Report: Good Practice in Radiation Exposure Control at the Fukushima Daiichi NPP

2016 ISOE Asian ALARA Symposium

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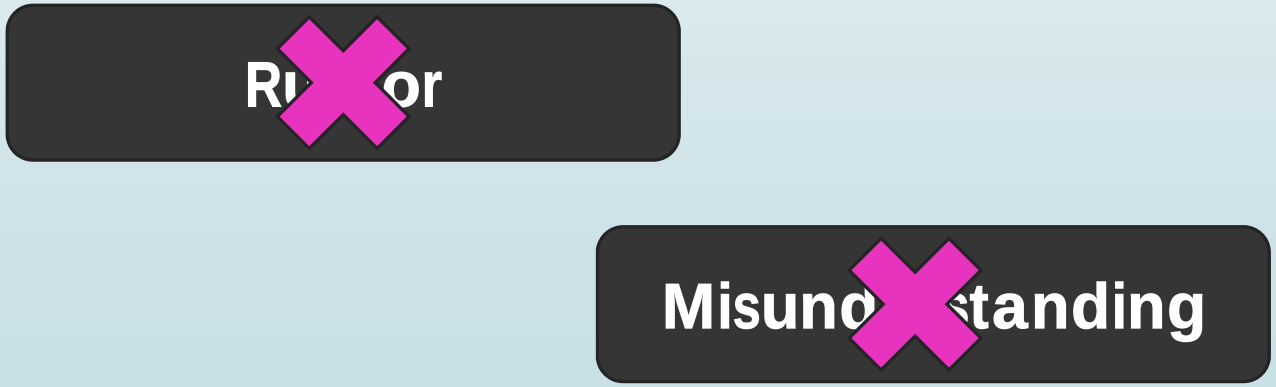
Nuclear Safety Research Association

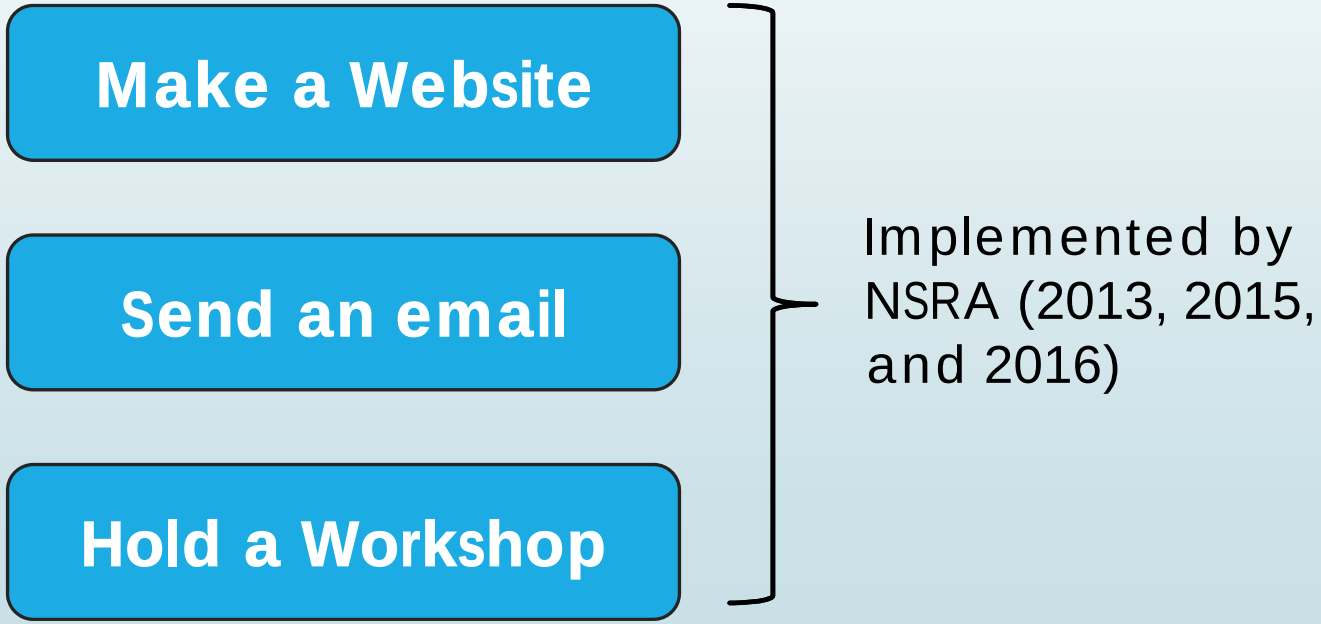
NSRA

The government-commissioned project by the Ministry of Health, Labour and Welfare (MHLW) of Japan has been implemented since 2013.

The purpose of this project is to provide “correct” information on the radiation workers who are or were engaged in works relating to the TEPCO Fukushima Daiichi NPP accident.



With the purpose to contribute to better understanding on health status and work environment of the workers, the MHLW decided to provide “accurate” and the “latest” information to the world in a timely manner.



“Workshop on Radiation Exposure Control at Fukushima Daiichi NPP”

Date: 10th November 2015

Participants: 77

Tokyo Electric Power Company Incorporated. (TEPCO), and primary contractors.

(Hitachi-GE Nuclear Energy, Ltd.
Mitsubishi Heavy Industries Ltd.
Toshiba Corporation
Kajima Corporation
Taisei Corporation
Shimizu Corporation)

+Foreign media

JFA National Training Center J-Village Convention Hall

Program

Session1

“Improving working environment activities at the Fukushima Daiichi NPP”

“Measures for improving the work environment in the Fukushima Daiichi nuclear power station” (TEPCO)

“Present State & Future Response to TEPCO’s Fukushima Daiichi Nuclear Power Station” (TEPCO)

Session2 and 3

“Good activities in radiation exposure reduction, technological research and development”

“Activities concerning radiation control for the treatment of accumulated water at the Fukushima Daiichi NPP” (Hitachi-GE)

“Evaluation of the total exposure reduction measures during construction of the land-side impermeable walls using the frozen soil method” (Kajima)

“Introduction of examples for reducing exposure dose during the decontamination at the reactor building (Fukushima Daiichi NPP unit 3)” (Mitsubishi)

“Dose rate reduction by decontamination of the reactor building at the Fukushima Daiichi NPP Unit 2” (Toshiba)

“Activities to reduce exposure doses during disassembling bolted type tanks” (Taisei)

“Efforts for reducing radiation exposure during facing construction of slope areas” (Shimizu)

“Activities concerning radiation control for the treatment of accumulated water at the Fukushima Daiichi NPP” (Hitachi-GE)

(Construction of facilities for treatment of the accumulated radionuclide-contaminated water)

1) Individual dose control (for key persons).

-Set a target value of the control for each of the workers.

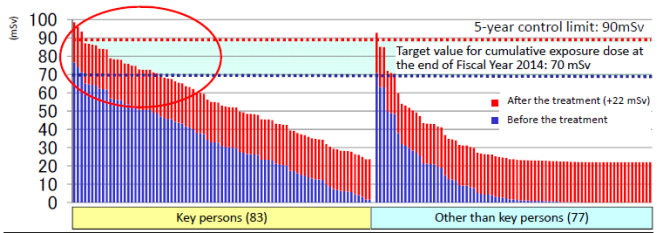
-Allocation of workers considering the dose rate of the work place, etc.

4. Exposure dose reduction measures for key persons

HITACHI

Cumulative exposure dose by workers: After the treatment (expected for group leaders)

Assuming that all workers uniformly receive dose from the treatment (+22 mSv/worker)



	Key persons	Other than key persons
No. of workers	83	77
90 mSv <	3	1
70 mSv <	24	6

Cumulative exposure dose, exceeding 70 mSv for many group leaders as well.

2) Exposure dose reduction with respect to the environment.

-Reduction by modifying design of the constructed facilities (e.g. change of piping routes).

-Reduction by improving methods (e.g. employing a remote monitoring method).

-Reduction by utilizing shielding (e.g. installing shielding).

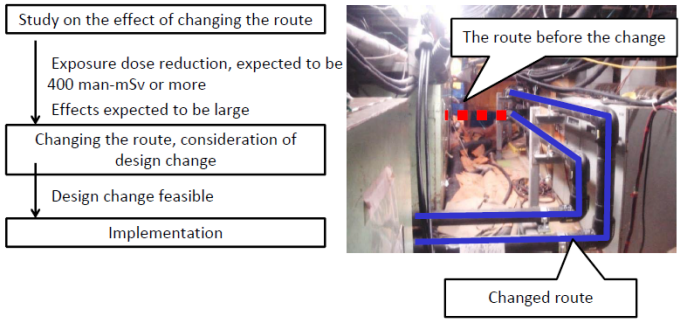
-Other measures (e.g. visualization).

4.2 Measures for exposure dose reduction

HITACHI

① Implementation of exposure reduction measures (Reduction by design modification)

Change of piping routes at the Matsuno-roka (corridor) in T/B of Unit 1



Significant exposure dose reduction. Reduced by about 510 man-mSv.

“Evaluation of the total exposure reduction measures during construction of the land-side impermeable walls using the frozen soil method” (Kajima)

(Construction of the land-side impermeable walls using the frozen soil method)

1) Implementation of the measure for radiation exposure reduction.

-Measures to reduce the air dose rate.

-Measures to shorten working ours by improvement of the construction methods.

Implementation of the measure for radiation exposure reduction (1): 3-Block Areas

Reduction measure: Crushed stone pavement and installation of L-shaped protective walls

Before the measure (Radiation sources : Ground surface/left side building)

Air dose rate:
1.0 - 2.0 mSv/h

After the measure
(At the work area protected by the L-shaped protective walls)

Air dose rate:
0.2 - 0.3mSv/h
(Reduced to 1/5 - 1/6)

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Measures for improvement in work efficiency (3)

Amount of reduced exposure dose by automated welding of freezing pipes

Data for Calculation		Values	Note
Dose rate (mSv/h)	a	0.13	・Reduction of work hours, attempted by automated welding for connecting freezing pipes.
Reduction of hours (min./pipe)	b	20	
Number of workers (man/day)	d	100	
No. of pipes	c	1500	(Reduction of Work Hours per One Freezing Pipe)
Rate (pipe/day)	e	8	・Welding by humans: 30 min/joint; Automated welding: 20 min/joint
			・No. of joints: 2 joints/pipe; Reduction of hours: (30 min - 20 min)*2=20 min/pipe
Reduced amt. of exp. rate(man*mSv)		Eq.: 0.13 mSv/h × 20/60 h × 100 man/day × 1500 ÷ 8/day =	-813 man*mSv

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2) Evaluation.

-Evaluation of the reduction of the total exposure dose (based on a quantitative analysis of the trade-off between “exposure dose” and “prevented potential exposure dose”.

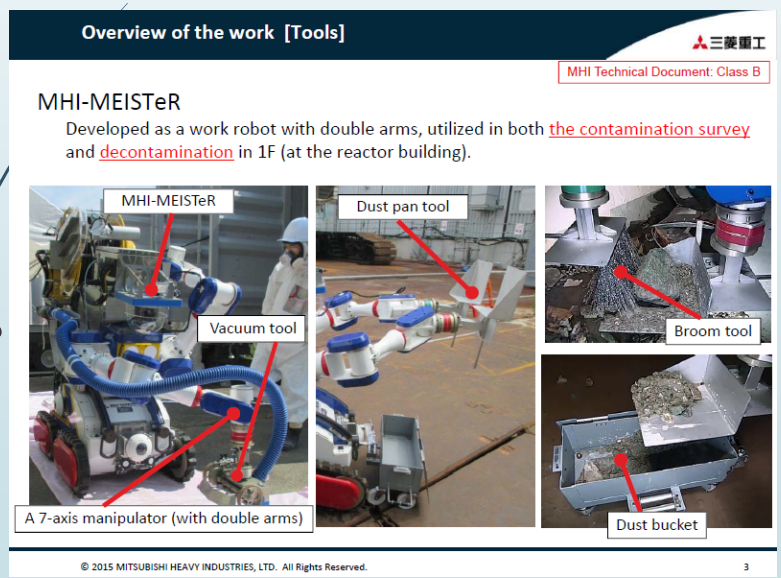
“Introduction of examples for reducing exposure dose during the decontamination at the reactor building (Fukushima Daiichi NPP unit 3)” (Mitsubishi)

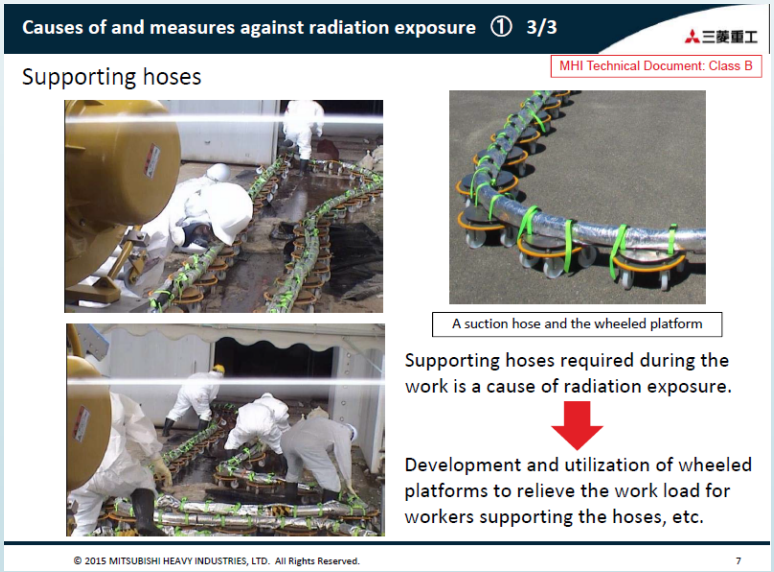
(Decontamination of the reactor buildings)

1) Development of remote decontamination technology in the reactor building.

-Reduction of the work load of the workers for the cables and hoses.

-Development and utilization of wheeled platforms.





2) Information exchange.

-information on the rest facilities and areas of low radiation was mutually shared.

“Dose rate reduction by decontamination of the reactor building at the Fukushima Daiichi NPP Unit 2” (Toshiba)

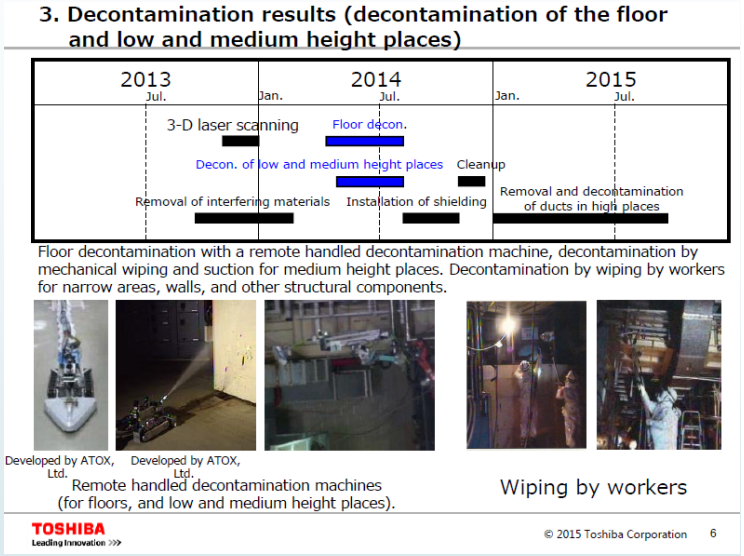
(Decontamination of the reactor buildings)

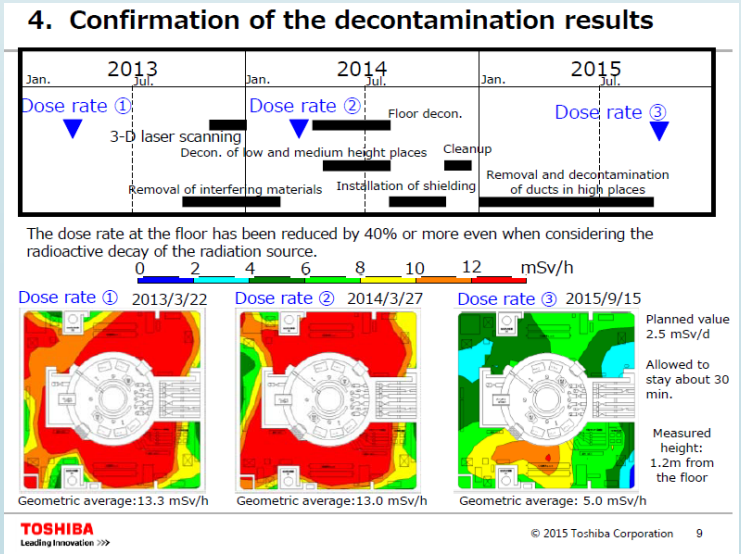
1) Decontamination of the reactor building using a remote handled decontamination machine.

-Removal of interfering objects.
-3D laser scanning.
-Decontamination of floor, and low and medium height places.
-Installation of shielding
-Cleanup
-Removal of ducts in high places

2) Confirmation of the decontamination results.

-The dose rate at the floor has been reduced by 40% or more.





“Activities to reduce exposure doses during disassembling bolted type tanks” (Taisei)

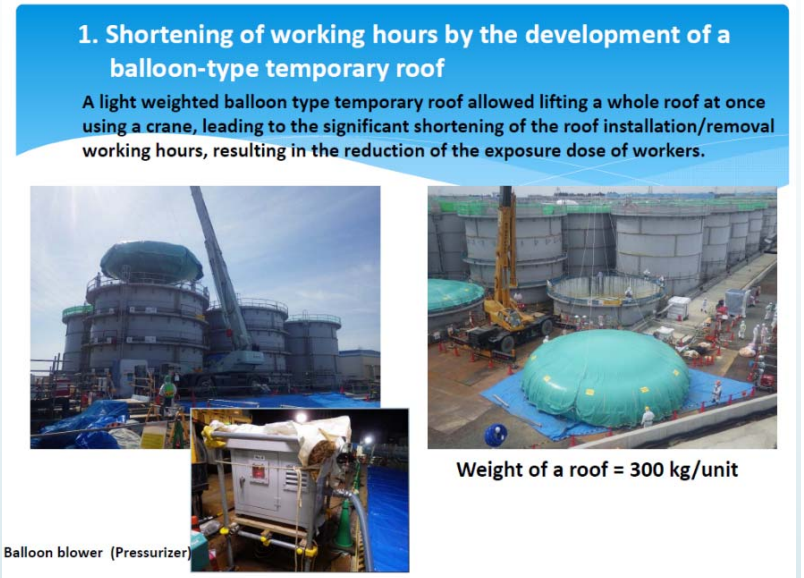
(Development of the balloon-type temporary roof)

1) Shortening of working hours by development of a balloon-type temporary roof.

-Development and installation of balloon-type temporary roof which can be put into place immediately using a crane.

2) Installation of shielding materials for work inside the tank.

-Installation of rubber mat on the floor and composite panels on the wall.



“Efforts for reducing radiation exposure during facing construction of slope areas” (Shimizu)

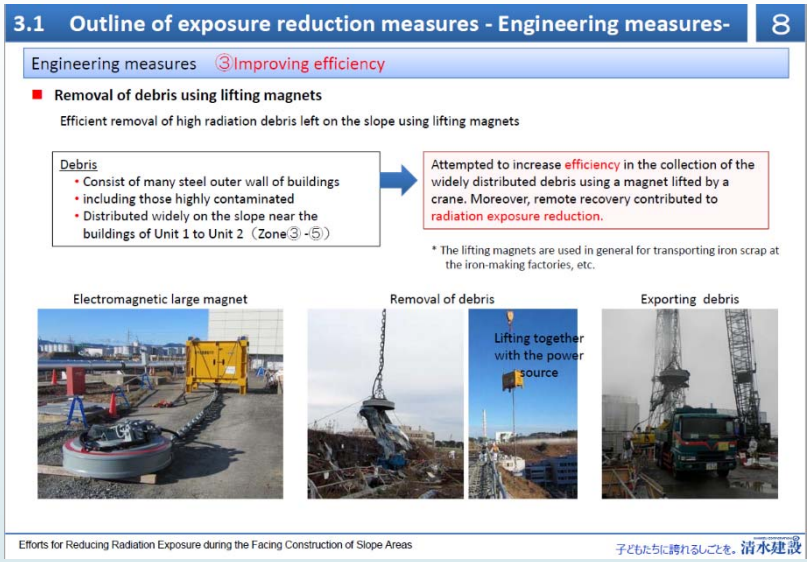
(Weeding, topsoil stripping, shotcrete for facing construction of slope area)

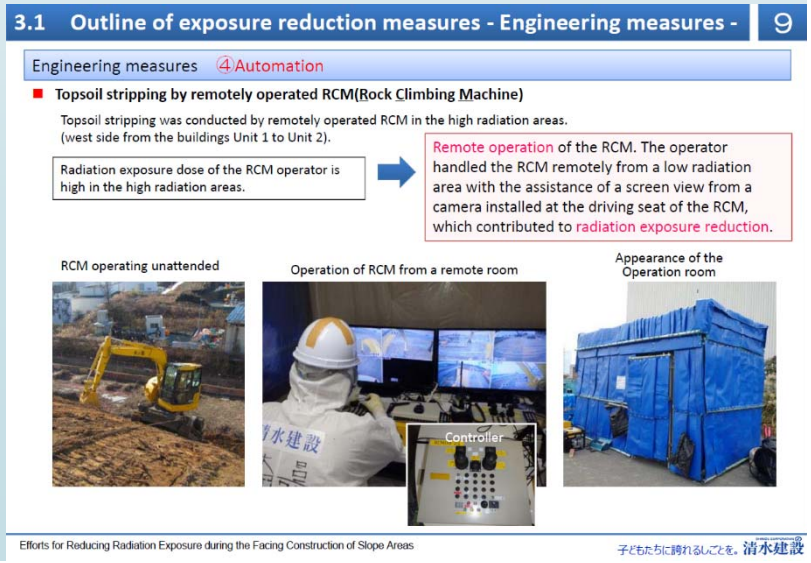
1) Remote recovery of debris using a large magnet.

-Collection of debris using a lifting magnet equipped with a strong magnet.

2) Automated RCM (Rock Climbing Machine).

-Topsoil stripping conducted by a remotely operated RCM in high radiation areas.





厚生労働省
Ministry of Health, Labour and Welfare

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In Focus: Radiation Protection at Works Relating to TEPCO's Fukushima Daiichi Nuclear Power Plant Accident (IRPW)



▶ What's New

- Jun 30, '16 Exposure Dose Distribution of the Workers at Fukushima Daiichi Nuclear Power Plant (Updated on 30 Jun 2016)

- Jun 24, '16 Start of a weekly on-site consultation desk to address health matters of decommissioning workers, etc.
- Apr 22, '16 Dose distribution among workers engaged in decontamination and related works, etc, per quarter {Flash report} [From January 2015 to December 2015] (by Radiation Effects Association)
- Apr 13, '16 Results of supervision and instruction activities for employers of decommissioning and decontamination workers at the TEPCO Fukushima Daiichi Nuclear Power Plant (in 2015)

TEPCO Fukushima Daiichi NPP

The status on the exposure dose, health care management and radiation protection of the workers at Fukushima Daiichi Nuclear Power Plant are shown.

- Status of Radiation Exposure
- Radiation Protection

Decontamination/Remediation

The status on radiation protection of the workers engaged in decontamination and remediation of contaminated materials derived from Fukushima Daiichi NPP Accident are shown.

- Decontamination/Remediation

Links

Japanese Government

- Prime Minister of Japan and His Cabinet
- Ministry of the Environment
- Reconstruction Agency
- Agency for Natural Resources and Energy
- Nuclear Regulation Authority

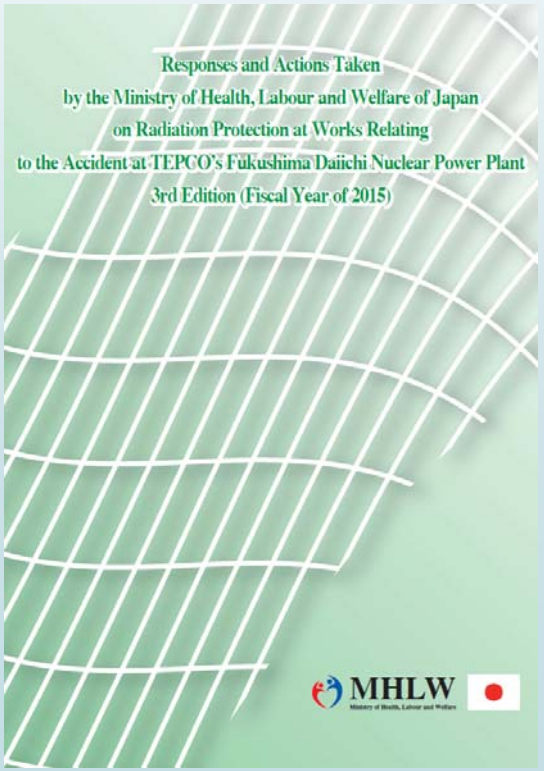
International Organization

- ILO:International Labour Organization
- WHO:World Health Organization
- UNSCEAR:United Nations Scientific Committee on the Effects of Atomic Radiation
- IAEA:International Atomic Energy Agency

http://www.mhlw.go.jp/english/topics/2011eq/workers/index.html

http://www.mhlw.go.jp/english/topics/2011eq/workers/tepco/gre/gre_151111.html

http://www.mhlw.go.jp/english/topics/2011eq/workers/ri/gr/gr_160131.pdf

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