2. Current Status of Fukushima Daiichi and Fukushima Daini Nuclear Power Station

(as of May 31, 2011)

Plant Status: Fukushima Daiichi

- Units 1-3: Injecting fresh water by temporary motor-driven pumps in order to cool the fuels in reactors.
- Units 1-4: Injecting fresh water from the top or via Fuel Pool Cooling System intermittently in order to cool the fuels in spent fuel pool.
- Units 1-3: Found contaminated water with high radioactive materials in turbine buildings. Pumping out of the water into the Central Radioactive Waste Disposal Facility, etc. is in progress.
- Unit 1: Injecting N_2 into PCV to lower the possibility of hydrogen explosion. Also scheduled for Units 2&3.
- Units 5&6: Under cold shutdown.
- Incidents assumed to be hydrogen explosion occurred at Unit 1 on March 12 and at Unit 3 on March 14. At that time it is also pointed that hydrogen explosion might have occurred at Unit 4; however, this is assumed to be caused by hydrogen gas generated at Unit 3 that flowed into Unit 4.

			#1 460MW	#2 784MW	#3 784MW	#4 784MW	#5 784MW	#6 1,100MW
Pre-Earthquake Status			**Operating**			**Shutdown for Outage**		
After Earthquake	**Shutdown**		○ **Automatic Shutdown**			—	—	—
	Cooling	**Reactor**	△ Offsite Power Freshwater	△ Offsite Power Freshwater	△ Offsite Power Freshwater	– Fuels have been removed	○ Cold Shutdown	○ Cold Shutdown
		Pool	△	△	△	△	○	○
	***Containment**		X Highly contaminated water	X Highly contaminated water	X Highly contaminated water	△	○	○

○ :functioning △: non-functioning (work in progress) X: non-functioning (not working)

*There are damages on upper part of the Reactor buildings of Unit 1,3 and 4. There is a possibility of malfunction of containment in suppression chamber of Unit2. Holes were drilled on the roof of reactor buildings of Units 5 and 6 to prevent hydrogen accumulation.

*Results of the provisional analysis show that the fuel pellets of Unit 1melted and fell to the bottom of RPV at a relatively early stage after the tsunami reached the plant. However, as the temperature of the RPV of Unit 1 is in the range of 100℃ - 120℃, stable cooling is being achieved.

Plant Status: Fukushima Daini

- Unit1-4: Automatic Shutdown, although operating at the time of the earthquake.
- Unit 3: Cold Shut down in 22hrs after the quake.
- Unit1,2 & 4: Although offsite power maintained, heat removal facilities for reactors were submerged due to the Tsunami. The heat removal functions were restored by the following recovery work.

		# 1 1,100MW	# 2 1,100MW	# 3 1,100MW	# 4 1,100MW
Pre-Earthquake Status		Operating			
After Earthquake	Shutdown	○			
	Cooling	○ (Cold Shutdown)			
	Containment	○			

○ :functioning △: non-functioning (work in progress) X: non-functioning (not working)

Plant Parameters (Fukushima Daiichi) as of May 30 at 13:00

RPV Pressure [MPa-g]

Unit 1	Unit 2	Unit 3
1.518	-0.011	-0.108

RPV Temp [℃]

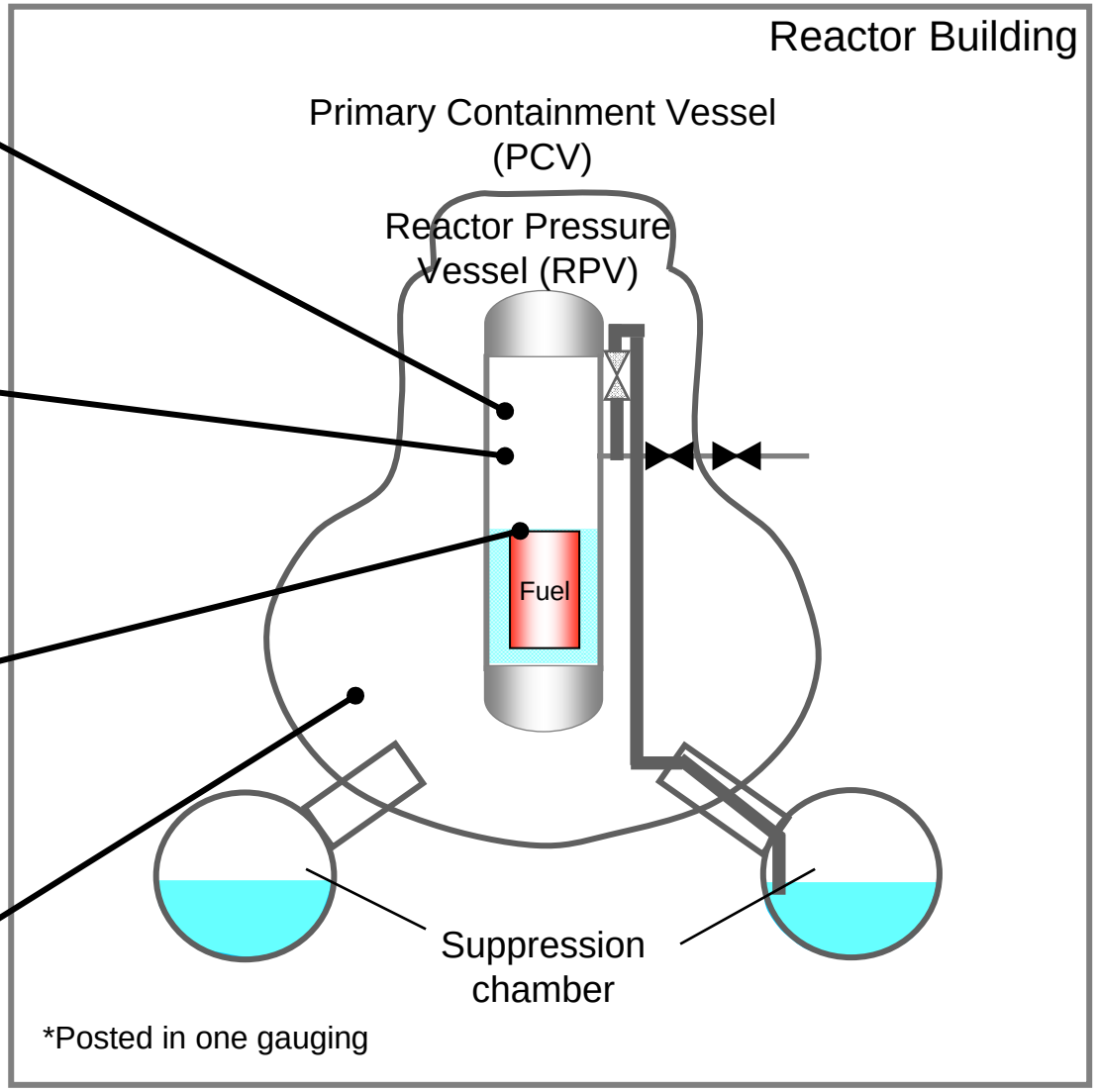
Unit 1	Unit 2	Unit 3
110.7 (Feedwater Nozzle)	110.4 (Feedwater Nozzle)	129.6 (bottom of RPV)

Reactor water level [mm]

Unit 1	Unit 2	Unit 3
Below the range	-2,100	-1,950

Drywell pressure [MPa-abs]

Unit 1	Unit 2	Unit 3
0.1297	0.030	0.0987



*We are judging the plant status by utilizing data obtained from multiple instruments including their changing trend in a comprehensive manner considering that some of them possibly are showing inaccurate data due to the irregular condition for use

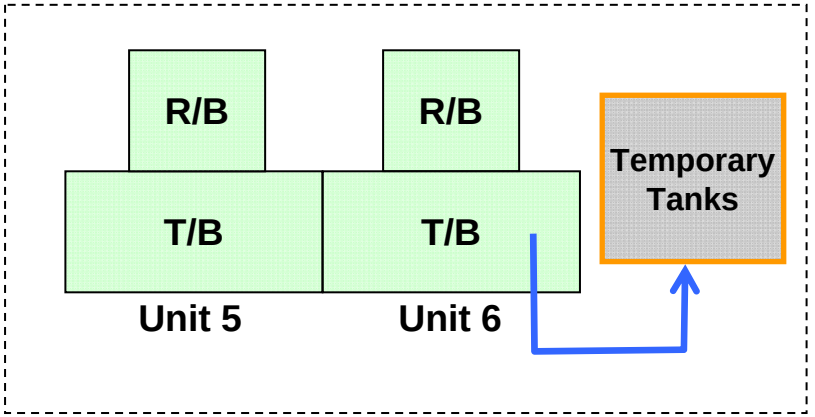
Pressure conversion: Gauge pressure (MPa-g)=absolute pressure (MPa-abs)-atmospheric pressure(0.1013Mpa)

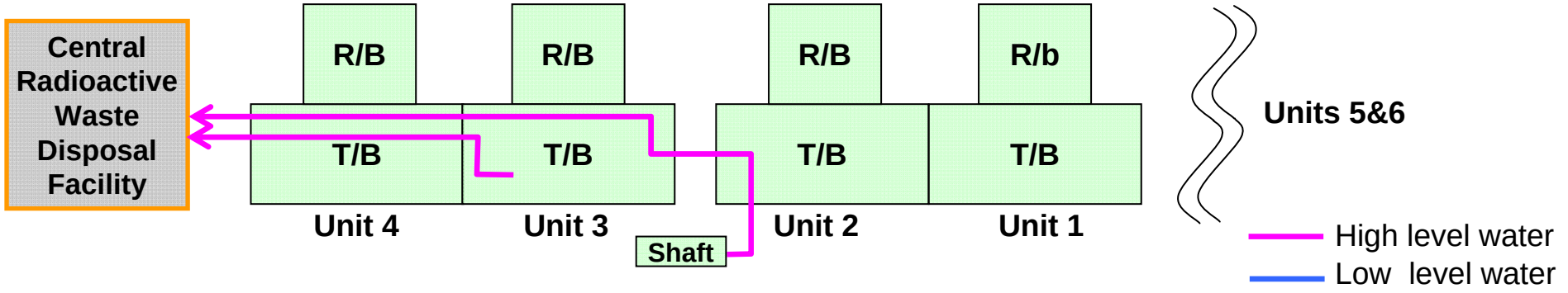
Measures against Accumulated Water at Fukushima Daiichi

- Contaminated water with high radioactive materials has been found in large quantity in turbine buildings etc.
- Transfer the water to Central Radioactive Waste Disposal Facility (CRWDF) etc, and store them safely to prevent them from running off outside the boundary.
  - ✓ Begun transferring the high level water in Unit 2 and Unit 3 to CRWDF (Currently suspended).
  - ✓ Transferring low level water in Turbine Building of Unit 6 to the temporary tanks.

Temporary tanks installed beside the Units 5&6

R/B: Reactor Building, T/B: Turbine Building





Countermeasures to Prevent Diffusion of Radioactive Materials

- Sprayed dust inhibitor agents to reduce spreading of powder dust containing radioactive materials on the ground. (Had been spraying intermittently since April 1st. Have been spraying at full-scale since April 26).
- Took following measures in order to prevent radioactive contaminated water from running off into the sea.
  - ✓ Injected coagulants from the holes near the shaft and confirmed the outflow stopped. (at 5:38 am, April 6)
  - ✓ Installed a rubber plate and jig to enhance water sealing.
  - ✓ Installed large sandbags and silt fences around the breakwater at the site.

Spraying dust inhibitor agents to the site yard

Coagulant injection to stop outflow

Inflective water cannon car

Borrowed from Tokyo Fire Department

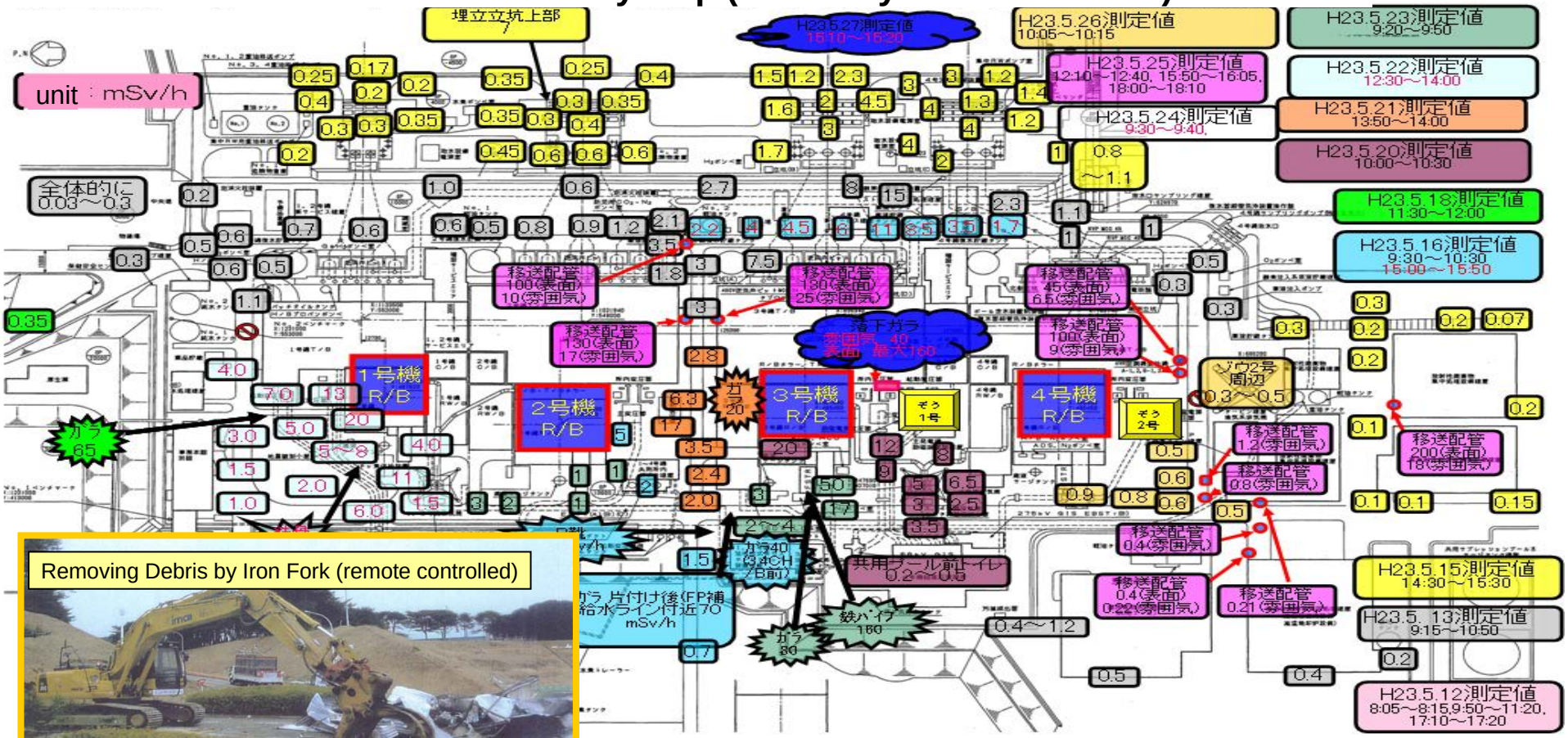
Spraying dust inhibitor agents to the buildings

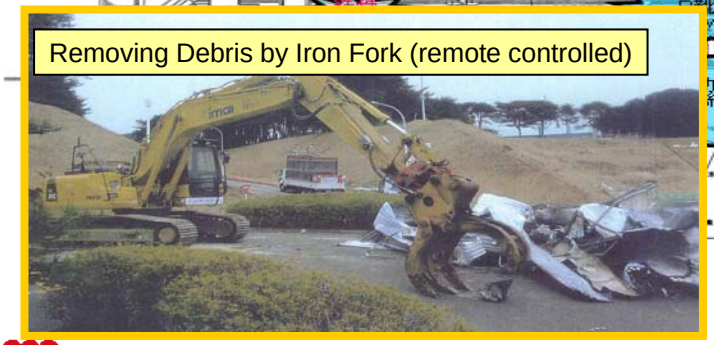
Silt fence installment

Measurement of Radiation Dose at the Power Station and Removal of Debris

- Onsite dose map has been compiled and attention has been called upon workers to reduce exposure during works on the site.
- Many debris are on the site and some of them are high radiation dose. These debris are being removed by using heavy machineries.

Fukushima Daiichi survey map (as of May 27th at 7:30 PM)





Radiation Protection for Workers

- Under high radiation circumstance at all area of Fukushima-Daiichi nuclear power station, we are managing and controlling radiation dose.
- It was confirmed that the effective exposure dose of two female employees were exceeded the statutory dose limit from May 1, 2011. We drew up and submitted recurrence prevention measures to the government at May 2.
- We will review the radiation control which was conducted at the time of earthquake and take the following actions in order to make a safer situation for the restoration work.

Radiation Protection Equipment and Control of Work

- Equipment for radiation protection： tyvek and glove is wore for working. Inhaler is wore when density of radioactive substances in the air exceeds the notification level. In addition, anorack etc. are also considered according to weather and pollution situation of a work site.
- Work management：When making working plans, we conduct thorough pre-survey and inform to secure safety, and avoid exposure as much as possible by appropriate management such as indication of high radioactive area by rope.

Main Anti-Earthquake Building

External Radiation Dose Control

- When employees work outdoors, we will make them carry their dosimeters to manage their radiation dose. We will procure the required number of dosimeters soon and, until then, we will make a representative carry his dosimeter and we will conduct evaluations.

Internal Radiation Dose Control

- To reduce internal exposure, all the staffs are periodically measured once in a month (normally once in 3 months).

Compliance with Radiation Limitation

- In case that external exposure exceeds 100 mSV → Internal exposure is evaluated by a whole body counter.
- In case that external exposure exceeds 150 mSV → Judgment for continuation of work is made.
- In case that total exposure (external and internal) exceeds 200 mSv → They are not assigned for work.

statutory dose limit ※

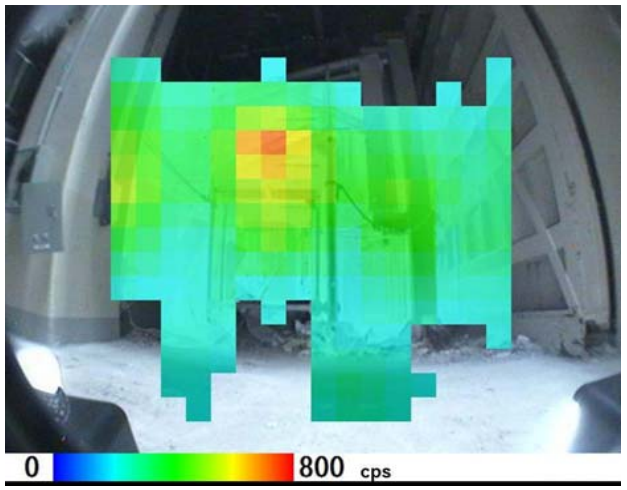
Male：50mSv / 1year and 100mSv / 5year, Female：5mSv / 3month

※At Fukushima-daiichi nuclear power station, dose limit has raised up to 250 mSv limited to unavoidable emergency case.

Entrance into the Reactor Buildings

- Workers have entered into the reactor buildings and implemented radiation survey or instrument checkup, etc in Units 1~3.

Instrument checkup (Unit 1)



Radiation survey (Unit 1)

Entrance into the reactor building (Unit 2)

Radiation survey (Unit 2)

Survey inside Reactor Buildings by Robots

- Measurements of dose, etc were carried out by remote control robots inside the Double Doors (D/D) of reactor buildings (R/B) of Units 1-3, where previously it was assumed to be impossible to enter due to anticipated high dose.
- Examining how to utilize robots for field surveys such as measuring radiation dose indoors and outdoors.

Opening a double door (April 18)

<Measurement Results>

	Unit 1	Unit 2	Unit 3
Date	4/17 16:00~17:00	4/18 13:42~14:33	4/17 11:30~14:00
Measuring Area	R/B 1st floor Northern D/D ~ Elevator	R/B 1st floor Around southern D/D	R/B 1st floor Around southern D/D
Radiation dose	49mSv/h(Max) 10mSv/h(Min)	4.1mSv/h (D/D opened)	57mSv/h(Max) 28mSv/h(Min)
Temperature	Approx. 28~29℃	Approx. 34~41℃	Approx. 19~22℃
Humidity	Approx. 49~56%	Approx. 94~99%	Approx.32~35%
Oxygen density	Approx. 21%	Approx.19~20%	Approx. 21%

(provisional figure)

<List of Robots Provided to TEPCO>

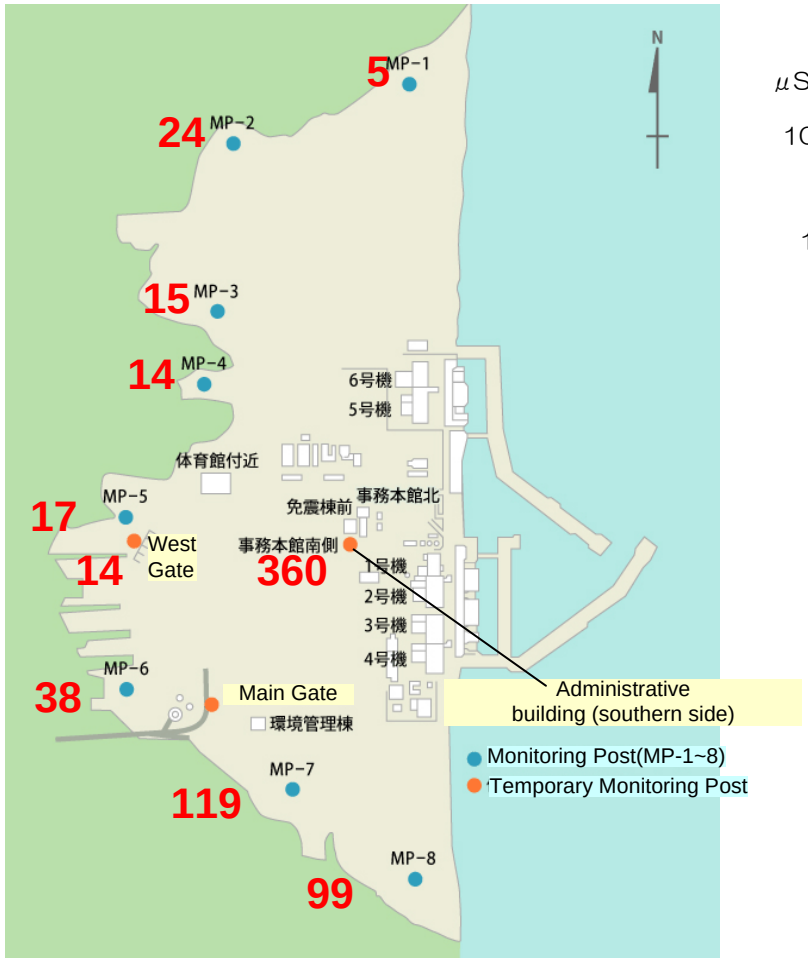
Manufactures	Robots by iRobot		Robots by QinetiQ	
				
Name	Packbot	Warrior	Talon	Dragon Runner
Monitoring function	image	Image only	image	Image only
	Radiation etc.	—	Radiation etc.	—
Arm retention capability	○	◎	○	○

Monitoring Data (at Site Boundary of Fukushima Daiichi)

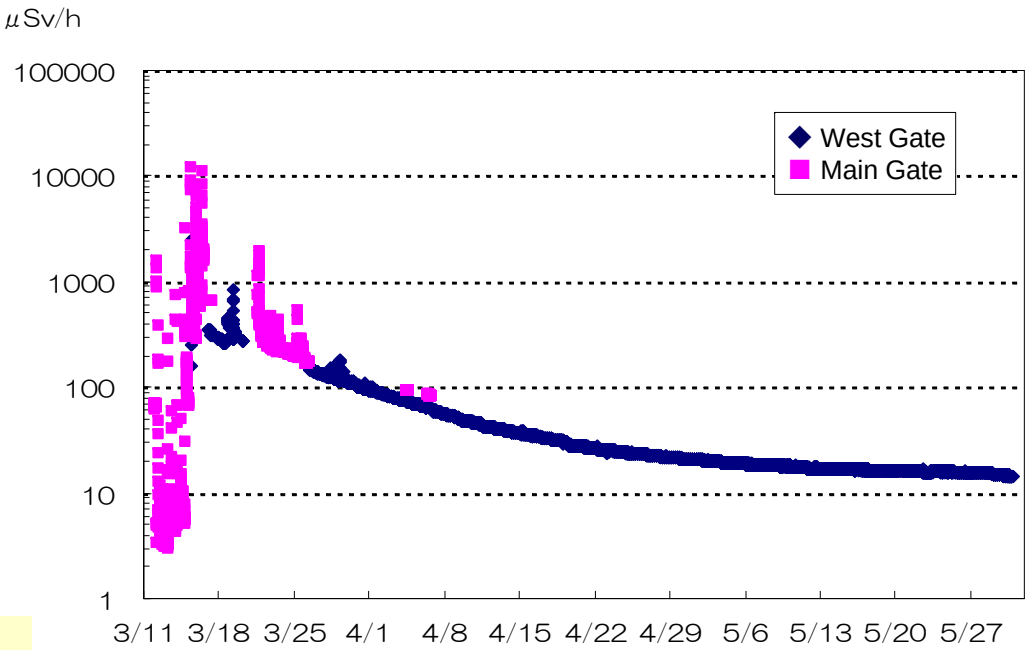
- Monitoring data at the site boundary of Fukushima Daiichi.
- We Continue to monitor the surrounding environment.

Monitoring post air dose rate

: μSv/h as of 9:00 pm on May 30th , 2011



Dose Rate Trend at the Site Boundary of Fukushima Daiichi



Nuclide Analysis Data Sampled in and Near the Site

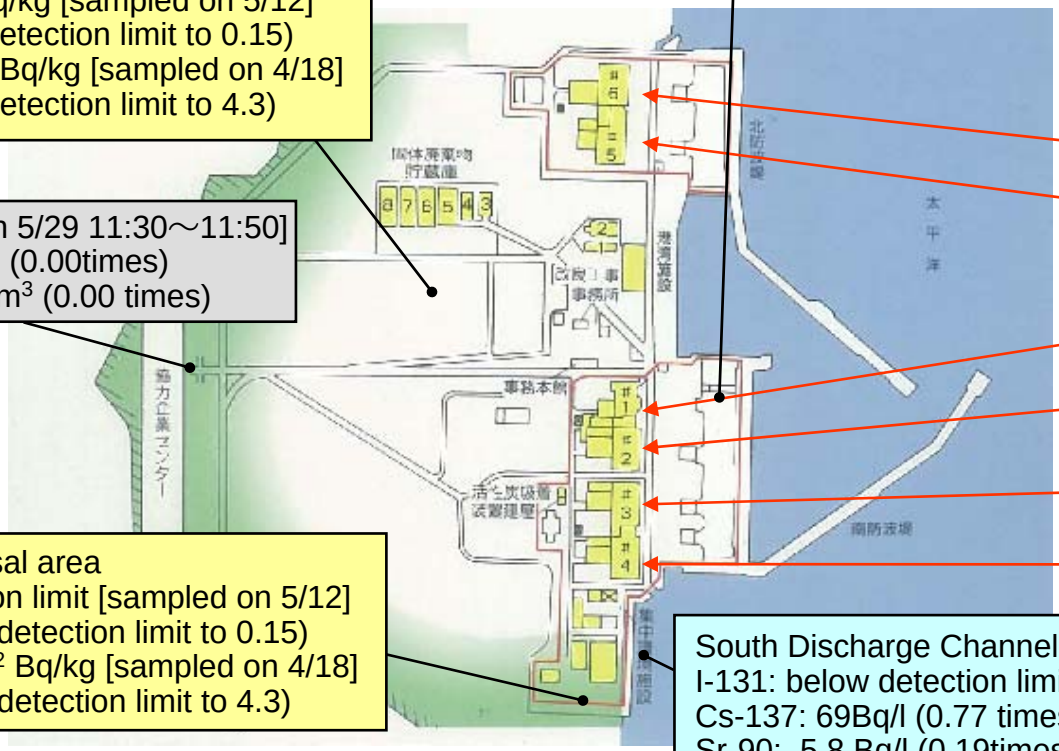
- Plutonium and strontium were detected from the soil at the site.
- We continue to monitor the surrounding environment.

＜Result of nuclear species analysis*＞

Ground
Pu-238: 0.11±0.022 Bq/kg [sampled on 5/12]
(normal level is below detection limit to 0.15)
Sr-90: (4.0±0.05)X10^2 Bq/kg [sampled on 4/18]
(normal level is below detection limit to 4.3)

North Discharge Channel of Units 1~4
I-131: 660Bq/l (17 times) [sampled on 5/29 6:13]
Cs-137: 1500 Bq/l (17 times) [sampled on 5/29 6:13]

West gate [sampled on 5/29 11:30～11:50]
I-131: 2.2X10^{-6} Bq/cm^3 (0.00times)
Cs-137: 7.5X10^{-6} Bq/cm^3 (0.00 times)



Industrial waste disposal area
Pu-238: below detection limit [sampled on 5/12]
(normal level is below detection limit to 0.15)
Sr-90: (5.7±0.06)X10^2 Bq/kg [sampled on 4/18]
(normal level is below detection limit to 4.3)

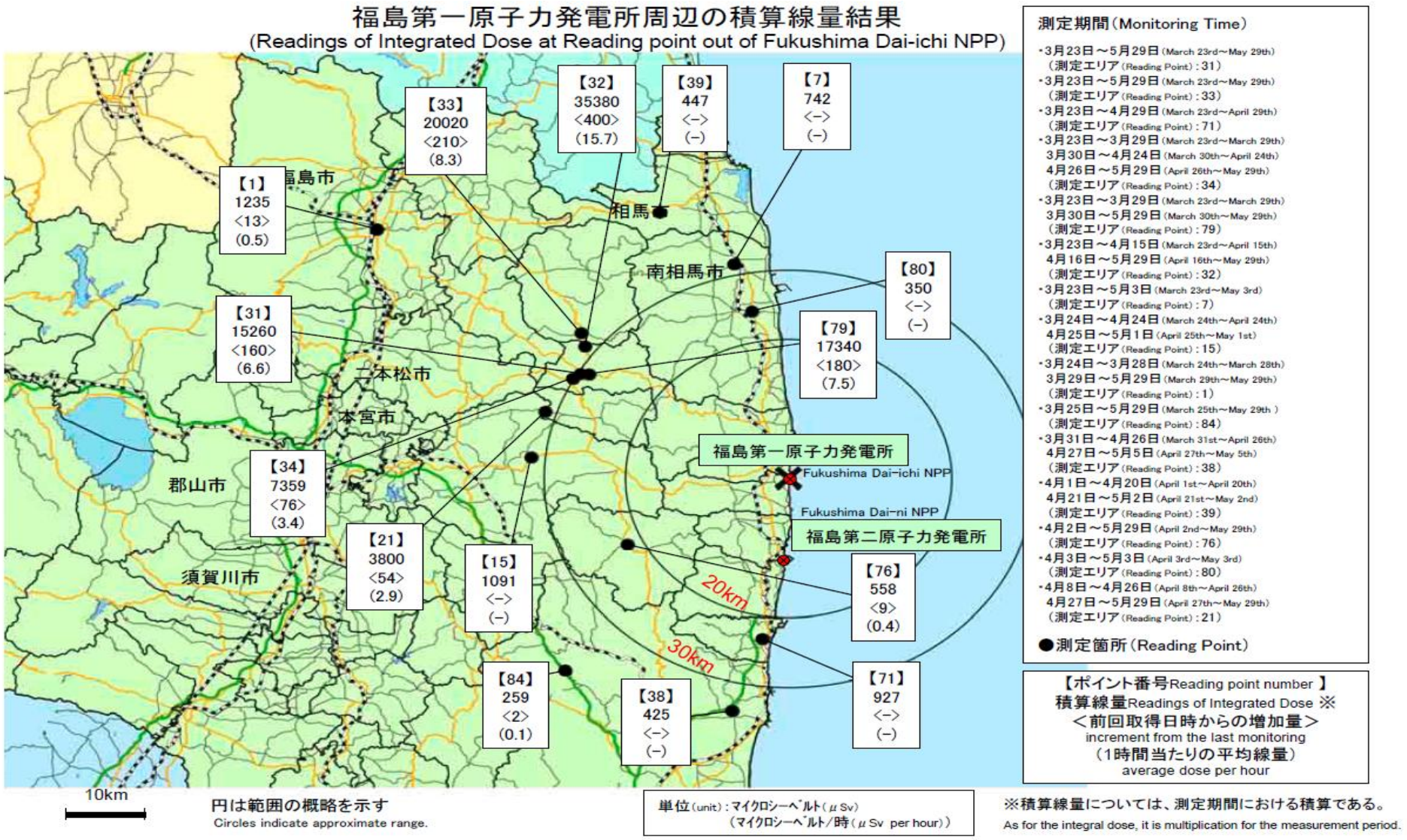
South Discharge Channel
I-131: below detection limit [sampled on 5/29 13:10]
Cs-137: 69Bq/l (0.77 times) [sampled on 5/29 13:10]
Sr-90: 5.8 Bq/l (0.19times) [sampled on 4/18]

*Representative nuclides concentration described out of detected nuclides
(times in the bracket is the ratio of concentration limit by law)
*We have been sampling many other places.

: sea water : air : soil
I : Iodine, Cs : Cesium, Pu : Plutonium, Sr : Strontium

Monitoring Data (Surroundings of Fukushima Daiichi)

- Accumulated dose in surrounding areas of Fukushima Daiichi (～29 May)



Source: Ministry of Education, Culture, Sports, Science and Technology

Evacuation

- The government took measures such as taking shelters or evacuation as follows based on the reports from Fukushima Daiichi & Daini.

Fri, 11 March

14:46 The earthquake occurred
19:03 Emergency Declaration by the Gov't (Daiichi)
21:23 3 km radius evacuation (Daiichi)
10 km radius taking shelter (Daiichi)

Sat, 12 March

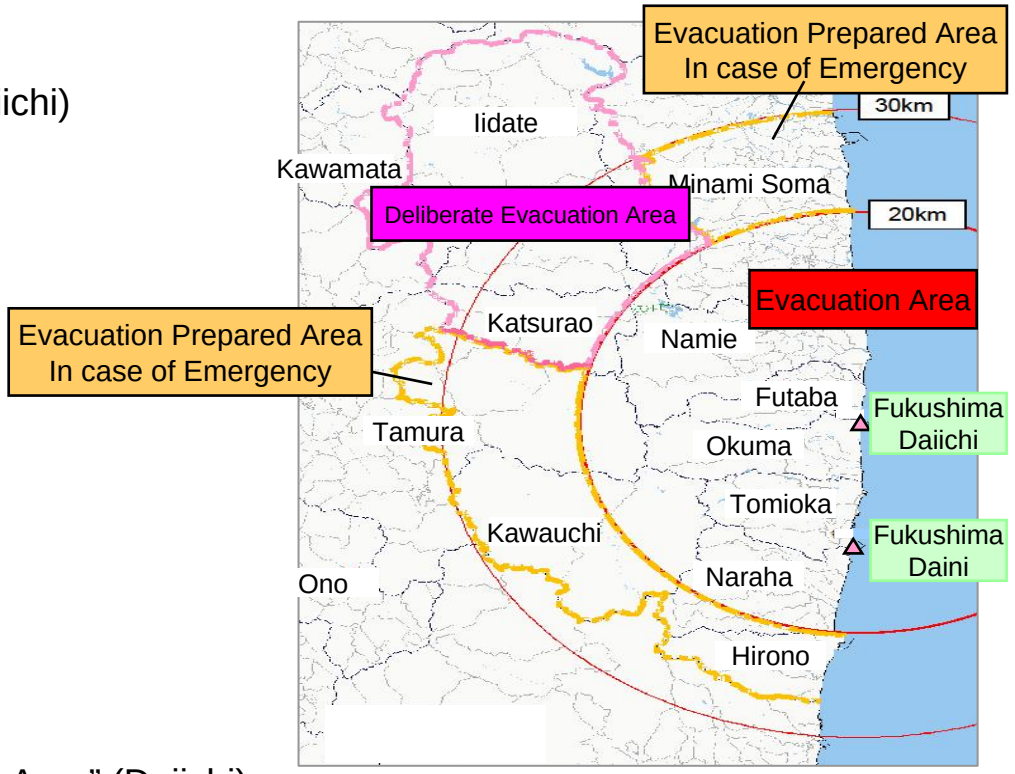
5:44 10 km radius evacuation (Daiichi)
7:45 3 km radius evacuation (Daini)
10 km radius taking shelter (Daini)
17:39 10 km radius evacuation (Daini)
18:25 20 km radius evacuation (Daiichi)

Tue, 15 March

11:00 20-30 km radius taking shelter (Daiichi)

Thu, 21 April

11:00 20 km radius is designated as "Restricted Area" (Daiichi)



Source: NISA website

Fri, 22 April

9:44 20-30 km radius taking shelter has been lifted (Daiichi)
Establishment of "Planned Evacuation Area" and "Emergency Preparation Area"

Impacts to Food and Water

- Since March 21, radioactive materials that exceed provisional standard set by the Ministry of Health, Labour and Welfare have been detected from vegetables, milk and tap water, which led to the restriction of food distribution, etc.

Vegetables, milk, fish		Fukushima pref.		Ibaraki pref.	Tochigi pref.	Gunma pref.	Chiba pref.
		All area	By region	Kitaibaraki city, Takahagi city			
Non-head leaf vegetables	spinach	D.R. , C.R.	Lifted*1	D.R.	—	—	—
	All other Non-head leaf vegetables			—	—	—	—
head leaf vegetables		D.R. , C.R.	Lifted*2	—	—	—	—
flowerhead brassicas		D.R. , C.R.	Lifted*3	—	—	—	—
turnip		D.R.	Lifted*4	—	—	—	—
parsley, celery		—	—	—	—	—	—
log-grown shiitake (grown outdoor)		—	D.R.*5, C.R.*6	—	—	—	—
Bamboo shoot		—	D.R.*7	—	—	—	—
Ostrich Fern		—	D.R.*8	—	—	—	—
sand lance (juvenile)		D.R. , C.R.	—	—	—	—	—
raw milk		D.R.	Lifted*9	—	—	—	—
Tap water		—	—	—	—	—	—

D.R.: Distribution Restricted, C.R.: Consumption Restricted (as of May 30, 2011)　Voluntary restraint is excluded

*1 Shirakawa, Iwaki, Yabuki, Tanagura, Yamatsuri, Hanawa, Nishigo, Izumizaki, Nakajima, Samegawa, Aizuwakamatsu, Bandai, Inawashiro, Kitakata, Kitashiobara, Nishiaizu, Aizumisato, Aizubange, Yugawa, Yanaizu, Mishima, Kaneyama, Syouwa, Minamiaizu, Shimogou, Hinoemata, Tadami, Shinchi, Soma, Minamisoma(excluding area within 20 km of the Fukushima Daiichi) were lifted.
*2 Aizuwakamatsu, Bandai, Inawashiro, Kitakata, Kitashiobara, Nishiaizu, Aizumisato, Aizubange, Yugawa, Yanaizu, Mishima, Kaneyama, Syouwa, Minamiaizu, Shimogou, Hinoemata, Tadami, Koriyama, Sukagawa, Tamura (excluding area within 20 km of the Fukushima Daiichi), Iwaki, Kagamiishi, Ishikawa, Asakawa, Furudono, Miharu, Ono, Tenei, Tamagawa, Hirata, Fukushima, Nihonmatsu, Date, Motomiya, Kori, Kunimi, Kawamata (excluding Yamakiya area), Otama, Shirakawa, Yabuki, Tanagura, Yamatsuri, Hanawa, Nishigo, Izumizaki, Nakajima, Samegawa, Shinchi, Soma, Minamisoma(excluding area within 20 km of the Fukushima Daiichi)were lifted.
*3 Shirakawa, Yabuki, Nishigou, Izumizaki, Nakajima, Tanagura, Yamatsuri, Hanawa, Samegawa, Iwaki, Koriyama, Sukagawa, Tamura (excluding area within 20 km of the Fukushima Daiich), Kagamiishi, Tenei, Ishikawa, Tamagawa, Hirata, Asakawa, Furudono, Miharu, Ono were lifted.
*4 Fukushima, Nihonmatsu, Date, Motomiya, Koriyama, Sukagawa, Tamura (excluding area within 20 km of the Fukushima Daiich), Iwaki, Kori, Kunimi, Kawamata (excluding Yamakiya area), Kagamiishi, Ishikawa, Asakawa, Furudono, Miharu, Ono, Otama, Tenei, Tamakawa, Hirata were lifted.
*5 Date, Iitate, Soma, Minamisoma, Namie, Futaba, Okuma, Tomioka, Naraha, Hirono, Kawamata, Katsurao, Tamura (limited within 20 km of the Fukushima Daiich), Kawauchi (limited within 20 km of the Fukushima Daiich),, Fukushima, Motomiya
*6 Iitate　*7 Date, Soma, Iwaki, Miharu, Tenei, Hirata , Minamisoma, Motomiya, Kori, Kunimi, Kawamata, Nishigo, Hirata　*8 Fukushima, Kori
*9 Kitakata, Bandai, Inawashiro, Mishima, Aizumisato, Shimogou, Minamiaizu, Fukushima, Nihonmatsu, Date, Motomiya, Kunimi, Otama, Koriyama, Sukagawa, Tamura（excluding miyakoji area）, Miharu, Ono, Kagamiishi, Ishikawa, Asakawa, Hirata, Furudono, Shirakawa, Yabuki, Izumizaki, Nakajima, Nishigo, Samegawa, Hanawa, Yamatsuri, Iwaki, Soma, Shinchi, Minamisoma (limited to Kashima-ku excluding Karasuzaki, Ouchi, Kawago and Shionosaki area), Kawamata (excluding Yamakiya area) were lifted.

Source : web site by the Ministry of Health, Labour and Welfare

Relationship between Health and Radiation Dose

Radiation exposure in daily life

10000

（Whole body exposure）99% mortality　7,000～10,000

1000

（Whole body exposure）50% mortality　3,000～5,000

（Whole body exposure）decrease of lymphocyte　500

100

Maximum permitted for staff working in emergency cases (only Fukushima Daiichi case)　250

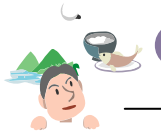
Maximum permitted for staff working in emergency cases (ordinary)　100

Maximum permitted for radiation workers in one year　50

10

Natural Radiation at Guarapari Beach, Brazil (per year)　10

Chest X-Ray computed tomography (one time)　6.9



Natural Radiation per person (per year, world average)　2.4

1

Regular public space (except medical area)　1.0

Abdominal X-Ray for health check up (one time)　0.6

0.1

Tokyo – New York flight (round trip)　0.19

(radiation varies depending on the flight altitude)

The target figure around Nuclear Power Plant area (per year)　0.05

(Note) The amount of natural radiation is including the effect of inhalation of Radon.
(source) UNSCEAR 2000 Report, "Sources and Effects of Ionizing Radiation" etc.

Government's Guidance of Compensation for Nuclear Damages and Payment of "Temporary Compensation"

- The government's " Economic Damage Response Headquarters" decided to make TEPCO pay expenses needed at the moment as Temporary Compensation to the people forced to evacuate due to the accident. Pursuant to the decision, TEPCO is disbursing 1 million yen per household and 750 thousand yen per individual's household as Temporary Compensation as appropriation to damages caused by the evacuation. Intended areas for payment of Temporary Compensation are: Evacuation Area; Indoors Evacuation Area; Deliberate Evacuation Area; Evacuation Prepared Area in Case of Emergency.

- The guidance of compensation was discussed at the Nuclear Damages Compensation Dispute Committee set up under MEXT on April 11th and the first guidance was announced on April 28th.
- Intended damages covered by the first guidance about deciding damage:
  - Damages caused by government's evacuation directions : evacuating expense, business losses, losses accompanied by being unable to work, losses or decreases of the value of estates, inspection expenses (person, possession), damages to the life or body, mental damages
  - Damages caused by government's directions for danger area for cruise : business losses, losses accompanied by being unable to work
  - Damages caused by government's directions for the restriction of distribution: business losses, losses accompanied by being unable to work

On April 28th 2011, the "Fukushima Nuclear Compensation Office" was established to provide consultation concerning financial compensation related to the damage caused by the nuclear accident.

In addition, "Compensation Consultation Center (Call center)" under the Fukushima Nuclear Compensation Office to handle matters related to losses caused by the nuclear accident including temporary compensations and regional consultation centers to handle consultations concerning visitations have been established.