dose notification, by January 2013.

(7) Others

- a) TEPCO shall provide the required assistance to ensure the main contractors implement the actions shown in sections (1) to (6).

To ensure the main contractors implement the actions shown in sections (1) to (6), TEPCO adds the procedure to the radiation management specifications that instructs the main contractors to reflect the answers to Kian Notice No. 1030-2 to the basic radiation management plan, and submit the relevant plan. We incorporate the procedure in the conventional framework for providing guidance and advice from TEPCO as a contract term.

- b) The power station chief shall collaborate with TEPCO Head Office to address problems including the shortage of rental accessories and the long waiting time of vehicle contamination test as far as possible, while avoiding any impact on work management and the precision of contamination tests.

Through a meeting on safety promotion liaison and joint labor environment improvement, TEPCO continues to examine the requests and improvement proposals submitted by main contractors or related subcontractors, and reflect them as much as possible.

(8) Special Health Checkup of Ionizing Radiation

The power station chief shall note the following items for the Special Health Checkup of Ionizing Radiation for TEPCO employees:

- a) Concerning the Special Health Checkup of Ionizing Radiation specified in the Ionizing Radiation Damage Prevention Regulations, Article 56 Clause 1, the same regulations allow omission of some items under Clauses 3 and 4 of the same Article. However, based on work conditions involving exposure to high doses in the power station, it is desirable not to omit the items specified in Clause 3 of the same Article, for workers whose actual annual occupational dose in the power station is likely to exceed 5 mSv.

TEPCO has provided a Special Health Checkup of Ionizing Radiation without omitting items under the Ionizing Radiation Damage Prevention Regulations, Article 56 Clauses 3 and 4, for our employees engaging in radiation work, which will be continued in future.

- b) For workers whose accumulated dose from March 11, 2011 to March 31, 2012 exceeds 50 mSv after December 16, 2011, ensure they are provided with eye examinations concerning cataracts throughout the period of engaging in said radiation work, on a comprehensive basis. This examination shall be performed using a slit lamp.

For workers whose accumulated dose from March 11, 2011 to March 31, 2012 exceeds 50 mSv during regular work after December 16, 2011, TEPCO ensures they are provided with eye examinations concerning cataracts throughout the period of engaging in said radiation work, on a comprehensive basis. TEPCO also ensures that this examination is performed using a slit lamp.

End

## Indoor Survey Results of the Main Office Building, etc. (Air Dose Rate/Floor Surface Contamination)

Measurement Day: September 28, 2012 (Fri.)

Measurer : 2F Safety Group

Meters : L-SC-64, L-GMAD-144

Measurement Results: The air dose rate remains almost unchanged, and no significant variation (more than  $\pm 50\%$ ) was detected.

For floor surface contamination, no value exceeding the indoor screening level (6kcpm) was detected.

Action : None.

Measurement Place		Air Dose Rate [ $\mu\text{Sv/h}$ ]						Floor Surface Contamination [kcpm]			Note	Specific Measurement Point
		(Regular Time: Around 0.05)						(Regular Time: Around 0.1)				
		7/31	8/30	9/28	7/31	8/30	9/28					
Units 1 and 2	1F S/B Entrance	0.36	0.37	0.35	0.7	0.7	0.6	*1	After passing the S/B Protection Gate			
	2F Check Point	0.09	0.09	0.09	0.1	0.1	0.1		In front of ACD inside the check point			
	3F Central Operation Room	0.05	0.05	0.05	0.1	0.1	0.1		Beside the shift supervisor desk			
Units 3 and 4	1F S/B Entrance	0.11	0.11	0.12	0.3	0.4	0.4	*1	After passing the S/B Protection Gate			
	2F Check Point	0.08	0.08	0.08	0.1	0.1	0.1		In front of ACD inside the check point			
	3F Central Operation Room	0.04	0.04	0.04	0.1	0.1	0.1		Beside the shift supervisor desk			
RW/B	1F Building Entrance	0.16	0.15	0.16	0.1	0.1	0.1	*2	In front of the automatic door (indoor side)			
	1F Check Point	0.13	0.12	0.13	0.1	0.1	0.1		In front of ACD inside the check point			
	3F Central Operation Room	0.10	0.09	0.10	0.2	0.2	0.2		Beside the shift supervisor desk			
On-site Bunker	1F Building Entrance	0.10	0.10	0.10	0.1	0.2	0.1		In front of the entrance door (indoor side)			
	2F Check Point	0.10	0.09	0.10	0.2	0.2	0.1		In front of ACD inside the check point			
Main Office Building 1F Floor	Entrance Control Office	0.25	0.21	0.22	0.2	0.2	0.1	*2	In front of the shoe change entrance door (indoor side)			
	Main Entrance Hall	0.14	0.14	0.14	0.2	0.2	0.2	*2	In front of the automatic door (indoor side)			
	Maintenance Dept. - Turbine G	0.07	0.08	0.08	0.3	0.3	0.3		Corridor in front of Turbine (Units 1 and 2) G (in front of the sign)			
	Maintenance Dept. - Reactor G	0.08	0.07	0.07	0.2	0.2	0.2		Corridor in front of Reactor (Units 1 and 2) G (in front of the sign)			
	Maintenance Dept. - Measurement Control G	0.09	0.08	0.08	0.1	0.1	0.1		Corridor in front of Measurement Control (Units 3 and 4) G (in front of the sign)			
	1F Maintenance Department 2	0.09	0.08	0.09	0.1	0.2	0.2		Corridor in front of 1F Maintenance Department 2			
	Health Management Room	0.11	0.10	0.10	0.1	0.1	0.1		Around the center of the Health Management Room			
	Registration Office	0.11	0.12	0.12	0.1	0.1	0.1		Space between the counter and the waiting place			
Night Shift Sleeping Space	0.14	0.14	0.14	0.1	0.1	0.1	*2	Around the center of Meeting Room 113 (a corner room)				
Main Office Building 2F Floor	General Manager Room	0.11	0.10	0.11	0.1	0.1	0.1		Around the center of the General Manager Room			
	General Affairs Dept. (General Affairs G side)	0.08	0.08	0.09	0.1	0.1	0.1		Corridor in front of Guest Room 1			
	General Affairs Dept. (Civil Engineering G side)	0.07	0.07	0.07	0.2	0.2	0.2		Corridor in front of Civil Engineering G (in front of the sign)			
	Quality and Safety Dept.	0.09	0.08	0.08	0.2	0.2	0.2		Corridor in front of Safety Management G (in front of the sign)			
	Public Relations Dept.	0.07	0.07	0.07	0.2	0.2	0.2		Corridor in front of Planning and Public Relations G (in front of the sign)			
	Technical Management Dept.	0.09	0.09	0.09	0.2	0.2	0.1		Corridor in front of Engineering G (in front of the sign)			
	Operation Management Dept.	0.10	0.10	0.11	0.1	0.1	0.1		Corridor in front of Power Generation (Units 1 and 2) G (in front of the sign)			
	Cafeteria	0.09	0.08	0.09	0.1	0.1	0.1		Around the center in front of the cafeteria counter			
	Library Management Room	0.10	0.10	0.10	0.2	0.2	0.2		In front of the counter in the Library Management Room			
Safety Inspector Room	0.13	0.13	0.13	0.1	0.1	0.1	*3	Around the center of the Safety Inspector Room				
Union Office	0.12	0.11	0.11	0.3	0.4	0.3		In front of the copy machine				
Visitors' Hall	Building Entrance	0.39	0.38	0.38	0.2	0.2	0.2	*3	In front of the automatic door (indoor side)			
	Inside the Office	0.38	0.36	0.37	0.6	0.5	0.5	*3	In the office beside the Entrance Hall			
Main Anti-Earthquake Building	2F Building Entrance	0.09	0.09	0.09	0.1	0.1	0.1		In front of the Main Anti-Earthquake Building chart			
	1F Corridor Center	0.18	0.19	0.20	0.1	0.1	0.1	*4	In front of the cabinet			
	2F Corridor Center	0.07	0.07	0.07	0.1	0.1	0.1		In front of the men's WC			
	3F Corridor Center	0.06	0.06	0.06	0.1	0.1	0.1		In front of the women's WC			
	Technical Support Office Center	0.07	0.07	0.07	0.2	0.1	0.2		Behind the central table			
2F Inside the Building (Indoors)	Main Management Office	0.20	0.19	0.21	0.2	0.2	0.1	*2	Inside the Main Management Office			
	Protection Center (PP)	0.12	0.11	0.12	0.2	0.2	0.2		Around the building center			
	Training Building 1F	0.16	0.16	0.16	0.1	0.1	0.1	*3	Corridor in front of Training Building 1			
	Training Building 2F	0.34	0.34	0.34	0.2	0.2	0.2	*3	Corridor in front of the Simulator Room			

## Notes

\*1: As contamination is accumulated on the floor carpet, both the dose and contamination are higher (The contamination does not expand from the carpet)

\*2: As the place includes a large glass surface, which is more transparent than outer walls, and the check point is near the glass surface, only the dose is higher

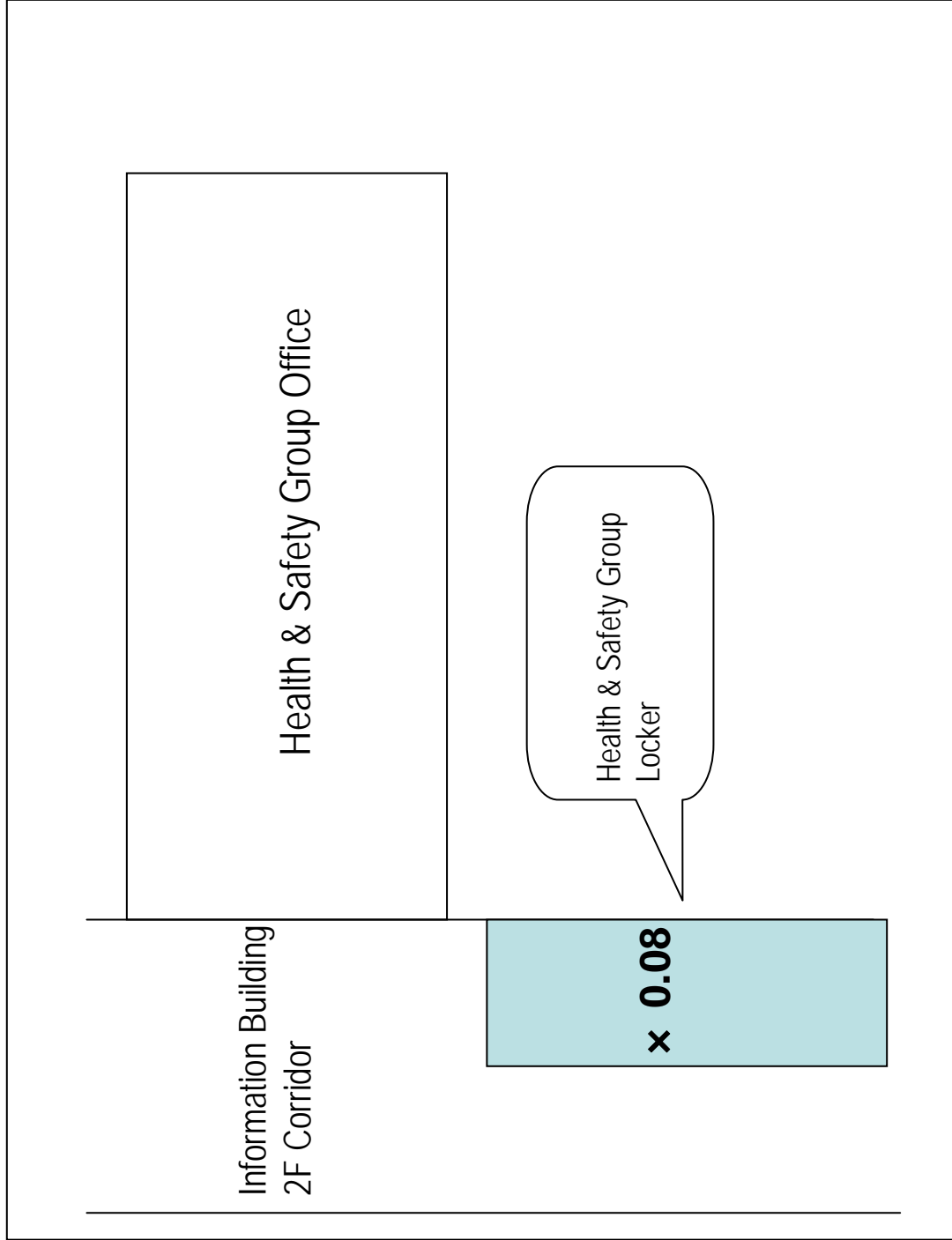
\*3: As there is an upward slope in the outside neighborhood, only the dose is higher.

\*4: Due to the high dose of RI filter in the 1F air-conditioner room, only the dose is higher (The air-conditioner room is set as a controlled zone)



# Survey Record (Inside the Glass Badge Storage Locker)

Unit:  $\mu$  Sv/h



<Measurement Day.>  
November 19, 2012

<Measurer>  
Health Safety Group

<Meter>  
L-SC-35