

# **Additional Re-evaluation of Committed Effective Doses of Emergency Workers at TEPCO's Fukushima Daiichi Nuclear Power Plant (Overview)**

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Occupational Safety and Health Department,  
Labour Standards Bureau,  
Ministry of Health, Labour and Welfare

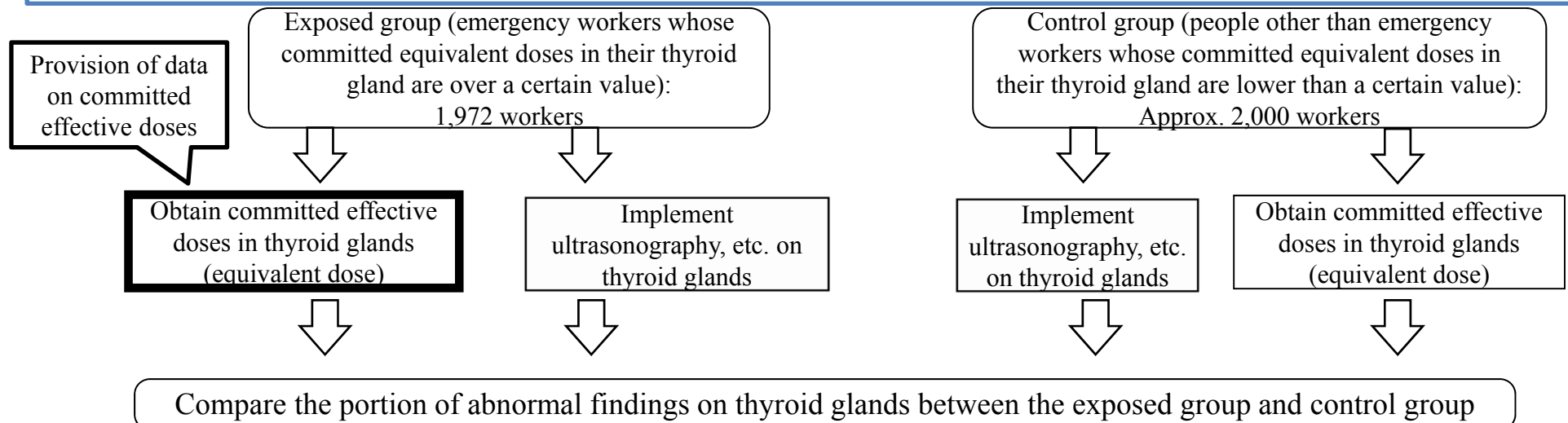
# Background to the Additional Re-evaluation of Committed Effective Doses

## Investigation on the committed effective dose by the Ministry of Health, Labour and Welfare

- (1) **Provision of data for the epidemiological studies on thyroid glands, targeting emergency workers at Fukushima Daiichi Nuclear Power Plant (NPP)**
  - (i) The research team funded by the Ministry of Health, Labour and Welfare (MHLW) requested the Tokyo Electric Power Company (TEPCO) to submit detailed data of measured committed effective doses and assessment procedures with the aim of utilizing such data for the epidemiological studies.
  - (ii) **On 31 January, 2014**, when TEPCO was inputting measured committed effective doses in the data sheets, it found that the assessments for nine workers were done by a method other than the standard assessment methods. **(See Figures 1 and 2 for the principle of the standard methods.)**
  - (iii) **Since 4 February, 2014**, the MHLW has closely examined data on emergency workers' committed effective doses to ascertain whether there are any other similar cases. Examined data were for 6,245 emergency workers, excluding those covered by the previous re-evaluation\* from a total of 7,529 emergency workers (data for workers engaged in March and April 2011). This examination revealed that the data for 1,536 emergency workers are suspected to have been obtained by a method other than the standard assessment methods.
- (2) **Additional re-evaluation and readjustment of committed effective doses**
  - (i) **On 6 March, 2014**, the MHLW instructed TEPCO and primary contractors to re-evaluate these data.
  - (ii) As a result of the re-evaluation, the committed effective doses for 142 emergency workers were readjusted.

\* Press release on 5 July, 2013; conducted with regard to workers whose committed effective doses assessed by TEPCO and the relevant primary contractor differed significantly

## Outline of the “the Studies on Thyroid Glands of Emergency Workers at TEPCO’s Fukushima Daiichi NPP” by the research team funded by the MHLW



# Methods for the Additional Re-evaluation

## 1 Principles of the additional re-evaluation and difference from the previous re-evaluation

### (1) Purpose and principles

- (i) There are multiple methods to assess committed effective doses depending on circumstances regarding exposure. **Under circumstances with uncertainty, lacking very basic information, i.e., when workers took in radioactive substances**, TEPCO and contractors adopted methods that they considered optimal at their option.
- (ii) Under circumstances with uncertainty, the MHLW provided administrative guidance to choose assessment methods so as to ensure conservative assessment within a reasonable extent and to standardize assessment methods of committed effective doses to the extent possible.

### (2) Difference from the re-evaluation conducted in July 2013

- (i) The re-evaluation in July 2013 was conducted on the premise that the details of assessment methods for committed effective doses were left to the discretion of employers. It only covered data in which assessment results by contractors were lower than those by TEPCO and **whose validity was doubted**. The purpose of the re-evaluation was to confirm the validity of such discrepancies in the data.
- (ii) The current additional re-evaluation was conducted **with the aim of completely integrating detailed measurement results by nuclide, various coefficients, calculation procedures, etc.**, which will be necessary for exposure assessment in epidemiological studies. This is administrative guidance to get involved in the details of assessment methods, whose choice is left to the discretion of employers, and **covers all data on committed effective doses** of emergency workers, apart from the previous re-evaluation.

## 2 Process of the additional re-evaluation

- (1) Detailed procedures for calculating committed effective doses for each of the standard assessment methods (Attachment 1) were required for conducting exposure assessment in epidemiological studies concerning the effects of radiation on the thyroid gland of emergency workers.
- (2) TEPCO divided its data for assessing workers' committed effective doses into assessment methods. In that process, **on 31 January, 2014**, it was found out that committed effective doses for nine workers had been assessed by a method other than the standard assessment methods.
- (3) In order to check whether there were any similar cases, **from 4 February, 2014**, the MHLW closely examined committed effective dose data for workers engaged in March and April, 2011, which were assessed by TEPCO and contractors. The MHLW input all the data (**for 6,245 workers (1,845 at TEPCO and 4,400 at contractors)** excluding 1,284 workers covered by the previous re-evaluation) into data sheets for each assessment method and, as a result of the examination, it became clear that **committed effective doses for a total of 1,536 workers (608 at TEPCO and 928 at contractors) may have been assessed by a method other than the standard assessment methods** (see Attachment 2 for details).
- (4) The MHLW collected recommendations from experts concerning issues newly identified (Attachment 3) and instructed TEPCO and primary contractors to re-evaluate their data on workers' committed effective doses and readjust them as necessary, **based on the views of the MHLW described in Attachments 2 to 4, on 6 March, 2014**.

# Results of the Additional Re-evaluation

## 1 Overview of the readjustment

(1) **Subjects for close examination (emergency workers with internal exposure in March and April 2011):**

6,245 workers (1,845 at TEPCO and 4,400 at contractors) excluding 1,284 workers covered by the previous re-evaluation

(2) **Subjects for re-evaluation:**

1,536 workers (608 at TEPCO and 928 at contractors)

(3) **Subjects for readjustment (limited to those whose committed effective doses were not less than 2mSv with a fluctuation range of + 1mSv or larger):**

142 workers (24 at TEPCO and 118 at 18 contractors) (**0.73%** of the total 19,346 emergency workers)

(i) Fluctuation range: 5.86mSv on average (1.01mSv to 89.83mSv)

(ii) Effective dose (emergency exposure dose): 2.17mSv to 180.10mSv

# Results of the Additional Re-evaluation

## 2 Increase in workers whose emergency exposure dose exceeded 100mSv or 50mSv

### **(1) Increase in the number of workers whose emergency exposure dose exceeded 100mSv (exposure doses by December 2011, in principle):**

- (i) **One worker (one at TEPCO)** \***0.6% increase** to 174 workers compared with 173 workers prior to the readjustment
- (ii) Fluctuation range: 89.83mSv (internal exposure: 100.05mSv; external exposure: -10.22mSv)
- (iii) Effective dose: 90.27mSv → 180.10mSv (internal exposure: 37.11mSv → 137.16mSv)
- (iv) Reasons for the readjustment:
  - Measurement values with WBC (Ge), which has high measurement accuracy, have also shown high levels of Cs-137. Considering the fact that the ratio of I-131/Cs-137 in the environment was around 100, the residual amount of I-131 in the body on the measurement date must have been around 10 times that of the MDA, even taking into account the residual percentage by the measurement date. However, I-131 was inexplicably not measured. Therefore, TEPCO considered that **stable iodine tablets taken by the workers had been effective to some extent** and did not conduct an estimation of exposure to I-131 by any of the standard methods.
  - However, based on the opinions of experts, the MHLW considered it **preferable to ignore the effects of the stable iodine tablets, as long as the possibility of exposure to I-131 cannot be completely denied, even though this may result in overassessment**. Consequently, the MHLW instructed TEPCO to estimate exposure to I-131 under the assumption that the MDA of I-131 was detected and to add such estimated values to the data.

### **(2) Increase in the number of workers whose emergency exposure dose exceeded 50mSv but did not exceed 100mSv:**

- (i) **Two workers at two contractors** \***0.3% increase** to 731 workers compared with 730 workers (as of July 2013) prior to the readjustment
- (ii) Fluctuation range: 2.44mSv; 3.67mSv
- (iii) Effective dose: 49.4mSv → 51.84mSv; 46.9mSv → 50.57mSv
- (iv) Major reasons for the readjustment:

Estimation of exposure to I-131 was not conducted because Cs-134 was detected but Cs-137 was not detected.

**(See note of Figure 1)**

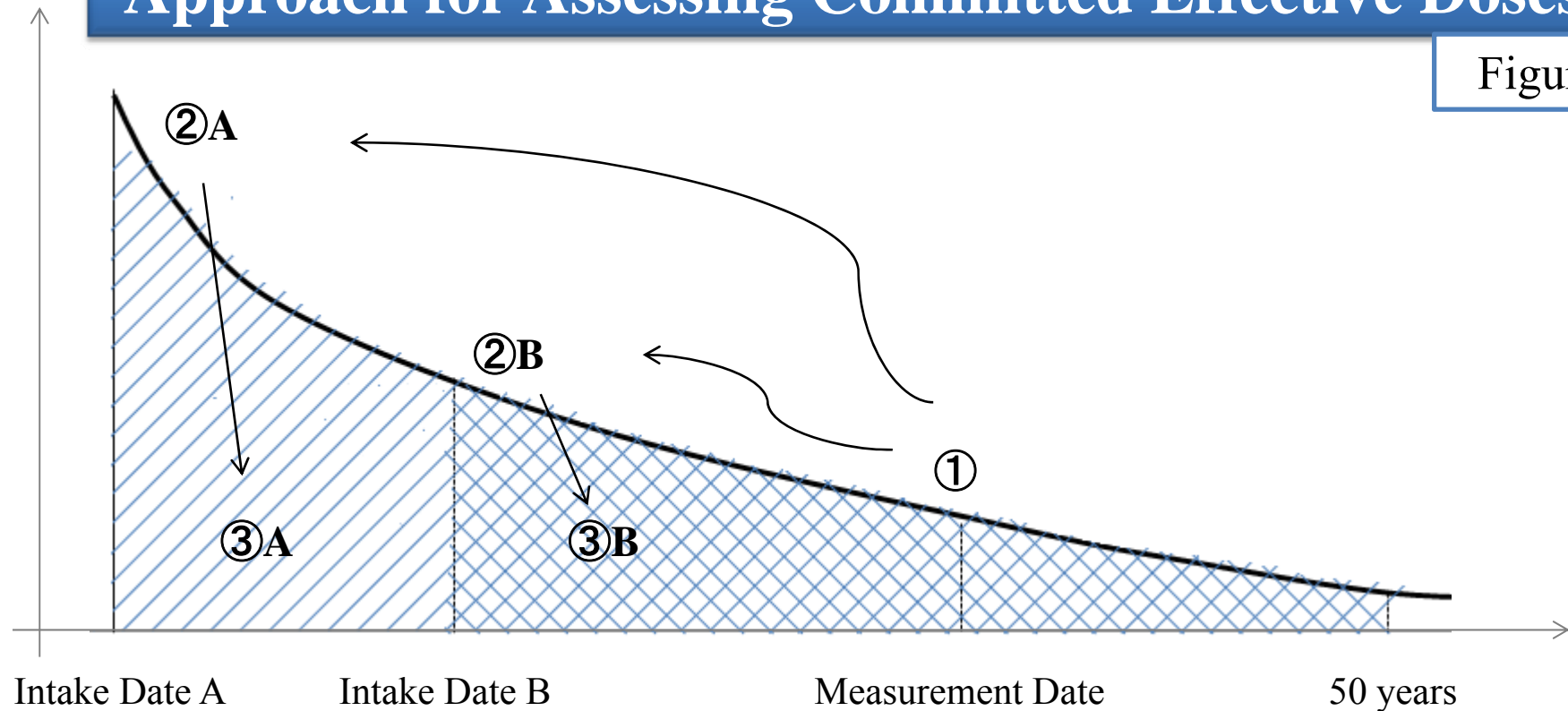
# Responses by the MHLW

- Based on the results of the additional re-evaluation, the MHLW shall take the following measures.

- (1) The MHLW provides TEPCO with guidance on the following matters.
  - a. The internal audit sector should inspect the sector in charge of the management of personal doses, check the flow of its operations and data management, etc., and take necessary remedial actions.
  - b. Before externally reporting or announcing radiation exposure doses, the data should be checked by a person in of radiation management in a quality management sector, in principle.  
The MHLW also instructs contractors (that independently assess committed effective doses) about thorough preservation of all the records, etc.
- (2) Based on the Minister's guidelines, the MHLW demands business operators to provide their workers with cancer screening tests, etc., in addition to mandatory medical examinations, in accordance with the committed effective doses during the period of emergency work. After the retirement, the national government will provide workers with these medical examinations (see the References).
- (3) Rigorous epidemiological studies, including surveys of the age structure, personal habits of smoking and drinking and medical histories, etc., are indispensable for identifying the health effects of radiation. For this purpose, the MHLW will steadily carry out required epidemiological studies.
  - (i) FY2013: Studies on cataracts and studies on thyroid glands
  - (ii) FY2014 onward: Steadily carry out required studies in addition to the studies conducted in FY2013

# Approach for Assessing Committed Effective Doses

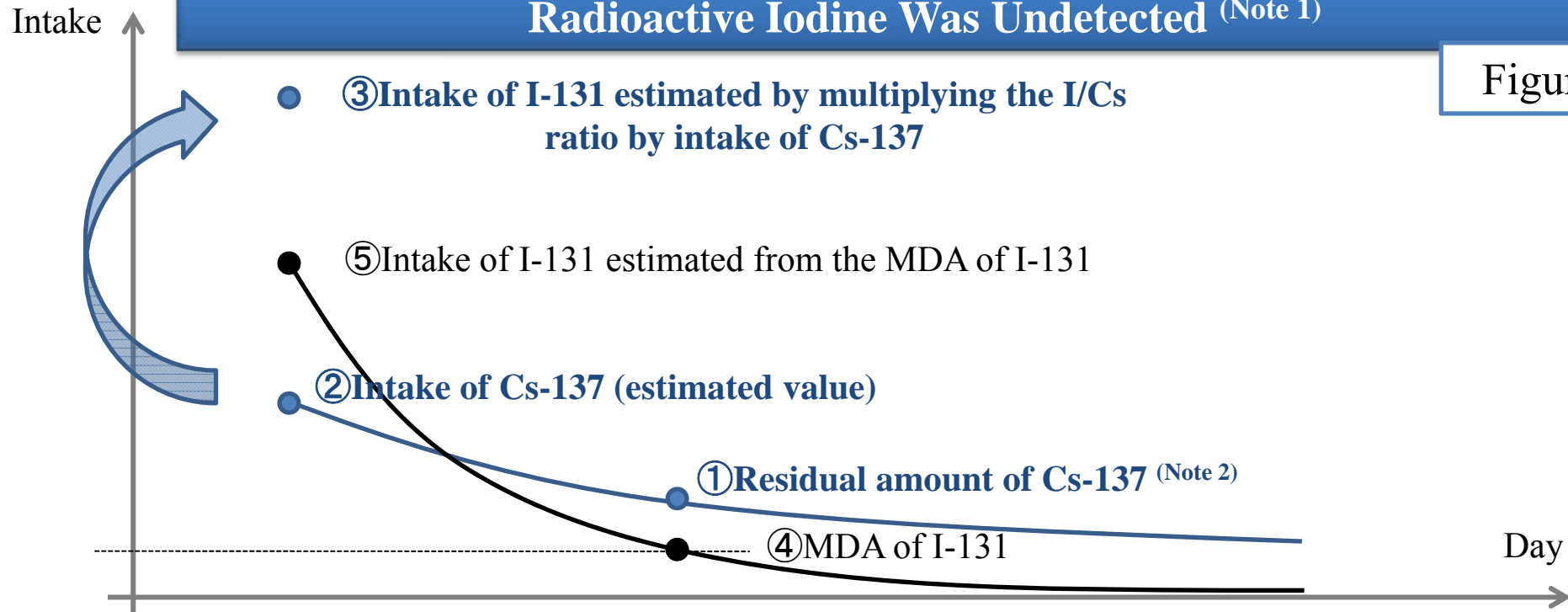
Figure 1



- ① Radiation exposure dose received by the body measured with WBC on the measurement date (Bq)
- ② Radiation exposure dose on the intake date calculated while considering the decays with a radioactive half life (residual factor) in the body during the period from the intake date to the measurement date (Bq)
- ③ Calculate the total of internal exposure dose (committed effective dose) (mSv) received during the period of 50 years from the intake date (effective dose factor)  
⇒ There is a significant difference between the committed effective dose for the intake date in ③A and for the intake date in ③B.

# Estimation Methods for Internal Exposure Dose in the Case Where Radioactive Iodine Was Undetected <sup>(Note 1)</sup>

Figure 2



● ③ Intake of I-131 estimated by multiplying the I/Cs ratio by intake of Cs-137

● ⑤ Intake of I-131 estimated from the MDA of I-131

● ② Intake of Cs-137 (estimated value)

● ① Residual amount of Cs-137 <sup>(Note 2)</sup>

● ④ MDA of I-131

(1) Estimation using the I-131/Cs-137 ratio based on environmental data

Amount of intake is estimated as follows when I-131 was undetected and Cs-137 was detected.

- Calculate intake of Cs-137 by dividing the measured value of Cs-137 by its residual ratio (①→②)
- Calculate intake of I-131 by multiplying the intake of Cs-137 by the environmental I-131/Cs-137 ratio of the intake date (②→③)

(2) Estimation using the MDA of I-131

- Calculate intake of I-131 by dividing the MDA of I-131 by its residual percentage (④→⑤)

(3) Decision of estimated value

- The lower value among ③ and ⑤ is adopted.

(Note 1) In the case where a WBC can identify nuclides

(Note 2) If Cs-137 was undetected and Cs-134 was detected, the intake of Cs-137 is estimated assuming that the MDA of ①Cs-137 was detected. When the MDA is unknown, the intake of Cs-137 is assumed to be the same amount as ②Cs-134.




- ① Because the radiation exposure dose limit has been tentatively raised to 250mSv, long-term health care for emergency workers (approximately 20,000 workers) will be provided according to the guidelines (11 October 2011)

### 1 Development of a database

- Personal identification (name, affiliation, address, etc.)
- Exposure dose, job descriptions
- Results of medical examinations, etc.
- Health consultation/guidance, etc.
- Others (lifestyle, etc.)

Submission  
(Managed by the  
database)



MHLW

- Operation/management of the database
- Administration of health consultation/guidance
- Response to data inquiry

### 2 Health care control items

Medical examinations commensurate to the levels of radiation exposure dose will be provided with the development of a database \*1

#### Specific medical examination items

- For all emergency workers
  - Statutory medical examinations (general and ionizing radiation medical examinations)
  - Health consultation/guidance including mental health.
- For emergency workers with doses exceeding 50mSv (\*2)
  - Examinations for cataract, in addition to the aforementioned examinations.
- For emergency workers with doses exceeding 100mSv (\*2)
  - Thyroid examinations, cancer screenings (stomach, lung, colon) in addition to the aforementioned examinations.

Issue a passbook upon application (radiation exposure dose, certificate for medical examination, etc.)

Issue a database registration card (Certificate for the inquiry of the data)

\*1 In principle, the medical examination cost shall be paid by employees. However, the national government shall cover the cost if the workers whose doses exceed 50mSv are (a) not engaged in radiation work after changing their job, (b) engaged in non-radiation work though still employed by the same employer (small and medium sized employer only) as that when they had been engaged in the emergency work, (c) currently unemployed.

\*2 Effective radiation doses received while engaged in the emergency work.

- ② Workers excluding emergency workers (The most are engaged in work after 16 December 2011)

- Medical examinations pursuant to the Act and the Ordinances (general and ionizing radiation medical examination, etc.)
- Health consultation and health guidance pursuant to the Act and the Ordinances