

Re-evaluation results of committed doses for emergency workers at the TEPCO
Fukushima Daiichi Nuclear Power Plant (overview)

Issues Associated with the Evaluation of the Committed Dose

Identification of the issues by the MHLW

(1) Methods for obtaining committed doses of emergency workers designated by the MHLW

- ① Mandate employers to submit radiation exposure doses (internal and external) of emergency workers to the MHLW (October 2011)
- ② The TEPCO submitted its provisional evaluation results at first. Then, the TEPCO submitted the evaluation results finalized by the primary contractors to the MHLW.
- ③ The TEPCO submitted the evaluation results of the internal exposures during the fiscal year of 2010 and 2011 measured by primary contractors at the end of April 2013.

(Note) For those workers to whom the emergency exposure dose limit (increased from 100mSv to 250mSv for the period from 14 March 2011 to 16 December 2011) had been applied. In principle, the application ended on 16 December 2011.

(2) Differences in the evaluation results of internal exposures between the TEPCO and the primary contractors

- ① Certain differences were identified in the finalized evaluation results by primary contractors and the provisional evaluation results by the TEPCO submitted in early May this year.
- ② The all data were confirmed in mid May, and they were lower than the provisional data identified in the finalized evaluation for 431 workers.
- ③ In late May, the MHLW started reevaluation of the committed doses for workers employed by primary contractors, which resulted in revision of the committed doses for 479 workers.

Reevaluation methods for the committed dose obtained by the MHLW

1 Objectives and processes of the reevaluation of the committed dose

(1) Objectives and principles

- ① Compare the evaluation results of internal exposures by the TEPCO and that of the primary contractors. For those with significant differences in the evaluation results between the TEPCO and the primary contractors, investigate the causes of the differences and revise the reported committed doses if necessary.
- ② Standardize the approach and the methods for the evaluation among relevant parties so that evaluation could be made as reasonably as possible, though considerable uncertainty exists on the intake date.

(2) Reevaluation process

- ① In mid May, data for 431 workers whose committed doses in the evaluation conducted by the primary contractors had been lower than the counterpart obtained by the TEPCO were extracted.
- ② The MHLW started interviewing primary contractors in late May to determine the validity of the differences and received opinions from experts.
- ③ The investigation confirmed that no revisions of the committed doses were required for the data for 138 workers (see Figure 3). (This is attributed to the use of measurement values not understood by the TEPCO and adoption of more precise work commencement date.)
- ④ The MHLW instructed to reevaluate the data for 293 workers. Additional data with higher doses than the counterpart obtained by the TEPCO were submitted from the primary contractors. Calculations errors were found in data for 29 workers.

2. Revisions of the committed doses

The data from a total of 479 workers out of approximately 19,346 emergency workers (about 2.5%)

(1) Revisions of the committed doses of workers with the standardized evaluation methods were determined by the MHLW through the process of reevaluation

- ① Standardization of committed dose evaluation methods with the common approach was established by the TEPCO on August 2011 (with respect to principles for determining the intake date (see Figure 1), the intake scenarios (see Figure 2), and the estimation methods for radioactive iodine nuclides)
- ② The data for 450 workers were revised.

(2) Correction of errors in calculations

- ① Errors in calculations were found in the evaluation results by primary contractors during the reevaluation. (Errors in input of factors, etc., confounds in data, errors in reporting, and omitted data)
- ② The data was corrected for 29 workers from seven contractors. * Issued warning to workers to prevent recurrence of similar errors.

Reevaluation results of the committed doses obtained by the MHLW

1. Overview of the revisions

A Total 479 workers out of 19,346 emergency workers (approximately 2.5%)

(1) Revised due to the change in evaluation methods (a total 450 workers)

- ① Doses were corrected to higher values for 431 workers
Max. +48.9 mSv, Ave. + 5.0 mSv
- ② Doses were corrected to lower values for 19 workers
Max. - 9.2 mSv, Ave. - 2.1 mSv

(2) Revised due to errors in calculations

- ① 29 workers managed by seven contractors received the doses in the range of -3.5 mSv to +18.1 mSv
* Issued warning to workers to prevent recurrence of similar errors.

2 The increase in the number of workers with committed doses exceeding 50 mSv or 100 mSv during the period when they were engaged in the emergency work

(1) The increase in the number of workers with committed dose in the range of over 50 mSv and below 100 mSv during the period when they were engaged in the emergency work

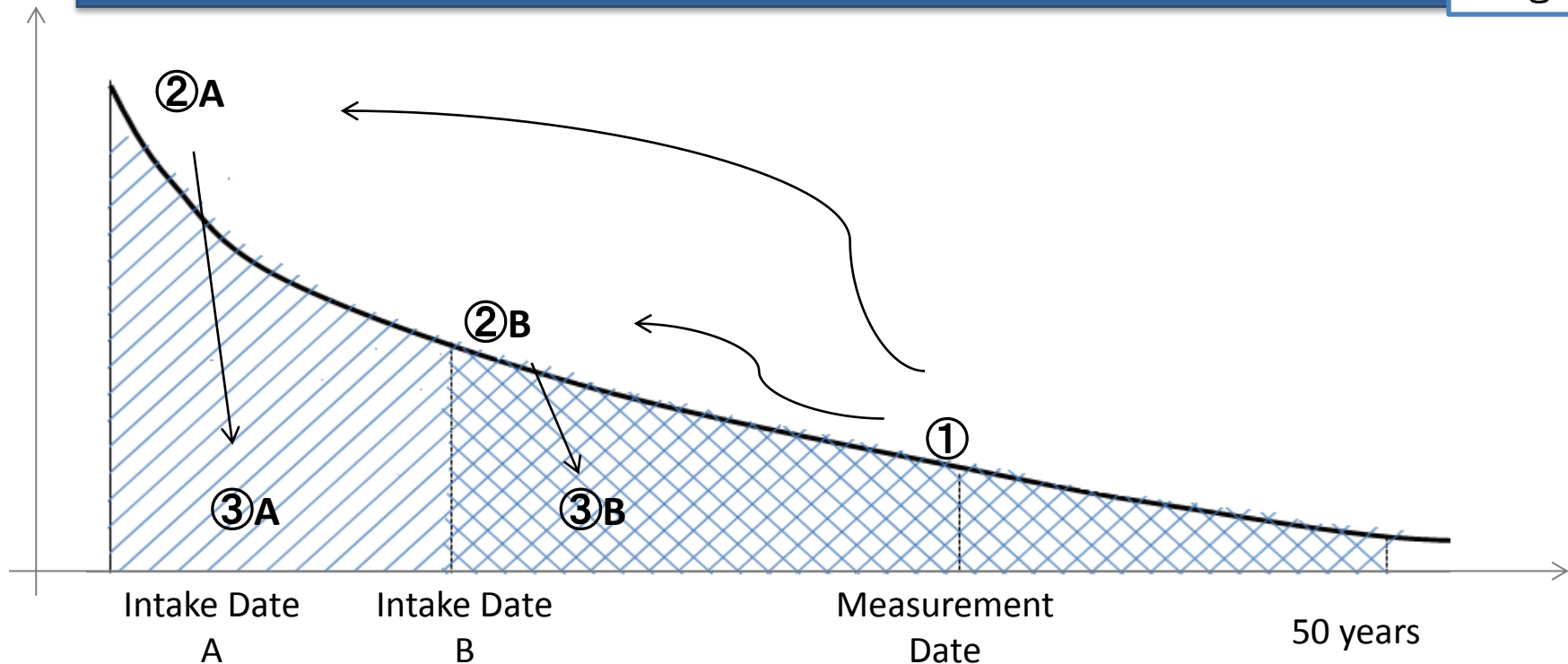
- ① 12 workers (2 contractors) * Compared to 723 workers (as of December 2011) before the revision by increase of 1.7%
- ② Variation range: 36.2 mSv to 3.2 mSv (committed dose), Ave. 13.4 mSv
Effective dose after the revision: 65.1 mSv to 51.4 mSv
- ③ Major reasons for the revision: The intake date was changed to the work commencement date (see Figure 1) and the intake scenario was revised (see Figure 2).

(2) The increase in the number of workers with committed dose exceeding 100 mSv during the period when they were engaged in the emergency work

- ① A total of six workers (3 workers from the TEPCO and 3 workers from related contractors) * Compared to 167 workers before the revision by the increase of 3.6%
(Note) The committed dose for one of the TEPCO employees exceeded 100 mSv during the emergency work after December 2011.
- ② Variation range: 48.91 mSv to 7.39 mSv (committed dose), Ave. 21.3 mSv
Effective dose after the revision: 148.78 mSv to 101.83 mSv
- ③ Major reasons for the revision: The intake date was changed from the mid-term date to the work commencement date.

Approach for evaluating the committed dose

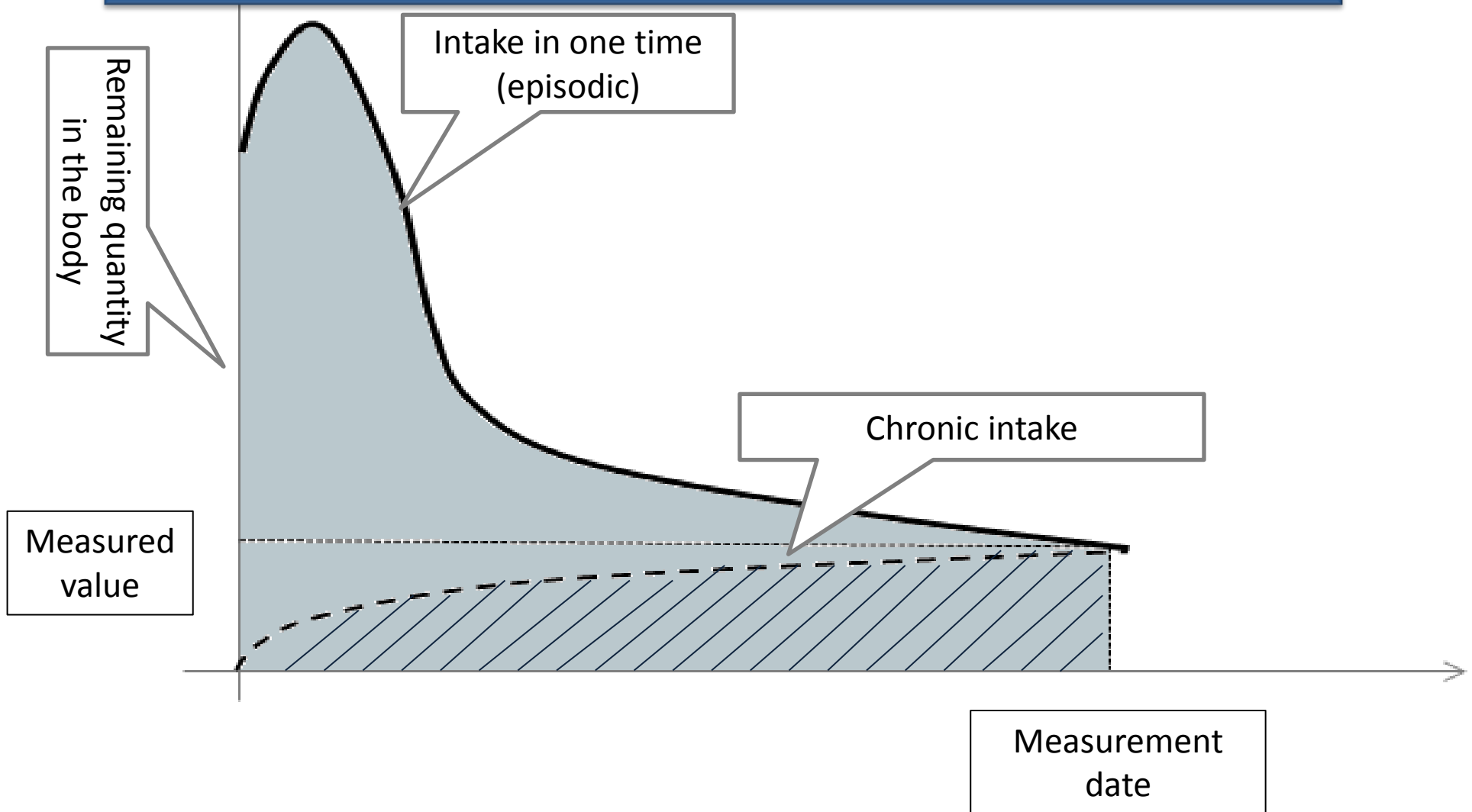
Figure 1



- 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 dose) (mSv) received during the period of 50 years from the intake date (Effective dose factor)
⇒ There is a significant difference between the committed dose for the intake date in ③A and for the intake date in ③B.

Differences in Chronic and Episodic intakes

Figure 2



Reasonable differences in the evaluation results of internal exposure (example)

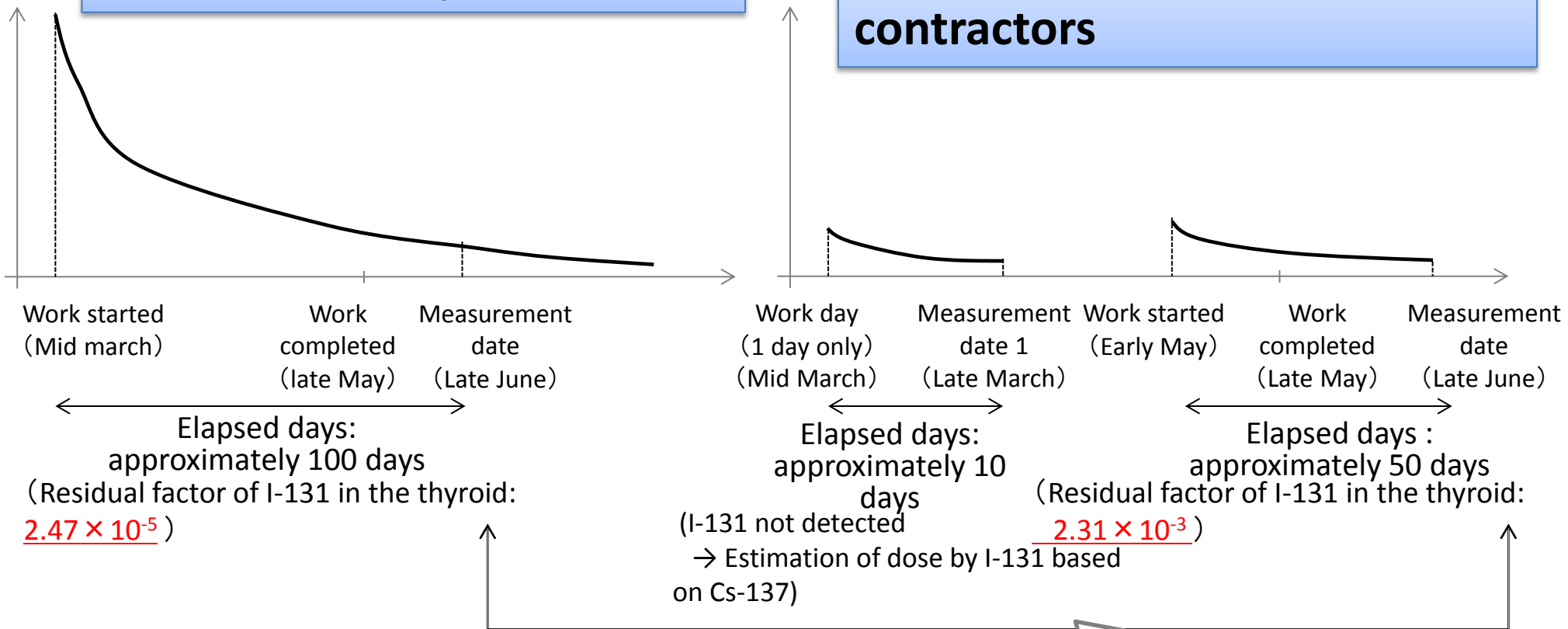
Figure 3

1. Presence of internal exposure measurements not known to the TEPCO
2. Work break not known to the TEPCO

Reasonable differences in committed dose

① Evaluations by the TEPCO

② Evaluations by the primary contractors




There is a 100 times difference in committed dose calculated by the residual factor.

① Because the radiation exposure dose limit has been tentatively raised to 250 mSv, 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 50 mSv (*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 personally paid. However, the national government shall cover the cost if the workers whose doses exceed 50 mSv are (a) not engaged in radiation work after changing their job, (b) engaged in non-radiation work though still employed by the employer (small and medium sized employer only) 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